



This is to certify that the

thesis entitled

THE EFFECTS OF URBANIZATION ON AGRICULTURAL
LAND USE IN LOWER MICHIGAN

presented by

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has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Agricultural
Economics


Major professor

Date April 14, 1958



THE EFFECTS OF URBANIZATION ON AGRICULTURAL
LAND USE IN LOWER MICHIGAN

By

Clarence W. Jensen

AN ABSTRACT

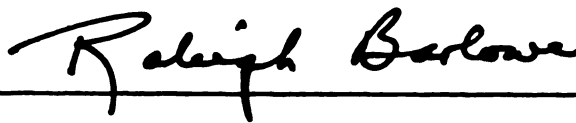
Submitted to the School for Advanced Graduate Studies of
Michigan State University of Agriculture and
Applied Science in partial fulfillment of
the requirements for the degree of

DOCTOR OF PHILOSOPHY

Department of Agricultural Economics

1958

Approved

A handwritten signature in dark ink, reading "Raleigh Barlowe", is written over a horizontal line.

Clarence W. Jensen

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Agriculture in Lower Michigan, as elsewhere, has been releasing a great many acres of land to urban and other non-agricultural uses of land at varying rates since urban areas first began developing. The most recent upsurge in the outward expansion of the urban population began during the war-time years of the 1940's. During this period, the state of Michigan experienced a large influx of migrants to its war, and other, industries.

Fringe area studies completed during the last ten to fifteen years have noted the trend of urban people toward the suburbs and rural area residences. Such movements have brought many problems to a large number of areas, many of which were ill-equipped to handle them.

This treatise has attempted to indicate what some of the effects of such population movements might be upon the agricultural sector of the economy. The area of study is limited to the lower 38 counties in the state of Michigan. It is here that the majority of the urbanizing of large land areas has taken place, and here that the effects of urbanization would be most strongly felt.

An inventory of land uses in the study area discloses a very substantial acreage of land that has moved into urban and urban-related uses. Since 1940, urban and related land acreages in the major city areas of the study area have increased by more than 385,000 acres. Urban land acres amount to slightly more than one-half of the total in non-agricultural uses of land.

Clarence W. Jensen

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Other land uses, public in nature, are becoming increasingly important in the acreages required to meet the needs of an expanding urban population. Such land uses as highways and roads, parks, recreation areas, and Metropolitan Authority parks are expanding rapidly as the population becomes more demanding of services for transportation and recreation facilities.

When townships are arrayed in concentric rings around the central cities, the effect of urbanization upon agriculture is quite evident. Farms nearer the city are fewer and smaller, and generally have a larger proportion of their cropland left idle.

Statistical regression tests relating rural non-farm population to the pattern of land use by county also indicate non-farm population effects upon farms in the area. When counties are arrayed according to their percentage of rural non-farm population, considerable impact upon agricultural land use is noted. Especially significant is the large increase in extremely small farms, in the number of part-time farms, and in the amount of farmland that is rented out as the rural non-farm population percentage increases.

No effect of urbanization was noted upon the intensity of grazing, where the measure of this was the per cent of the total farm pastured, and animal units per acre of pasture. Neither was there any significance in the relationship between rural non-farm population and the proportion of cropland devoted to grain crops, hay and legumes, or other crops.

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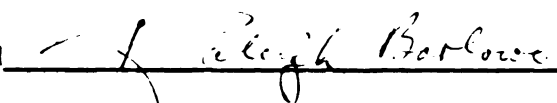
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ACKNOWLEDGEMENTS

The author is indebted to Dr. Raleigh Barlowe, chairman of the guidance committee, for his counsel and guidance during the development and completion of this thesis, and to Dr's. V. E. Smith and L. W. Witt who helped plan the author's graduate program and reviewed the manuscript.

Also appreciated are the suggestions and encouragement received from other staff members at Michigan State University and by colleagues at Montana State College. Thanks are also due a wife and family whose patience was often tried, to Mr. Charlie Liu, graduate student at Montana State College, who assisted with some of the tabulations, and to Mrs. Catherine Lewis for her time and effort in typing the manuscript. Any errors and omissions are the responsibility of the author.

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CHAPTER I

INTRODUCTION

An increasing amount of interest is being shown in the more recent phenomena of population expansion and residential location commonly referred to as "urbanization".¹ More and more studies are being conducted throughout the nation to determine the causes and effects of these occurrences in an attempt to find solutions to the many problems that arise in connection with urbanization. These problems are a result of an ever increasing number, as well as proportion, of our population and business firms seeking locations away from the more congested urban centers. Because of the characteristics of automobiles, truck transportation, and highway systems, especially prior to the late 1920's, urban people were pretty much tied to the location of their employment, being forced by circumstances to establish their homes either within walking distance of their jobs,

¹The term "urbanization" as used here is intended to include the full variety of urban and urban-type developments such as residential site platting, streets, service areas and roads, industrial uses of land for factory sites, roadside shops, stores, filling stations, drive-in theatres, recreation area developments, and any other non-agricultural uses to which agricultural lands may be put. With such a definition, urbanization includes also the many homesites, or rural residences, that may be found out beyond any platted or developed residential area which may or may not be contiguous to the city proper -- thus excluding only the incorporated area of the city itself. Admittedly, this definition goes considerably beyond those of the "fringe", the "urban fringe", the rural-urban fringe, the "commuter zone", and many others as delimited and defined in various political, sociologic, and economic studies conducted in the past. But this study also encompasses a much greater area and requires a much broader definition of the term.

or depend upon public transportation of one form or another. Industries were, likewise, more or less tied to specific area locations along railroads or navigable waterways.

Areal restrictions of this sort typically resulted in population movements toward the city proper. Multi-storied apartment buildings were constructed, and often the platting of residential building lots were platted at the very minimum size that would allow the construction of homes upon them. The attraction of urban industrial employment, coupled with relatively low returns to agricultural labor and a consequent exodus of farm people to the city, caused a considerable increase in pressure of urban population for living and business space.

The 1930's, and following years, have seen a reversal of that trend with populations in the rural areas showing much more rapid gains than the urban populations. This has come about from changes in many things, including the thinking and attitudes of both rural and urban people. Rapid improvements in automobile performance, truck transportation, and increased mileages of improved highways and roads have increased the mobility of the population. This has permitted people to live farther from their places of employment. At the same time, many people have shown a desire for "a place in the country" on which to plant a garden, farm on a part-time basis, or simply to hold land as an investment for future sale. Many more have located homes in the country for purposes of health, more open space for family living and enjoyment, and a good many other reasons, without regard to the possible agricultural values of the land they own.

The urbanization movement, with its consequent development of agricultural land for urban and urban-oriented uses, has been especially evident around the larger cities in Lower Michigan for a number of years. However, even the smaller cities of 5,000 - 10,000 and less, have been experiencing the same sort of development, though on a much smaller scale.

One might typify the current pattern of development as, first, the irregular absorption of the very near fringe farms, or parts of them, for residential or industrial sites, and later, a continually expanding population spilling outward over this newer boundary, with many families showing a desire for even more open country by going out a considerable distance beyond the fringe of the city to take up their residences.

Along with this has come the development of roadside small-business and residential areas, spreading onward before the widening area of the more highly developed residential sections of the suburbs, often forming a complete link of urban-type land uses between various pairs of cities. These "ribbon" developments -- the buying of sufficient frontage along the main highways and improved, connecting side-roads for business establishments or residential needs -- are everywhere evident in the Lower Michigan area. Such frontages are whittled out of existing farms, the farm owner possibly hoping that he can continue an efficient, though smaller, farming operation; that he can obtain additional acreages back away from the highway to re-establish the size of this previous operation at a lower cost; or that he may be able to hold out a while longer with

his smaller farm acreage, and that sooner or later the urbanization movement will be appropriating his entire farm at such a price that he profit by selling and moving farther out, possibly to another farm and to another similar process of piecemeal sales of his farm acreages.

Objectives of the Study

In the critical periods of the last 15 - 20 years, especially during World War II and the Korean conflict, there was considerable concern expressed over the ability of our nation's farmers to provide agricultural products in sufficient quantities to fulfill the needs of the United States and its Allies.

Since that period as well, many people have expressed concern over the increasing amounts of agricultural land being taken up for uses other than agricultural production. There are many who predict dire consequences for our productive capacity in agriculture if the present-day trend is allowed to continue without some form of regulation that would keep our better grades of agricultural land in production and force urban expansions into those areas least suited for agriculture, thereby reserving our agricultural land base with which to meet our future food needs.

That this may or may not be a very serious question depends upon technological developments in the agricultural industry and the future growth of our population, as well as the amount of farm land that we might maintain. If our agriculture is unable to keep pace with an expanding population, there will be a time in the not too distant future when a growing part of our food needs will have to be imported.

However, if technological developments occur with such rapidity as they have since the depression of the 1930's, this would serve to push farther back into the future the time when population pressures on the food producing land base become too great for the land to be able to satisfy that need.

How we react to these prospects is not simply a matter of "faith" in our future technological abilities, but one's judgment of future developments in the technical field as well as population growth. This will determine our reactions and affect the expressions of doubt (or belief) that future food needs cannot (or can) be satisfied.

That we are losing more and more of our agricultural land must be admitted; that we are soon to fail to meet our food production needs is a much more controversial matter. Crystal balls with which to predict the future are not available to us, but we can make a partial approach to the problem by evaluating the effects from the side of population growth and movement, and the way in which this has affected the agricultural sector of the economy up to the present.

Only a limited amount of urbanization data has been made available from an economic standpoint, the majority of such research being of a political or sociological nature.

The economic problems associated with urbanization were made the subject of a study, begun in 1951, of two sample areas outside the

developed areas of the Lansing-East Lansing suburbs.² The sample areas chosen were out beyond the last platted land of the suburbs of these cities to insure a study of an area that was still in the process of ripening from agricultural to urban-type land uses. This was set up as a first-phase, pilot study attempting to measure the impact of urbanization on land use and productivity, land and property values, and to determine the more urgent community problems arising from the urbanization movement along with the reactions of the residents to these problems.

As a second phase, the present study follows with four general objectives. The first will be to determine the amount of agricultural land that has been lost to industrial and urban developments, highways, parks, and other urban-type land uses. An inventory is to be made of the past and present uses of land within the townships included in the area of the state covered by this study. A second purpose is to determine the impact of rural residences and part-time farms on agricultural production. Some emphasis will be given to the types of agricultural land uses in those areas which have experienced the greatest increase in urban-employed people and in part-time farming being carried on. The third objective is to determine the total effects of urban and urban-type land uses, rural residences and part-time farming on agricultural production, including shifts in production

²Elon Howard Moore, The Effects of Suburbanization on Land Use in a Selected Segment of the Lansing Rural-Urban Fringe. Unpublished Ph.D. thesis, Michigan State University, East Lansing, 1953.

that have been brought about as a result of factors related to the urbanization movement and the taking of agricultural land for non-agricultural uses. A final objective will be to indicate areas where more intensive studies might profitably be made in order that the effects upon the agricultural sector of the economy might be better evaluated.

The Study Area

The area chosen for study includes the entire area of the State of Michigan lying south of a line drawn, roughly, between the cities of Bay City and Muskegon, including the counties of Bay, Isabella, Montcalm, Kent, and Muskegon as the northern boundary of the area hereafter referred to as the "study area".

It is within this general area that most of the problems associated with urbanization have arisen. As shown in Table 1, several reasons (aside from the economy of limiting the study to an area within only a part of the State) may be given for choosing this particular area for more concentrated study. Although only 38 of the State's 83 counties are included in this area, they make up almost 90 per cent of the State's total population, more than 75 per cent of the rural farm population, and over 85 per cent of the rural non-farm population.³

³The use of the term "rural non-farm" is somewhat different from that used by the Census Bureau. As defined in the 1950 Census of Population, "the rural non-farm population includes all persons living outside urban areas who do not live on farms." That definition includes as rural non-farm all people living in towns and villages of less than

Table 1

State and Study Area Comparisons^a

Item	State	Study Area	Per cent of Total
Total Population	6,371,766	5,710,720	89.6
Rural Farm Population	694,742	534,786	77.0
Rural Non-Farm Population	1,134,902	966,652	85.2
Urban Employment	2,231,543	2,065,192	92.5
Farm Workers (family and hired)	214,906	160,948	74.8
Number of Farms	155,589	117,500	75.5
Total Acres in Farms	17,269,992	11,933,960	69.1
Total Acres of cropland	9,060,577	7,153,583	79.0
Value of Farm Marketings	\$473,611,992	\$391,659,347	82.6

^aSource: 1950 United States Census of Population: General Characteristics, Michigan, United States Department of Commerce, Bureau of Census, United States Government Printing Office, Washington 25, D. C., 1952.

1950 United States Census of Agriculture: Michigan, United States Department of Commerce, Bureau of Census, United States Government Printing Office, Washington 25, D. C., 1952.

³(continued). 2,500 population (this being the lower limit of the urban classification). In this study, rural non-farm population is defined as all those rural area residents living outside the limits of any city, town or village, regardless of its size. To arrive at this classification we then need to subtract the populations of all towns and villages under 2,500 (as well as farm population) from the total population of each township as that is given in the census. The result is then an enumeration of all those non-farm residents of rural areas who hold land for residential purposes primarily, and carry on too little agricultural operations to qualify as a farm, as that is defined by the Census Bureau.

In this area are also more than 92 per cent of the non-agriculturally employed people, and about 75 per cent of those employed on farms. Of the 155,589 farms in the State, 117,500, or more than 75 per cent, are found in the study area. The cropland in these farms makes up more than 80 per cent of the total crop acreage, and in 1950, marketed more than 82 per cent of the total value of all farm products sold in the State.

This is the area that has drawn most of the attention of people concerned with the problems brought on by urbanization. Here, also, is generally acknowledged to be the most productive soil in the State, and the land that is under the more severe threat of loss to urban uses. Being the more intensively farmed land, its loss will be felt more heavily than the loss of a similar acreage less intensively farmed elsewhere.

Sources of Data

The basic data for this study have been taken from the publications of the United States Bureau of the Census for the decennial years of 1930, 1940, and 1950. Since the urbanizing of farm lands can be expected to have its effects upon the organization and operation of the farm business, the types of data collected were, therefore, those relating to the number and size of farms, types of crops grown, acres of cropland idle, acreages leased out, proportion of tenancy and tenure of farm operators, part-time farms, and the numbers and values of the various types of livestock on farms. Also gathered

were data on the value of all farm products marketed, and land and building values. In addition to this, information was collected on population numbers for the various population categories (i.e., urban, rural farm, and rural non-farm population). Not all the data desired were available at the township level, the county being the smallest civil division for which some of the desired information was published by the Census Bureau. In the 1930 census, for example, no information was given, by townships, on the acreages of crops grown. None of the censuses gave figures at the township level for livestock numbers and values of farm products sold. Because of this it was felt that the census data would have to be supplemented by additional information obtained elsewhere. This was done by contacts with three general sources. One source of additional township information was obtained by discussions with the township officials in those areas that had undergone the greatest changes in population, farm numbers, and farm acreages from 1930 to 1950. Another source of information was the various County, City, and Regional planning commissions. State offices also made available much information concerning public uses of land, furnishing such information as the total acres taken up by all county roads and highways, and parks and recreation areas for each county in the State.

Methodology

The method of this study is to inventory the past and present uses of land within the study area including urban and urban-related

uses as well as agricultural uses of land. In choosing the time period for study the census years of 1930, 1940, and 1950 were selected as years in which data needed would be most available, besides best showing the changes that have taken place in land use in the more recent past. These years were also chosen as including the period of greatest change in the urbanization of agricultural land areas throughout the study area as well as in many other states. For comparative purposes, the same types of data were collected for the remaining counties in the state as a total.

This is not primarily a "fringe-area" study, but one of assessing the effects of urbanizing the rural land areas throughout the lower five to six tiers of counties in Michigan's Lower Peninsula. This study aims to go beyond the typical fringe area type of analysis although those areas commonly referred to as fringe areas are probably the most significant single factor in the effects of an expanding urban and urban-oriented population.

As a probably major user of agricultural lands, these fringe areas which have been developed for residential and other purposes were, therefore, included in the problem of determining acreages of land taken up for urban useages.

In order to get an estimate of total urban acreages, the suburbs of all cities in the study area over 15,000 population in the 1950 census were mapped by observing, and drawing on maps obtained for the purpose, the outline of the outer boundary of the developed city suburb

area. These maps as finished show the total area taken up by the more intensely developed urban areas of the State for 1955, the year in which the mapping was carried out. The maps used were Michigan State Highway Department county maps showing a detail of one-half inch to the mile. These maps show the outlines of city suburban boundaries beyond the corporate limits as they existed in 1940.

Starting with the incorporated limits of the city we then have a "pre-1940" boundary of the city, the suburbs as they had developed up to 1940, and the expansions of the suburbs for each of the mapped cities that had occurred by July, 1955. From this mapping, inferences will be drawn with respect to the possible trend in acreage expansion that can be expected in the future for city suburbs, with acreage projections made on the basis of the current population: land relationships as determined from the amounts of land taken up by suburb fringe developments, and including also acreage changes that have taken place in land requirements for roads, highways, parks, and other recreation areas. This will be taken up in Chapter IV.

The study period was limited to the three census years chosen primarily for the reason of consistent variations that vary at different periods during any particular year. The 1920 decennial census, and each of the five-year agricultural censuses following, were all taken as of January 1, while the decennial censuses beginning with 1930 have all been taken as of April 1. Differences in animal inventory values show up as a result of these differences in enumeration periods. Also, only agricultural information is published in the five-year

censuses. There is no comparable urban data for other than the ten-year censuses. For these reasons this study is limited to the three decennial census years, 1930, 1940 and 1950.

Analyses will be made of the township data to determine the degree of changes and possible trends that have taken place in urban population, rural non-farm population, and urban employment as they may be related to, or affect, the organization and operation of farms in the study area.

For purposes of this study a classification of townships (and counties) as "Rural", "Primarily Rural", "Primarily Urban", and "Urban" has been made. This was done on the basis of the proportion of the total rural population that is made up of rural non-farm residents. A township or county that has less than ten per cent rural non-farm population is classified as "Rural"; if between ten per cent and fifty per cent rural non-farm it is classed as "Primarily Rural"; if between fifty per cent and ninety per cent it is classed as "Primarily Urban"; and if the rural non-farm population makes up more than ninety per cent of the total rural population it is classified as "Urban". This classification has been made for each of the years included in the study period.

Some attention will be given to the changes that have taken place in the townships and counties with regard to this classification. A further step will be made in relating average farm size and value of marketings to this classification. It is felt that those counties classified as "Primarily Urban" or "Urban" will also have a high

proportion of farms having very little product to market as one of the effects of urban growth on nearby agricultural operations. The opposite tendency should be evident in those counties classified as "Rural" or "Primarily Rural". Inter-county comparisons will be made to explore these possible relations.

It was also thought desirable to measure statistically the influence that rural non-farm population might have upon farm sizes, part-time farming, etc. Three observations such as furnished by 1930, 1940, and 1950 census data would be insufficient as a basis for regression analyses. Therefore, a "point-in-time" analysis will be made, using 1950 data only, but ranking the counties according to their per cent rural non-farm population. The results obtained should be indicative of what might be expected to happen in a county as that county becomes more urbanized and its rural non-farm population increases.

Through the years, many changes have taken place in farm organization and technology. If urbanizing agricultural land has had a depressing effect upon farms, and returns to farming, the real income position of agriculture would likely have deteriorated over the period of study relative to agriculture in other areas which have not experienced such a widespread degree of suburbanization. Final comparisons will be made between the study area as a whole and Upper Michigan, to determine, if possible, the effects of urbanization on the relative position of study area farmers.

CHAPTER II

REVIEW OF LITERATURE

Agricultural economists, sociologists, political scientists, geographers and others have shown considerable interest at various times in several of the different types of economic and sociologic problems that may be looked upon as being caused by, or associated with, the expanding growth of city populations and their outward spread beyond the city's political boundaries.

This chapter will be concerned with a review of some of the past studies that have been conducted by many of these people in their special areas of interest. It is not intended here to compile an exhaustive listing of past urbanization and related studies, but to summarize a few of the major works in this general area with a view to the relationships of those studies to the general topic of this study and their possible contribution to this work.

Economic Studies

Economic literature in the study of the problems brought about by fringe area development for residential and other purposes is relatively scarce. The problem of urbanization is only indirectly suggested, or related to most of the fringe-area and part-time farming studies conducted in the past fifteen to twenty years.

Earliest use of the term "fringe", and its definition, is attributed to a rural sociologist, T. Lynn Smith. In 1937, Smith defined the 'urban fringe' as "the built up area just outside the corporate

limits of the city," referring primarily to the very near fringe of urban residential development.¹

First use of the term fringe in an economic study was by John D. Black and others, in 1939, where they wrote of the "city's fringe" as it affected farming in the area surrounding the city.²

In papers delivered to the First National Conference on Land Classification in 1940, both Wehrwein and Salter mentioned the "rural-urban fringe," indicating, by the use of this term, a mixture of rural land uses in an area developing into an urban residential section.³ Wehrwein later defines the rural-urban fringe as "the area of transition between well recognized urban land uses and the area devoted to agriculture."⁴

Andrews defined the urban-fringe as an area smaller than the rural-urban fringe, which he classes as "that area adjoining the

¹Samuel W. Blizzard, a discussion in "The Social Significance of the Rural-Urban Fringe," Rural Sociology, Vol. 18, No. 2, June 1953, p. 118.

²John D. Black, Bushrod Allin, and Charles C. Colby, "The Soil and the Sidewalk," American Planning and Civic Annual, as reported by S. W. Blizzard, Ibid.

³George S. Wehrwein, "Land Classification for Rural Zoning," Proceedings of the First National Conference on Land Classification, Missouri Agricultural Experiment Station Bulletin 421, Columbia, 1940 pp. 135-143; and Leonard A. Salter, "Land Classification Along the Rural-Urban Fringe," Ibid., pp. 12-19.

⁴George S. Wehrwein, "The Rural-Urban Fringe," Economic Geography, Vol. 18, July, 1942, p. 217.

urban-fringe outward from the economic city in which there is an intermingling of characteristically agricultural and characteristically urban land uses."⁵ The urban-fringe was looked upon by Andrews as an active expansion sector of the compact economic city, while the rural-urban fringe was less an expansion area but more a transitional area, where rural land use patterns begin to be affected directly by the urban economy.

Most of these early studies were made by agricultural economists who were either recognized as farm management specialists or land economists. Their major concern at that time was the new trend of increasing numbers of rural residences and part-time farming as this reflected a change from the earlier pattern of migration from farms to cities. As the tempo of this movement increased, other problems arose and drew considerable comment, especially in the localities affected -- problems such as competition for farm land, urban industrial development and its land requirements, changing demand for the products of commercial farms, and the implied competition from part-time farmers. Many such farmers could not only furnish part or all of their own food needs, but could also place agricultural products on the market. This was felt by some to operate to the detriment of commercial farmers. Since part-time farmers were believed able to market their produce at much lower prices than bona-fide farmers, it would thus depress prices

⁵Richard B. Andrews, "Elements in the Urban-Fringe Pattern," The Journal of Land and Public Utility Economics, Vol. 18, No. 2, May, 1942, p. 167.

below what they would be without their activities. Another direction of interest was oriented to the central city as economic forces radiated outward and affected land values, costs of farming, and prices of farm products.

These brief mentions of studies concerned with the transition in types of land use taking place around growing cities indicate the earliest recognition of the problem of urbanization and the beginnings of attempts at solving the problems that follow it.

One early study recognizing the effects the central city had on outlying farms was made by Arnold and Montgomery in the Louisville, Kentucky area. A farm management survey of commercial farms at varying distances from the city was made, showing the urban effects upon land values, incomes and expenses, and the prices for different types of farm produce marketed in the city.⁶

Another farm management study of a southern area, completed in 1918 by Funk of the United States Department of Agriculture, analyzed the value of part-time farming to the workers in the cotton mills in supplementing their income with garden and other farm products produced mainly for home consumption.⁷ This study was a forerunner of a number of other part-time farming studies that followed some years later.

⁶J. H. Arnold and F. Montgomery, Influence of a City on Farming, United States Department of Agriculture Bulletin 678, United States Government Printing Office, Washington 25, D. C., 1918.

⁷W. C. Funk, Value of a Small Plot of Ground to a Laboring Man, United States Department of Agriculture Bulletin 602, United States Government Printing Office, Washington 25, D. C., 1918.

One of the earlier of such subsequent studies was completed by Rozman in 1930.⁸ This study reported the results of a survey of all the rural residents within two Massachusetts towns (townships) showing the degree to which the residents had engaged in part-time farming. On the basis of this study, and an earlier, related study, the author estimated that about one-half of the farms in Massachusetts were being operated on a part-time basis.

Other studies in various industrial areas around the nation were concerned with part-time farming as this type of activity might offer opportunities for industrially employed people to supplement their urban incomes and thereby provide their families with an "adequate standard of living."⁹ Later studies, made during the depression of the 1930's, were especially concerned with the possibilities that part-time farming might offer the unemployed in reducing their living costs by providing part or all of their food needs.¹⁰

One such study was carried out by Robertson in 1934, emphasizing the economic effects of rural residences in northwestern Indiana.¹¹

⁸D. Rozman, Part-Time Farming in Massachusetts, Massachusetts Agricultural Experiment Station Bulletin 266, Amherst, 1930.

⁹L. A. Salter, A Critical Review of Research in Land Economics, The University of Minnesota Press, Minneapolis, 1948, p. 153.

¹⁰Ibid.

¹¹Lynn Robertson, The Economic Significance of the Non-Farming Rural Population in Northwestern Indiana, Purdue Agricultural Experiment Station Bulletin 388, Lafayette, 1934.

Attention was given to the effect rural residences had upon commercial farms in that area through their competition for land, their effects upon the tax base of the rural area, and problems of public service needs created by the increased rural population.

An earlier study by Robertson had concerned itself with the effects of distance from the central city on land values, incomes and expenses, and types of farming for commercial farms at varying distances from the city of Chicago.¹² The effects of an expanding urban population in the central city and the increase in rural residences were shown in such things as land values, prices of products grown on these farms, and income and expenses. The survey included two groups of farms selected as being typical in the two areas of the study. The sample included sixty farms in Lake and Porter counties near Chicago and sixty-five other farms located farther from the city in Clinton county. The areas chosen included similar types of soils and generally similar climatic conditions. Differences were measured in the above mentioned factors for the two groups of farms. Farm organization and operation deviations in the Lake-Porter counties sample from the Clinton county sample of farms were attributed to nearness of the urban center with all its influences.

¹²Lynn Robertson, Changes in Farming in Lake and Porter Counties, Indiana, As a Result of Nearness to Industrial Cities, Purdue Agricultural Experiment Station Bulletin 365, Lafayette, 1932.

In 1935 Salter and Darling reported a study of an entire valley which carried the analysis beyond the agricultural elements found in the area to include factories, schools, part-time farms and city residents.¹³ The city residents were questioned about their possible interests in getting started as part-time farmers, thus determining the potential number of part-time farms for the area being studied on the premise that if a government aid program could assist these people in getting established there would result a general improvement of economic and social conditions.

Several other part-time farming studies followed the Salter and Darling study, most of them being born of the depressed economic conditions of the 1930's and aiming at some measure by which current conditions of extremely low incomes might be alleviated.

One such study was completed in the Elmira and Albany areas of New York by Hood in 1936.¹⁴ The relative costs of living for the urban resident and the part-time farmer were compared, emphasizing the supplemental income to be obtained from part-time farming activities.

Several part-time farming studies of this nature were analyzed for content and purpose, and were reported by Salter and Diehl in

¹³L. A. Salter and H. D. Darling, Part-Time Farming in Connecticut-A Socio-Economic Study of the Lower Naugatuck Valley, Storrs Agricultural Experiment Station Bulletin 204, Storrs, 1935.

¹⁴Kenneth Hood, An Economic Study of Part-Time Farming in the Elmira and Albany Areas of New York, 1932 and 1933, Cornell Agricultural Experiment Station Bulletin 647, Ithaca, 1936.

1940. Their intent was to summarize "what has been learned about certain aspects of part-time farming," and to "aid in the orientation of future research efforts in the field."¹⁵ Their review of this type of research led them to the conclusion that part-time farming was not then a serious threat to commercial farmers, and that part-time farmers were not disadvantaged in securing outside employment both contrary to popular conceptions of that time.¹⁶ This conclusion, however, is not too firmly founded on the assembled evidence, since the majority of the studies did not include all of the part-time farms in the area of the study, but excluded certain types of them. Some of the studies eliminated entirely the commercial part-time farms from their analyses, thus possibly biasing the results obtained with respect to market competition with full-time commercial farms.

A part-time farming study with a slightly different emphasis was made by Greeley in 1940 of the New England area. This study was partly concerned with the effects of the vacation and tourist business on farms in the locality.¹⁷ In addition to this influencing of farm incomes, Greeley also determined from census reports that 42 per cent of all New England farmers at that time did some off-farm work

¹⁵L. A. Salter and L. F. Diehl, "Part-Time Farming Research," Journal of Farm Economics, Vol. 22, No. 3, August, 1940, pp. 581-600.

¹⁶Ibid., p. 598.

¹⁷Roland B. Greeley, "Recreational Land Use in New England," Economic Geography, Vol. 18, No. 2, April, 1942, pp. 146-152.

in manufacturing and other urban-types of employment. He found, too, that the average of those farmers working off-farm worked more than one-half time at these pursuits. This was seen as the largest source of part-time non-farm income for the farm residents of this area.

Without specifying what economic activities were included, Greeley stated that recreational land use, as another separate category of part-time farming income, amounted to three to five per cent of the total income of all the farms in the New England area. Concurrent with this, he noted that there could not be 130,000 summer homes in the area requiring servicing and maintenance without the "employment of thousands of carpenters, plumbers, gardeners, and other workmen."¹⁸ The inference was also drawn that the use of much New England land for recreational purposes meant the difference of marginal and submarginal farms in a great many cases.

Two separate studies in the early 1940's were made using a broader concept of the area under study. One, by Diehl in 1941, "considered the landed economy as a whole and the process of change that took place in the fringe region" around the city of Philadelphia, Pennsylvania.¹⁹ The following year Faust published the results of a study of the Eugene,

¹⁸Ibid., p. 150.

¹⁹L. F. Diehl, "Problems of Suburbia," Land Policy Review, Vol. 4, No. 8, August, 1941, as reported in E. H. Moore, op. cit., p. 21.

Oregon, rural-urban fringe. Here, he was concerned with the process of changing from one land-use pattern to another,²⁰ rather than simply describing the change, as this method typifies most of the earlier fringe area research.

Industrial land-use in the fringe area as well as the control over land-uses was the subject of a study of the urban fringe around the city of Portland, Oregon.²¹ In his analysis the author reasoned that the fringe is a particularly important area to industries, especially in its locational attractiveness because of the available labor supply, terminal facilities, related industries, and required services.

Arpke found that urban industrial and residential expansion into the fringe had resulted in a difficult and confusing situation for commercial farmers. Tax rates had risen higher than customary land rents within the fringe area. Yet, most of the farmers interviewed recognized the financial risks involved in attempting to subdivide their properties. The main source of their hesitancy stemmed from the over-subdivision that had taken place in the past which resulted

²⁰Cited in L. A. Salter, op. cit., p. 156.

²¹Frederick Arpke, "Land Use Control in the Urban Fringe of Portland, Oregon," Journal of Land and Public Utility Economics, Vol. 18, No. 4, November, 1942, pp. 468-480.

in an excess of subdivided land still in existence in the Portland fringe in 1940.²²

Gibson and Bell also concerned themselves with the effects of industrialization upon the utilization of land in one county in Virginia.²³ Primary concern of the study was with the process by which the area became industrialized, and the land utilization problems that resulted.

The rural-urban economy of a two-city area in south-central New York and northern Pennsylvania was studied by Conklin in 1944.²⁴ The author divided the outlying area round the central cities into two parts, limiting his considerations to the latter: (1) the suburban development area in the near urban fringe, and (2) the open-country commuting area. In this area he found that the basic problem was one of maintaining employment and incomes of those who work in the city, rather than one having an agricultural basis.

²²By 1940 the subdivided land area of the Portland fringe alone amounted to 46,626 acres, or enough land to house a population of 1,500,000 in single-family dwellings on standard 50 x 100 foot lots. The central city had an equal area of land but with a total population, including the fringe, of just over 400,000. Source: Ibid., pp. 474-475.

²³W. L. Gibson, Jr. and S. Bell, Jr., Land Utilization in Henry County, Virginia Agricultural Experiment Station Technical Bulletin 93, Blacksburg, 1944.

²⁴Howard E. Conklin, "The Rural-Urban Economy of the Elmira-Corning Region," The Journal of Land and Public Utility Economics, Vol. 20, No. 1, February, 1944, pp. 3-19.

Conklin classified as "urban-employed households" those families with one or more members working in the city, regardless of the amount of farming done. Using this classification, it was found that one-half of all the open country households fell into the urban-employed category. Of the full-time farms in existence at the time of the study, forty to fifty per cent were expected to pass out of the full-time farming class, provided that industrial employment continued to offer opportunities in the future as it had in the past.

The study is summarized into four major findings: (1) A large proportion of the residents of the open-country commuting area obtain all or most of their income from urban employment. (2) A large proportion of the rural population will continue to seek part-time urban employment because of the limited income opportunities for them in agriculture. (3) Only a small proportion of existing farms are of a large enough size to provide a satisfactory income from farming alone. (4) A large proportion of the rural population is more highly dependent upon the level of industrial activity in the area than to the economic conditions in agriculture.

A number of studies have been concerned with excess subdivision of land and the problems this created. Subdivision of land in the fringe area around cities in the United States took place at a rapid rate during the 1920's. In many city areas much of this kind of development was premature in the light of conditions in later years.

Under the depressed economic conditions of the following decade local areas were given cause for much concern. Large blocks of land

were lying idle and, in many cases, tax delinquent. Much of the land had also been quite fully developed with streets, sewers, water lines, etc., so that it could not revert back to agricultural use without considerable expense.

Excessive subdivision of agricultural land for urban residential use was found to be quite general in a New Jersey area studied by Lee and Hauck in 1943.²⁵ This was found to result in additional rural problems of land abandonment, tax delinquency, and financial distress for local governments. Costs of public services were found to be high in proportion to the services rendered because of the uneven settlement patterns resulting from poorly planned, premature subdivision.

A metropolitan area study around the city of Philadelphia, Pennsylvania, by Diehl in 1943, reports that many acres of land were lying idle in the zone of transition between rural and urban uses -- a result of excessive and speculative subdivision -- with a large proportion of the land in absentee ownership and tax delinquent.²⁶

A survey of the Janesville and Madison, Wisconsin, areas was reported by Andrews in 1945, with the study oriented to the urban

²⁵A. T. M. Lee and J. F. Hauck, "Excessive Land Subdivision in the New Jersey Pine Area," The Journal of Land and Public Utility Economics, Vol. 19, No. 2, May, 1943, pp. 207-221.

²⁶L. F. Diehl, "Major Aspects of Urbanization in the Philadelphia Metropolitan Area," The Journal of Land and Public Utility Economics, Vol. 19, No. 3, August, 1943, pp. 316-328.

picture of fringe area developments.²⁷ The residents were questioned on such points as present living conditions in terms of housing, family size, income and expenses, manner of settlement, how property had been obtained and financed, use of land, tenure, conditions leading to the move to the fringe, and reasons for moving in addition to personal history and background of the husband and wife.

Of the motives for moving to the fringe, the strongest, as reported by the people interviewed, was a set of dislikes for the central city that had increased as conditions became more crowded, rents and taxes increased, and other discontents arose. Another dislike for the central city residential area was found to be rooted in the agricultural background of the fringe residents who had retired or for other reasons moved off the farm and into the fringe.

Research in the Flint, Michigan urbanized area by Firey also found a sizeable amount of land that was vacant and tax delinquent. In spite of the fact that there were still 40,000 vacant subdivided city building lots within the city of Flint, fringe area platting had proceeded at a rapid rate. Firey found that a majority of the land occupants were mobile, youthful people who were part-time farming shop workers. These people and their relationships formed the setting for the problems that developed in the fringe area. The most obvious of these problems, according to Firey, are those which follow

²⁷ Richard B. Andrews, "Urban Fringe Studies of Two Wisconsin Cities: A Summary," The Journal of Land and Public Utility Economics, Vol. 21, No. 4, November, 1945, pp. 375-382.

the unregulated subdivision of agricultural land both by promoters and the farmers themselves. With subdivision of agricultural lands proceeding in excess of effective demand for that land, the fringe problem is essentially founded in the disorderly, wasteful use of land, since surplus platting simply results in idle land which eventually becomes tax delinquent and raises service and utility costs to the residents in the area.²⁸

Reeder conducted a study of the Chicago Standard Metropolitan Area covering a 25-year period from 1926 to 1950.²⁹ Three hypotheses were tested by data obtained from census publications and from utility companies. These were: (1) that industries coming into the SMA³⁰ tend to locate in an area adjacent to the city; (2) that industries locating in the SMA form nucleated concentrations; and (3) that there is a positive relationship between population growth and industrial development in the area. These hypotheses, according to Reeder, were verified by the data obtained. This conclusion also accords with that of Arpke in his study of the Portland, Oregon fringe referred to above.

²⁸Walter Firey, Social Aspects to Land Use Planning in the Country-City Fringe: The Case of Flint, Michigan, Michigan Agricultural Experiment Station Special Bulletin 339, East Lansing, June, 1946.

²⁹L. J. Reeder, "Industrial Decentralization as a Factor in Rural-Urban Fringe Development," Land Economics, Vol. 31, No. 3, August, 1955, pp. 275-280.

³⁰Standard Metropolitan Area.

In 1953, Moore reported the results of a block sample survey of twenty township sections in the Lansing, Michigan fringe.³¹ One of the objectives of this study was to determine the effects of urbanization upon land use in this area. The survey included a total of 224 farmers and rural residents of the area whose responses to a prepared questionnaire were used as the basic data for the analysis.

As one indication of the effects of urbanization, Moore presents a table which shows land owned and rented by rural residents in the sample area.³² The data from this table, and figures shown by Moore and Barlowe³³ indicate that the average amount of land held by rural residents was about fifteen acres per residence, with only six to seven per cent of this land in crops or pasture. Although not considered idle because of its use as homestead area, this land is not in agricultural production, and has been removed from the agricultural land base of the region.

In addition, Moore also found that urbanization has resulted in an increased emphasis on the cultivation of cash crops with a corresponding decline in livestock. This stemmed, primarily, from the emphasis placed on cash crop production by the part-time farmers in the area.

³¹Elon H. Moore, op. cit.

³²Ibid., Table 8, p. 59.

³³Elon H. Moore and Raleigh Barlowe, Effects of Suburbanization on Rural Land Use, Michigan Agricultural Experiment Station Technical Bulletin 253, East Lansing, September, 1955, pp. 13-14.

Another effect was found to be in the reduction in crop yeilds on part-time farms. This was reasoned to result partly from such factors as the lack of opportunity for the part-time farmers to perform their farming operations at the proper time. Some also had to depend upon hiring their neighbors to do their field operations for them -- a service not likely always to be available when needed. Another factor in reduced yields which has some significance for agricultural production in fringe areas is the probable reduction in land productivity. The majority of part-time farmers concentrated on the production of one or two cash crops (wheat and/or corn), and did not follow a practice of crop rotation including soil-building crops. This tendency apparently is more pronounced on part-time farms nearer the central city: fewer numbers of these farmers were found to have pastures on their farms in the part of the sample nearest the city of Lansing -- the area that has also experienced the greatest amount of suburbanization.

Sociology

Research studies in the social aspects of the urbanizing of rural areas have been much more numerous than have economic analyses. These studies have been concerned with such things as the relationships of individuals, participation and membership in various activities, community characteristics, the process of population movement, social competition and conflict, and the adjustments people have made to the changed situation. The studies reviewed here are intended to serve only as

a sample of the large amount of fringe area research that has been carried on by sociologists. A bibliography of this type of research up to 1953 is available, listing 88 journal and other articles dealing with the fringe area and its social characteristics and problems.³⁴

The concept of the fringe and research devoted to its problems in several studies conducted previously were reviewed by Blizzard and Anderson in 1952.³⁵ They were concerned with how past studies defined the fringe area and how well such definitions were suited to the area within which the studies were centered, comparing various of these fringe area definitions in some of their characteristics. The authors then attempted to apply several of these definitions and conceptions to the Williamsport, Pennsylvania rural-urban fringe. Some were found to be too restrictive, while others were too general in their scope to be applicable to that fringe. The definition worked out for the Williamsport study used the point at which full city services were no longer available as the inner boundary of the fringe, and the outer limit was placed where agricultural land uses were predominate. Using such a definition, Blizzard and Anderson found an inner boundary line that was not necessarily tied to the political boundary of the city;

³⁴Bibliography of Selected References, pp. 114-117, following an article by W. C. McCain, Jr. and R. G. Burnright, "The Social Significance of the Rural-Urban Fringe: From the Rural Point of View," Rural Sociology, Vol. 18, No. 2, June, 1953, pp. 108-117.

³⁵S. W. Blizzard and W. F. Anderson II, Problems in Rural-Urban Fringe Research: Conceptualization and Delineation, Pennsylvania Agricultural Experiment Station Progress Report No. 89, State College, November, 1952.

at still other points along the encircling fringe they found that the outer boundary of the fringe fell within the city limits.

The relationships of part-time farming and industrial employment to the economic security of the individual formed the basic question for a study of rural factory employees in Massachusetts by Useem.³⁶ It was found, contrary to two earlier writings, that decentralization of industry out into the rural areas caused additional insecurity to the rural resident because of fluctuations in rates of employment.

Useem also found that, contrary to popular belief, the part-time rural factory worker did not have the required flexibility to combine farm and factory work to his advantage. When urban employment was reduced because of depressed market conditions, the agricultural sector was also depressed and farming could not provide an opportunity to replace the loss in income.

By analyzing wage rates over a period of ten years for each type of worker, Useem found that rural factory wages were adversely affected earlier in the cycle than those of the urban factory workers and recovered more slowly, and that they also had a greater number of unemployed periods.

The settlement pattern of the rural-urban fringe of Madison, Wisconsin was the subject of a study by Rodehaver in 1945.³⁷ He found

³⁶John Useem, "Does Decentralized Industry Mean Greater Security? The case of Massachusetts," Rural Sociology, Vol. 6, No. 1, March, 1941, pp. 43-56.

³⁷Myles W. Rodehaver, "Fringe Settlement as a Two Directional Movement," Rural Sociology, Vol. 12, No. 1, March, 1947, pp. 49-57.

that about seventy per cent of the families in the fringe had moved there from urban places, with the remaining thirty per cent coming from rural areas. The primary reason urban people gave for making the move to the fringe was to escape the congestion and lack of space for family living. Rural residents stated they had moved mainly to take advantage of the occupational and educational opportunities they felt existed in the fringe.

In the same year Dewey made a study of the Milwaukee County area finding that the rural-urban fringe population growth was primarily an out-movement of urban people.³⁸ Eighty per cent of the fringe residents had come from Milwaukee and its six largest suburbs, twelve per cent from rural areas of Milwaukee county, and eight per cent from other areas outside the county. Dewey stated that many, and probably the majority, of the rural migrants were urban in origin.

Answers to prepared questionnaires showed that several dislikes for the central city were the major causes for migrating outward to the fringe, a result borne out by Rodehaver's study. Reasons given for voluntary moves were mainly that the fringe was a better place to raise children, less congestion than the city, a cleaner place in which to live, larger building sites, lower taxes, and cheaper land. Based upon these findings, Dewey suggested that if realistic city planning

³⁸Richard Dewey, "Peripheral Expansion in Milwaukee County," The American Journal of Sociology, Vol. 54, No. 2, September, 1948, pp. 118-125.

were carried out in response to these types of complaints, it could do a great deal toward reducing the out-migration of the city's residents.

The social problems of three sample areas in the "country-city" fringe around Flint, Michigan were studied by Firey in 1945.³⁹ One hundred people in these three areas were interviewed to discover what land use problems there were in their particular location, the relations between these problems and the plans and attitudes, organizations, and group activities of the fringe residents.

In an article published in 1946, Firey considered the fringe area growth as a reflection of the social utility people derived from that type of urban expansion and settlement.⁴⁰ He stated that progressive subdivision of land at relatively low density can increase social utility only up to a point. From that point and on, further subdivision decreases utility because of the increased costs of new health and sanitation problems that arise out of inadequate water and sewerage facilities, a diminishing tax base resulting from the outflow of city residents, higher fire insurance rates and costs of public utilities, and decreased civic participation by the suburban resident.

³⁹Walter Firey, op. cit.

⁴⁰Walter Firey, "Ecological Considerations in Planning for Rural-Urban Fringes," American Sociological Review, Vol. 11, No. 4, August, 1946, pp. 412-421.

Land use patterns in the Flint fringe show considerable variation and instability. Firey states, "Side by side there may be trailer camps, cemeteries, golf courses, country estates, junk yards, wayside stands and taverns, country clubs, part-time acreages, general farms and obnoxious industries."⁴¹

These areas, according to Firey, are marginal, and they are so because no one type of land use clearly yields a greater social utility than another. It is, therefore, unable to preempt the land to that one use. This results in a wide variety of land uses that are seldom compatible with one another.

Beegle examined the age, sex, race, and fertility of the fringe residents of ten major metropolitan areas in southern Michigan, using published census data for 1940.⁴² In this study he found that birth rates in the fringes are relatively high, and in some cases exceed those of the rural farm areas. Birth rates in the urban centers were considerably lower, being exceeded by the fringe birth rates by more than sixty per cent. Another finding, with respect to age, was that Michigan's fringe areas have a very high proportion of youth, resembling the adjacent rural-farm population in that respect, and also indicating a relatively high proportion of young parents. At the same time,

⁴¹Ibid., p. 416.

⁴²J. Allen Beegle, "Characteristics of Michigan's Fringe Population," Rural Sociology, Vol. 12, No. 3, September, 1947, pp. 255-263.

Beegle found the fringe to be quite similar to the rural-farm population in its high sex ratio (males per hundred females), having a ratio of 114, compared to 102 in the urban areas.

A study of social participation was carried out by Anderson in 1952 in the Ithaca, New York area to determine whether much change took place in the participation of families after they moved from the city to the fringe.⁴³ A total of 378 fringe area families who had lived within the city of Ithaca were interviewed. It was found that a large percentage of the families had increased their social participation, with the majority maintaining their relationships with city organizations. However, it was also found that visiting with relatives and former neighbors in the city was reduced and substituted for by fringe neighbor visiting. The more formal relations with city organizations serve to indicate the relatively strong ties between the city and its fringe.

In a later study, Beegle, as well as many studies in other areas not cited here, found that fringe growth from 1940 to 1950 exceeded the population growth of the central city. This was determined in a study of the North Lansing, Michigan fringe over the years 1900 to

⁴³W. A. Anderson, Fringe Families and Their Social Participation, Cornell University Agricultural Experiment Station Bulletin 909, Ithaca, April, 1955.

1950.⁴⁴ Of the fringe area problems, those most often cited by the residents referred to distances from the city and the equality of the transportation facilities, and condition of the roads. Other things considered as area problems by the residents related to the lack of such city-type services as sidewalks, water and sewerage systems, street lights, and fire and police protection.

Comparisons were made to determine how fringe residents resembled, and differed from, urban residents. Beegle reported that there were several significant differences, the most striking being the low rate of voluntary participation by the fringe residents, which suggests that "those who live on the fringes of the community are also on the fringe socially."⁴⁵

In a study of "open country" residents who were employed in the city, Gist found that participation in organized groups in the city had been maintained by those migrating to the country.⁴⁶ Social visiting was also found to be quite extensive. Here, too, city ties were apparently quite strong. Visiting with people in the city exceeded by about 65 per cent the frequency of visiting with other

⁴⁴J. Allen Beegle, Social Organization in the North Lansing Fringe, Michigan Agricultural Experiment Station Technical Bulletin 251, East Lansing, September, 1955.

⁴⁵Ibid., p. 26.

⁴⁶Noel P. Gist, "Ecological Decentralization and Rural-Urban Relationships," Rural Sociology, Vol. 17, No. 4, December, 1952, pp. 328-335.

residents of the rural area. Gist also found interdependency existing between the city and country, as expressed by the efforts of many city groups to attract members and gain support for varied urban enterprises from the surrounding rural area residents.

Geography

Geographers have shown considerable interest in the urbanization of rural areas. Generally, they have shown an interest broader than urbanization as such, with studies related to population growth and shifts in area densities for various regions in the country. Some such studies have attempted to derive a method which will permit predictions of changes in population movements and population growth in these regions.

The contribution that geographers can make to regional planning is described in a report on the analysis of a large area surrounding Cleveland, Ohio.⁴⁷ The area was studied in the light of possible effects that completion of the St. Lawrence Seaway project would have upon Cleveland and the surrounding area. These effects were related to the part that planning could be expected to play in helping the whole area prepare for considerably expanded activities of all kinds.

In this study, certain aspects of climate, soil, topography, geologic formations and the like were related to the transportation system and the types of facilities then available, and to be needed, for the increased volume of raw materials and finished products.

⁴⁷A. Melamid, "Geography and Planning: An Example from Cleveland, Ohio," The Journal of Geography, Vol. LVI, No. 4, April, 1957, pp. 161-167.

Other geographers have shown interest in urban community studies in which emphasis is placed upon the urban center as a functioning unit.⁴⁸ The service aspect of the urban center is stressed. This is contrasted to the notion regarding the city as a place of residence for a concentrated number of people. When services define a community area, the outlying rural area is tied to the urban center by the flow of services from one part of the area to another.

Political Science

In general, studies in this area have been concerned with government problems that develop as areas become urbanized.

One such study by Perkins dealt with governmental problems in areas he referred to as "rurban" -- a combination area in which rural and urban uses of land were interspersed, but with urban uses becoming more predominant.⁴⁹ With suburbs developing in areas that were formerly agricultural, there develop new needs for urban services such as water and sanitation provisions, police and fire protection, etc. The existing governmental unit ordinarily is not prepared to provide such services as readily as they are needed.

An example of a specific type of localized study interested in the governmental problems that arise as an area urbanizes rapidly is given

⁴⁸ See for example, J. D. Fellman, "Urban Geographic Concepts at the Elementary and Secondary Levels," The Journal of Geography, Vol. LVI, No. 6, Sept., 1957, pp. 275-280.

⁴⁹ J. A. Perkins, "The Government of 'Rurban' Areas," The American Political Science Review, Vol. XXXVII, No. 2, April, 1943, pp. 306-313.

in a report by Bromage and Perkins.⁵⁰ The study deals with the many problems that grew out of the Federal government's decision to construct the Willow Run bomber plant in 1941. In that instance, plans had to be laid for expanded hospital facilities, sanitation and water supply needs, highways and roads, zoning to prevent tar paper shack construction and "wildcat" subdividing, and all the other services needed in urban areas.

These problems were made especially acute by the rapid influx of thousands of new residents and the inability of local governments with overlapping jurisdictions to cope with community needs which were suddenly very critical. Since the local governmental units were unable to reach decisions with respect to the provision of services, the State and Federal governments were forced to make provisions that would allow local action. The need for joint efforts by the individual units of government was met by the formation of an inter-governmental planning commission including city, township and school district officials.

These brief mentions of past work in the field of rural-urban changes serve to indicate how each study has been oriented toward consideration and analysis of one particular segment of the whole picture referred to here as "urbanization."

Some of the studies have been concerned with part-time farming and its effects upon commercial farms in the area, with some noting an

⁵⁰ A. W. Bromage and J. A. Perkins, "Willow Run Produces Bombers and Inter-Governmental Problems," The American Political Science Review, Vol. XXXVI, No. 4, August, 1942, pp. 689-697.

apparent relationship between increased urban populations and a consequent increase in part-time farming.

Certain studies have chosen the more highly urbanized fringe, or a part of it, surrounding the central city for analysis. Generally, agricultural economists have limited themselves to the changes that have taken place in the agriculture of an area, while sociologists and rural sociologists have limited themselves to considering the social problems that develop out of the process of urbanizing a rural area. Interest has also been shown in individual and family participation in the city and in the new community, group activity memberships, and adjustments made by the fringe residents as they are faced by problems raised by changes in the developing community and in the utilization of the land base.

Other studies have been concerned with the effects of industrialization upon some local area. They have recognized that increased economic activities within a city will also be evident in the surrounding countryside as farmers, and others, obtain supplemental employment in the industries and also find stronger markets for their farm products.

The contribution of geographers in this general problem area has received some emphasis, but generally the orientation has been toward larger population aggregations, such as state economic areas, or groups of states. Current work by people in this field is also directed toward more specific analysis of changes in land use patterns that occur as a result of urbanization.

The major concern of political scientists has been with the problems of government (at all its levels) that arise as the urbanization process continues. Concern is directed toward alleviating problems that result when new population groupings exert pressures on existing governmental units that, for various reasons, are not equipped to cope with them.

This has not been intended as an exhaustive review of all possible fields of interest in the development of suburbs and the surrounding rural areas. Rather, this selection of articles presented here is intended to show the general areas of interest in urbanization and some of the problems that have been dealt with. At best, it may be taken as a cross-section of interest displayed by those disciplines that appear to be most interested in the whole problem area that seems to follow the urbanizing process.

CHAPTER III

URBANIZATION AND ITS EFFECTS IN THE RURAL AREAS

Broadly stated, the general objective of this study is to determine the effects of urbanization in the rural areas. Attention is directed primarily toward the effects upon farms and farming. These are by no means the only effects within an area when certain forces act to bring about changes in land-use patterns.

Such effects as those shown by changes in farm size and organization, and in other non-agricultural uses of land, are but surface indications of the economic and other forces bringing about such changes. These forces which may emanate from a central market have long been portrayed by economists interested in spatial and market influences on the different uses to which land can be put.

Only brief mention will be made here of the theory of location such as first expressed by Johann von Thünen as early as 1826.¹ Von Thunen used distance from the central market (as this affects transportation costs) as the major determinant in the pattern of agricultural land use. He concluded, generally, that there would arise zones of intensity in the use of land, with use-intensity declining as the distance from the central city increased. The most intensive agriculture would be engaged in nearest the city, concentrating on the

¹For a clear explanation of von Thünen's location theory, see Richard T. Ely and George S. Wehrwein, *Land Economics*, the Macmillan Co., New York, 1940, pp. 66-73.

production of the more bulky food products such as vegetable crops. The farther from the city, the more extensive would become the cultural methods, with grazing representing the most extensive use of land out at the periphery of the area.

This basic theory has also been adapted to an explanation of the location of manufacturing industries, as typified by the work of E. M. Hoover in his study of the shoe and leather industries.²

Further use has been made of location theory in explaining the competition and scaling of intensities of land-use within cities.³ At some particular point in the city is what is sometimes called the "100 per cent location." It is towards this location that the greatest numbers of customers will gravitate. It is the location, also, of the highest land values, and the point which can command the highest rent. Use of land will be at its greatest intensity here, declining with distance from this "100 per cent" point. At the outer fringe of the urban area will be the less intensive residential uses of land, competing for the land with agriculture.

The appropriation of agricultural lands for urban use would seem to indicate this is a higher use than agricultural production. That urban utilization can outbid agriculture for land is well demonstrated

²Edgar M. Hoover, Jr., Location Theory and the Shoe and Leather Industries, Harvard University Press, Cambridge, 1937.

³Richard T. Ely and George S. Wehrwein, op. cit., pp. 138-139 and 441-447.

around towns and cities. No matter how productive land may be for agricultural production, urban use seems always able to pay a higher price for that land.⁴

Urbanization and the "ripening" principle. Each use to which land may be put must compete with all other uses when there are no artificial controls regulating the variety of land uses. Intensive farming operations must compete with extensive farming; each urban-type use must compete with other urban-type uses as well as agriculture for land. Such competition will tend to force each parcel of land into its highest and best use. As stated by Ely and Wehrwein, "Various utilizers bid for the better site, thereby establishing a scale of rents or values which only those utilizations performing the most valuable services per unit of area can afford to pay....in this way utilizations are sorted and assigned by economic competition to various sites...."⁵ Where each of a number of different uses can produce a net return from that use, the greater the net return the more competitive will that use be, making it able to outbid other uses for that land.

The ripening process, of land being put to uses of greater and greater intensity, is itself a result of change. Given a set of conditions where there is no change -- either in physical, technical,

⁴As an example, in July of 1955, farmland in Nankin township (averaging about 15 miles west of Detroit) was selling for urban use for around \$5,000 per acre. Few if any agricultural ventures could be so organized under current production and marketing conditions as to offer a higher price for the land, and thereby outbid urban buyers, and still maintain a profitable business.

⁵Ibid., p. 445.

or economic conditions -- an equilibrium among land-uses would be established. Each use-intensity would find its "proper" location and remain there. Such stable or static conditions can hardly be expected. More often, we can expect changes to take place in the physical attributes of resources, in prices and markets, in technologies of production, and especially in population.

As the population grows, demands for various goods and services will be increased, but not necessarily in any proportional way because of shifts in the tastes and preferences of individuals. Likewise, production costs may be changed in different degrees by improvements in production techniques, resulting also in altered positions of advantage as regards different uses of land.

Growing urban populations need additional space for living and carrying on business activities. The demand for space can be met by intensifying the utilization of the present area of urban land. For residential areas this would mean reduced building lot sizes and a closer spacing of dwellings, or the construction of multi-family dwelling units. This alternative, however, is objectionable to a sizeable number of people at the present time.⁶

In recent years the choice for meeting the demand for urban land, especially for residential purposes, has been the appropriation of

⁶See references in Chapter II to the studies by Rodehaver, and Dewey, where they each found that several dislikes for the central city were the main causes for the out-migration of city residents to the suburban areas.

additional land surround the central city. In this way the desires for "living space" and escaping the congestion of the city are at least partially met. When this desire is strong among a large number of people, and they have the economic means to satisfy it, additional land will be taken up for urban-type uses in direct competition with the agricultural use of that land.

With economic ties maintained in the urban center, these people will move out as far as their dislikes will "push" them. The distance of the move, however, will likely be limited by the ability of their incomes to pay the costs of the increased transportation requirements between residence and working or shopping areas. Besides the living satisfactions achieved by moving out to the country, there are dollar savings to be realized as well. These savings result primarily from lowered costs of land and taxes, or tenant rental rates, as compared with the corresponding rates within the city. Whether the move results in a net saving will depend upon the relative levels of the cost items and the distance of the move. In addition, commuting and living in the outer fringe may not only be indulged in at a cost in collar terms, but are also time-consuming. There is a limit to the amount of time that people can devote to traveling to and from their work, although as transportation facilities improve, this distance also expands.

Effects upon agricultural land use. When urban use competes with agriculture for land, the most noticeable effect is the actual loss in acreages of land for farming. Land that was once

devoted to farming becomes spotted with dwellings or plattings of various numbers of residences. Highway frontages become dotted with small businesses and homes, sometimes completely filling in the frontages between pairs of cities. Most of this kind of urban expansion is chipped out of existing farms, usually resulting in farms of lesser operating efficiency than previously. Under the influence of increased mechanization, for the nation as a whole, optimum farm size has been moving upwards. but in areas where the urbanization movement has been going on for some time, one would expect the tendency to be toward smaller and smaller average farm sizes.

Without reference to the social utilities or disutilities of such a ripening pattern, this type of disorganized expansion of residential areas and homesites can do little if anything constructive toward helping farmers organize their farms into economically sized units. Given the possibility that farms in an area were beyond the optimum size to begin with, fragmentation of farm holdings could result in more efficient production. The evidence would seem to be otherwise, however, the average size of farms in Michigan, as elsewhere, has been increasing with increased mechanization, particularly in the least urbanized counties, indicating they were generally below the optimum. Urbanization within well adjusted agricultural areas may serve to hinder or delay further adjustments in the future and, therefore, have a depressing effect upon agricultural efficiency in production.

On the other hand, rural land purchases for residential purposes may also be an aid to some farmers in expanding the acreage of their

farms. In an area of too-small farms, a farmer may find it difficult to sell his entire farm to a neighboring farmer because of the relatively large investment in the house and other buildings. With the investment made, the owner would want to recover as much of it as possible. When selling to a person interested only in the land, he either must take a loss, or the buyer pay a premium over the value of the land itself because of the value of the buildings (especially the house).

Where there is an outward movement of urban people seeking rural residences, there is a possibility for the owner to sell the house separately, as a residence. This allows him to sell the land to a neighboring farmer and also to retrieve at least some part of his investment in the dwelling. It also permits the buyer of the land to combine that land with land he already holds, and organize a larger farm operation without having to pay an additional premium for improvements he does not want.⁷

In some cases, urbanites take up considerably more land than they might require for their residences. A number of these may rent out their excess land to operating farmers, thus allowing for some expansion in operating farm size, in a few instances, at least. In a large number of other cases, however, the land is simply left idle. Moore found that farmers were not interested in renting plots of land

⁷Several such cases were observed in an area of Wisconsin, and mentioned to the writer by Dr. E. H. Ward, Department of Agricultural Economics, Montana State College, Bozeman, with the feeling that in some areas this practice may be more prevalent than many people realize.

as small as five acres.⁸ In that same study it was found that, of the total land in the survey area, 21 per cent was owned by rural residents. Of this land, 35 per cent was idle at the time of the study.⁹

Average farm size is also affected by nearness to the city. As will be shown in Chapter IV, the average size of farms is substantially reduced in those areas nearest the urban center. This results from a whole set of influential factors, but primarily from rural resident purchases of land from existing farms and the change in farm organization and size.

The average size of farms for full-time and part-time farmers in Moore's study amounted to about 95 acres per farm. Compare this with the 1950 average farm size of 115 acres for farms in Ingham county as

⁸Elon H. Moore, op. cit., pp. 68-73.

⁹Ibid. Walter Firey, op. cit., pp. 21-22, also noted considerable idle farm land in his fringe study around the city of Flint: "Farmers themselves, seeing profit in the platting of highway frontages, have cut up much of their farm land thinking that they could carry on agricultural operations on the residue of their land lying to the rear. Failing in this they have frequently let their estates fall into utter idleness. Weeds have grown up which seed nearby farm lands and depreciate the agricultural productivity of the entire area." Another thing noted by Firey, pp. 20-23, was what resulted from over-optimism on the part of promoters and local officials during the 1920's. In 1936, there were 40,000 vacant subdivided building lots within the corporate limits of the city of Flint, many of these lots having been laid out at substantial cost with water, gas, sewer, and other utilities. Nearly all of these lots were still vacant in 1945.

R. R. Renne, Land Economics, Harper and Brothers, New York, 1947, footnote 15, p. 425, cites a tabulation of subdivided land in Chicago where enough suburban land had been platted in the early 1920's to house 18 million people. This land no doubt went through a long period of idleness before it either became used as urban land or reverted back to agriculture.

shown by the 1950 census.¹⁰ This difference does not appear to be too significant unless we note the area of study chosen by Moore: ". . . the region selected should be one which was beyond the last platted area surrounding a city. This would give an area which has started to develop towards a use other than farming, but one in which the land still was used primarily for agriculture."¹¹ Evidentially the process of urbanization was beginning to be felt in that study area, which ranged from 5 to 14 miles out beyond the Lansing city limits. A study of average farm size much nearer the suburbs of Lansing would likely show a much smaller acreage.

As the urban population increases, a locational advantage arises for those farmers located nearest the urban center. As mentioned previously, this advantage finds expression in the changes in agricultural land-use patterns, for example, changing from small grain cropping, or meat livestock production to dairying and othermore intensive uses of land. This is simply a result of the population pressure on the local land base reflected in net market prices to the producer of different foods that can be produced on the land.

Within the pattern of land moving into urban use that has been experienced, however, land utilization does not move to greater intensity with the neatness or smoothness that location theory might suggest. Most

¹⁰1950 United States Census of Agriculture: Michigan, United States Department of Commerce, Bureau of the Census, United States Government Printing Office, Washington 25, D. C., Vol. I, part 6, County Table I, p. 44.

¹¹Elon H. Moore, op. cit., p. 7.

often we find considerable disruption in farm organization and land-use because of the patterns of urban settlement. Increasing urban populations do not spread out in a smooth way and around the existing urban area, but jump out beyond, leaving "islands" of farm land to be filled in later as the urban pressure continues to increase.

This sort of unguided, unregulated development has been criticized by many of those who have conducted fringe area studies. It has been considered wasteful of agricultural land and more costly in terms of providing urban-type services to these outlying urbanized areas.

In such settlement areas, farmers also are forced to make adjustments in their operations.¹² They may, at times, be forced to adjust even though they may not be in the path of the urban expansion because their marketing facilities are no longer operative. A product marketing facility must handle some minimum volume of a particular commodity, or group of commodities, else that facility cannot operate profitably. As urban land expands farms become fewer, and with fewer local acres available to produce a given product, the business must be abandoned or move elsewhere. Marketing groups that may have been

¹²In 1955, for example, several farmers in southwestern Wayne County were experiencing difficulty in producing and marketing certain crops. Their marketing facilities have disappeared with the urbanization of nearby areas, and even though they felt they were best suited to one type of crop production, their costs of hauling to markets farther away were forcing them into other types of output. These farmers felt that they were not able to carry on truck-gardening and would soon have to sell out to someone who could. These people stated they simply did not have the financial ability or the technical know-how to set up intensive farming operations of this sort.

organized must fail to function as farmer-member numbers and the quantity of their marketable products decline. Farmers thus find themselves pushed out of some crops even though with their particular likings and abilities they would prefer not to make the change.

The supply of agricultural land. Obviously, when land is appropriated for urban and other non-agricultural uses it is no longer available for agricultural production. As the amount of land taken for urban use increases, we experience also a decrease in the physical supply of farm land.

To some people, this poses a real threat. They see in this a growing population which will constantly reduce the supply of agricultural land to the point where that population can no longer be supported by its land base.¹³

It has been estimated for the United States that by 1950 a total of 105 million acres of land had gone out of agriculture into "special uses".¹⁴ This estimate also shows an annual rate of about one million acres going into these special uses over the period 1910 to 1950.¹⁵ These uses, however, include roughly 35 million acres of land in farmsteads, farm lanes, rural highways and roads. As such, they can hardly

¹³Further comment on this point will be reserved for Chapter VI.

¹⁴"Special use" includes the acreages in urban areas and towns of over 1,000 population, industrial sites, farmsteads and feed-lots, highways, roads, and railroad rights-of-way, parks, wildlife refuges, airports, and military reservations.

¹⁵H. H. Wooten, Major Uses of Land in the United States, Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C., Tech. Bul. 1082, October 1953, Table 3, p. 10.

be considered a wasteful use of available land, since this type of utilization enhances the farmer's ability to produce his product and move it to market.

A statement regarding the quality of special use land can only be inferred since data are not available to indicate which acreages are, and which are not, going into non-farming uses. But there can be little room for doubt that much of the land now in urban and related uses was of the better grades of agricultural land.

Generally, cities are located in places most accessible from the standpoint of transportation. This is usually the lowest, most level land in the area. Quite often these lands are river valleys or flood plains in which the soil usually is much more fertile than that of the surrounding area. Much of our urban residential expansion goes out into the areas most easily developed -- again, taking the more level land and leaving the hillier land to agriculture.

Railroad and highway rights-of-way are usually located on the most easily traveled routes -- the land that also could be most easily tilled. On the other hand, parks and recreation areas especially appear to take lands quite often unsuited to agriculture, being located in hilly, forested or water-covered areas. Too, there is a certain amount of esthetic appeal to urban developments on very hilly land around many cities, which has taken this type of land in preference to level land.

Farmers in this country are still quite far from using all of the available land for crop and livestock production. Tabulations by the United States Department of Agriculture estimate that by 1955 about

340 million acres of land were being used for crop production. This is an increase of 15 million acres from 1910, but a decrease from the high of 371 million acres in 1932.¹⁶ In addition to the cropped acres, Wooten shows an average for the period 1948-1952 of 70 million acres of cropland used for pasture and 31 million acres which were idle for one reason or another.¹⁷ In total, there are about 480 million acres of cropland of which a little over 70 per cent is currently being used.¹⁸

Zimmermann gives an estimate of some 998 million acres of cultivable land in the United States -- an estimate which he admits to be a "gross approximation."¹⁹ If this is even a near correct figure, we are using something less than one-half of our physical supply of land for crop production today. Such an estimate very likely includes a large acreage of land of extremely poor quality from which only little product could be derived.

So far, this has considered only the physical supply of land -- a measure of doubtful value when used to compare productive ability

¹⁶Changes in Farm Production and Efficiency: 1955 Summary, United States Department of Agriculture, Agricultural Research Service, Washington, D. C., ARS 43-33, June 1956, Table 3, p. 14. Acreages of cropland includes cropland harvested, crop failure, and summer fallow.

¹⁷H. H. Wooten, op. cit., Table 6, p. 20.

¹⁸Ibid.

¹⁹Erich W. Zimmermann, World Resources and Industries, Harper and Brothers, New York, 1951, Fig. 7.3, p. 88. Zimmermann discusses (p. 86) four factors which set the limits to cultivability: (1) temperature, (2) moisture, (3) topography, and (4) soils, including both physical structure and chemical and bacteriological characteristics. To be cultivable, land must meet these four basic criteria.

between two widely separated points in time.²⁰ Use of a simple area measure lends historical validity to future production relationships and technology, saying that what we produced in the past is all we can expect to obtain in the future. When a purely physical measure is applied, it ignores entirely the trend in agricultural output that has taken place, and changes which will likely take place in the future.²¹

Improved techniques in the use of land and other resources has brought about considerably increases in agricultural productivity. Table 2 shows some of the changes that have been brought about by mechanization, improved crop varieties, increased use of fertilizers, better livestock selection, breeding, and feeding practices and soil management.

²⁰See Warren S. Thompson, Population Problems, McGraw-Hill Book Co., Inc., New York, 1942, p. 65. Thompson states that, "Area is one of the least valuable of all criteria for estimating the population 'carrying capacity' of any land." He makes this statement with reference to the inaccuracy of comparing two separate areas because of differences in soil fertility and climatic conditions. His statement would be equally applicable to productivity comparisons for a given area over time on the basis of area alone.

Zimmerman too, op. cit., n. 7, p. 86, indicates that physical area as a measure of future food production is inadequate, and says, "It is safe to assume that in the calculable future the world's food supply will depend primarily on the development of the arts. . ."

²¹John D. Black, in "Coming Readjustments in Agriculture - Domestic Phases," Journal of Farm Economics, Vol. XXXI, No. 1, pt. 1, February, 1949, p. 7, says, "The major part of the increased agricultural output of the years since 1939 appears to have been due to higher technical intensity of cultivation and new applications of technology. There was a very large backlog of technologies only sparingly used in 1940. My friends in the Agricultural Research Administration of the USDA tell me that there is a surprisingly larger backlog today than in 1940."

Table 2

Acres of Cropland and Indexes of Total
Cropland and Farm Output, United States, 1920-55^a

Year	Acres used for		Total	Index	Index of
	Feed for horses	Domestic use	cropland	of total	total farm
	and mules	and export	used ^b	cropland	output
	(000,000)	(000,000)	(000,000)	(1947-49=100)	
1920	90	270	368	97	70
1925	78	282	370	98	70
1930	65	304	382	101	72
1931	62	303	384	101	79
1932	60	311	384	101	76
1933	59	281	378	100	70
1934	57	248	375	99	60
1935	56	389	377	100	72
1936	54	269	375	99	65
1937	52	295	379	100	82
1938	48	301	372	98	79
1939	45	285	364	96	80
1940	43	296	367	97	83
1941	40	302	366	96	86
1942	39	307	369	97	96
1943	37	319	377	100	94
1944	36	325	379	100	97
1945	32	322	373	98	96
1946	29	322	369	97	98
1947	26	328	372	98	95
1948	24	332	378	100	104
1949	22	338	387	102	101
1950	19	325	375	97	100
1951	18	326	379	100	103
1952	15	334	379	100	107
1953	13	335	383	101	108
1954	11	335	379	100	108
1955	10	330	379	100	112

^a Sources: 1957 Agricultural Outlook Charts, United States Department of Agriculture, Agricultural Marketing Service and Agricultural Research Service, Washington, D. C., November, 1956, Tables 1, 3 and 4, p. 70. Also H. H. Wooten, Supplement to Major Uses of Land in the United States, United States Department of Agriculture, Bureau of Agricultural Economics, Washington, D. C., September, 1953, Table 29, p. 72.

^b Includes acres of crop failure and summer fallow.

Mechanization has not only made a greater output possible from our physical resource base through the timeliness of field operations. It has also released considerable acreages for crop production that was formerly devoted to feed production for horses and mules. By 1955, replacement of horses and mules by tractors had reduced this acreage from a high of 93 million acres in 1915 to 10 million acres.

Although some of the increased agricultural output can be accounted for by the use of additional acres for crop production, drainage, and irrigation, much of the increase is attributable to technical improvements in agricultural production. While there was no increase in the acreage of cropland in 1955 over the 1947-49 base average, there was a 12 per cent increase in total farm output for the same period. The relative increase from 1920 to 1955 is even much greater. Total cropland increased only three per cent over the 35-year period, but total farm output increased by 60 per cent during that period of time.

The use of tractors, combines, trucks, pick-up balers, field choppers, etc., make a substantial contribution to the productivity of the farm business. All of these items showed a sizeable increase over the 1947-49 average.²²

As indication of the effects of mechanization can be seen in the measures of labor output as shown in Table 3. Comparative measures

²²See Appendix A for an enumeration of the various items of equipment over the past 45 years.

are also shown for the East North Central region from which inferences may be drawn for the state of Michigan.

Table 3

Index Numbers of Output, United States and the
East North Central Region, 1920-55^a

Year	: Total		: Crop pro-		: Cropland		: Man-hours:		: Farm output	
	: farm		: duction		: used for		: of labor		: per man-hour	
	: output		: per acre		: crops		: farm work:		: of labor	
	: US	: ENC	: US	: ENC	: US	: ENC	: US	: ENC	: US	: ENC
1920	70	69	86	79	97	107	140	148	50	47
1930	72	64	75	68	101	96	134	129	54	50
1940	83	83	88	90	97	93	120	126	69	66
1941	86	89	90	97	96	94	117	125	74	71
1942	96	97	100	100	97	96	122	127	79	76
1943	94	94	91	91	100	98	121	125	78	75
1944	97	94	96	89	100	102	120	123	81	76
1945	96	98	95	97	98	100	112	117	86	84
1946	98	100	101	101	97	100	108	113	91	88
1947	95	90	95	87	98	98	103	103	92	87
1948	104	105	106	108	100	101	100	101	104	104
1949	101	105	99	105	102	101	97	96	104	109
1950	100	102	98	100	99	100	89	91	112	112
1951	103	106	99	103	100	101	91	89	113	119
1952	107	110	103	107	100	101	89	88	120	125
1953	108	112	102	108	101	102	88	88	123	127
1954	108	113	101	109	100	102	86	86	126	131
1955 ^b	112	118	105	115	100	101	85	86	132	137

^a Source: Changes in Farm Production and Efficiency, 1955 Summary, United States Department of Agriculture, Agricultural Research Service, Washington, D. C., ARS 43-33, June, 1956.

^b Preliminary data.

Substantial increases can be noted in farm output for both the United States and the East North Central region, with productivity increases in the East North Central region being generally greater than for the United States as a whole.

However, it is possible that Michigan farmers have not "held pace" with the other farmers in the region, and apparently not with United States farmers either. Michigan's share of the output of the region fell from 14.4 per cent in 1940 to 11.7 per cent in 1950; of the United States total, it fell from 2.7 per cent in 1940 to 2.1 per cent in 1950. Some of this effect might stem from the relative rates of mechanization that have taken place in Michigan and elsewhere. But most of the relative loss must be due to the higher rate in the loss of farm land to urbanization in Michigan as compared with the other states as a whole.

Census enumeration of certain farm machines and implements is available, by states, only for 1945 and 1950. This does give some indication of the improvements in technology that have taken place with respect to mechanization, as shown in Table 4.

Changes in farm numbers have taken place at a much greater rate in Michigan than in the other East North Central states. In Michigan, farms declined in number by 11 per cent over the five-year period from 1945 to 1950. This is almost double the rate experienced by the other states during this same period of time.

Table 4

Farm Machinery, East North Central States, 1945 and 1950^a

Item and Year		Other States ^b		Michigan	
		Number	No. per farm	Number	No. per farm
No. of farms	1945	778,529	--	175,268	--
	1950	729,815	--	155,589	--
% change, 1945 to	1950	-6		-11	
No. of tractors	1945	533,299	.69	110,120	.63
	1950	742,683	1.39	149,377	.96
% change, 1945 to	1950	39		36	
No. of Farms with milkers	1945	119,421	.15	27,060	.15
	1950	192,712	.26	42,269	.27
% change, 1945 to	1950	61		57	
No. of farms with grain combines	1945	84,616	.11	12,920	.07
	1950	165,104	.23	27,234	.18
% change, 1945 to	1950	95		111	
No. of corn pickers	1950	165,671	.23	10,681	.07
No. of pick-up balers	1950	36,123	.05	7,480	.05

^a Source: 1950 United States Census of Agriculture, United States Department of Commerce, Bureau of the Census, Washington, D. C., 1952, Vol. 2, General Report, Table 11, pp. 221-222.

^b Ohio, Indiana, Illinois, and Wisconsin.

The per-farm densities of tractors, grain combines and corn pickers declined in Michigan relative to the other states in the region. For pick-up balers, the densities were equal, and for farms with milking machines, Michigan farmers showed a slight relative increase.

This census data would seem to indicate that adjustment in Michigan agriculture to changing conditions had been hampered relative to the other states. Although one cannot point the finger of

responsibility to urbanization, this could well be one of the causes. The disruption of agricultural enterprises by piece-meal farm sales, as many of them are, certainly cannot be looked upon as conducive to greater efficiency in the operation of the farm business. Indications of how effective this factor might be will be discussed in the next chapter.

CHAPTER IV

URBAN AND RELATED LAND USES AND CHANGES

IN SELECTED CITY AREAS

A great amount of change in urban¹ and urban-type land uses is evident in the lower Michigan region included in the study area. City boundaries, both corporate limits and the outer suburbs, have expanded considerably since 1940. The urbanized land is located primarily around the boundaries of the cities, but a significant amount of land out in the open country has also been taken for residential and other purposes. Acreages of land in various types of uses will be noted and discussed in this chapter, including an attempt to estimate the amount of land in urban and other types of non-farm holdings.

In June and July, 1955, cities in the study area with over 15,000 population were mapped.² This was done by driving around the outer boundary of the suburb area of each city and plotting on a map the location of the outer extreme of the build-up area as accurately as

¹The land that is referred to here as being urban is all of the land within a city, town or village, and the subdivided land contiguous to it that is used for residences or business places.

²These cities are Adrian, Ann Arbor, Battle Creek, Bay City, Benton Harbor, Detroit and nearby cities, East Lansing, Flint, Grand Rapids, Jackson, Kalamazoo, Lansing, Monroe, Muskegon, Muskegon Heights, Owosso, Pontiac, Port Huron, Saginaw, St. Joseph and Ypsilanti.

In most cases, the outer perimeter of the suburb was quite clearly defined. In a few other instances, however, urban uses "thinned out" toward the outer extreme of the suburb and became interspersed with farm land. In such cases, it became necessary to make a judgment as to which use predominated.

possible.³ The total acreage of urbanized land lying outside the corporate limits of these cities was then estimated for each of the cities mapped.

Estimates have also been made of land included within the corporate limits of towns and cities, and rural land in highways, county and township roads, state and national forest and game areas, parks and public conservation areas, military reservations, airports and railroads for the study area and the remainder of the state.⁴

The state highway maps that were used show the incorporated areas for all cities as well as the land lying outside of each city that had been subdivided by 1940. This is used as a base from which to measure the change in urban acreages to mid-summer 1955.

Growth Observed in Selected City Areas

Maps have been drawn for each of the above-mentioned cities showing the incorporated area, the pre-1940 subdivisions, and the plattings for the years, 1940 to 1955. These maps are duplicates of the field maps used to outline the boundaries of the suburbs surrounding the cities listed above. Estimates made from these maps are given in Table 5 which shows the acreages of urban land for each of the major

³General Highway maps of counties from the Michigan State Highway department with a scale of one-half inch to the mile were used for mapping. The rectangular survey system of township and section lay-out aided in mapping with some degree of accuracy, since plots of land are usually measured and sold in blocks of 20, 40, 80 acres, and etc., making it fairly easy to determine quite closely the acreages out of each section of land that was urbanized, and its location.

⁴Michigan State Department of Conservation county maps were used to obtain acreage totals for all but the incorporated city areas, as of June 1, 1955.

Table 5

Urban Land Acreages in Study Area: Selected Cities

City ^a	Incorporated area (1940) ^b	Pre-1940 plattings ^b	1940-1955 plattings	Total urban area (1955)
Adrian	2,640	160	1,640	4,440
Ann Arbor-Ypsilanti	5,300	3,600	11,200	20,140
Battle Creek	5,440	3,680	18,890	28,010
Bay City	7,120	1,040	14,280	22,440
Benton Harbor - St. Joseph	4,960	1,240	3,620	9,820
Detroit area ^c	207,160	38,360	132,000	377,520
Flint	20,400	4,200	22,540	47,140
Grand Rapids	20,240	6,720	45,720	72,680
Jackson	6,560	2,880	6,680	16,120
Kalamazoo	5,800	5,120	17,920	28,840
Lansing - East Lansing	9,780	3,380	13,960	27,120
Monroe	4,725	1,400	7,320	13,445
Muskegon - Muskegon Heights	9,480	2,560	43,280	55,320
Owosso - Corunna	4,240	360	1,000	6,600
Port Huron	8,740	400	4,630	13,770
Saginaw	10,800	2,920	7,340	21,060
Totals	334,385	78,020	352,020	764,425

^a When it is not possible clearly to separate the suburban area of one city from another they are given as one.

^b Source: General Highway Maps, Michigan State Highway Department, Lansing, 1940.

^c Includes the following cities and towns: Allen Park, Berkley, Birmingham, Bloomfield Hills, Center Line, Clawson, Dearborn, Detroit, East Detroit, Ecorse, Erin Lake, Farmington, Ferndale, Fraser, Garden City, Grosse Pointe, Grosse Pointe Farms, Grosse Pointe Park, Grosse Pointe Shores, Grosse Pointe Woods, Hamtramck, Harper Woods, Hazel Park, Highland Park, Huntington Woods, Inkster, Lake Angelus, Lincoln Park, Melvindale, Mt. Pleasant, Northville, Oak Park, Orchard Lake, Pleasant Ridge, Plymouth, Pontiac, River Rouge, Riverton, Royal Oak, St. Clair, Trenton, Van Dyke, Warren, Wayne and Wyandotte.

city areas in the study area. In a number of cases it was not possible to separate the suburban area of one city from another. In such instances, the total for the two (or more) cities is given as one.

For the cities, in total, the plattings in the last fifteen years are greater than the 1940 incorporated area (352,020 acres, as compared with 334,385 acres, respectively). If the pre-1940 plattings are added to the incorporated area, the total urban area for these cities amounted to 412,305 acres in 1940. When this is compared with the developments since 1940, we get an indication of the rapid rate of urban growth that has taken place. Total urban acreages for the cities mapped have increased by 85.4 per cent over the 15-year period, 1940-1955.

Individual cities show wide differences in rates of expansion. They range from a low of slightly less than an 18 per cent increase in total acreage for the Owosso-Corunna area, to a high of almost 360 per cent for Muskegon.⁵

The Lansing area had an increase of 106 per cent, slightly more than doubling its total area in 15 years. This is also the area that will be used later in this chapter as a basis for speculating on the possible land area that is now optioned for purchase, or currently being held for subdividing at some time in the future.

⁵In this tabulation, the area around the city of Muskegon is not wholly urbanized in the sense of being subdivided into city blocks in the usual manner. There are 6,880 acres east and south-east of Muskegon that are relatively sparsely settled. The area is, however, almost totally in residential use, with each residence taking up several acres. This acreage has been included in the urban total.

Total urban acreages are shown in Table 6 for all of the study area counties. The increase in total acreages over those of Table 5 is due to the many small towns and villages, lying outside the suburban area of the mapped cities, that were not included in the previous tabulation.

Urban expansion for the study area as a whole amounted to 58 per cent during the 15-year period, 1940-1955. A number of counties have blank spaces in the "new plattings" column. This is because there were no cities of 15,000 population or over in these counties and, therefore, were not mapped.

Here, also, is a source of understating the total urban area. There are many cities of less than 15,000 population, a number of which undoubtedly experienced some degree of subdivision development beyond the city limits.⁶ On the other hand, there are possibly even more cities and towns that include sizeable acreages of farmland within their corporate boundaries. In driving through many of these towns, it was observed that the city limits often included one section (640 acres), while the business and residential area occupied only a part of the incorporated area, the remainder being in farms. It is doubtful that new plattings in the unmapped towns and villages could "balance off" the acreage of such farmland within cities. The 1950 census shows a

⁶As a check, five smaller cities (Charlotte, Hastings, Hillsdale, Lapeer and Mt. Pleasant) were mapped. Their populations ranged from 14,285 for M. Pleasant, to 6,096 for Hastings. Their combined incorporated area amounted to 18,340 acres, with only 120 acres shown as being subdivided prior to 1940, while plattings since 1940 totalled 4,480 acres. This is an area increase of just over 24 per cent from 1940 to 1955.

Table 6

Urban Acreages in Study Area by County

County	Incorporated area (1940) ^a	Pre-1940 plattings	1940-1955 plattings	Total urban area (1955)	1940-1955 as % of total
Allegan	8,440	--	--	8,440	--
Barry	7,860	--	480	8,340	5.8
Bay	7,480	1,040	14,280	22,800	62.6
Berrien	14,900	6,200	25,240	46,340	54.5
Branch	5,870	--	--	5,870	--
Calhoun	12,510	3,680	18,890	35,080	53.8
Cass	4,480	--	--	4,480	--
Clinton	6,420	--	940	7,360	12.8
Eaton	9,680	240	2,280	12,200	18.7
Genesee	27,580	4,200	22,540	54,320	41.5
Gratiot	6,760	--	--	6,760	--
Hillsdale	7,480	40	640	8,160	7.8
Huron	8,320	--	--	8,320	--
Ingham	15,280	3,380	13,980	32,640	42.8
Ionia	9,780	--	--	9,780	--
Isabella	2,700	80	1,200	3,980	30.2
Jackson	10,580	2,880	6,680	20,140	33.2
Kalamazoo	9,440	5,120	17,920	32,480	55.2
Kent	25,520	6,720	45,720	77,960	58.6
Lapeer	8,000	--	620	8,620	7.2
Lenawee	11,400	160	1,640	13,200	12.4
Livingston	3,730	--	--	3,730	--
Macomb	25,100	5,240	21,080	51,420	41.0
Midland	6,160	1,120	10,220	17,500	58.4
Monroe	10,425	1,600	5,440	17,465	31.1
Montcalm	9,920	--	--	9,920	--
Muskegon	16,360	2,560	43,280	62,200	69.6
Oakland	45,980	16,320	56,040	118,340	47.4
Ottawa	7,680	--	--	7,680	--
Saginaw	14,845	2,920	7,340	25,105	29.2
Sanilac	16,360	--	--	16,360	--
Shiawassee	9,780	360	1,000	11,140	9.0
St. Clair	15,120	400	4,630	20,150	23.0
St. Joseph	6,220	--	--	6,220	--
Tuscola	7,760	--	--	7,760	--
Van Buren	7,120	--	--	7,120	--
Wastenaw	8,940	3,600	11,200	23,740	47.2
Wayne	151,920	16,960	55,600	224,480	24.8
Totals	583,900	84,820	388,880	1,057,600	36.8

^a Source: General Highway Maps, Michigan State Highway Department, Lansing, 1940.

total of 182,751 acres in farms within the cities of the study area.⁷ To equal this would require an area increase of about 45 per cent for all unmapped cities and villages.

Acreages of land in the various urban and related non-farm land uses are shown in Table 7. Urbanized areas comprise more than 50 per cent of the total of these uses, yet they take up only 6.8 per cent of the total land in the study area counties.

Other non-urban uses of land are not so sharply affected by urban population as is urban land. State and federal rural highways, for example, seem to be affected only slightly by the city population. Wayne county had 1,684 acres of land in rural highways, while Barry county, with a population of less than 10 per cent that of Wayne, had 1,484 acres.⁸ Since only rural acres of highways and others of these different land uses were tabulated, the acreage in state and federal

⁷1950 United States Census of Agriculture: Minor Civil Divisions, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C.

⁸Mileages of highways as of January 1, 1955, from: State Trunk-line Mileages--Rural, Michigan State Highway Department, Lansing, 1955. Mileages of County roads as of December 31, 1953, from: Third Annual Progress Report, Michigan State Highway Department, County Road Commissions, Lansing, December, 1954.

Highway and county road acreage estimates are based upon a conversation with Henry Ferenz of the Michigan State Highway Department, Lansing, Michigan. Mr. Ferenz stated that state trunklines have a minimum standard width of 120 feet. This width is used to compute the acreage estimates. A very few highway mileages are of the old statutory width of 100 feet, while expressways vary from 200 to 300 feet in width.

County roads have a statutory width of 66 feet, with about 95 per cent meeting this standard. Approximately 5 per cent of all county roads are wider than this minimum.

Table 7

Acres of Non-farm Land Uses in Study Area, by County and Type of Use, 1955

County	Urban	State high- ways ^a	County roads	Rail- roads ^b	Public ^b	Other ^b	Total non-farm	% non- farm	Urban as % of total area	non- farm
Allegan	8,440	1,668	14,421	945	38,240	---	63,714	12.0	1.6	13.2
Barry	8,340	1,484	8,457	245	19,555	---	38,081	10.8	2.4	21.9
Bay	22,800	1,155	7,959	927	1,116	40	33,997	11.9	8.0	67.1
Berrien	46,340	1,947	10,256	945	1,086	120	60,694	16.4	12.5	76.4
Branch	5,870	1,031	7,573	273	---	1,074	15,821	4.9	1.8	37.1
Calhoun	35,080	1,640	10,374	655	---	4,120	51,869	11.4	7.7	67.6
Cass	4,480	1,645	7,646	336	2,860	600	17,387	5.6	1.4	25.8
Clinton	7,360	901	8,898	418	2,320	780	20,677	5.7	2.0	35.6
Eaton	12,200	1,801	8,318	627	---	160	23,106	6.4	3.4	52.8
Genesee	54,320	1,916	10,840	527	---	400	68,003	16.5	13.2	79.9
Gratiot	6,760	1,056	9,578	536	7,920	---	25,850	7.1	1.9	26.2
Hillsdale	8,160	1,921	8,926	691	2,040	---	21,738	5.7	2.1	37.5
Huron	8,320	2,187	12,745	1,036	2,881	---	27,169	5.2	1.6	30.6
Ingham	32,640	1,190	9,011	527	4,040	3,700	51,108	14.3	6.4	63.8
Ionia	9,780	1,512	8,666	636	2,520	1,529	24,643	6.7	2.7	39.7
Isabella	3,980	810	9,095	527	1,840	560	16,812	4.6	1.1	23.7
Jackson	20,140	2,044	11,181	1,036	10,480	4,582	49,463	11.0	4.5	40.7
Kalamazoo	32,480	1,263	9,817	1,191	2,060	8,008	54,819	15.1	9.0	59.2
Kent	77,960	2,797	15,727	1,255	7,040	260	105,039	19.0	14.1	74.2
Lapeer	8,620	1,610	9,838	645	9,784	1,038	31,535	7.5	2.0	27.3

-continued on facing page-

Lenawee	13,200	2,016	11,953	1,036	956	291	29,452	6.1	2.7	44.8
Livingston	3,730	1,348	8,450	644	14,885	2,010	31,087	8.5	1.0	12.0
Macomb	51,420	1,347	9,598	491	1,387	3,400	67,643	22.0	16.7	76.0
Midland	17,500	994	6,407	218	35,920	---	61,039	18.3	5.3	28.7
Monroe	17,465	1,997	9,538	1,155	4,594	240	34,989	9.7	4.9	49.9
Montcalm	9,920	1,551	11,888	782	13,560	---	37,701	8.3	2.2	26.3
Muskegon	62,200	1,384	9,542	545	12,017	280	85,968	26.7	19.3	72.4
Oakland	118,340	2,253	19,989	891	24,965	160	166,598	29.7	21.1	71.0
Ottawa	7,680	1,242	11,141	682	327	160	21,232	5.9	2.1	36.2
Saginaw	25,105	2,502	13,650	791	3,480	320	50,848	9.8	4.8	49.4
Sanilac	16,360	2,622	14,169	809	6,120	160	40,240	6.5	2.7	40.7
Shiawassee	11,140	1,074	8,316	864	1,240	120	22,754	6.6	3.2	49.0
St. Clair	20,150	1,964	11,974	1,100	3,349	80	38,617	8.2	4.3	52.2
St. Joseph	6,220	1,577	7,721	727	1,480	160	17,885	5.5	1.9	34.8
Tuscola	7,760	2,047	12,743	1,236	18,440	1,400	43,626	8.4	1.5	17.8
Van Buren	7,120	1,702	10,117	736	320	60	20,055	5.2	1.8	35.5
Washtenaw	23,740	1,842	10,906	936	13,231	3,176	53,831	11.7	5.2	44.1
Wayne	224,480	1,684	11,736	882	1,820	10,040	250,642	64.5	57.8	89.6
Totals	1,057,600	62,724	399,164	28,527 ^c	278,693	49,028	1,875,736	12.1	6.8	56.4

a Source: State Trunkline Mileages: 1955, Michigan State Highway Department, Lansing, 1955.
County road acreages are for 1953 from Third Annual Progress Report, Michigan State Highway Department, County Road Commissions, Lansing, 1954.

b Source: County Maps: 1955, Michigan Department of Conservation, Lansing, 1955. "Public" uses include state and federal forests, parks and recreation areas, and Metropolitan Authority parks and recreation areas. "Other" uses include acreages in military reservations, airports outside city limits, and land holdings by State agencies, institutions, training schools and sanitariums.

c Counties total to 28,523 because of rounding error.

highways in Wayne county is reduced by about one-half.⁹ Highway acreage expansion proposed for completion within the next three to eight years will take up approximately 50,000 acres more.¹⁰

For railroad mileages and acreages, no information could be found specifying either miles of track or right-of-way width, by county, or in total. Mileages of railroads were read off the Conservation Department maps and converted to acreages based upon an estimated average width of 75 feet for all rail lines. Acreages of land so estimated in railroads, for the study area, amount to less than two-tenths of one per cent of the total non-farm land.

The public lands within the study area are made up primarily of state and national forests and game areas, which amount to 210,308 acres. Of the remainder, 60,905 acres are in state recreation areas, all of which have been acquired since 1940.¹¹

The remainder of the acreage shown as "public" lands is that acreage in Metropolitan Authority parks. Although small in total, they are becoming increasingly important in the most heavily populated counties in southeastern Michigan. The area included within such parks totalled

⁹Since such a large percentage of Wayne county is urban, a sizeable acreage of land in highways is not tabulated here. Approximately one half of the total highway mileage in Wayne county is urban highway.

¹⁰In 1955, there were 900 miles of highway, 300 feet wide, planned for completion between 1960 and 1965. These are all new relocation roads. Another 1,200 miles of highway, now 100 to 200 feet wide, are to be widened to 200 to 250 feet. Information obtained in conversation with Henry Ferenz, op. cit.

¹¹From a tabulation of the State Park System, as of January 1, 1955, by the Michigan Department of Conservation, Lansing, Michigan.

7,480 acres by 1955,¹² and will likely continue to expand as population increases and pressure on existing facilities increases.

Airports (located outside of city limits) comprise 9,480 acres out of the 49,028 acres included in "Other" uses. Military reservations (including military airfields) amounted to 15,080 acres, with the balance of 24,468 acres being in various state institutions, training schools and sanitariums.¹³

When forest and game areas are included as non-farm land, the total of all non-farm land in the study area is considerably smaller than for the remaining counties in the state, as shown in Table 8. State and federal forest and game acreages amount to 278,693 acres, or 14.9 per cent of the total non-farm land, as compared to 90.7 per cent for the non-study area counties.

The majority of urban land is located in the area of this study, being nearly 85 per cent of the total urban land in the state, yet this area includes only a little over 42 per cent of the total area of the state.

The degree of urbanization also can be seen in figures showing urban land as a percentage of the total land area. In the study area, urban land takes up 1,057,600 acres, or 6.8 per cent of the total area, as compared with the remaining counties in the state where this amounts to 192,430 acres, and only 0.9 per cent of the total area. This total for the urban land in the non-study area counties, however,

¹²County Maps: 1955, Michigan Department of Conservation, Lansing, 1955.

¹³Ibid.

Table 8

Acreages of Non-farm Land Uses, by Areas, 1955^a

Type of Use	State	Study Area	Other Counties
Urban	1,250,030	1,057,600	192,430
Highways	120,970	62,724	58,246
County roads ^b	680,524	399,164	281,360
Railroads	59,818	28,527	31,291
Parks and conservation ^c	7,060,853	278,693	6,782,160
Airports	16,980	9,480	7,500
Military reservations	130,160	15,080	115,080
Others ^d	44,370	24,468	19,902
Total non-farm	9,363,705	1,875,736	7,487,969
Total land area	36,494,080	15,505,740	20,987,520
Per cent non-farm	25.7	12.1	35.7
Per cent urban	3.4	6.8	0.9

^a Sources: State Trunkline Mileages--Rural, Michigan State Highway Department, Lansing, 1955.
Third Annual Progress Report, Michigan State Highway Department, County Road Commissions, Lansing, Dec., 1955.
County Maps: 1955, Michigan Department of Conservation, Lansing, 1955.

^b County road acreages are as of December 31, 1953.

^c Includes State and Federal forests and game areas, parks and recreation areas, and Metropolitan Authority parks.

^d Land in Conservation Department Experiment stations and fish hatcheries, University and Agricultural Experiment Station holdings, and State institutional farms.

includes the incorporated area and the subdivided land lying outside the city boundaries as of 1940 only. There has quite likely been some amount of urban expansion in this area, at least for the larger cities. It is possible that recreational developments have taken a considerable amount of land, especially since the late 1940's. Likewise, there may

currently be a relatively rapid expansion in residential and business appropriation of land as an influence of the construction of the Mackinac bridge.

It is recognized that since this area of the state was not mapped, the urban acreage total is understated. If the up-state cities of over 5,000 population experienced the same degree of urbanization as the five check cities mentioned on page 68, there could have been around 17,000 acres taken up by suburban expansion between 1940 and 1955. Quite likely, the expansion in urban and related acreages was somewhat greater than this because of the additional influences mentioned above.

Township Changes in Tiers Around Cities

Some evidence of effects reaching out from the central city can be found in the relative differences in changes that have taken place within the townships, depending upon their locations with respect to the city. Data have been taken from census reports on population and various kinds of farm information for each of the townships.

For purposes of discussion, three separate city areas and their surrounding townships have been selected from among those city areas mapped.¹⁴ Following this, all mapped city areas will be discussed as a group.

¹⁴These three cities were chosen for two reasons: Their second tier townships do not overlap those of a nearby city, and their 1950 populations cover the range from 163,143 for Flint, 92,129 for Lansing to 11,393 for Hillsdale.

Flint. The city of Flint is located centrally in a block of four townships (Genessee, Burton, Flint, and Mount Morris) which make up the first tier. The second tier of townships is made up of Forest, Richfield, Davison, Atlas, Grand Blanc, Mundy, Gaines, Clayton, Flushing, Montrose, Vienna and Thetford.

Figure 1 shows the city of Flint and the land area in urban use, as it was mapped. The cross-hatched area is the incorporated area, and the area shaded with diagonal cross-hatchings shows the amount of land that had been subdivided by 1940. The plattings that have taken place from 1940 to 1955 are indicated by the unshaded area lying within the outer most boundary line.

The incorporated area within the cities of Flint, Mount Morris and Grand Blanc, in 1940, amounted to 20,400 acres. Urban expansion had taken up an additional 4,200 acres by 1940. This amounts to a total area increase of 11.8 per cent by that time.

The plattings that have taken place since 1940, shown by the diagonal lines, amount to 22,540 acres -- an increase of 98.9 per cent in total area over a 15-year period.

Highway and main road influences upon suburb developments can be seen in the pattern of expansion around the city. Highway 10 running generally north and south through the city, connecting Flint with Saginaw and Pontiac, seems to have exerted considerable influence on home and business location decisions. The suburbs have extended about five miles in either direction along the highway outside the Flint city limits. This compares to expansions of one to three

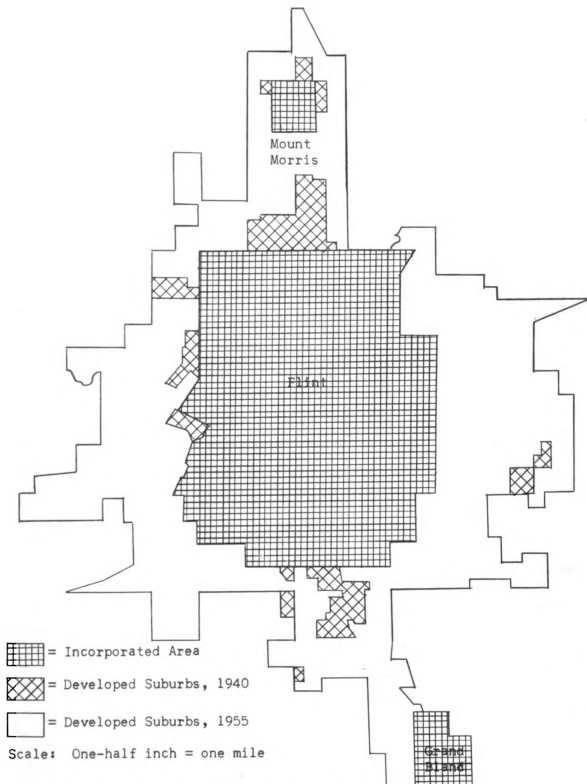


Figure 1. Corporate and Suburb Areas, Flint, Mount Morris and Grand Blanc, Michigan.

miles in other directions from the city limits. "Pointings" of suburb developments can also be noted along highways connecting Flint with Lansing, Owosso, Flushing, and Davison and Lapeer.

Such an influence is to be expected, since good roads simply make commuting easier and less time consuming. This makes it possible for people employed within the city to live farther out than those who live along streets and roads that are of poorer construction.

The pattern of effect out in the townships is noted in Table 9. In the first tier townships, population increases have been quite large. Of the individual townships, Burton township made the most rapid gains in total population from 1930 to 1950, increasing by 11,444, or 177 per cent, over the 20-year period. The largest numerical increase between ten-year censuses took place during the years from 1940 to 1950, when the population increased by 7,262, an increase of over 66 per cent in that period. The lowest population gain between 1930 and 1950 was shown by Mount Morris township, one which had neither a small city located out in the township, nor a major highway traversing through much of the township. Although the numerical gain amounted to 6,457, its percentage increase was 143 per cent from 1930 to 1950, second only to Burton township.

Table 9

Population Changes in Townships, by Tiers, Flint City Area^a

Township :	Total population :			RNF population :			Farm population		
and tier :	1950 :	1940 :	1930 :	1950 :	1940 :	1920 :	1950 :	1940 :	1930 :
First Tier									
Genesee	12,390	8,437	5,889	11,722	6,539	5,227	668	1,898	662
Burton ^b	18,171	10,909	6,727	16,194	9,661	6,300	255	1,248	427
Flint	12,944	9,183	6,320	12,535	7,552	5,313	409	1,631	1,007
Mt. Morris	10,968	6,245	4,511	10,140	4,889	1,940	828	1,356	643
Total	54,473	34,774	23,447	50,591	28,641	18,740	2,160	6,133	2,739
Ave./twp.	13,618	8,694	5,862	12,648	7,160	4,695	540	1,533	685
Second Tier									
Forest	1,932	1,745	1,481	234	72	-0-	1,068	1,139	1,047
Richfield	3,036	2,361	1,658	2,022	829	447	1,014	1,532	1,211
Davison	3,103	2,372	2,945	2,196	979	802	907	1,393	845
Atlas	1,900	1,660	1,494	961	691	612	939	969	882
Grand Blanc	4,687	3,225	1,948	3,885	1,890	1,005	832	1,335	943
Mundy	2,964	1,884	1,552	1,848	510	519	846	1,374	1,003
Gaines	2,418	2,132	1,858	1,114	756	591	952	1,108	1,017
Clayton	2,146	1,818	1,527	1,065	652	359	1,081	1,166	1,168
Flushing	4,707	3,705	3,298	1,343	435	285	1,138	1,464	1,290
Montrose	3,156	2,501	2,072	960	159	95	1,259	1,667	1,354
Vienna	3,993	3,052	2,351	2,840	501	1,376	1,153	2,551	975
Thetford	2,404	1,861	1,405	1,121	436	47	1,283	1,425	1,358
Total	36,176	28,316	23,587	19,589	7,910	6,138	12,472	17,123	13,123
Ave./twp.	3,015	2,360	1,966	1,632	659	512	1,039	1,427	1,094

^a Source: 1950 United States Census of Population: Characteristics of the Population, Michigan, United States Department of Commerce, Bureau of the Census, Washington 25, D.C., Vol. II, Part 22, 1952.

^b Lapeer Heights (population 1,722) reported for the first time in the 1950 census. Burton township rural non-farm population for 1930 and 1940 is thus overstated by the population of that village in those years.

The growth of the rural non-farm population was even more rapid than the total population, since this was partially offset by losses in farm population. Here, again, Burton township experienced the most rapid

gain numerically, showing an increase of 6,495 from 1930 to 1950, but being exceeded in percentage gain by Mount Morris township which increased from 1,940 to 10,140 for an increase of 422.7 per cent.

As a whole the first tier townships showed an increase in total population of 7,756 per township from 1930 to 1950, with 4,924 of that increase occurring from 1940 to 1950. The average rural non-farm population per township increased 7,953 between 1930 and 1950, with two-thirds of that gain occurring since 1940.

The townships showed a substantial increase in farm population from 1930 to 1940, and a sizeable loss from 1940 to 1950, with an overall loss averaging 145 per township over the 20-year period. It is possible that this is simple due to changing economic conditions between census periods, rather than a result of people moving on and off farms as the enumeration might suggest.¹⁵ Quite likely, a number of people were attempting to carry on agricultural operations at the time of the 1940 census that had not done so in the previous census period. Likewise, the drop in farm population from 1940 to 1950 may

¹⁵ To be counted as a farm in the 1940 census required only that a place of more than three acres produce agricultural products with a value of \$250 or more, either for home use or for sale. For places of over three acres no minimum product value was required.

A change in farm definition for 1950 also eliminated some places counted as farms in 1940. In 1950, places of more than three acres with less than \$150 output value were not counted as farms. Places of less than three acres were counted as farms only if the value of products sold was more than \$150. This change in definition eliminated 12,260 places with agricultural operations, most of which would have been counted as farms in the earlier census. (See: 1950 United States Census of Agriculture, Volume II, General Report, United States Department of Commerce, Bureau of the Census, Washington, D. C., 1952, pps. xxx to xxxiii.)

be due to these people feeling that their incomes were not in need of being supplemented by agricultural operations by the time the 1950 census was taken.

The "back to the farm movement" that took place during the 1930's would also have its effect on the number of farms in the different census periods. Other things remaining unchanged, as more and more people moved back into agriculture during that period, farm numbers for 1940 would be greater than for 1930. Also, as this trend was reversed, 1950 farm numbers would be lower than 1940. That this factor may have been quite influential can be seen in farm numbers for the three census periods as presented here for the Flint area. This can also be noted in the data to be presented for other study area townships.

Second tier townships experienced the same directions of change as those in the first tier, but not to as large a degree. While total population per township in the first tier increased by 7,756, the average increase per township in the second tier was only 1,049. Neither were there such wide differences between townships in the second tier as there were in those of the first.

The rate of rural non-farm population increase in the second tier was considerably higher as a percentage than the first tier, yet their numerical increase was much smaller. The average rural non-farm population increase amounted to 1,120 per township for the second tier, being less than one-seventh that of the first tier.

Farm population changes in the second tier were somewhat similar to those of the first tier, but at a lesser rate. From 1930 to 1940 the average farm population per township increased by 333, and declined by 385 from 1940 to 1950. Overall, the second tier townships averaged a five per cent loss in farm population for the 20-year period between 1930 and 1950, compared with a 21.2 per cent loss for the first tier townships during the same period.

Those second tier townships through which major highways pass showed population changes that were much higher than the other townships of that tier. By 1950, Davison, Grand Blanc, Flushing and Vienna townships had more than 45 per cent of the total population in the second tier, and more than 52 per cent of the rural non-farm population, yet they make up only one-third of the total area of that tier. These four townships showed a per township total population increase of 1,487 and an increase in rural non-farm population of 1,699 per township, as compared with an 832 increase in rural non-farm population for the remaining second tier townships.

Table 10 indicates some of the effects of urbanization and rural non-farm residence developments on farms in the first and second tier townships.

In farms, as well as in population, certain differences in the degree of change can be noted as distance from the city increases.

Farm numbers in the first tier townships changed a great deal over the 20-year period of this study. Except for Flint township,

Table 10

Farm Changes in Townships, by Township Tiers, Flint City Area^a

Township : Number of farms :		Total acres in farms: Acres cropland harvested: Acres of cropland idle									
and tier :		1950:	1940:	1930:	1950:	1940:	1930:	1950:	1940:	1930:	1950:
First tier											
Genesee	212	423	148	11,047	13,174	12,316	5,712	6,642	7,723	1,247	1,268
Burton	124	289	70	7,010	9,281	7,908	4,057	5,678	4,229	853	1,061
Flint	132	301	132	8,694	11,302	13,315	5,086	6,425	7,559	574	978
Mt. Morris	219	278	109	12,865	14,634	11,853	7,465	8,050	6,623	1,628	859
Total	687	1,291	459	39,616	48,391	45,392	22,320	26,795	26,134	4,302	4,166
Ave./twp.	172	323	115	9,904	12,098	11,348	5,598	6,699	6,534	1,076	1,042
Second tier											
Forest	229	299	205	18,922	21,489	19,860	8,279	8,879	7,281	1,445	1,606
Richfield	251	345	211	18,297	19,615	19,846	9,359	9,772	10,057	1,565	2,028
Davison	200	257	144	19,316	19,686	17,381	9,651	10,124	8,957	1,682	1,224
Atlas	177	188	172	20,311	20,860	20,656	9,654	10,137	9,147	1,467	389
Grand Blanc	171	297	121	15,711	19,918	15,333	8,785	10,141	7,959	929	1,454
Mundy	234	301	180	20,474	21,712	19,062	11,388	12,114	11,320	1,691	1,275
Gaines	182	180	168	19,321	19,411	19,515	11,417	12,017	12,048	1,554	511
Clayton	180	271	191	19,980	21,648	19,645	12,648	14,105	12,024	956	1,175
Flushing	271	342	178	19,424	21,400	15,859	10,612	11,439	8,118	2,060	2,031
Monterose	265	336	263	17,538	18,084	19,038	8,468	9,213	8,835	2,851	1,801
Vienna	285	391	144	15,925	18,528	13,809	8,337	9,383	7,151	1,918	1,774
Thetford	246	342	132	17,239	19,175	13,609	8,715	9,826	6,352	1,402	1,082
Total	2,691	3,549	2,109	222,458	241,526	213,613	117,313	127,150	109,249	19,520	16,350
Ave./twp.	224	296	176	18,538	20,128	17,801	9,776	10,596	9,104	1,627	1,363

^a Source: 1930, 1940, and 1950 United States Census of Agriculture: Minor Civil Divisions, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C.

all townships in this tier show an increase in farm numbers between 1930 and 1950. As a group, these townships averaged almost a 50 per cent increase in number of farms, increasing from 115 per township to 172. These townships experienced changes different from first tier townships for all city areas as a group, as will be shown later in Table 16. The total of all city areas show a loss in number of farms in the first tier townships from 1930 to 1950. First tier townships around Flint, however, showed an increase of 57 farms per township over the 20-year period.

Total acres in farms changed somewhat over the period from 1930, increasing by 1940 and declining more sharply by 1950. Coupled with the changing number of farms, the average farm size for the first tier declined substantially from 1930 to 1940, falling from 98.7 acres per farm to 37.5 acres. By 1950, average farm size had increased to 57.6 acres per farm.

Acreages of cropland from which crops were harvested in each of the three census years were approximately 55 per cent of the total acres in farms. Cropland that was lying idle was reduced slightly from 1930 to 1950. Idle cropland per farm in the first tier townships was 7.3 acres per farm in 1930 and 6.3 in 1950. As a proportion of total cropland from which crops were harvested, however, idle cropland increased from 12.9 per cent in 1930 to 19.4 per cent in 1950.

Second tier townships experienced changes similar to those of the first tier, but, as with population changes, the degree of change was not so large.

The number of farms per township increased from 176 in 1930 to 224 in 1950, being a 27.3 per cent increase from 1930, but a drop of 24.3 per cent from 1940.

Total acres in farms increased slightly over the 20 years, as did the acreage of cropland harvested. The average acreages per farm were reduced from 1930 to 1950 in both total acres in farms, and in cropland harvested. In these townships, as in those of the first tier, cropland harvested made up a little over 50 per cent of the total acres in farms, with idle cropland amounting to less than ten acres per farm.

In general, there were more farms per township in the second tier than in the first, with farms being larger and having more acres of cropland from which crops were harvested. With the additional competition for land from non-farm sources, we would expect a smaller total area of land to be available for farms in the first tier townships than in the second tier. And with competition bidding up land prices, first tier farms would likewise tend to be smaller than farms in the second tier.

Lansing. The city of Lansing, shown in Figure 2, takes up most of the area of Lansing township, referred to in Table 11 as the center township. The first tier is made up of the eight surrounding townships (Bath, Meridian, Alaiedon, Delhi, Windsor, Delta, Watertown and DeWitt). Beyond these are the surrounding second tier townships (Sciota, Woodhull, Williamston, Wheatfield, Ingham, Vevay, Aurelius, Eaton Rapids, Eaton, Benton, Oneida, Eagle, Westphalia, Riley, Olive, and Victor).

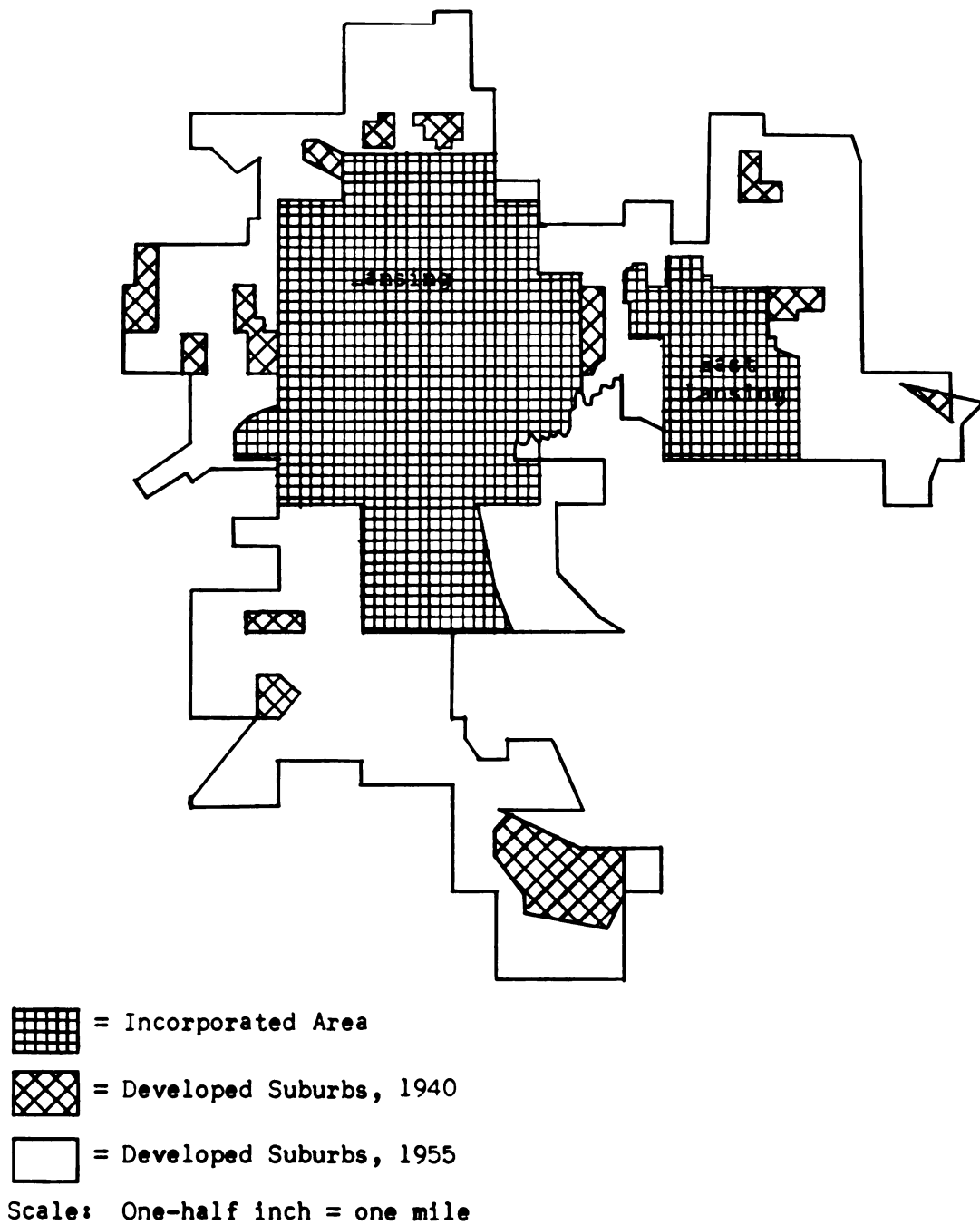


Figure 2. Corporate and Suburb Areas, Lansing and East Lansing, Michigan.

The incorporated area including the cities of Lansing and East Lansing in 1940 amounted to approximately 9,780 acres. Plattings that had been laid out prior to 1940 amounted to 3,380 acres.

Plattings completed between 1940 and 1955 totalled approximately 13,960 acres. This is an area expansion since 1940 of more than 140 per cent, as compared with the pre-1940 expansion of almost 35 per cent over the incorporated area.

Here, as with the Flint suburbs, highways show considerable influence upon suburb spreadings. The built-up area extends eastward beyond Okemos (approximately two miles beyond the East Lansing city limits, or about five miles beyond the Lansing city limits).

South of Lansing, the suburb area extends for more than four miles beyond the city limits toward Mason, and about two and one-half miles in the direction of Eaton Rapids on Highway 99.

Other highway approaches to Lansing show lesser extensions of the suburbs, reaching out no more than two miles to the west and north.

In addition to the suburb areas mapped, "string" plattings extended several miles beyond the suburbs of Lansing and East Lansing. In some locations, homes were quite closely spaced, but in most they were spotted along the highway frontage at irregular intervals.

Table 11 shows some of the changes in population that have taken place in the townships included in the center, first, and second tiers.

Lansing township shows a considerable change in total population from 1930 to 1950. From 1930 to 1940, the population increased 67.6 per cent, followed by an additional increase of 23.5 per cent from

Table 11

Population Changes in Township Tiers, Lansing Area^a

Township:	Total population			RNF population			Farm population		
and tier:	1950	1940	1930	1950	1940	1930	1950	1940	1930
Center twp.									
Lansing ^b	17,627	14,274	8,518	17,333	13,651	8,188	294	623	330
First tier									
Bath	2,804	1,626	1,033	1,864	831	279	940	795	754
Meridian ^b	9,180	4,767	2,878	8,272	3,485	1,937	836	1,282	941
Alaiedon	1,480	1,132	1,011	430	381	75	1,056	751	936
Delhi	10,077	6,723	4,512	8,781	5,105	3,553	1,296	1,618	959
Windsor	2,628	2,114	1,798	735	296	25	1,119	1,214	1,228
Delta	4,131	2,618	1,921	3,158	1,487	730	973	1,131	1,191
Watertown	1,585	1,219	1,196	816	277	178	769	942	1,018
DeWitt	4,896	3,210	2,545	3,283	1,470	35	789	1,089	2,034
Total	36,787	23,409	16,894	27,339	13,332	6,812	7,778	8,822	9,061
Ave./twp.	4,598	2,926	2,112	3,417	1,667	852	972	1,103	1,127
Second tier									
Sciota	1,640	1,544	1,324	34	-0-	-0-	664	738	619
Woodhull	1,053	887	625	358	306	95	695	581	530
Williamston	1,175	2,682	2,291	465	130	183	710	848	750
Wheatfield	761	821	776	107	86	114	654	735	662
Ingham	1,203	1,095	995	132	97	-0-	638	647	707
Vevay	1,114	1,035	938	119	70	48	995	965	890
Aurelius	1,482	1,316	1,109	389	197	241	1,093	1,119	868
EatonRapid	1,311	1,103	1,033	366	-0-	232	945	1,103	801
Eaton	958	838	823	207	6	112	751	832	711
Benton	1,660	1,442	1,319	237	61	94	799	834	733
Oneida ^b	1,552	1,269	1,169	745	237	284	807	1,032	885
Eagle	1,098	1,109	1,011	266	-0-	125	678	963	763
Westphalia	1,417	1,297	1,249	120	-0-	-0-	838	940	943
Riley	896	867	875	257	8	69	639	859	806
Olive	1,142	1,012	945	298	12	51	844	1,000	894
Victor	976	898	769	211	112	97	765	786	672
Total	19,429	19,215	17,251	4,311	1,322	1,745	12,515	13,982	12,234
Ave./twp.	1,214	1,201	1,078	269	83	109	782	874	765

^a Source: 1950 United States Census of Population: Characteristics of the Population, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C., Vol. II, Part 22, 1952.

^b Part of Lansing township annexed to Lansing city in 1949, and to East Lansing city in 1944 and 1949. Part of Meridian township annexed to East Lansing city in 1940, and part of Oneida township annexed to Grand Ledge city in 1947.

1940 to 1950. The numerical gain from 1930 to 1940 was 5,756, considerably larger than the increase of 3,353 from 1940 to 1950.

Rural non-farm population changes took place at about the same rate as total population, increasing 66.7 per cent from 1930 to 1940, and 27.0 per cent from 1940 to 1950. The numerical gain was slightly less than for total population, but here, again, the most rapid gain occurred between 1930 and 1940. Approximately 60 per cent of the total increase in rural non-farm population took place in the first ten years following 1930. Rural non-farm population increased by a greater percentage between 1930 and 1950 than total population, being partly offset by a 10.9 per cent reduction in farm population during this period of time.

Townships in the first tier experienced population gains that were quite rapid, but under a different growth pattern than the center township. Where two-thirds of the center township's total population growth took place during the first ten years of this study period, about two-thirds of the growth in total population in the first tier townships occurred in the last ten years.

The increase per township amounted to 117.7 per cent over the twenty years from 1930; a higher rate than in the center township, but numerically, considerably less with the population increase averaging 2,486, compared with 8,869 for the center township.

The rate of increase in rural non-farm population in the first tier townships was much more rapid than their total population increase. As a whole, these townships increased their rural non-farm population

by more than four times, showing a growth from 852 per township in 1930 to 3,417 in 1950.

Four of the townships (Meridian, Delhi, Delta, and DeWitt), through which major highways pass, exhibit much more rapid rates of growth than the remaining four townships in the first tier. In 1930, these four townships had 70.2 per cent of the total population; by 1950, they had 77.1 per cent. Where the 1930 to 1950 increase in population for these four townships were 139.4 per cent, the remaining four showed an increase of 67.0 per cent. Similarly, in 1930 they had 67.5 per cent of the rural non-farm population, and by 1950 their percentage had risen to 85.8. The rural non-farm population increase in these townships was 410.4 per cent while the remaining four showed an increase of 74.9 per cent. In 1930, these four townships included 54.5 per cent of the total farm population in the first tier, with this percentage falling to 51.4 per cent by 1950.

As with Flint, Lansing's second tier townships exhibit changes generally similar to the first tier, but at a considerably lower rate.

Total population per township averaged an increase of only 12.6 per cent from 1930 to 1950, with a numerical increase of only 136 per township. Similarly, rural non-farm population, although increasing 146.8 per cent per township, amounted to only 160 over the twenty years.

Farm population increased slightly in the second tier, compared with an average township loss in farm population of 13.8 per cent in the first tier townships.

Table 12

Farm Changes in Townships, by Township Tiers, Lansing Area^a

Township and tier	Number of farms			Total acres in farms		
	1950	1940	1930	1950	1940	1930
Center twp.						
Lansing	46	170	105	2,310	5,617	6,158
First tier						
Bath	163	203	160	16,151	17,648	16,560
Meridian	144	260	178	11,538	18,082	16,071
Alaiedon	191	181	217	20,020	18,224	21,673
Delhi	198	297	226	16,405	17,748	16,267
Windsor	219	238	254	19,088	19,617	21,340
Delta	188	227	235	17,000	18,150	19,419
Watertown	208	195	238	19,817	19,611	22,031
DeWitt	152	247	175	17,344	17,855	19,339
Total	1,463	1,848	1,683	137,363	146,935	152,700
Ave./twp.	183	231	210	17,170	18,367	19,088
Second tier						
Sciota	132	150	151	14,959	14,921	16,715
Woodhull	131	138	131	13,937	16,350	14,914
Williamston	164	179	153	18,136	17,152	17,161
Wheatfield	129	130	156	16,841	18,568	18,570
Ingham	135	150	154	16,997	19,031	18,322
Vevay	150	200	241	17,514	19,424	21,471
Aurelius	202	191	224	20,760	21,187	21,543
Eaton Rapids	203	212	190	21,911	21,022	18,963
Eaton	181	179	202	19,820	19,002	20,037
Benton	193	195	182	20,017	21,447	20,924
Oneida	186	226	222	19,244	21,202	19,385
Eagle	151	182	165	19,004	22,156	20,971
Westphalia	149	174	174	20,797	22,588	22,258
Riley	156	166	180	20,475	20,546	21,120
Olive	194	206	216	20,965	22,270	21,976
Victor	163	190	173	19,851	21,171	19,976
Total	2,619	2,868	2,914	303,228	316,337	313,676
Ave./twp.	164	179	182	18,952	19,771	19,605

^a Source: 1930, 1940, and 1950 United States Census of Agriculture: Minor Civil Divisions, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C.

Table 12 continued.

Township and tier	Acres of cropland harvested			Acres of cropland idle		
	1950:	1940	1930	1950	1940	1930
Center twp.						
Lansing	1,127	2,931	3,256	331	564	927
First tier						
Bath	6,140	7,227	7,195	1,327	1,414	1,597
Meridian	5,199	8,114	7,744	979	1,256	1,817
Alaiedon	11,182	10,296	11,462	2,131	714	1,488
Delhi	8,153	9,261	8,342	1,724	1,321	2,116
Windsor	10,366	10,114	11,203	1,996	1,143	1,698
Delta	8,936	9,345	10,599	2,088	1,060	1,448
Watertown	10,711	10,810	12,183	1,415	731	1,554
DeWitt	9,231	9,774	10,996	2,063	1,364	628
Total	69,918	74,941	79,724	13,723	9,003	12,346
Ave./twp.	8,740	9,368	9,966	1,715	1,125	1,543
Second tier						
Sciota	7,502	7,393	7,817	1,424	2,535	1,417
Woodhull	5,281	5,215	6,094	1,559	1,151	1,294
Williamston	9,674	8,256	8,973	1,147	1,334	465
Wheatfield	8,916	9,607	9,583	1,120	466	1,370
Ingham	8,824	8,504	8,559	1,416	1,115	1,581
Vevay	9,239	9,435	11,120	1,452	583	1,324
Aurelius	11,238	11,329	11,242	1,614	500	1,358
Eaton Rapids	10,885	10,041	9,404	1,450	583	1,228
Eaton	9,996	9,444	10,245	1,525	951	1,655
Benton	12,027	11,106	10,945	1,349	727	959
Oneida	11,894	12,005	11,274	1,099	609	1,408
Eagle	10,629	11,985	11,815	870	775	971
Westphalia	12,592	12,799	12,060	368	938	1,013
Riley	12,684	12,058	11,616	469	454	1,340
Olive	11,446	12,006	11,959	1,488	1,096	1,559
Victor	8,529	9,063	9,017	2,158	950	1,900
Total	161,356	160,246	161,723	20,508	14,767	20,842
Ave./twp.	10,085	10,015	10,108	1,282	923	1,303

Farm changes in the center township were quite abrupt due to the urban competition for land. Farm numbers were reduced by 59 from 1930 to 1950, with the average farm size also falling to 50.2 acres from the 1930 average of 58.9 acres.

Acreages of cropland harvested fell by 2,129 acres, with about 90 per cent of that reduction coming after 1940.

Farm numbers per township in the first tier were considerably greater than in the center township, with average farm size also being much greater. While the average size of farms in the center township was reduced in both 1940 and 1950, farms in the first tier townships also declined in 1940, but reversed that trend in 1950, increasing about three acres over the 20-year period.

Cropland harvested per farm in the first tier averaged almost double that of the center township. Of the total acres per farm, first tier farms by 1950 were using 50.9 per cent of their land for cropping, compared with 48.8 per cent for the center tier. Second tier farmers used a slightly larger proportion of their land in farms for cropping than this. Cropped land amounted to 61.5 acres per farm, or 53.2 per cent of the total acreage. The proportion of land used for crops declined only slightly but steadily from 1930 for the center and first tier, while the second tier farmers have increased the proportion of land harvested from the 51.6 per cent cropped in 1930.

Farms in the second tier were not as numerous as in the first tier, and averaged somewhat larger. Second tier farms averaged 115.6 acres by 1950, compared with 93.8 acres per farm for the first tier and 50.2

acres for the center township. Where average acres in farms in the first tier dropped by 1940, those in the second tier increased in both 10-year periods, rising by about three acres per farm from 1930 to 1940 and approximately five acres more by 1950.

Idle cropland seemed not to be affected by township location. In all townships, idle cropland was less than ten acres, being 7.2 acres per farm in the center, 9.4 acres in the first tier, and 7.8 acres in the second tier townships.

Mt. Pleasant. Urban acreages in and around the city of Mt. Pleasant are shown in Figure 3. The incorporated area of the city amounted to 2,180 acres in 1940. Plattings laid out prior to 1940 were approximately 80 acres, which apparently were not very densely settled at that time. The acreage taken up by new developments between 1940 and 1955 totalled approximately 1,200 acres, an area expansion of more than 50 per cent over that occupied by 1940. Most of the new developments extend out less than two miles along Highway 20 from Midland, and south about one mile from the city limits on Highway 27 toward Shepherd. Other small developments extend out no more than one-fourth mile to the west, wouthwest and southeast of the city.

Union township, within which the city of Mt. Pleasant is located, also includes all the area over which urban use around the city has expanded. Most of the changes in this township, as well as those in the first and second tiers have been relatively slow when compared with changes in the townships around Flint and Lansing. With a much smaller urban population, and relatively little urbanization, the

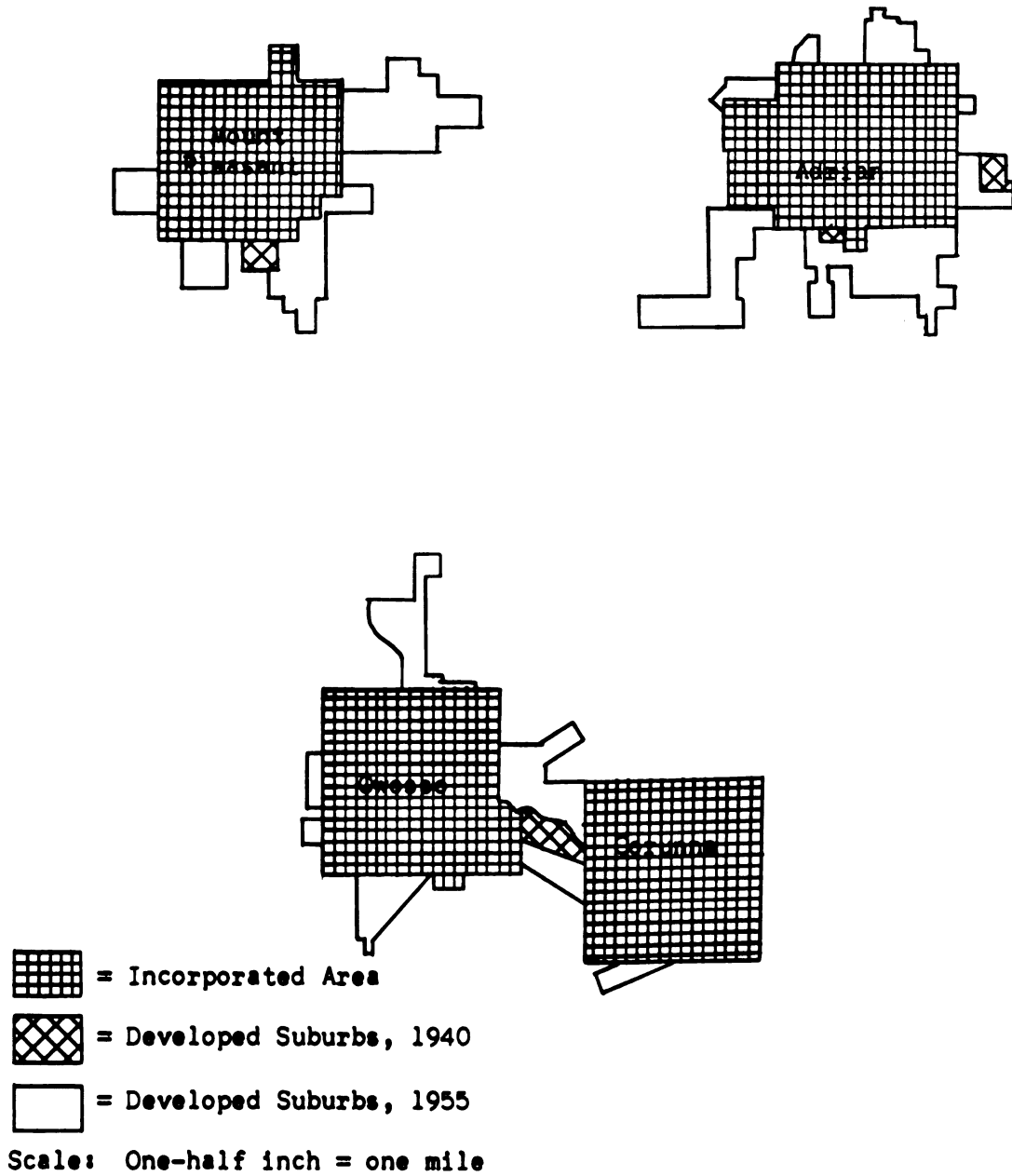


Figure 3. Corporate and Suburb Areas, Mount Pleasant, Adrian, Owosso and Corunna, Michigan.

effects out in the townships would also be much less than in the other city areas.

Population data for the townships around the city of Mt. Pleasant are presented in Table 13. The 1950 total population of Union township was a little more than double that of 1930, increasing by 1,316 during that period of time. Rural non-farm population growth was somewhat larger, being a 20-year increase of 1,535. This was partly off-set by a farm population loss of 219 during the same period.

First tier townships increased their total population by only 19, and their rural non-farm population by 119, which is considerably lower than for the center township. Township population gains in this tier were also less than those in the second tier. In both tiers there was close to a ten per cent loss in farm population.

As with population changes, adjustments in farms and acreages were also made at a lower rate than in the Flint and Lansing areas. As indicated in Table 14, the center township showed a reduction in total acres in farms and cropland harvested, as well as in the number of farms. In spite of this, farms averaged 123 acres in 1950, compared with 82.3 acres in 1930, with slightly more than one-half of this acreage used for crops.

First and second tier townships also showed fewer farms in 1950 than in 1930. Average size in the first tier was increased by almost 10 acres to 116.7 acres per farm, while those of the second tier increased by 18.5 acres to 124 acres per farm. Farms in both tiers increased their acreages of cropland harvested, with those of the first

Table 13

Population Changes in Township Tiers, Mt. Pleasant Area^a

Township : <u>Total population</u> : <u>RNF population</u> : <u>Farm population</u>									
and tier : 1950 : 1940 : 1930 : 1950 : 1940 : 1930 : 1950 : 1940 : 1930									
Center two.									
Union	2,596	1,767	1,280	1,758	570	223	838	1,197	1,057
First tier									
Denver	799	916	775	147	299	152	652	617	623
Chippewa	1,151	1,191	918	298	4	242	853	1,187	676
Coe	2,046	2,128	2,130	181	63	155	966	1,213	1,136
Lincoln	1,021	1,097	1,037	252	208	82	769	889	955
Fremont	885	901	825	194	151	145	691	750	680
Deerfield	842	882	856	248	39	34	594	843	822
Nottawa	1,263	1,358	1,302	417	219	329	846	1,139	973
Isabella	1,381	1,456	1,394	606	275	250	775	1,181	1,144
Total	9,388	9,929	9,237	2,343	1,258	1,389	6,146	7,819	7,009
Ave./twp.	1,174	1,241	1,155	293	157	174	768	977	876
Second tier									
Warren	872	792	655	159	87	12	713	705	643
Geneva	623	613	620	157	67	126	466	546	494
Greendale	751	850	536	395	513	304	356	337	232
Jasper	735	810	704	176	218	51	559	592	653
Bethany	1,205	1,293	1,258	264	12	35	941	1,281	1,223
Pine River ^b	1,459	1,181	1,093	703	127	194	756	1,054	899
Seville	1,498	1,428	1,315	768	619	370	730	809	945
Richland	1,125	1,029	900	461	307	207	664	722	693
Home	1,955	1,896	1,907	147	65	149	837	1,006	861
Rolland	942	1,032	1,004	283	286	314	659	746	690
Broomfield	616	738	670	59	10	4	557	728	666
Sherman	682	887	720	292	254	302	390	633	418
Coldwater	619	628	677	122	32	44	497	596	633
Gilmore	566	610	496	31	19	17	535	591	479
Vernon	1,092	1,071	955	315	98	96	777	973	859
Wise	1,070	907	876	259	51	81	811	856	795
Total	15,810	15,765	14,386	4,591	2,765	2,306	10,248	12,175	11,183
Ave./twp.	988	985	899	287	173	144	641	761	699

^a Source: 1950 United States Census of Population: Characteristics of Population, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C., Vol. II, Part 22, 1952.

^b Part of Pine River township annexed to St. Louis city in 1947.

Table 14

Farm Changes in Townships, by Township Tiers, Mt. Pleasant Area^a

Township and tier	Number of farms			Total acres in farms		
	1950	1940	1930	1950	1940	1930
Center Union	143	203	228	17,592	17,161	18,753
First Tier						
Denver	139	132	113	14,857	13,696	11,688
Chippewa	151	189	150	14,015	13,695	13,369
Coe	208	217	235	22,302	22,389	22,998
Lincoln	172	190	202	21,042	21,080	21,161
Fremont	151	165	150	19,119	21,259	18,924
Deerfield	116	152	146	14,085	17,180	16,540
Nottawa	160	183	161	21,687	21,342	18,716
Isabella	169	215	193	20,455	21,705	21,055
Total	1,266	1,443	1,350	147,562	152,346	144,451
Ave./twp.	158	180	169	18,445	19,043	18,056
Second tier						
Warren	172	181	150	16,359	17,716	13,048
Geneva	110	115	119	12,139	11,449	10,951
Greendale	56	47	45	6,708	3,629	3,735
Jasper	110	134	130	13,250	13,875	14,145
Bethany	227	238	253	22,333	22,248	20,537
Pine River	169	226	214	19,409	21,315	20,260
Seville	162	199	212	20,076	18,736	19,858
Richland	136	149	156	14,540	16,247	15,683
Home	163	217	191	17,498	18,792	17,736
Rolland	137	141	147	18,610	17,538	17,518
Broomfield	132	138	132	18,733	16,848	16,881
Sherman	77	88	97	14,722	12,250	13,714
Coldwater	98	116	127	15,560	16,997	18,135
Gilmore	86	114	110	13,133	13,627	13,536
Vernon	153	184	171	23,349	23,266	21,135
Wise	144	179	145	17,439	19,161	16,229
Total	2,132	2,466	2,399	263,858	262,694	253,101
Ave./twp.	133	154	150	16,491	16,418	15,819

^a Source: 1930, 1940, and 1950 United States Census of Agriculture; Minor Civil Divisions, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C.

Table 14 continued

Township and tier	Acres of cropland harvested:			Acres of cropland idle		
	1950	1940	1930	1950	1940	1930
Center twp.						
Union	9,567	10,140	11,762	673	548	1,072
First tier						
Denver	7,823	7,462	7,093	493	358	487
Chippewa	7,136	6,798	6,756	497	1,067	695
Coe	14,382	14,438	14,769	550	382	635
Lincoln	12,069	11,639	12,180	722	914	989
Fremont	8,665	8,850	8,626	1,518	960	1,221
Deerfield	6,216	7,501	8,300	863	773	1,014
Nottawa	12,046	11,763	11,221	606	1,274	460
Isabella	12,086	12,493	11,956	986	312	841
Total	80,423	80,944	80,904	6,235	6,040	6,342
Ave./twp.	10,053	10,118	10,113	779	755	793
Second tier						
Warren	6,243	6,287	5,067	1,050	389	572
Geneva	5,067	4,413	4,394	278	559	809
Greendale	940	1,090	1,068	840	186	134
Jasper	7,282	6,962	7,274	582	332	363
Bethany	15,341	14,837	13,454	518	176	739
Pine River	11,943	11,783	11,565	806	336	974
Seville	9,335	10,060	9,581	1,423	580	2,674
Richland	5,037	5,670	6,230	1,507	1,833	1,745
Home	8,143	8,595	8,849	1,925	1,298	1,342
Rolland	7,682	7,000	7,379	1,437	1,742	1,069
Broomfield	6,788	6,650	7,349	2,457	1,346	850
SSherman	3,883	3,380	4,831	1,124	21	1,132
Coldwater	5,218	5,699	6,881	1,610	695	705
Gilmore	4,419	4,916	5,374	867	806	846
Vernon	10,914	10,567	10,268	1,465	213	485
Wise	9,159	8,563	7,650	531	196	1,594
Total	117,394	116,472	117,214	18,420	10,758	16,033
Ave./twp.	7,337	7,280	7,326	1,151	672	1,002

tier utilizing a somewhat larger proportion. More than one-half of the total farmland in the first tier was used for cropping, and second tier farmers used less than 45 per cent of their total farmland for crops.

In the Mt. Pleasant area, as in the Flint and Lansing areas, idle cropland amounted to less than 10 acres per farm, and in the center and first tier, was less than five acres per farm. Little change in this acreage occurred over the twenty years from 1930.

All mapped city areas. Acreage changes in urban land have been presented in Table 5 above. Figures 4 through 14 show the city areas that were mapped, from which acreage estimates of the degree of urbanization have been made.

For most of the city areas, the influence of highways and improved roads shows quite plainly. Housing developments extend further out from the city limits along these roads, while being retarded in the areas between. This influence is much more noticeable around the larger cities, but is not entirely absent around the small cities of the study area.

Another strong effect upon the direction of suburb expansion is the location of another city nearby. In pairs of cities such as Ann Arbor and Ypsilanti, Detroit and Pontiac, Detroit and Mt. Clemens, Bay City and Saginaw, and smaller cities such as Owosso and Corunna, much of the development has taken place between these cities. Suburb development activity seems stronger in such between-cities areas than elsewhere.

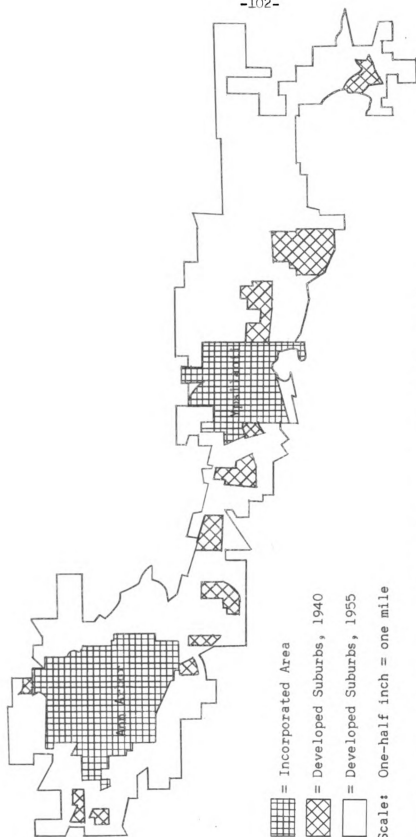


Figure 4. Corporate and Suburb Areas, Ann Arbor and Ypsilanti, Michigan.

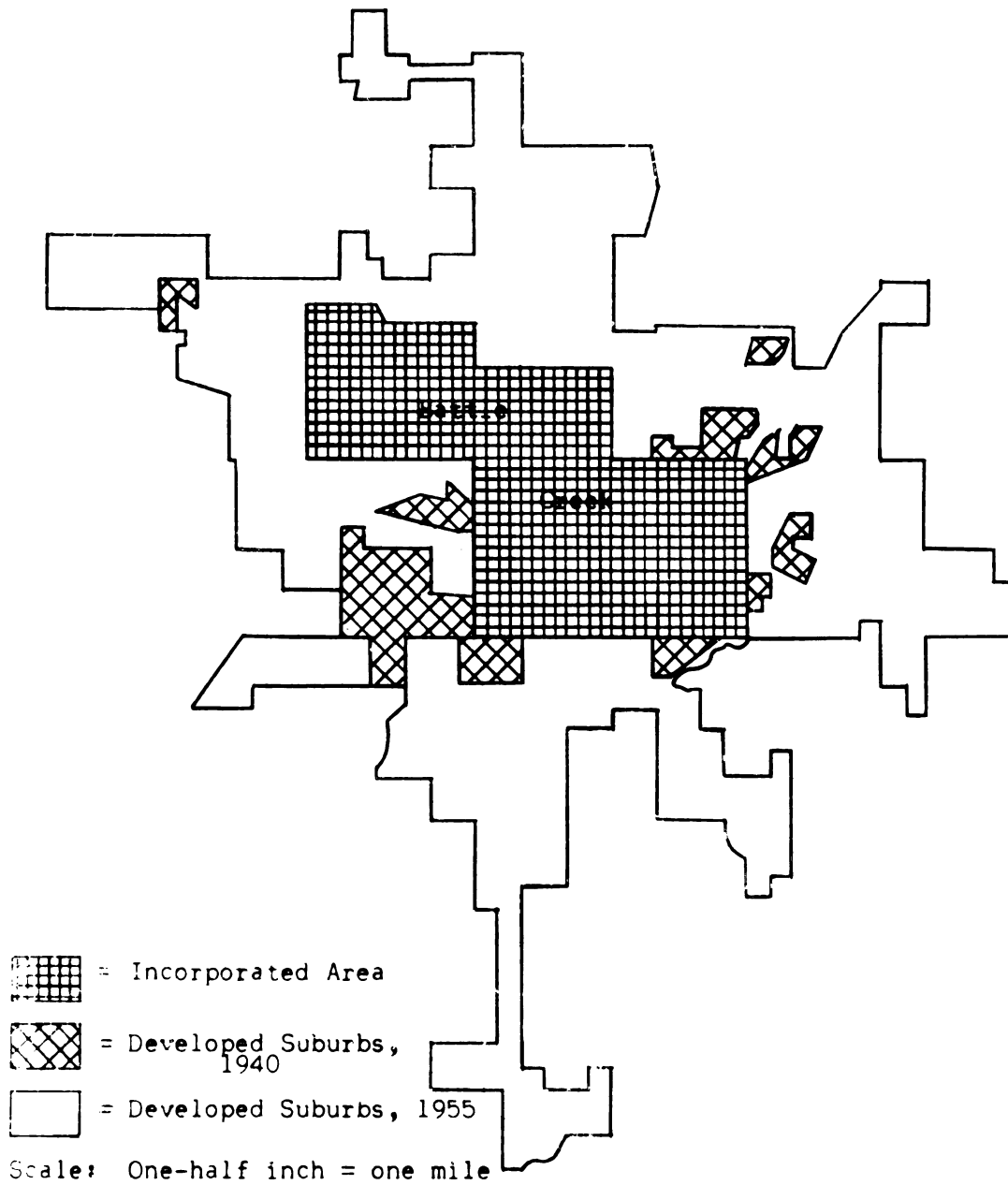


Figure 5. Corporate and Suburb Areas, Battle Creek, Michigan.

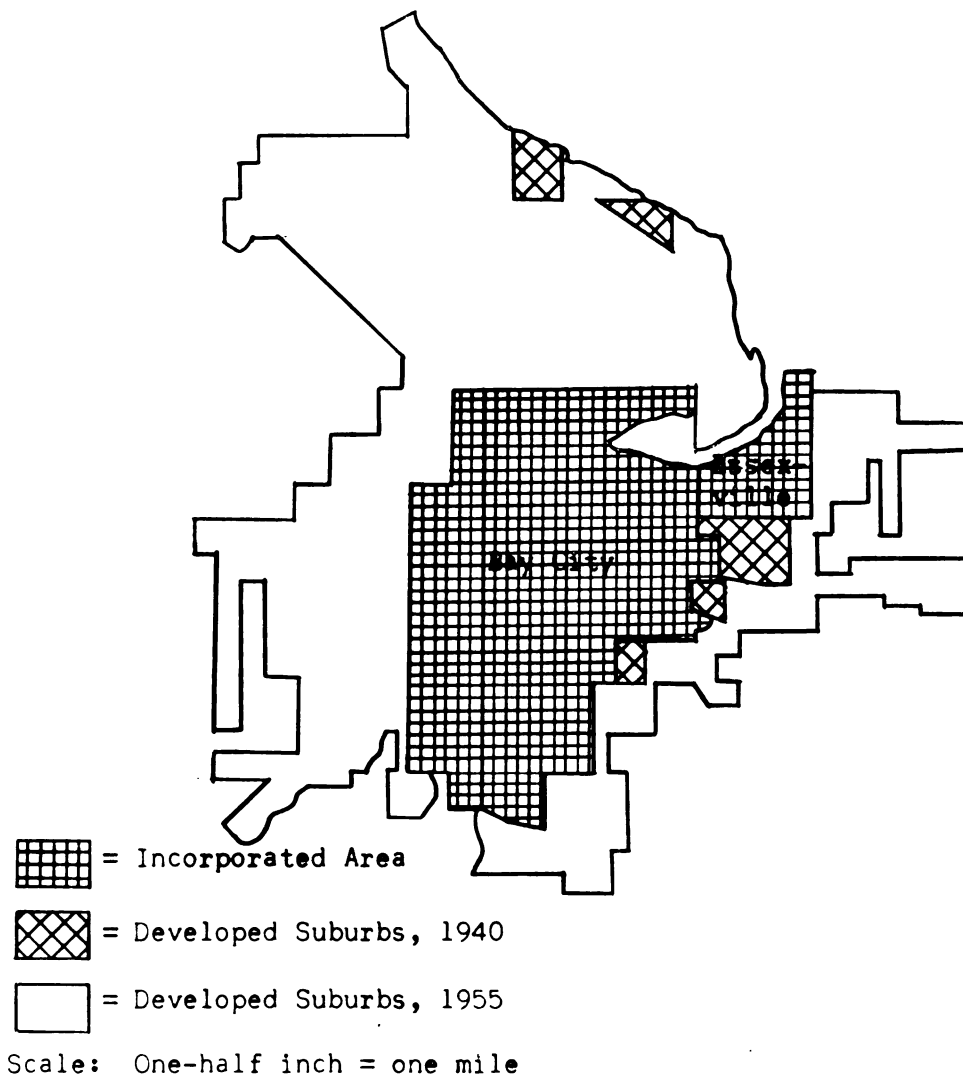


Figure 6. Corporate and Suburb Areas, Bay City and Essexville, Michigan.

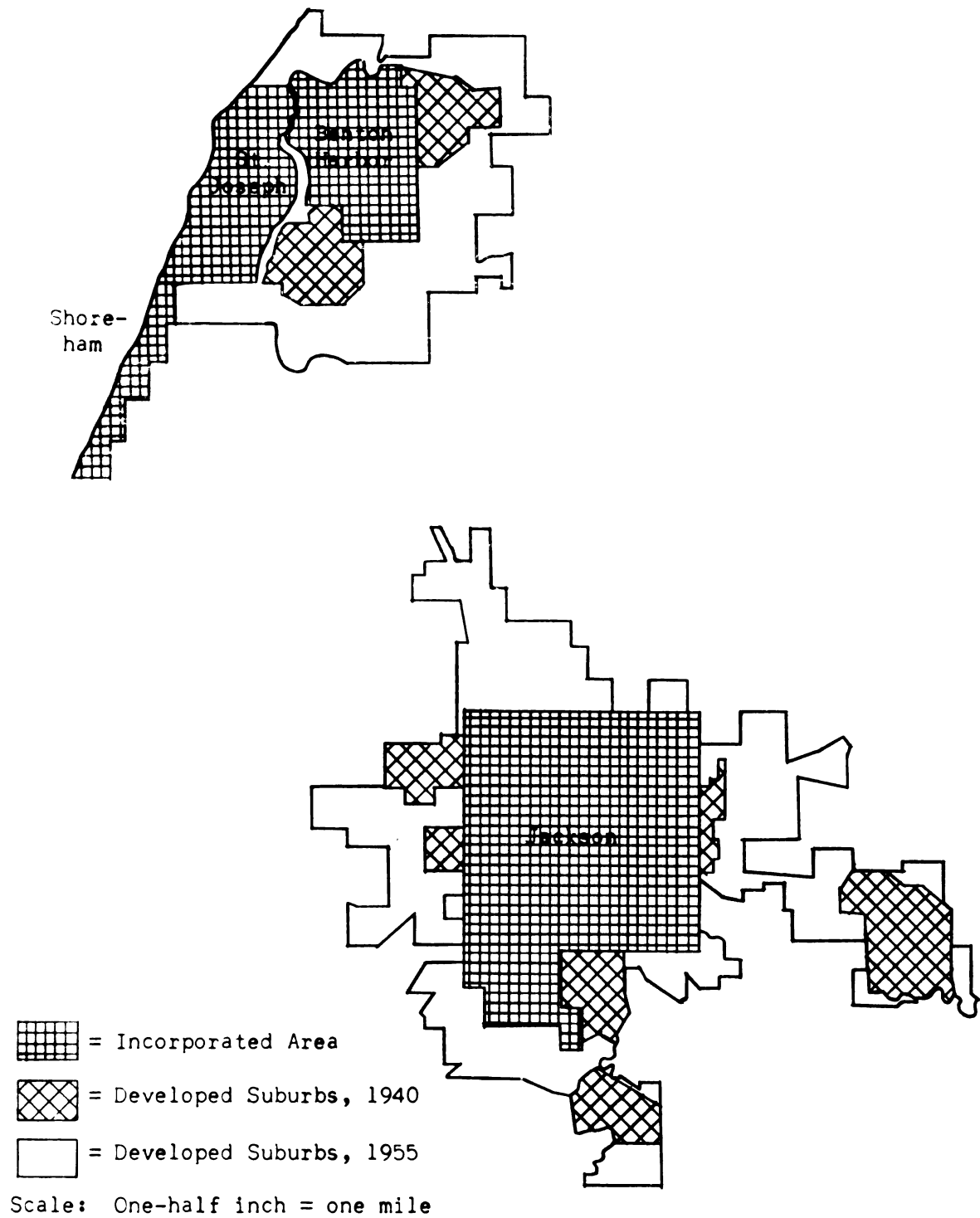


Figure 7. Corporate and Suburb Areas, Benton Harbor, St. Joseph, Shoreham and Jackson, Michigan.

Figure 8. Corporate and Suburb Areas, Detroit, Michigan, and Outlying Cities.

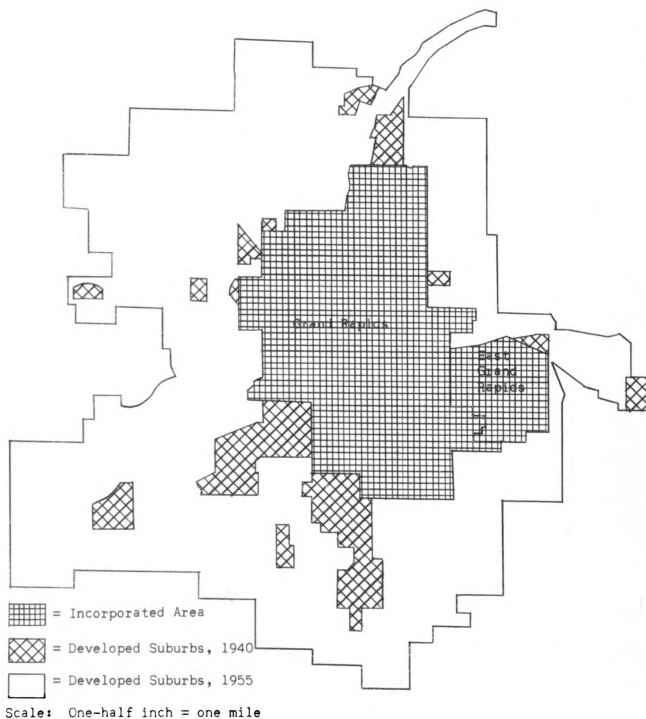


Figure 9. Corporate and Suburb Areas, Grand Rapids and East Grand Rapids, Michigan.

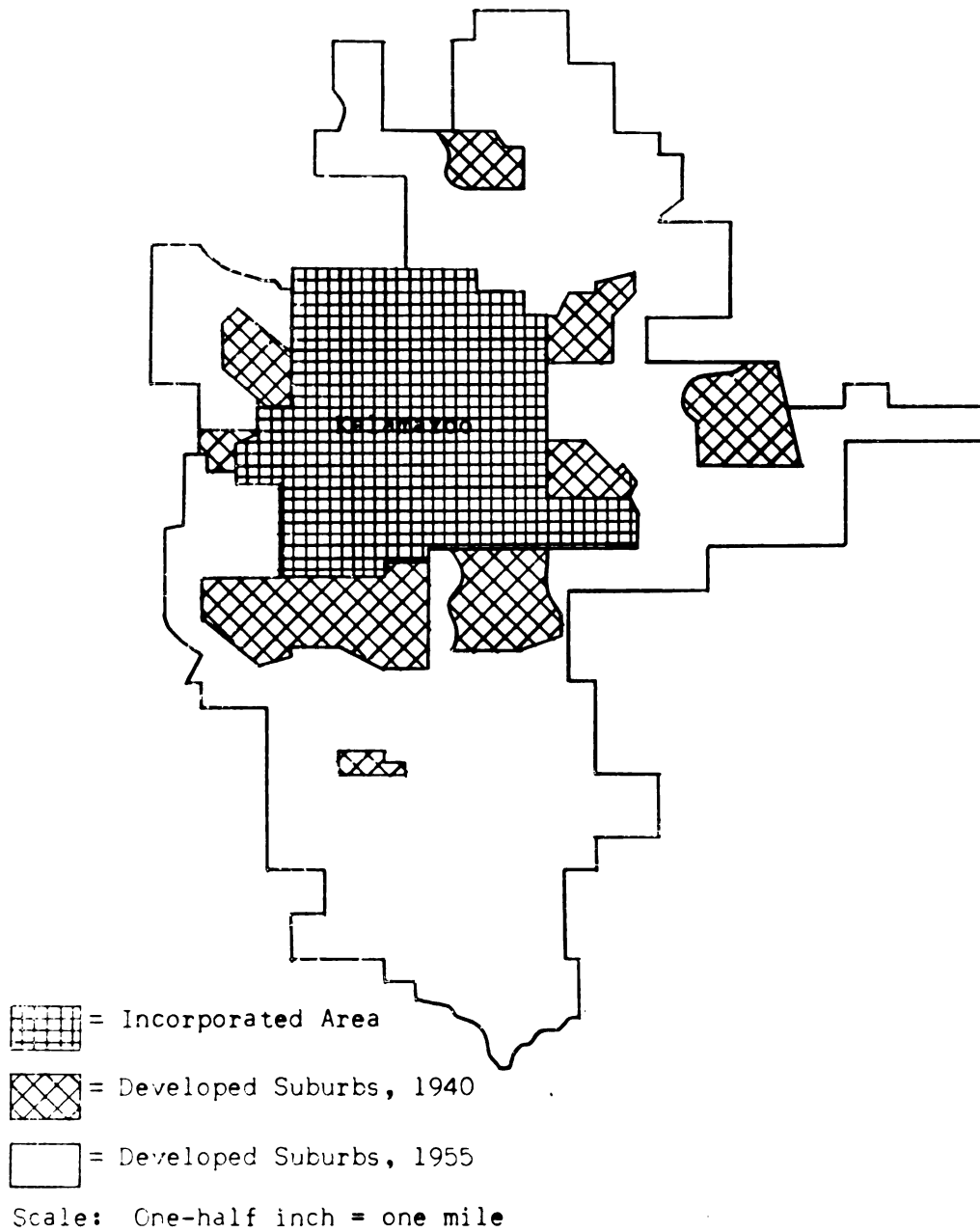


Figure 10. Corporate and Suburb Areas, Kalamazoo, Michigan.

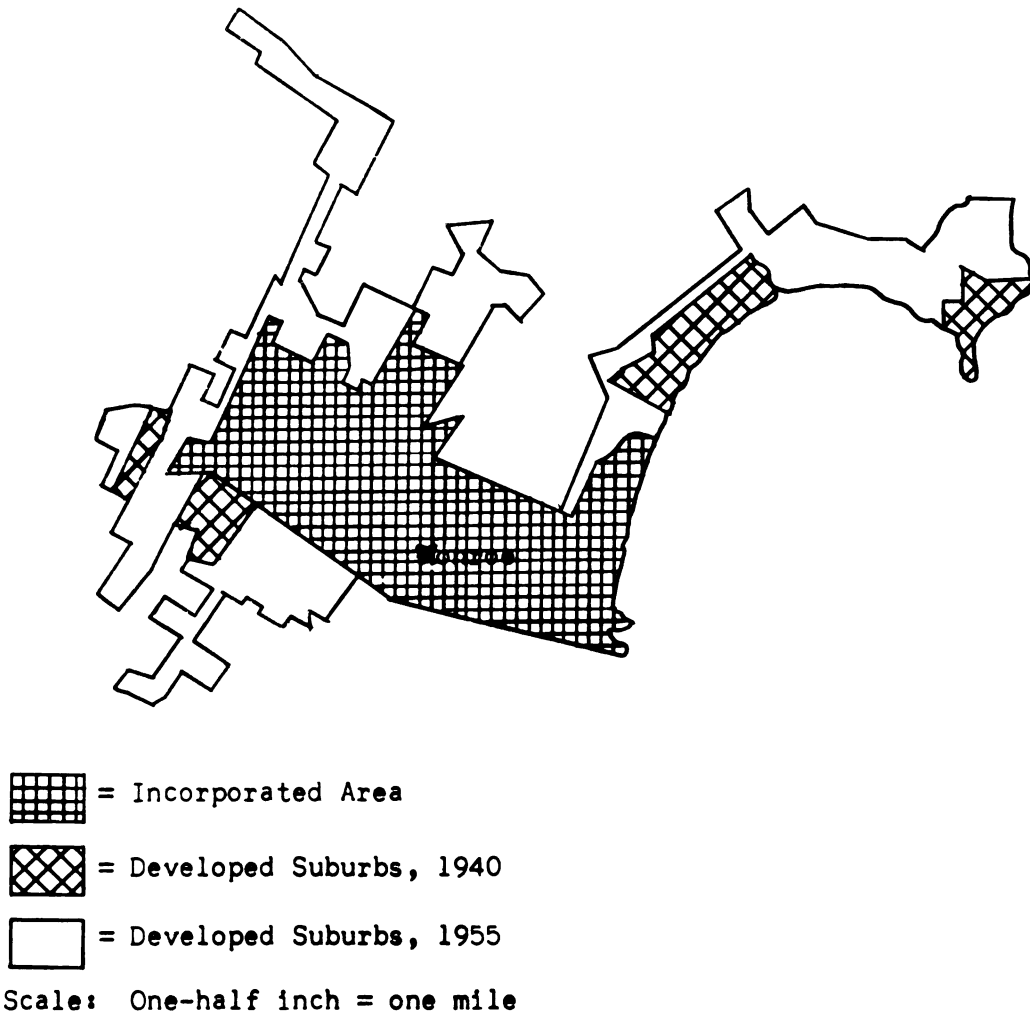
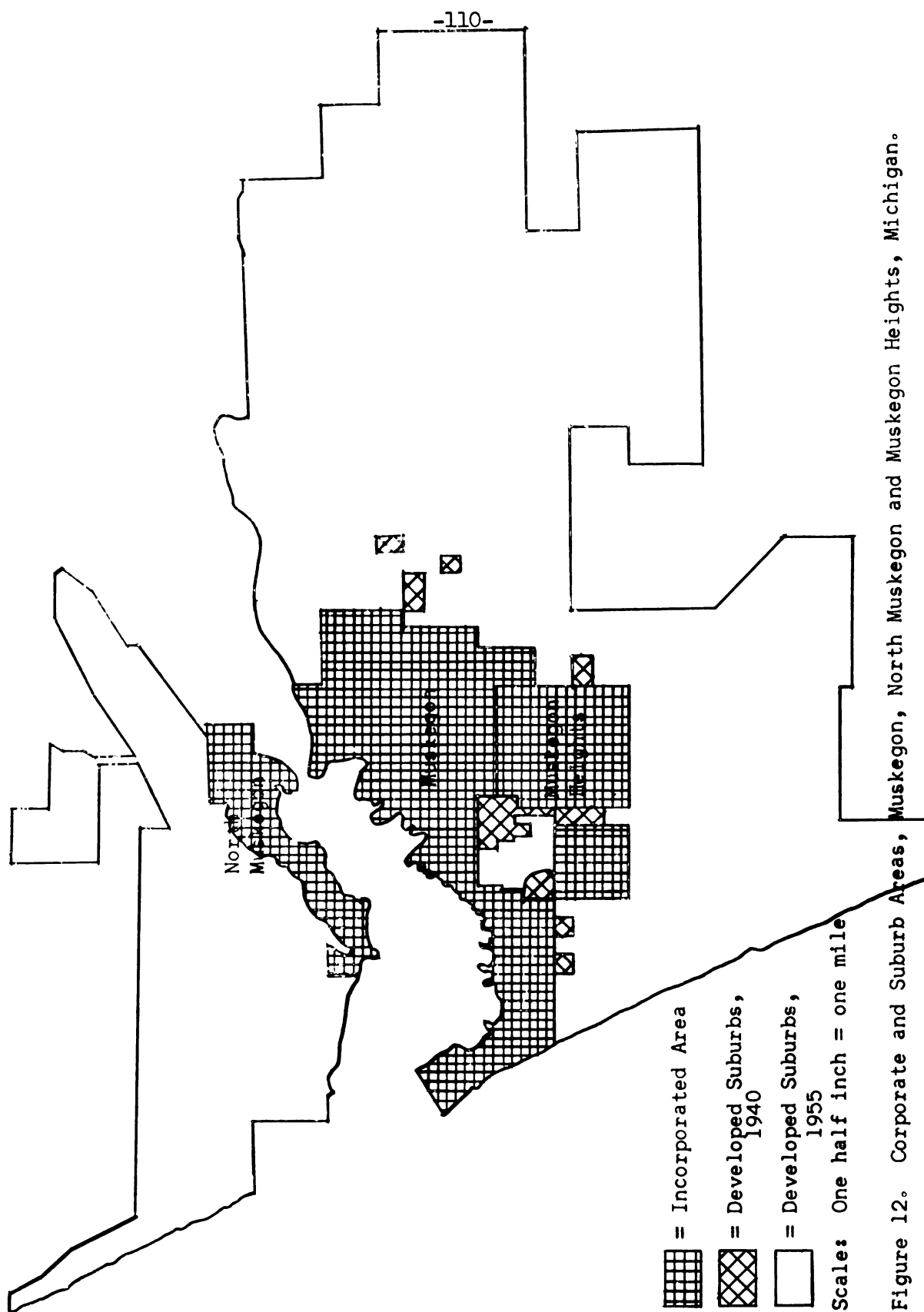
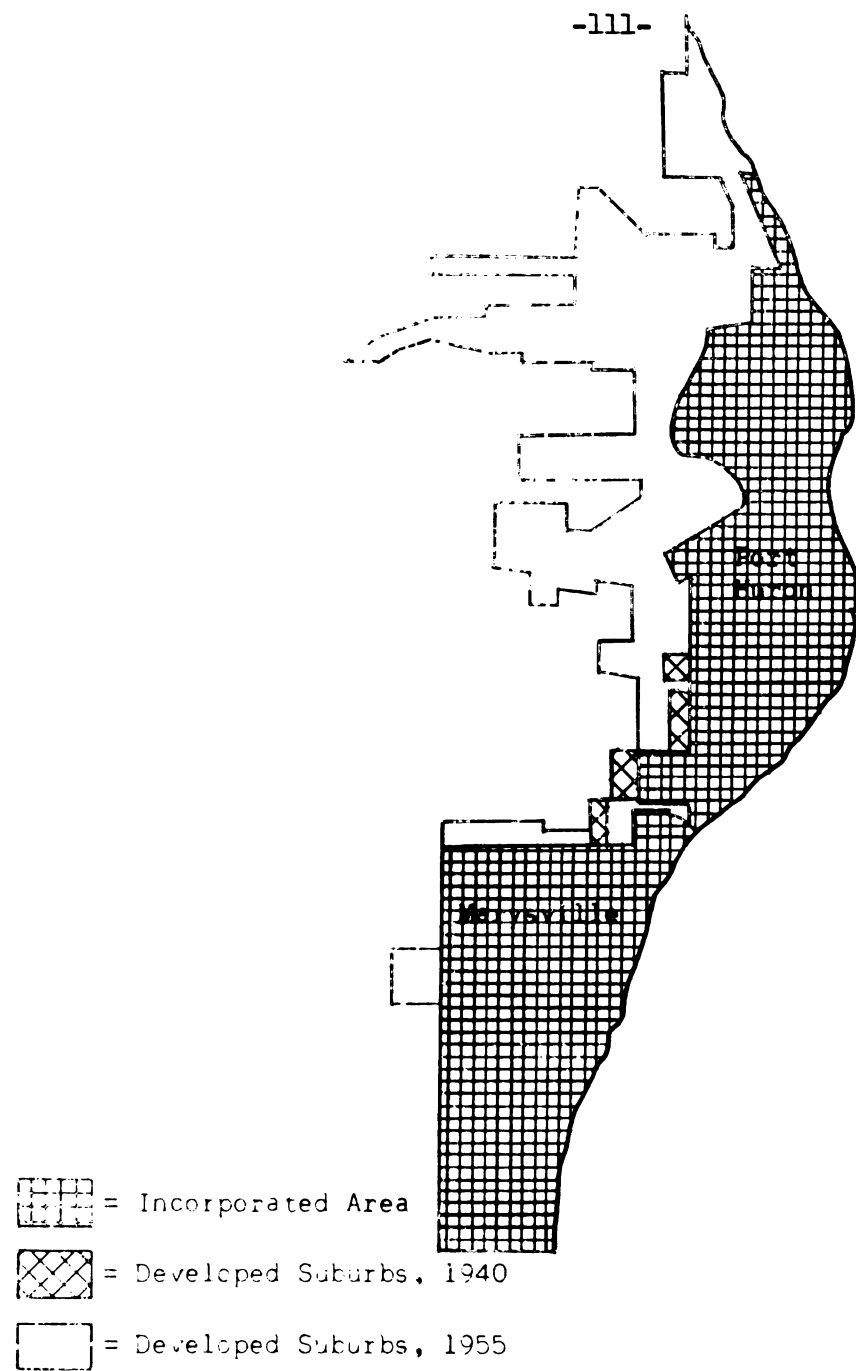


Figure 11. Corporate and Suburb Areas, Monroe, Michigan.





Scale: One-half inch = one mile

Figure 13 Corporate and Suburb Areas, Port Huron and Marysville, Michigan.

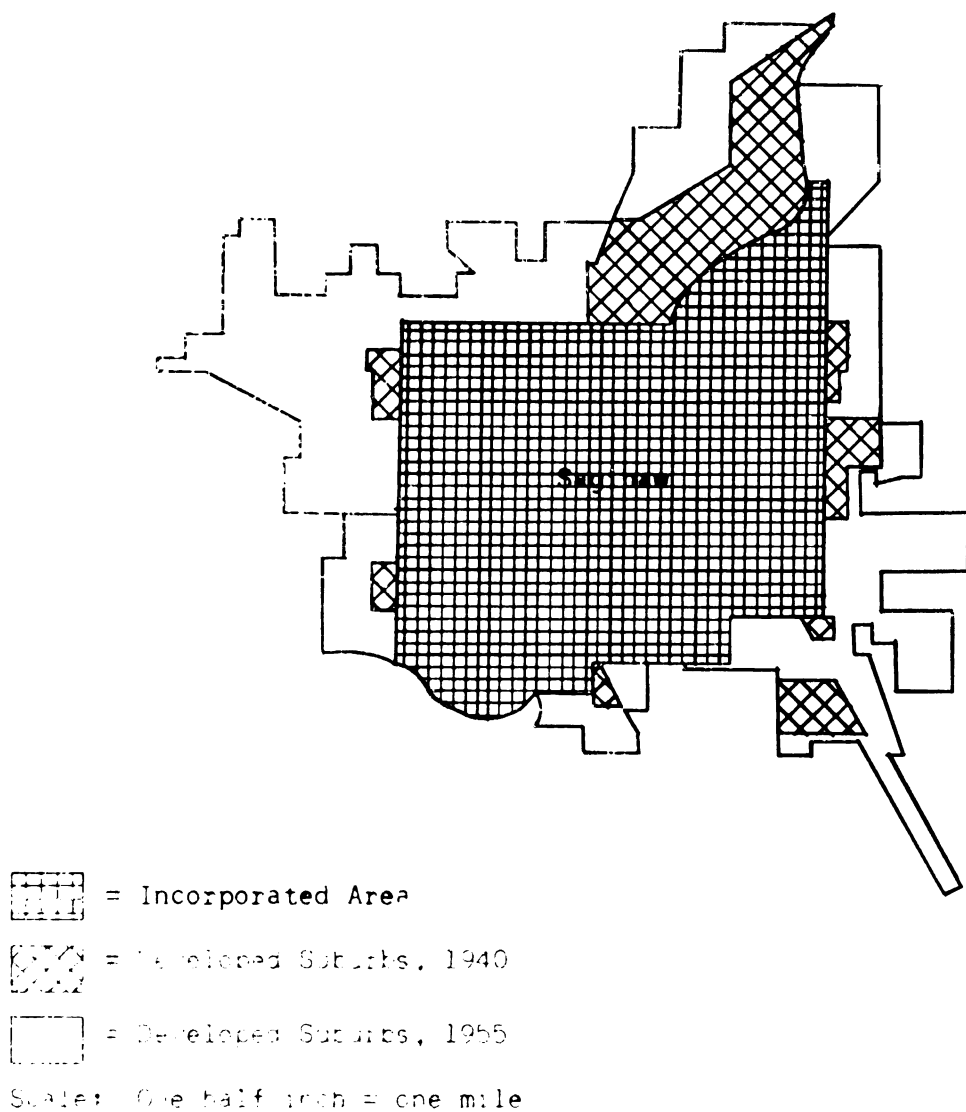


Figure 14 Corporate and Suburb Areas, Saginaw, Michigan.

In addition to the suburb expansions that have taken place are the "string" plattings along highway approaches to the cities. These plattings extend far beyond the suburbs that have been developed. In most of such cases, individuals have simply purchased enough land fronting on highways to meet their needs for space. In some areas these plattings become almost continuous, but in most instances are quite irregularly spaced. The highway frontage from Bay City to Midland, for example, is quite heavily platted, a distance of approximately 12 miles from the Bay City suburbs to the Midland city limits. A number of other highways are similarly settled, but usually of somewhat lesser density.

Information on the population changes that have taken place in the townships is presented in Table 15. In this tabulation, only the averages for each of the townships in a particular location are given. For example, there are 10 cities each of which is located within one township, called the center township. The figures in the table for the center township are averages for these 10 center townships.¹⁶ First tier and second tier townships are presented in the same manner, with the township location given clockwise, beginning with the average of all townships lying in a northeasterly direction from the central city.

Center townships in the areas mapped averaged a 1950 population of 6,622. This is an increase of more than 90 per cent since 1930. The largest numerical increase occurred from 1940 to 1950, when these townships gained 1,659 per township over 1940.

¹⁶For the totals of all the townships, see Appendix Table B.

Table 15

Population Per Township, by Township Tiers, All Mapped City Areas^a

Township location and tier	Total population ^b			RNF population			Farm population		
	1950	1940	1930	1950	1940	1930	1950	1940	1930
Center twp's.	6,622	4,963	3,429	6,132	3,900	2,773	474	649	660
First tier									
NE twp's.	7,059	4,224	3,437	5,106	3,035	2,528	856	1,116	840
E twp's.	5,879	3,601	2,996	2,838	1,340	1,106	843	1,111	938
SE twp's.	5,979	4,068	3,547	3,483	1,857	1,717	783	1,034	831
S twp's.	5,651	3,414	2,843	3,725	2,434	2,141	633	842	664
SW twp's.	6,041	3,806	2,809	4,192	2,689	1,871	696	849	811
W twp's.	6,149	3,431	2,444	5,318	2,427	1,551	688	914	805
NW twp's.	4,268	2,589	1,982	3,388	1,567	880	712	941	771
N twp's.	3,508	4,721	4,153	3,952	2,600	3,049	618	916	840
Total	44,534	29,854	24,211	32,002	17,949	14,843	5,829	7,723	6,500
Ave./twp.	5,567	3,732	3,026	4,000	2,244	1,855	729	965	813
Second tier									
NE twp's.	2,144	1,654	1,347	1,006	563	356	732	793	741
ENE twp's.	2,540	1,931	1,982	1,274	644	787	737	857	811
E twp's.	2,261	1,728	1,469	1,024	329	271	808	1,006	835
ESE twp's.	2,291	1,826	1,587	998	454	288	936	1,062	922
SE twp's.	1,855	1,487	1,307	756	302	182	941	1,057	968
SSE twp's.	2,405	1,830	1,587	1,208	459	342	857	1,056	954
S twp's.	3,082	2,503	1,795	958	928	143	724	766	720
SSW twp's.	2,472	1,873	1,680	1,069	499	376	913	1,022	928
SW twp's.	2,170	1,779	1,705	969	500	351	926	1,108	968
WSW twp's.	3,156	2,136	1,605	1,612	739	395	953	1,122	951
W twp's.	7,243	3,852	2,902	3,990	2,010	1,520	713	908	756
WNW twp's.	2,542	1,847	1,516	1,302	500	402	773	954	755
NW twp's.	1,471	1,220	1,083	474	162	133	786	898	799
NNW twp's.	1,765	1,400	1,219	774	247	368	790	979	811
N twp's.	2,226	1,734	1,748	668	220	342	727	854	818
NNE twp's.	2,497	1,203	1,523	1,449	647	347	790	921	779
Total	42,120	29,994	26,055	19,531	9,203	6,503	13,097	15,363	13,516
Ave./twp.	2,633	1,875	1,211	1,221	575	406	819	960	845

^a Source: 1950 United States Census of Population: Characteristics of the Population, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C., Vol. II, Part 22, 1952.

^b In this tabulation there are 53 unincorporated towns and villages, and cities incorporated since 1940, with a population total of 128,621 listed for the first time in the 1950 census. RNF population is therefore overstated by the total population of these villages and cities in 1930 and 1940. In addition, there were a large number of annexations during this period of time that do not specify the populations of the annexed areas, which also overstates the RNF population for 1930 and 1940.

Rural non-farm population in the center townships grew at a more rapid rate than total population. The townships showed an increase of 121.1 per cent over the 20 years from 1930, and a numerical increase of 3,359 during that time. The greatest increase in this population category was also shown in the years 1940 to 1950. A total of 2,232 rural non-farm residents were added during that time, almost double the 1,127 increase from 1930 to 1940, reflecting the increased emphasis on residential location outside of the city.

Farm population for the center townships averaged an annual decline of just less than 10 per year, declining 28.2 per cent from 1930. The largest decline occurred from 1940 to 1950 in these townships, while those of the first and second tier showed a decline only in the period from 1940 to 1950. First tier townships showed a farm population decline of 10.3 per cent from 1930 to 1950, and second tier townships averaged a loss of 3.1 per cent during the same period of time.

First tier townships increased their total population by 84 per cent from 1930 to 1950, higher than the 61.7 per cent in the second tier. Numerically, first tier townships showed a 1930 to 1950 population gain more than two and one-half times that of the second tier, while that of the center townships was more than 25 per cent greater than for the first tier.

Rural non-farm population also shows the effects of distance upon population density and population changes. While the 1950 rural non-farm population totals for the center, first and second tiers

were 6,132, 4,000 and 1,221, respectively, the increase for the center township amounted to 3,359, for the first tier 2,145, and 815 for the second tier townships.

Farm changes that have taken place are presented in Table 16. Because of the method of tabulating farm data in the census, these indicators are not as accurate as would be desired.¹⁷

Farms were reduced in number in the first and second tier townships, as well as in the center townships, although not so rapidly. While the second tier farm numbers fell by 5.9 per cent from 1930 to 1950, and those of the first tier were reduced by 8.7 per cent, center township farm numbers fell by 38.3 per cent during that period of time.

Farms in the center townships averaged 104.8 acres, an increase of 30 acres per farm over 1930. Because of the error introduced in

¹⁷Farms located within an area defined as urban by the census are reported separately in the census as "Other Units", by county, only, without specifying either the urban territory or township within which they are located. A sizeable increase in the number and acreages of land in these other Unit farms results from the changed definition of urban territory in the 1950 census.

The following tabulation shows farms as reported by the census only for counties in which there was a city mapped:

Year	Number : of farms	Total acres : in farms	Acres of crop- : land harvested	Acres of crop- : land idle
1950	2,525	109,910	54,322	10,719
1940	1,080	40,419	19,712	4,336
1930 ^a	208	11,546	5,301	1,911

^a Macomb and Wayne counties only reported.

Table 16

Farm Averages Per Township, by Township Tiers, All Mapped City Areas^{ab}

Township tier : and location :	Number of farms			Total acres in farms		
	1950	1940	1930	1950	1940	1930
Center twp's.	100	138	162	10,478	10,774	12,123
First tier						
NE twp's.	171	238	190	14,240	15,495	14,987
E twp's.	177	226	188	15,348	16,604	15,293
SE twp's.	173	203	179	14,851	15,787	14,994
S twp's.	122	174	142	11,487	13,278	12,376
SW twp's.	143	187	166	13,039	14,698	14,383
W twp's.	153	191	171	13,821	16,156	15,710
NW twp's.	155	210	159	15,319	16,976	15,343
N twp's.	135	218	151	14,410	15,863	15,115
Total	1,229	1,649	1,346	112,515	124,842	118,201
Ave./twp.	154	206	168	14,064	15,605	14,775
Second tier						
NE twp's.	149	180	162	16,515	18,388	17,609
ENE twp's.	159	186	155	15,835	16,873	14,982
E twp's.	181	208	191	15,687	16,327	17,355
ESE twp's.	192	214	191	17,330	17,969	17,246
SE twp's.	189	207	208	19,063	19,066	19,609
SSE twp's.	178	254	195	18,167	19,245	15,116
S twp's.	170	191	183	18,741	19,523	18,441
SSW twp's.	163	223	174	15,759	18,463	15,772
SW twp's.	196	245	215	17,550	18,882	18,151
WSW twp's.	201	255	219	18,588	18,857	19,458
W twp's.	152	188	177	14,889	17,027	16,739
WNW twp's.	169	212	166	17,654	18,947	17,643
NW twp's.	167	194	183	17,315	18,709	18,760
NNW twp's.	170	190	166	17,063	17,280	16,524
N twp's.	164	184	193	17,152	18,250	19,328
NNE twp's.	161	199	156	15,951	18,046	15,979
Total	2,761	3,330	2,934	273,259	291,852	278,712
Ave./twp.	173	208	183	17,079	18,241	17,420

^a Source: 1930, 1940, and 1950 United States Census of Agriculture: Minor Civil Divisions, Michigan, United State Department of Commerce, Bureau of the Census, Washington, D. C.

^b For the totals for all the townships, see Appendix C.

Table 16 continued

Township tier : and location :	Acres of cropland harvested :			Acres of cropland idle		
	1950 :	1940 :	1930 :	1950 :	1940 :	1930 :
Center twp's.	5,233	5,263	6,046	4,872	643	1,361
First tier						
NE twp's.	7,430	7,575	7,747	1,301	1,279	1,367
E twp's.	8,534	8,683	8,101	1,033	1,182	1,370
SE twp's.	8,242	8,480	8,027	1,149	849	1,165
S twp's.	5,622	6,302	5,891	9,921	1,040	1,300
SW twp's.	6,926	7,073	7,190	860	1,257	1,285
W twp's.	7,148	7,853	7,782	1,258	1,097	1,239
NW twp's.	7,787	8,220	7,475	1,343	1,435	1,554
N twp's.	7,420	10,390	7,455	1,201	1,073	1,477
Total	59,109	64,576	59,668	18,075	9,212	10,757
Ave./twp.	7,389	8,072	7,459	2,259	1,152	1,345
Second tier						
NE twp's.	8,338	8,270	8,207	1,146	1,235	1,370
ENE twp's.	7,946	7,921	7,461	1,133	1,242	1,335
E twp's.	8,936	8,644	8,883	1,085	1,171	1,578
ESE twp's.	9,535	9,420	9,231	1,347	949	1,223
SE twp's.	10,714	9,339	10,138	1,336	1,055	1,555
SSE twp's.	10,425	10,185	9,389	1,146	910	1,462
S twp's.	9,795	10,426	9,145	1,421	1,028	1,752
SSW twp's.	8,715	9,239	7,964	1,135	1,457	1,322
SW twp's.	9,414	9,581	9,399	1,405	1,433	1,511
WSW twp's.	9,594	9,242	9,800	1,451	1,529	1,555
W twp's.	7,568	8,526	8,121	1,259	996	1,539
WNW twp's.	8,838	9,348	8,536	1,393	1,248	1,389
NW twp's.	8,591	8,830	9,055	1,390	1,184	1,485
NNW twp's.	8,851	8,257	8,170	1,155	1,293	1,518
N twp's.	8,577	8,541	9,254	1,145	1,409	1,727
NNE twp's.	7,791	8,237	7,795	1,231	1,365	1,439
Total	143,628	144,006	140,548	20,178	19,504	23,760
Ave./twp.	8,977	9,000	8,784	1,261	1,219	1,485

the census report, average farm size is larger in the center townships than for either the first or second tier farms, these being 91.6 and 99.0 acres, respectively, in 1950. (An adjustment of average farm size for the center ^{and} first tier township farms will be made following the discussion of Table 16.) One would conclude, however, that farm size would likely be much smaller near a city than further out in the open country.

Just as for total acres in farms, the center townships average a larger acreage of cropped land per farm than in the first and second tier farms, although the difference is not so great as for total acres in farms. Here, also, one would expect center township crop acres per farm to be smaller than in the other two tiers.

Except for the center and first tier townships, in 1950, idle cropland is a small part of the total acres in farms. In 1950, however, idle cropland in the center townships farms averaged 48.7 acres per farm, almost as large an acreage as that cropped. First tier farms averaged 14.7 acres of land idle in 1950, just over 16 per cent of the total acreage in farms. For all other years, idle cropland was less than 10 acres per farm, the highest being 8.4 acres in 1930 for center township farms.

The relative amounts of farm land per township in the different tiers show the effects of the urban competition for land. Center townships averaged 10,478 acres in farms in 1950, a reduction of 13.6 per cent from 1930. First tier townships averaged 14,064 acres, and the second tier averaged 17,079 per township. This was a decrease

of 4.8 per cent from 1930 for first tier townships, and 21.0 per cent for second tier townships.

Cropland harvested showed a similar decline for the center townships, dropping 8.7 per cent from 1930 to 1950. Second tier townships, however, increased their cropland by 193 acres per township. By 1950, first tier townships averaged 41.2 per cent more cropland per township than the center, and the second tier acreage was 71.5 per cent greater per township than the center townships.

As previously stated, this tabulation presents a somewhat erroneous picture of farms and their acreages within the center and first tier townships. This results from the methods of the census in reporting farms. Farms that are located within urban territory are called urban farms, and are, therefore, not reported with the township within which they are located. In reporting on urban farms, only the county total is given. (The urban area within which these farms are located is not specified.) An adjustment of the averages per township in Table 16 should be made to show more accurately the changes that have taken place within each of the township tiers -- center, first and second.

Table 17 presents farm data averages per township for each tier, adjusted to include urban farms within the counties in which there was a city mapped. The numbers and acreages in these farms are given above in footnote 17, page 117. Approximately 30 per cent of the total urban area is in the center townships, and about five per cent is in the second tier of townships. Almost the entire

Table 17

Adjusted Farm Averages Per Township, by Township Tier,
All Mapped City Areas^a

	Center		First tier		Second tier	
Year	townships		townships		townships	
and	Average	Average	Average	Average	Average	Average
Item	per twp.:	per farm:	per twp.:	per farm:	per twp.:	per farm:
1950						
No. farms	176		167		174	
Acreages:						
Total	13,775	78.3	14,636	87.6	17,103	98.3
Cropped	6,863	40.0	7,671	45.9	8,989	51.7
Idle	5,194	29.5	2,315	13.9	1,263	7.3
1940						
No. farms	170		212		208	
Acreages:						
Total	11,987	70.5	15,815	74.6	18,250	87.7
Cropped	5,854	34.4	8,175	38.6	9,004	43.3
Idle	773	4.5	1,175	5.5	1,220	5.9
1930						
No. farms	168		169		183	
Acreages:						
Total	12,469	74.2	14,835	87.8	17,422	95.2
Cropped	6,205	36.9	7,487	44.3	8,785	48.0
Idle	1,418	8.4	1,355	8.0	1,485	8.1

^a Source: 1930, 1940, and 1950 United States Census of Agriculture: Minor Civil Divisions, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C.

remaining 65 per cent of the total urban area is in the first tier townships. A similar division of these urban farms has been made -- 30 per cent of the total added to the center townships, 65 per cent added to the first tier townships, and 5 per cent added to the second tier townships.

With such a division of urban farms, the picture is changed somewhat. Center townships average more farms than the first tier, which, in turn, had fewer farms than the second tier. Farm size grows progressively larger as the distance from the central city increases. Likewise, the townships farther out average a larger acreage of cropland than those nearest the city.

Rural Non-Farm Population Adjustments

The enumeration of rural non-farm population is intended to include only those rural area people living outside of any city, town or village compact who carry on too little farming operations to be called farmers. However, the method of arriving at a listing of the rural non-farm population has resulted in the inclusion of a number of people that would be classified as urban in this study. All city suburb residents, living in unnamed suburbs of cities, are listed by the census as part of the population of the township in which they reside. When unincorporated town and village, as well as farm, populations are subtracted from the township population to arrive at the rural non-farm population, these suburb residents become tabulated here as rural non-farm.

Because of the impossibility of being able to distinguish in the census reports between suburb residents and those defined here as rural non-farm, the following method has been used to get a more accurate listing of rural non-farm population by township tiers. The results are given in Table 18.

Table 18

Study Area Rural Non-Farm Population Corrections
By Township Tiers, 1950

Township tier	Census rural : non-farm ^a	Approx. sq. mi. : of rural area ^b	Density per : sq. mi. : non-farm	Adjusted rural
Center	61,319	285	83.1 ^c	23,684
First tier	500,034	3,037	59.8 ^c	181,613
Second tier	262,686	7,195	36.5	262,686
"Other"	142,613	10,812	13.2	142,613
Total	966,652	21,329	28.6	610,596

^a Source: 1950 United States Census of Population, Characteristics of the Population: Michigan, United States Department of Commerce, Bureau of the Census, Washington 25, D. C., Vol. II, Part 22.

^b Net of urban and all other non-farm land uses.

^c Estimated by applying second tier and "Other" township density differences to the center and first tier townships.

For the mapped city areas, all the rural non-farm population in the center and first tier townships were deducted from the rural non-farm population for the study area. This leaves the rural non-farm in the second tier townships and all remaining study area townships (referred to here as "Other" townships). Rural non-farm population, in 1950, for the second tier was 262,686.¹⁸ Therefore, rural non-farm for "Other" townships is 142,613.

There are approximately 7,195 square miles of rural land area in the second tier townships, and 10,812 square miles in the "Other"

¹⁸See also Appendix Table B.

townships.¹⁹ This amounts to a rural non-farm density per square mile of 36.5 for the second tier, and 13.2 for the "Other" townships. The difference in density is 23.3 per square mile. Applying this figure to the differences between first and second tier densities results in a calculated density of 59.8 rural non-farm people per square mile for the first tier. A similar application to the difference between center and first tier densities results in an estimated rural non-farm population density of 83.1 per square mile for the center townships.

Estimates of the total amount of rural land net of all non-farm land uses in the different tiers have been made. Multiplying the density per square mile by the total area in each tier results in an adjusted rural non-farm population for center townships of 23,684, and 181,613 for first tier townships. These corrected figures are believed to be much more accurate in specifying the number of people who live out in the open country not classified as farmers by the census.

With these estimates, total rural non-farm population for the study area turns out to be 610,596, as compared with the 966,652 obtained by subtracting farm and village populations from the totals given for the townships by the census. The difference between these two figures, of 356,056 would be an approximation of the number of people living in city suburbs whose numbers were entered by the census as part of the township population.

¹⁹Total township area corrected to account for small (correction line) townships, and non-farm acreages, leaving only rural area.

Estimated Rural Non-Farm Land Holdings

No specific data are available which indicate the acreage held by rural non-farm residents. However, Moore's study of a segment of the Lansing area may be used as a basis for estimating such acreages. Moore's sample area was in two blocks, the Okemos area and the Williamston area.²⁰ The Okemos area was approximately five to eight miles beyond the Lansing city limits, and the Williamston sample area averaged about 12 miles from Lansing.

Urban influences in the Okemos sample area were found to be somewhat stronger than in the Williamston sample. For this reason, the Williamston area results, rather than the total sample area, will be used here as being more nearly similar to what may exist in this study area.

Moore found that in the Williamston sample rural non-farm residences averaged 13 acres per holding. Of this, 26 per cent was idle at the time of the survey.²¹ If we apply these findings to the adjusted rural non-farm population of 610,596 for the study area, there is a possibility of more than 2,300,000 acres of land being held in rural non-farm residences.²²

²⁰Elon H. Moore, op. cit., pp. 11, 12.

²¹Ibid., pp. 64, 69.

²²The 1950 census shows rural non-farm residences average 3.41 people per residence. For the study area this gives 179,060 rural non-farm residences if we use the adjusted rural non-farm population of 610,596. At 13 acres per rural non-farm residence, this amounts to a total of 2,327,780 acres in these holdings.

Such an estimate may be somewhat conservative, since the 1950 census for the state as a whole, lists 65,535 "places not counted as farms", with a total of 2,461,703 acres in these places.²³ These "places" would be included within the rural non-farm population tabulation that has been made for the state. At 2.41 persons per rural non-farm residence,²⁴ this accounts for only 223,474 rural non-farm residents, as compared with the 1,134,902 obtained here. If this total for the state is adjusted downward at the same rate as the study area, the corrected rural non-farm population for the state is 717,258. At 3.41 persons per rural non-farm household, the state had a total of 210,340 such residences in 1950, showing an enumeration by the census of less than one-third of the total rural non-farm residences in the state.²⁵ This would seem to indicate that the census listing understates considerably the amount of land held by rural non-farm residents. If this is so, then the estimate made here may also understate the total amount of land in rural non-farm residences by quite a large acreage. This estimate amounts to a total of 2,734,420 acres in rural non-farm residences for the state, after adjusting rural

²³1950 United States Census of Agriculture: General Report, United States Department of Commerce, Bureau of the Census, Washington, D. C., Vol. II, 1952, pp. xxxii-xxxiii.

²⁴1950 United States Census of Population: Characteristics of the Population, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C., Vol. II, Part 22, 1952, p. 55.

²⁵This is primarily an elimination from enumeration by the census of places of three acres or more which had less than \$150 value of products sold in 1940 and, therefore, does not intend to completely specify total acreages of land in rural non-farm holdings.

non-farm population for the state by the same percentage as the study area, and assuming that the rural non-farm residents in the remainder of the state held land at the same acreage per residence as that estimated for the study area.

On the other hand, holdings in places not counted as farms may be largely in the areas of the state outside the study area. That part of the state may include a substantial number of holdings on which there were no farming operations, or insufficient agricultural operations to qualify as farms. If this is a large number, with a large acreage of land per place, the attempt at a conservative estimate may not have been achieved.

From rural non-farm population totals for the entire state in each of the census years 1930 and 1950, presented in Chapter V, rural non-farm population has increased by 140.1 per cent from 1930 to 1950. Assuming that rural non-farm residence land holdings have not changed significantly over that period of time, there has been an increase of 1,466,501 acres in these residences since 1930. This is a rate of 73,325 acres going into rural non-farm residences annually. This, however, is not necessarily a net loss of land to agriculture, since Moore also found that 51 per cent of the land held by these people was leased out to farmers in the area. Assuming a similar proportion of land rented out by rural non-farm residents in the state, just less than one-half of this land annually going into rural non-farm residences has been lost to agriculture. However, there is likely nothing very permanent in this "loss" of agricultural land. Changing

economic conditions could change the attitudes of land owners to either farming this land themselves, or renting out more of it to farmers, since only a very small part of the land holding may have been altered in such a way that it is no longer suitable for farming operations.

Idle land in rural non-farm holdings in Moore's study amounted to 26 per cent in the Williamston sample area. If we again use the Williamston area as a basis for an estimate, there is a possibility of a substantial acreage of land in rural non-farm holdings that is lying idle. Using the adjusted rural non-farm population estimate for the study area, and the state, the estimate of idle land in the study area is 605,223 acres. That for the state amounts to 710,949 acres. This approximation is in addition to the idle land in farms as enumerated by the census.

Urban Acreage Potentials

On further estimate for the study area in general will be made here. This is the potential land now ripening into urban uses -- a ripening process that could be expected to take ten to twenty years, or more. To make this estimate, the Lansing-East Lansing area is used as possibly typifying the study area as to the extent of land ripening into urban uses.

Acreage data from a previous study by Barlow and Limberger²⁶ are used upon which to base a judgment of the extent to which urban pressures extend beyond the area here mapped as "developed".

In that study, lands within Ingham county were classified into four groups: urban, urbanized, suburban, and rural. All the land area within the corporate boundaries of cities were considered as urban land. Urbanized land boundaries were drawn around Lansing and East Lansing from the urbanized area described in the 1950 census, and including also the incorporated villages of the country.

The boundaries of the suburban area were drawn with the aid of local real estate agents who were familiar with the area and the land transfers that were taking place. This area-type includes land that has a high potential for subdivision in the near future. It is land that now has a strong suburban influence, but which also includes a number of farms within its boundaries. Within this area, a large number of subdivisions have been laid out, including also many non-platted residential properties and land that has been sold or optioned for subdividing later.

The outer boundary of the suburban area covers considerably more land than that mapped in this study as the contiguous, developed suburb of Lansing and East Lansing. Comparisons of the two areas

²⁶See Raleigh Barlowe and Othmar Limberger, "Relationship of Tax Assessed Valuations to the Sales Values of Real Properties, Ingham County, Michigan, 1950-53," Quarterly Bulletin, Michigan Agricultural Experiment Station, Michigan State University, East Lansing, Vol. 39, No. 1, Aug., 1956, pp. 143-162.

ought to give some indication of the amount of land that is ripening into urban use in part of Ingham county with implications for the study area.

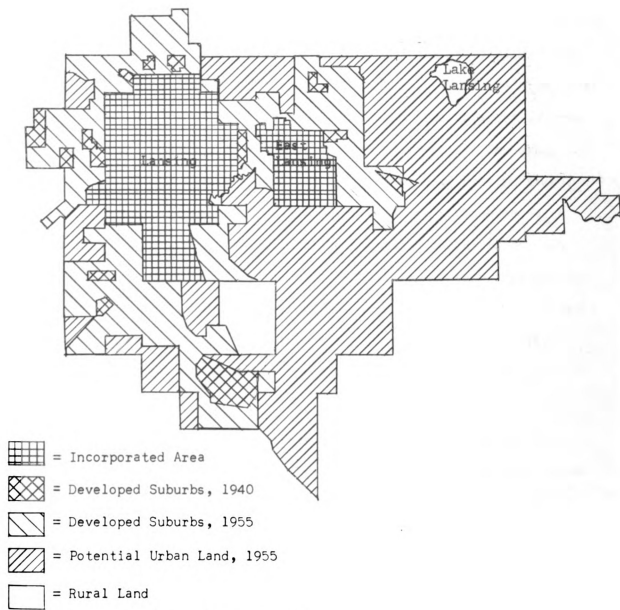
It should be remembered that this "potential" area includes only Ingham county, excluding in that study the similar land area lying in Eaton and Clinton counties. For this reason, probably not more than two-thirds of the total potential land area surrounding Lansing and East Lansing is accounted for.

Figure 15 shows the area outlined as suburban, or "potential" urban land, by Barlowe and Limberger. Also indicated is the land area mapped in this study as "developed" in this study.

As mapped in this study, the developed area, including incorporated land, totals approximately 31,480 acres. The total area outlined by Barlowe and Limberger amounts to about 61,940 acres -- an additional 30,460 acres, which may be looked upon as having a high potential for urban use due to the high proportion of real estate transfers intending this land to go into urban type developments.

If the potential urban land in Ingham county approximates two-thirds of the total potential urban land around Lansing and East Lansing, this acreage may approach 50,000 acres for the entire area ringing these two cities. Such an acreage would be about 159 per cent of the total area mapped in this study as developed urban land in the Lansing-East Lansing area.

Although the Lansing-East Lansing area may not closely typify the amount of land that may soon ripen to urban use in the study area,



Scale: Three-eighths inch = one mile

Figure 15. Corporate, Suburb, and Potential Urban Land Areas,
Lansing and East Lansing, Michigan.

adjustments to allow for differences in rates of change may aid in indicating the extent of such land acreages.

The rate of urban expansion in the Lansing-East Lansing area was approximately 25 per cent greater than that for the study area as a whole.²⁷ Adjusting for this difference in the relative rates of urban growth, and given the assumptions above, the remainder of the study area may have had an expansion in its potential urban land of about 120 per cent (based on the 159 per cent greater area of the potential urban land over that mapped as developed in the Lansing-East Lansing area). If that is so, these remaining mapped cities may be surrounded by an area of nearly 750,000 acres of land that has been purchased for subdivision, or optioned for that purpose. The total of such acreages for the study area would be, roughly, 850,000 acres, more than three-fourths of the total developed urban area existing in 1955 when these city areas were mapped, and more than two times the acreage platted between 1940 and 1955.

An estimate such as this cannot help but be highly speculative. Even if the acreage estimate is exactly accurate today, changing conditions may later cause this land to revert back to agricultural ownership and use. A considerable amount of this land classified as potential has been purchased as a speculation but is still being used as farmland. This estimate can approach accuracy, in direction if not in magnitude, only if the population growth of the study area

²⁷See Table 5, p. 67.

continues, and if economic activity continues to make it possible for large numbers of people to satisfy their desires for greater living space than the more compact city can offer.

CHAPTER V

AGRICULTURAL CHANGES IN THE STUDY AREA

A grouping of townships different from that of the previous chapter has been made that seems also to indicate substantial effects of the non-farm population upon agriculture in the area of this study. In this grouping, all townships within the study area have been classified on the basis of the rural non-farm population as a per cent of the total population for 1950.

Four groupings have been set up that classify townships (and counties) as "rural", "primarily rural", "primarily urban", and "urban". Those in which the rural non-farm population was 10 per cent or less of the total rural population were classified as rural; those from 10.1 per cent to 50 per cent, primarily rural, those from 50.1 per cent to 90 per cent, primarily urban; and those whose rural non-farm population was 90.1 per cent or more were classified as urban.

The townships. A simple tabulation of the townships in the various percentage group classifications is shown in Table 19. Changes in the number of townships within these groups is also shown for each of the three census years from 1930.

Only the rural group of townships has decreased in number over this period of time, being reduced by 81.5 per cent, with almost all of this decrease occurring after 1940.

Table 19

Number of Townships in Percentage Groupings
of Townships, 1930, 1940 and 1950^a

Township	Percentage Group ^b	Census Year		
		1930	1940	1950
Rural	0 - 10	276	272	51
Primarily Rural	10.1 - 50	347	334	433
Primarily Urban	50.1 - 90	69	85	184
Urban	90.1 - 100	17	18	41

^a Source: 1950 United States Census of Population: Characteristics of the Population, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C., Vol. II, Part 22, 1952.

^b Determined by calculating the rural non-farm population as a per cent of the total rural population for each township.

The other three groups also show sizeable changes in numbers. Again, the majority of these shifts occurred after 1940. The urban group of townships has increased by more than 140 per cent since 1930 while those classed as primarily urban increased by more than 165 per cent during that time. Primarily rural townships also showed an increase (24.8 per cent) between 1930 and 1950.

Together, the rural and primarily rural townships made up 87.9 per cent of all townships in 1930. By 1950, their percentage had fallen to 68.3, with 25.9 and 5.8 per cent being made up of primarily urban and urban townships, respectively.

Even though there was a certain amount of urbanization during the 1930's, it was not until World War II and the years following that

the process really gathered momentum. Here we have some evidence, at least from the standpoint of the growth in rural non-farm population, that "a home in the country" and the accompanying land-use changes were not of any great proportions until after 1940.

Table 20 presents information on average population and farm numbers per township within each of the percentage classifications.

Table 20
Population Categories and Farms in the Average
Township, By Township Groups, 1950^a

Township Group	:Number of : :Townships :	Population			: Number : of farms
		Total :	RNF :	Farm :	
Rural	51	1,209	44	764	160
Primarily rural	433	1,418	329	782	169
Primarily urban	184	3,431	1,906	743	156
Urban	41	13,574	11,489	412	182

^a Sources: 1950 United States Census of Population: Characteristics of the Population, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C., Vol. II, Part 22, 1952; and, 1950 United States Census of Agriculture: Minor Civil Divisions, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C.

Those townships labelled rural had the smallest total population, affected primarily by the small number of the rural non-farm population. For each progressively more urbanized grouping, total as well as rural non-farm population increased considerably. Little difference in farm population per township exists, except for the urban townships. In this group, farm population averages only 412 per township.

Consistent differences in farm numbers are not evident between percentage groups. The rural townships average 160 farms per township with the primarily rural townships averaging 169. Primarily urban townships, however, have fewer farms per township than either of these. On the other hand, urban townships show somewhat more farms than the other groupings, averaging 182 per township.

Some evidence of the effect of the non-farm population upon agriculture is given in Table 21.

Table 21

The Average Farm, by Township Groups, 1950^a

Township Group	Total	Acres of		Per cent of cropland in		
	Acres	Cropland	Grains ^b	Hay ^c	Other ^d	Idle
Rural	124.4	76.7	50.2	21.7	18.8	9.3
Primarily rural	107.7	64.8	54.0	19.7	14.3	12.0
Primarily urban	91.8	54.3	52.4	20.2	13.1	14.3
Urban	54.2	30.7	44.7	19.2	17.8	17.6

^a Source: 1950 United States Census of Agriculture: Minor Civil Divisions, Michigan, United States Department of Commerce, Bureau of the Census, Washington, D. C.

^b Includes corn for all purposes, winter wheat, oats, barley and rye.

^c Includes all cropland from which hay was cut, and silage made from grass or hay crops.

^d All other farm crop production not specified in b and c.

Acres of land in farms consistently decrease as the non-farm population increases, ranging downward from an average of 124.4 acres per farm in the rural townships to 54.2 acres per farm in the urban townships.

Cropland acreages are similarly affected. The rural township farms averaged 76.7 acres per farm, while those in the urban group averaged only 30.7 acres.

Another difference here is the percentage of total farm acres that is cropland (including idle cropland). In the rural township farms, cropland averaged 61.7 per cent of total farm acres. Primarily rural township farms averaged 60.2 per cent of their total acres in cropland. For the primarily urban and urban township farms, this proportion fell to 59.2 and 56.6 per cent, respectively.

One of the reasons for this difference may be that as farms get smaller and smaller (as they do in the more urbanized townships), the amount of land in fence lines, lanes, waste and farmstead area becomes proportionately larger.

Only small differences exist in the percentages of cropland in grain¹ and hay² crops. Roughly one-half of the cropland in the four groups was used for grain crops and about one-fifth for hay crops. Urban township farms used the smallest proportion of their cropland for grain crops (44.7 per cent), while the primarily rural township farms had the largest proportion with 54.0 per cent of their cropland used to produce grain crops.

A consistent difference in the scale from rural to urban townships was found in the proportion of cropland that was left lying idle at the time of the census enumeration. Rural township farms left 9.3 per cent of their cropland idle as compared with 12.0, 14.3, and 17.6

per cent respectively for the primarily rural, primarily urban, and urban townships.

The counties. Further indications of the effects of urbanization on agriculture can be seen in tabulations of data at the county level. Counties have been classified on the same basis as were the townships, using the rural non-farm population percentage of total rural population as an indicator of the degree of urbanization in each of the counties.

Statistical analyses of several pairs of variables have been made. the least-squares regression method with a two-variable equation of the form $Y_c = a + bX$ was used for describing the relationships between these paired variables.³ In each case, the dependent variable Y_c changes in value according to the variation in X , the independent variable. The coefficient of X (b) indicates the amount of this change in Y_c , showing the number of units of change in Y_c that accompanies each unit of change in X . The constant " a " gives the Y axis intercept -- the value of Y_c when X is zero.

The standard error for each estimating equation ($S_{Y.X}$) is calculated which measures the amount of divergence of the actual values of the dependent variable from their computed values.

³The method used is that described in F. E. Croxton and D. J. Cowden, Applied General Statistics (2nd ed.), Prentice-Hall, Inc., Englewood Cliffs, 1955, pp. 451-469.

The coefficient of correlation is also calculated which indicates the degree of relationship between the variables.⁴ The square of the correlation coefficient (r^2) permits a statement regarding the proportionate amount of variation in the dependent variable that has been explained by the estimating equation.

Per cent rural non-farm: the independent variable. For two reasons, the per cent rural non-farm population was here taken to be quite accurate as an indicator of the degree of urbanization that has taken place at varying rates in the counties included in the study area: (1) As a number of the studies reviewed in Chapter II indicated, urban pressures within the corporate city were, to a large extent, responsible for the out-migration of people to the rural areas; and (2) Since rural non-farm residents are not farmers of any type they must be employed in urban areas (or have other urban, or non-farm, sources of income). The per cent rural non-farm population category was, therefore, expected to represent quite well the county differences in urban population, and the differences between counties in the proportion of the population employed in non-agricultural pursuits. The simple correlation analyses which were made were carried out under the assumption that per cent rural non-farm population could be used

⁴The test of significance for the "r" value is made by the use of The F test table as given in F. A. Pearson and K. R. Bennett, Statistical Methods, John Wiley and Sons, Inc., New York, 1942, p. 412.

Where the correlation coefficient is significant at the 95 per cent level it will be reported as significant; and if at the 99 per cent level, as highly significant.

as the independent variable with which variations in agriculture could be correlated. Tests of relationship are then expected to show how much of the variation in these agricultural characteristics are related to or associated with variations in the rural non-farm population.

Figure 16 presents two tests using per cent rural non-farm population compared with average acres per farm and per cent of total farm in cropland.⁵ A close correlation for each pairing can be noted. For the effect of rural non-farm population on average farm size the regression equation is $Y_c = 131.17 - .542X$. The r^2 of .264 indicates that 26.4 per cent of the variation of farm size between counties is associated with county-to-county variation in rural non-farm population. The r value of $-.514$ is highly significant. The equation shows that as the rural non-farm percentage increases by 10 percentage points the average size of farm will decrease by 5.42 acres.⁶

⁵Data for Figure 16 are presented in Appendix Tables D-1 and D-2.

⁶The danger of attempting to extrapolate inferences beyond the range of the data covered here (and in the following Figures, as well) should be noted. It may not be too unreasonable to expect average farm size to be 131.17 acres, as shown in the equation, when the percent of rural non-farm population is zero. But going in the other direction to a rural non-farm population of 100 per cent would give an average farm size of 76.97 acres -- an obvious impossibility.

This may suggest the line of relationship is not linear as described in the equation, but that it is curvilinear. Average farm size does trend downward rather sharply at the highest rural non-farm population percentages, as can be seen in Appendix D-1.

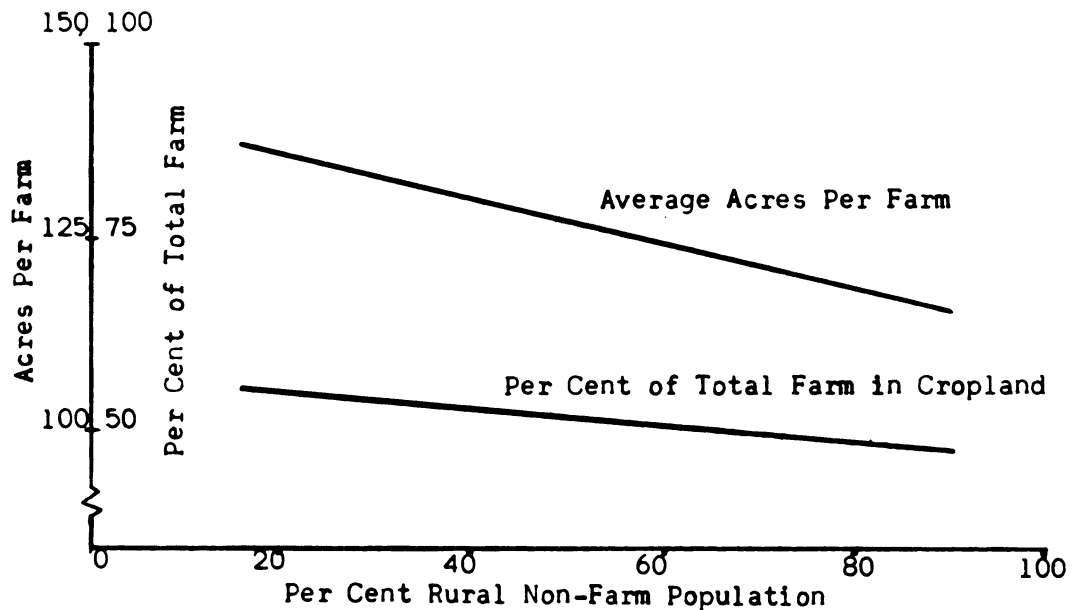


Figure 16. Per Cent Rural Non-Farm Population Related to Average Acres Per Farm, and to Per Cent of Total Farmland Cropped

The relationship between rural non-farm population and the percentage of the total farm in cropland was found to be non-significant. The plotting of the regression equation does not differ greatly from a horizontal line (the coefficient, b , equalling only .083). A value of .062 for r^2 indicates that only 6.2 per cent of the variation in the per cent of the farm in cropland is associated with variations in rural non-farm population. The r value of $-.249$ is somewhat below the .325 required for significance at the 95 per cent level.

In Figure 17 are presented regression lines plotted to show the relationships between rural non-farm population and four other measures of agricultural land use.⁷

⁷Data for Figure 17 are presented in Appendix Tables D-3 through D-6.

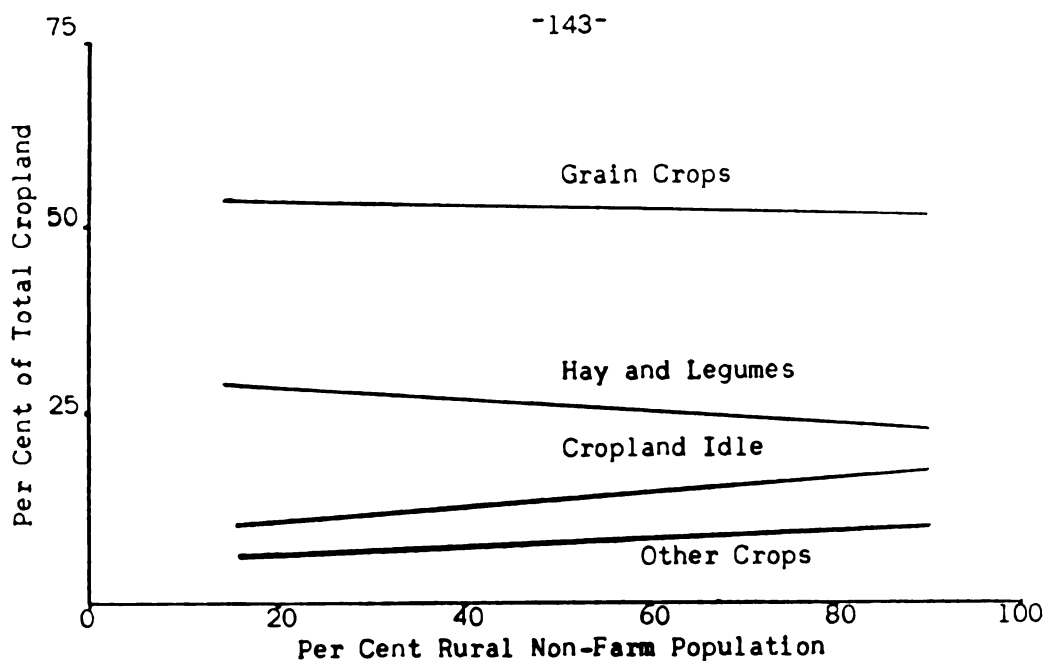


Figure 17. Per Cent Rural Non-Farm Population Related to Per Cent of Cropland in Grain Crops, Hay and Legumes, Other Crops, and Idle

The statistical measures relating rural non-farm population and each land-use type, individually, are:

<u>% of cropland in⁸</u>	<u>Regression equation</u>	<u>S_{y.x}</u>	<u>r²</u>	<u>r</u>
grain crops	$Y_c = 54.01 - .023X$	8.33	.003	-.056
hay and legumes	$Y_c = 31.28 - .091X$	6.97	.067	-.259
other crops	$Y_c = 5.10 + .043X$	6.05	.021	.143
idle	$Y_c = 9.32 + .076X$	4.61	.103	.321

The first three of these relationships show very little effect of the degree of urbanization on land-use patterns, yielding equations with

⁸"Grain crops" includes corn grown for all purposes, winter wheat, barley, oats and rye. "Hay and legumes" includes all land from which hay was cut, and beans and soybeans. "Other crops" includes spring wheat, buckwheat, flax, emmer and spelt, sugar beets, potatoes, popcorn, mint, all vegetable crops, berries, tree fruits and nuts.

low b values and non-significant r values. The most significant, although still a non-significant, r value is that for idle land. In this, a relatively low degree of association is shown with 10.3 per cent of the between-county variations in idle cropland occurring with the county-to-county variations in per cent rural non-farm population.

With land in the more highly urbanized areas being considerably higher in price, one would expect that the individual farmer nearest the urban center would make more intensive use of his land. However, for at least some farmland owners, there may have been a strong feeling of expectation related to current land use versus future sale of the land which causes this apparent inversion of use-intensity. During this period, the area included in this study was undergoing an especially rapid growth in urbanization with the result that land prices were rising rapidly in areas surrounding urban centers. A landowner near these centers may have been in a position to feel with considerable certainty that "next year someone will offer an even higher price for this land." With such an attitude, "today's" return compared with "tomorrow's" anticipated return might be of only minor consideration, relatively, and "not worth the effort" of carrying on agricultural operations.

Evidence that this could not have been a very widespread feeling is given by the low b value of only .076 -- an increase of 10 percentage points in rural non-farm population being accompanied by only 0.76 per cent increase in cropland left lying idle.

In line with von Thünen's location theory, one would have expected to find the proportion of grain crops, hay and legumes, and quite sharply reduced, and a substantial increase in "other" crops (including truck-gardening and other more intensive land-use crops) occurring along with increased urbanization. Since this does not occur, the relationships derived might appear to be at odds with that theory. It must be recognized, however, that the conditional assumptions laid down in that concept are not met in this study. Soils and topography are not perfectly uniform. The effect of distances from the market have been overcome to a large extent by greatly improved transportation, so that perishability and bulkiness are not such critical determinants of production location as in von Thünen's time. Nor is this a study of a single market isolated from all others, and, therefore, able to be a single price-determining market.

Because of technological improvements, markets are able to obtain much of the product of intensive land-use crops from areas of lesser seasonality of production. This reduces the necessity of relying upon local agriculture to intensify as demand develops for truck gardening and the variety of other crops needed for the urban market. The result is, that, instead of having a narrowly confined zone of production for each type of crop, sources become scattered over extremely wide areas.

No significant relationship can be noted between per cent rural non-farm population and the proportion of farms in pasture, or in the

intensity of grazing as expressed by the number of animal units⁹ per acre of pasture as shown in Figure 18.¹⁰

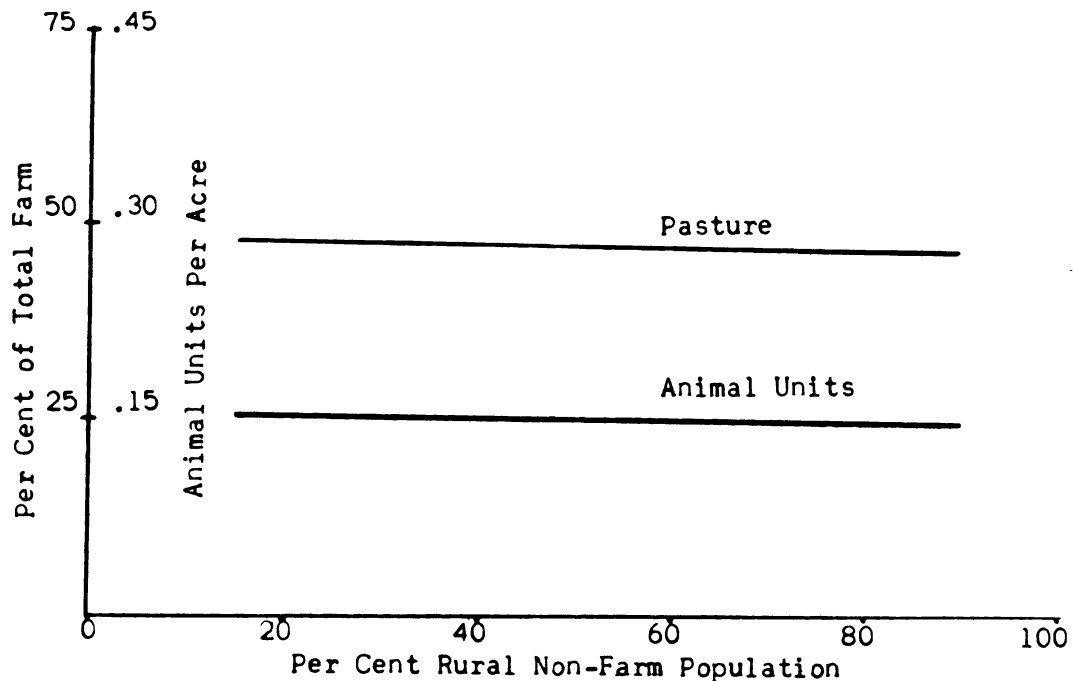


Figure 18. Per Cent Rural Non-Farm Population Related to Per Cent of Total Farm Pastured, and to Animal Units Per Acre of Pasture

The regression equation relating rural non-farm population to per cent of the farm in pasture is $Y_c = 26.77 - .032X$. The $S_{Y.X} = 4.77$, $r^2 = .018$ and $r = .135$. For rural non-farm and animal units per acre of pasture the estimating equation is $Y_c = .28 + .002X$, $S_{Y.X} = .078$, $r^2 = .003$ and $r = .055$. In both cases, the b value is little different from zero with a plot of the regression line being

⁹Animal unit conversion rates were taken from: Farm Management Facts and Figures, Ag. Econ. 529, Agricultural Economics Department, Cooperative Extension Service, Michigan State College, East Lansing, October 1953, Table 40, p. 67.

¹⁰Data for Figure 18 are presented in Appendix Tables D-7 and D-8.

ver nearly a horizontal line. Less than 2 per cent of the variation in per cent pasture land, and less than 8 per cent of the variation in animal units per acre of pasture are explained by these equations.

Measures of much greater significance resulted when the per cent rural non-farm population was related, in turn, to the per cent of all farms less than 50 acres, and the per cent of all farms with less than \$1,000 value of product. The lines of regression for these relationships are plotted in Figure 19, both with highly significant r values.

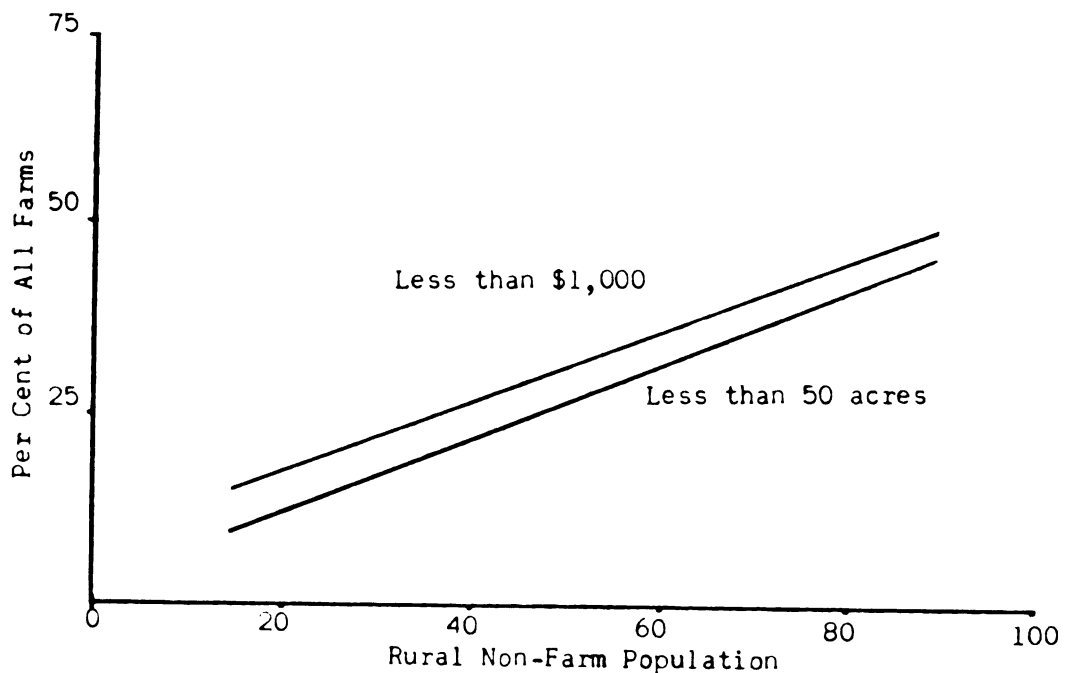


Figure 19. Per Cent Rural Non-Farm Population Related to Per Cent of all Farms Less than 50 Acres, and Per Cent of all Farm With Less than \$1,000 of Products Sold

The estimating equation for the relation between rural non-farm and farms of less than 50 acres is $Y_c = 9.88 + .417X$, with $S_{y.X} = 8.57$, $r^2 = .536$ and $r = .732$. A substantial effect by the rural non-farm population on the proportion of small farms is shown by this equation, with 53.6 per cent of the variation between counties being associated with between-county variations in the rural non-farm population.¹¹

In the test of relation between rural non-farm population and farms with less than \$1,000 value of product, the estimating equation is $Y_c = 15.15 + .382X$, $S_{y.X} = 7.76$, $r^2 = .503$ and $r = .709$. Here, too, a strong correlation is shown, with more than 50 per cent of the between-county variation in the per cent of farms producing a very low value of output, being associated with a similar type variation in rural non-farm population.

Part of the reason for the large number of very small farms in the more highly urbanized counties with low value of output would seem to be clear. As more and more individuals seek residence out in the open country, these sites must come from existing farms (e.g., highway frontage sales by farmers for residential sites). As this movement continues, the average farm size in an urbanizing area must be reduced.

The same effect must be exhibited in total production per farm. When it is recognized that farms do not intensify their operations to any large degree as a result of the urbanizing process, smaller

¹¹Data for Figure 19 are presented in Appendix Tables D-9 and D-10.

farms, operated on much the same pattern as before, cannot help but have a smaller volume of output to market.

The line of regression plotted in Figure 20 describes the relation found between per cent rural non-farm population and part-time farms as a per cent of all farms in each county.¹² The b value of .206 in the estimating equation ($Y_c = 21.89 + .206X$) indicates a substantially greater proportion of part-time farms associated with increased urbanization. The standard error is 8.58, $r^2 = .194$, with $r = .440$ being highly significant.

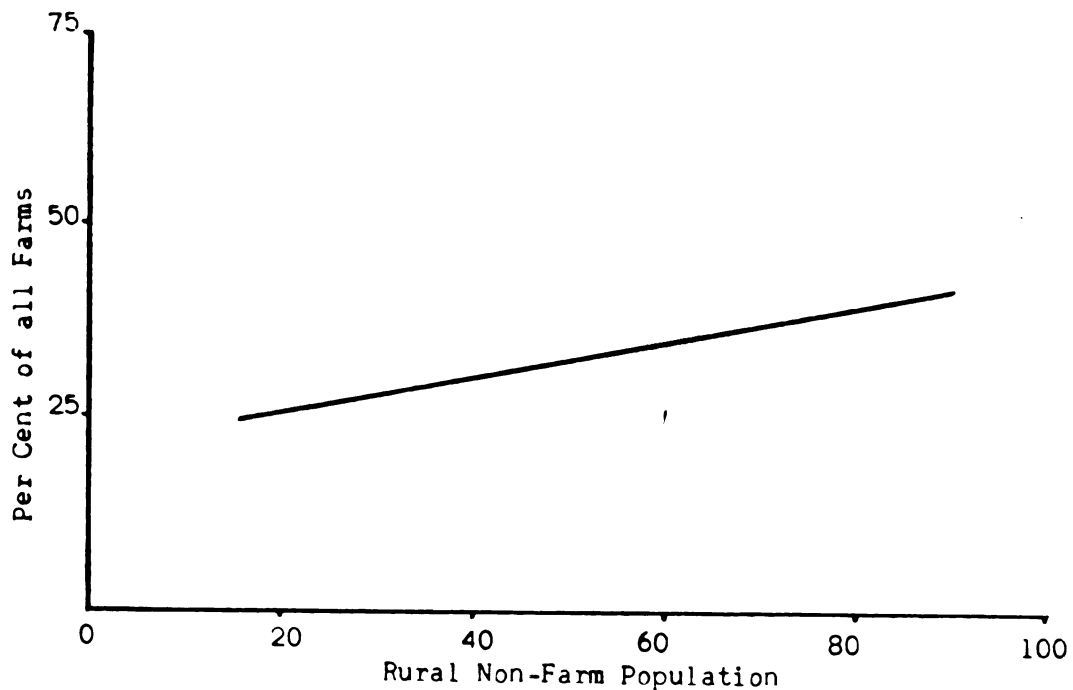


Figure 20. Per Cent Rural Non-Farm Population Related to Part-time Farms as a Per Cent of all Farms

¹²Data for Figure 20 are presented in Appendix Table D-11.

One would not expect rural non-farm population to be directly related to the increase in part-time farms, since a rural non-farm resident by definition is not a farmer. But, by their very presence, they must cause many farms to be reduced in size by each buying up a small part of a farm. Formerly full-time farmers might then find themselves in a position of having to supplement their farm income with off-farm employment.

The test of relationship between rural non-farm population and the per cent of all farmland rented out yielded the estimating equation $Y_c = 32.24 - .125X$, with $S_{Y.X} = 5.36$, $r^2 = .85$, and a highly significant r value of $-.430$. The plot of this equation is shown in Figure 21.¹³

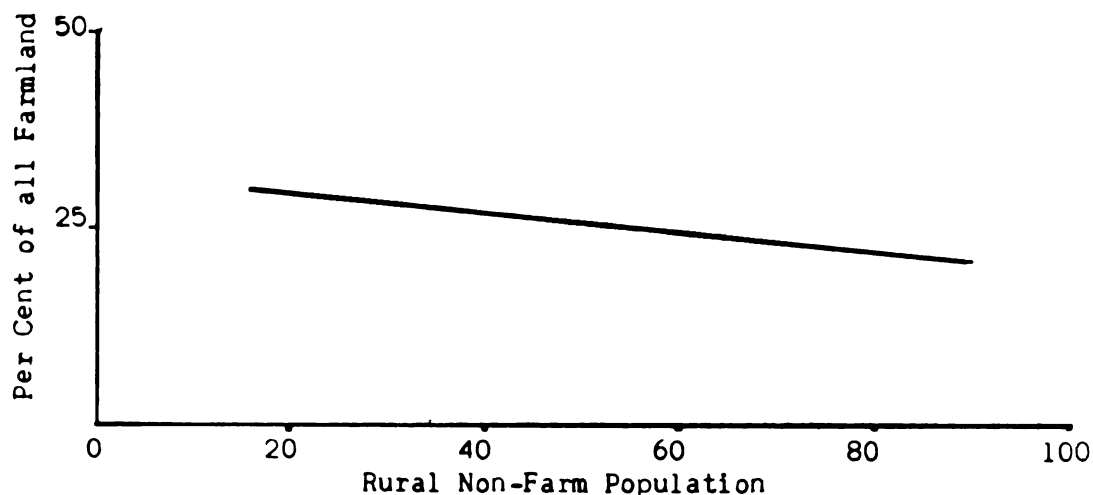


Figure 21. Per Cent Rural Non-Farm Population Related to Farmland That is Rented Out as a Per Cent of all Farmland

¹³Data for Figure 21 are presented in Appendix Table D-12.

The proportion of all farmland rented out approximates one-third in the most rural counties, generally declining as the counties become more urbanized. The rate of this decline is indicated by the b value of $-.125$.

Such a declining relationship is likely the result of the number of people who buy up farms, or parts of farms, to operate on a part-time basis or even a hobby farm basis. As the number of these types of farms increases, the remaining farmland available for rent must decline as a per cent of the total. Too, with stronger demand for land by non-farm people in the more highly urbanized counties, the sales market would likely attract a certain amount of land that might otherwise be offered for rent.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

Many people have been concerned with the problems caused by population growth and movement. Those whose interests center around the rural territory have pointed their studies toward particular problem areas in the rural community. As urban people move out of the more crowded city, a fringe area develops with problems unique to itself. A number of studies have devoted their attention to these areas and to methods that may be helpful in solving their particular problems.¹

Urban oriented studies have often condemned the patterns of urban development that result from complete individual freedom in the platting of land for urban use. Unregulated, haphazard suburb platting many times have resulted in failure to provide the kinds of services that could have been obtained from the appropriated land resources. A number of these studies have been critical of speculation and premature subdivision as this has resulted in losses of investors funds and a complete waste of large areas of land. Communities also lose when their tax bases are reduced as large blocs of land become tax delinquent and fail to contribute to the maintenance of community services.

¹There is a large number of such problems that result from the urbanization of rural land. These deal with the local social and civil problems that arise as an area becomes increasingly more densely populated. Such problems are outside the realm of this study. These would be of much concern to farm people especially when they are caught up in the problems of local government and financing for schools, roads and many other urban-type public service needs that increase with population.

This treatise has attempted to point out some of the effects of the urbanization process upon agriculture. Data upon which to base these indicators were taken from the United States population and agricultural censuses for 1930, 1940 and 1950. In order to gain some further insight into the land that has ripened into urban use, cities of over 15,000 population were mapped in a way which shows the extreme outer boundary of the built-up city and suburban area. With known urban acreages as of two given points in time (1940 and 1955), the trend in urban acreage expansion can at least be estimated if not closely specified.

A certain amount of census data available at the township level permitted an analysis of the effect of the degree of urbanization upon agriculture in the townships. The rural non-farm population as a percent of the total population was taken as an index of the degree of urbanization.

Several tests of relationship using census data at the county level were made, using the least-squares regression technique as the mechanical means of determining the closeness of the relationship for paired variables.

Conclusions

Urban expansion. The state of Michigan has experienced a rapid growth in its urban population which occurred most rapidly following the impetus to industrial expansion required to meet war-product needs

during the 1940's. With the return to production for civilian needs, the expansion of industrial output continued at a high rate and attracted many additional workers.

With the majority of the industrial capacity located in the southern part of the state, this area also experienced the greatest increase in population. Here it is that the expansion of urban land has been the most rapid and striking.

For the study area as a whole, the acreage that has gone into urban use is quite large. Of greater significance, however, is the fact that more than one-third of the total urban land mapped had ripened into urban use after 1940. The total incorporated urban land in the study area amounted to 583,900 acres in 1940. By that time an additional 84,820 acres had been subdivided and platted outside the incorporated area. By 1955, the total of incorporated urban and platted suburb land had grown to 1,057,600 acres. This 388,880 acres of new urban land represents an annual rate of 25,925 acres going out of agriculture into urban use.

This is only part of the total acreage of ripening land. As urban populations grow, additional needs develop for highways and improved areas for recreational use outside of the city. In addition to this there is a land use related to urbanization where rural land acreages are in the hands of non-farming people.

The rural non-farm population represents a rapidly growing segment of the total population. From 1930 to 1940, the rural non-farm population increased by 40.8 per cent. The increase in the next ten-year

period was more than twice as great, amounting to 91.79 per cent. In Chapter IV, an estimate of the total acreage held by rural non-farm residents was made. Admittedly only an approximation, this may account to more than 2,300,000 acres. If the average acres per rural non-farm residence holding has not changed significantly since 1940, the annual appropriation for this purpose may approach 100,000 acres for the study area.

Future urban land expansion can be expected to continue if population growth and economic activity is maintained. Measures of past changes in urban acreages reflect the stimulation of these two factors. Their continuation would result in approximately 125,000 acres per year going into urban and rural non-farm land uses.

In addition to these uses are the public appropriations of land. Recreation land use increases, as represented by parks and recreation areas, have shown considerable growth in recent years. Of the 7,118 acres in state parks within the study area, only 312 acres have been added to the system since 1940. But for the state as a whole there are 114,163 acres in this type of use, of which 77,471 acres have been added since 1940.

On the other hand there were in the study area, in 1955, a total of 60,905 acres in state recreation areas, all of which have been added since 1940. This represents an annual rate of 4,060 acres going into this use. Such appropriations of land for public enjoyment can be expected to continue as the population grows, and as leisure and recreation become more important uses of a person's time.

Public highway and road construction programs can also be expected to take considerable acreages of land in the future. In 1950, there were reported to be 853,000 acres in highways, county roads and railroad rights-of-way in the state of Michigan.² By 1955, this acreage had grown to 861,312 acres, even though there had been some amount of right-of-way abandonment by the railroads in the northern part of the state. For this five-year period, 1,662 net additional acres had been taken for transportation use annually.

The current highway building program is at a much more rapid rate. New highway locations and widening projects are expected to take another 50,000 acres by about 1962. Over this twelve-year span of time the average appropriation amounts to about 4,850 acres per year.

A rough estimate of the total land ripening to non-agricultural uses annually would be somewhere in the neighborhood of 135,000 acres. Can we expect this to continue on for a very long period of time?

The answer to this question is in the affirmative, provided: (1) the growth in population continues; (2) industrial expansion continues which provides jobs for these greater numbers of people; (3) economic activity remains at a relatively high level, with incomes also averaging high enough that the land holding desires of many can be satisfied; and (4) that people's desires do not change and alter the present pattern of preferences, including their support of public development of land acreages along many lines.

²United States Department of Agriculture, Basic Land Use Statistics, 1950, Supplement to "Major Uses of Land in the United States", Technical Bulletin 1082, United States Department of Agriculture, Bureau of Agricultural Economics, Washington, D. C., September, 1953, p. 33.

It is possible that a sharp downturn in the economy may halt or reverse the current population movement. But even during the extended depression of the 1930's, the rural non-farm population increased (from 1930 to 1940) by a little over 40 per cent. Whether all this increase occurred near the end of that ten-year period, or over the entire period is not known. Most likely it extended over most of that time. If that is so, even an extended depression probably would halt the movement only for a relatively short period of time.

Changes in agriculture. Measures of the degree of urbanization's effect upon agriculture in the study area are implied by changes in farming that have taken place.

In the tiers of townships surrounding the mapped cities, effects of some importance were noted. The nearer the township to the central city, the greater was the reduction in farm numbers from 1930 to 1950. The inner townships also experienced the greatest loss in total farm acres, and in total acres of cropland harvested. A reverse relationship was found with respect to idle land that is difficult to explain. Instead of finding a reduction in the amount of idle cropland in farms nearer the city, the idle acreage increased. One possible explanation is that the expected net return from farming the land, relative to the expected increase in salve value over a short period of time, was too small to encourage fuller use of that land.

Further analyses were made that attempted to more directly specify the effect of urbanization upon farms, and the way in which crop and

livestock production patterns might change as an area becomes more urbanized.

Counties were classified and arrayed according to their rural non-farm population as a percentage of the total population. With this scaling of counties, tests of relationship were made using per cent rural non-farm population and the proportions of different crops as these varied by county. Instead of measuring such changes as might have occurred in each county over time, from 1930 to 1950, this method makes a "point-in-time" analysis using 1950 data only. From this it was reasoned that the relationships found could be expected to occur as a county becomes more and more urbanized through time.

Some of the tests of relationships between per cent rural non-farm population and county-to-county land use variations showed highly significant results. The more highly urbanized the county, the greater the effect.

Table 22 presents a summary of the relationships that were tested. These relationships show how each of the related items increased or decreased as the rural non-farm population increased -- not as the rural non-farm population grew over time, for any one county, but on the basis of between-county variations in the rural non-farm population.

Table 22

Summary of Regression Equations Describing Relationships Between
Rural Non-Farm Population and Study Area Farms, 1950

Rural non-farm population related to	Regression equation	$S_{Y \cdot X}$	r^2	r
Average acres per farm	$Y_C = 131.17 - .542X$	18.48	.264	-.514**
% of farm in cropland	$Y_C = 56.01 - .083X$	6.64	.062	-.249
% of cropland in grain crops	$Y_C = 54.01 - .023X$	8.33	.003	-.056
hay and legumes	$Y_C = 31.28 - .091X$	6.97	.067	-.259
other crops	$Y_C = 5.10 + .043X$	6.05	.021	.143
idle	$Y_C = 9.32 + .076X$	4.61	.103	.321*
% of farm pastured	$Y_C = 26.77 - .032X$	4.77	.018	.135
Animal units/acre pasture	$Y_C = .28 + .002X$	0.08	.003	.055
% of farms less than 50 acres	$Y_C = 9.88 + .417X$	8.57	.536	.732**
% of farms producing less than \$1000 value of output	$Y_C = 15.15 - .382X$	7.76	.503	.709**
% part-time farms	$Y_C = 21.89 + .206X$	8.58	.194	.440**
% of farmland rented out	$Y_C = 32.24 - .125X$	5.36	.185	-.430**

* significant at the 95 per cent level.

**significant at the 99 per cent level.

The most highly significant relationships were found between rural non-farm population and the number of farms less than 50 acres as a per cent of all farms, and rural non-farm population and number of farms producing less than \$1,000 value product as a per cent of all farms. Part-time farms as a per cent of all farms, and land rented out as a per cent of all farmland also showed significant relationships to rural non-farm population percentages, as did average farm size.

Livestock grazing intensities as indicated by animal units per acre of pasture, and per cent of total farmland pastured showed the least effects from rural non-farm population variations. The category

of "other crops" (which includes truck and garden crops) also had a little effect from nearness to the urban centers.

Apparently technical improvements in production and transportation that have taken place in this area have reduced the locational advantages that may have existed in years past. Nearness to the central city market does not appear to offer a large enough transportation differential to make it more profitable for nearby farms to raise market-produce as compared with those farms further away.

That there was an impact upon agriculture as a result of urbanization is shown by the data. But to specify the degree of this impact is very difficult if not impossible.

The appropriation of well over 1,000,000 acres from 1940 to 1955 for urban and urban-related uses must have come primarily from study area farms. Such a loss would have made its mark upon the farms in the area. However, all of this land was not taken from farms. During the period from 1940 to 1950, total acres in study area farms were reduced by 641,337 acres. It is possible that a somewhat larger acreage than this was sold for urban purposes, with the balance being made up by bringing additional land into farms. During this same period of time, total cropland increased by 90,371 acres. Here, also, is the possibility that new lands were brought, not only into farms, but into production even while large acreages were finding their way into non-farm uses.

Non-tillable land that ripened into urban uses would not necessarily reduce current production on farms. But there was also a substantial

acreage of "good" farmland that ripened, and this would result in fewer crop acres.³ To offset this loss, farmers have had to reclaim, through brush clearing and drainage, land that was previously non-tilled land.

If this was a substitution of land more difficult and costly to till, for the land previously cropped, there has likely been an increase in the cost of carrying on farming operations. Here is one type of impact that cannot be measured because of the kind of data used in this study.

A very rough estimate may be made by determining how much value product study area farmers "gave up" in disposing of their land to urban uses. Michigan farm-account summaries for 1954 show a gross income per acre of \$65 for study area farms.⁴ If this becomes our measure of impact, study area farmers could have produced in the neighborhood of another \$75,000,000 gross value output per year.

³At the time the cities were mapped, an attempt was made to observe whether there had been any selectivity (with respect to land quality) of the land taken up for urban uses. There was no obvious attempt by developers to select either the "good" or "poor" land for urban use. Apparently the geographic location of the land was of much greater importance than land quality, with at least one exception. This is where hilly land has a particular appeal for a more exclusive type of development. Such land, in some areas, was chosen over more level land even though it may have been further away from the urban center.

⁴John C. Doneth, and others, Farming Today, Cooperative Extension Service, Department of Agricultural Economics, Michigan State College, East Lansing, A. Ec. 538, Areas 1 through 8, 1954.

Some qualifications to this must be stated. If this ripened land had been kept in farms, study area farmers would also have had to develop the additional acreages of tillable land as they did from 1940 to 1950. If this had been done, what would have been the effect upon product prices? Theoretically, the increased output would sell at lower prices, and the value product given up would be less than that estimated above. How much less would depend upon the position of these farmers in the total market. The effect for most farm commodities would likely be small, or even unnoticeable. For some others, however, Michigan production may make up a larger percentage of the total market, and there would be a noticeable reduction in market prices -- given other things remaining unchanged.

What of the future? Estimates of future urban and urban-related land use acreages, in themselves, do not tell much. It is important to know how much land may go into these uses. More important is where that land will come from and what its effects will be.

If the rate of movement of land into non-farm uses through the years from 1940 to 1955 is maintained over the following twenty years, it is possible that another 2,750,000 acres may ripen to urban and public land uses. If the rural non-farm residential acreages are correctly estimated, and their relative proportion to the total is not changed, somewhere near 75 per cent of this acreage would likely go into rural non-farm holdings.

A further question relates to the source of this land for expansion of non-agricultural uses. Out of the total of 15,505,740 acres in the

study area, 11,933,960 acres were in farms, and 1,875,716 acres were in non-farm uses as of 1950. This leaves an area of 1,696,064 acres which could be taken up for urban and related purposes without altering existing farms. But it is quite probable that only a very few of these acres are located near the urban centers. If this is so, future expansion would have to come at the expense of total farm acres.

If the estimated future urban and urban-related acreage all comes out of today's farmland, this will leave less than 10,000,000 acres in study area farms — a reduction of about 16 per cent. Will this loss reduce the productive ability of study area farms by the same amount? This would depend upon many things.

Moore found that, for his total sample, 46 per cent of the land in rural non-farm residences was rented out to farmers.⁵ This would reduce the amount of land "lost" to agriculture by about 1,000,000 acres, leaving nearly 11,000,000 acres in study area farms. Suppose the remainder to be lost. Study area farmers could still increase their productive acreage by much more than this if economic conditions furnish the incentive. These farms in 1950 had over 5,500,000 acres that were not cropland. Certainly some of this would be expensive to improve and produce agricultural products from, but a large part of it could be brought into production.

⁵Elon H. Moore, op. cit., pps. 64, 71-73. Moore conducted his survey during the period of the Korean crisis. The pressures of increased military demand for agricultural products may have influenced farmers to seek additional land from rural residents. In such case, this may not be a "normal" pattern of land rentals.

Our threatened food supply. Some people are greatly concerned over the possible seriousness incident to the urban appropriation of agricultural land. They see in this a growing momentum in the rate of land ripening to non-farm uses which keeps eating away at our food production base. Therefore, we must eventually reach a position at which our supply of land will be unable to furnish foods in the amounts needed. Is this an ill-founded concern?

The growth of our national population over the last one and one-half decades has been quite large. One forecast points to a population total for the United States of 200,000,000 to 225,000,000 by 1975.⁶ Certainly we need not expect it to stay there. But how much higher will the total go before it levels off — supposing that it will do that eventually?

Here is one factor, when coupled with the loss of agricultural land to urbanization, that for many, adds up to a serious threat to our future food supply. If the population continues to increase, where will the necessary food come from? Such a threat may or may not be a real problem.

Diminishing returns in agriculture certainly would prevent any multiplying of the output that might be attempted in meeting the needs of a multiplying population. But, over time, we are not dealing with diminishing returns to a particular production process which increases the application of a set of homogeneous variable inputs to a set of

⁶United States Department of Agriculture, Agricultural Outlook Charts, 1955, Agricultural Marketing Service and Agricultural Research Service, United States Department of Agriculture, Washington, D. C., October, 1954, p. 2.

fixed inputs. The inputs used, both variable and fixed, are changed, not only in quantity by quality as well over time. Improved crop varieties, higher grade, more productive livestock, and better management practices in the use of an increasing number of "output boosters" ought to be forthcoming in the future. When we think of diminishing returns over time, then we must be concerned with secularly diminishing returns, and this is a great deal more difficult to specify. The production process of the future can only be estimated, as we are only estimating what the future population will be. Why, then, should we ascribe any more accuracy to one estimate than to the other? Past population growth is little more an accurate index with which to predict the population of many years hence than is the past growth in agricultural production an accurate indicator of future production rates. These estimates can be used as guides only. So far, our agricultural plant has been more than able to keep pace with population growth. Why should it not keep pace in the future?

Given a constant level of technology, future land losses would result in a reduction of output in the study area farms. But a shrinking land base alone is a very poor measure of productive capacity because technologies do change.

Without considering any changes other than land acres used, study area farmers still have the ability to make substantial adjustments in their use of farmland. In 1950, these farmers were using a little over one-half of their total farmland for crop production, with an additional 889,404 acres left lying idle. If market conditions demanded, this land

could be brought into production without too much difficulty. Also, some fraction of the non-tillable land in farms could likely be brought into production, but at a higher cost. In addition to these output sources is the possibility of more intensive use of existing cropland acreages. These could all add up to a very large increase in food output using today's level of technology.

Welfare implications. What we do to our land base can aggravate any food supply problems that may develop in the future. It would not be unreasonable to assume that the majority of the increased population that can be looked for in the near future will locate in new suburb developments surrounding the cities. Some of these will also settle in the rural area.

Our land base is a perpetual resource that can be maintained or destroyed — destroyed entirely or a little bit at a time. Whatever the result, there will be an influence on future generations. This is a resource base whose use is a long-term consideration, and our actions today should attempt to evaluate at least some of the longer-term impacts.

On the question of appropriating land for urban-type uses, society may soon be called upon to make decisions as to whether this should be more carefully regulated.

Under our present market system, individuals are free to determine which lands they will appropriate for non-farm uses. Where non-farm uses can outbid agriculture for the use of land, these uses must be higher from the standpoint of private costs and returns. Private costs and

returns, on balance, may indicate that the individual is maximizing his satisfactions in taking agricultural land for residential or other urban-type uses. But what of other costs to society that the individual cannot consider?

Where the individual is free to select the best agricultural land near the city for residential development, farmers must substitute a poorer quality of land for it. A given agricultural output must be obtained at a higher cost as a result of individual freedom in site selection.

Another type of social cost resulting from complete individual freedom in taking land for urban use may be indicated by the waste of resources in "over-development". Renne has stated this was a common phenomena following World War I. In the 1920's there was estimated to be enough land subdivided to house another 18 million people.⁷ Individual freedom to choose (and to misjudge) resulted in much land idled and large investments lost, some for periods extending up to the residential building boom following World War II.

Firey brought up another problem that had serious social consequences. This was the springing up of blighted areas, both rural and urban, as a result of a complete lack of control.⁸ A number of township supervisors

⁷Roland R. Renne, Land Economics, Harper and Brothers, New York, 1947, n. 15, p. 425.

⁸Walter Firey, Social Aspects to Land Use Planning in the Country-City Fringe: The Case of Flint, Michigan, Michigan Agricultural Experiment Station Special Bulletin 339, East Lansing, June, 1946, pp. 19-25.

contacted at the time cities were mapped for this study also brought this out as a problem requiring local government action. One township in the Bay City - Saginaw area had this problem thrust upon it as tarpaper shacks sprang up very rapidly throughout the rural area, which later caused tax delinquency problems.

Public action for guidance. Regulatory action which "directs" urban and other developments assumes some set of goals important enough to make individual desires along these lines subordinate to the interests of the society. It also implies that we can specify today what is the best use tomorrow of a parcel of land. Are we able to so judge, if that requires control now to assure certain land will be available at some future date? If the individual had difficulty in determining the best use of land within the framework of his personal criteria, how can we expect to predict with any accuracy what the welfare changes for a large number of people might be as a result of land use regulation?

Control over general types of land uses could have several goals, each of them of some importance to society.

To this writer, the least justifiable of all is the "saving" goal -- preventing urban type uses of the good land so that land may be kept in agricultural production. If technological improvements in agriculture follow population growth, this saving of land would be simply a waste of effort -- effort that could have been better diverted to more productive channels.

In terms of the total physical supply of land, urban land use will likely be only a very small proportion. From the standpoint of national food needs, reserving agricultural lands in Michigan can hardly be expected to make a very great difference. Given the possibility that technology does fall behind population growth, actions to control urban uses would not have saved very many acres percentagewise. About all it can expect to do is postpone the day of reckoning when the supply of agricultural land is insufficient to produce the necessary food and fiber. What is the value of such a "parole" in the life of a society — a parole only, because the problem would still be there.

The solution to the food supply problem lies in a growth of technology which approximates that of the population. But since we have no assurances that such will be the case, some degree of prudence could be exercised in the way our land as a resource base is expended. Looked at in this light, there may be some cause for concern. This would be so, especially, if current action could preserve the resource base and thereby have our needs met in the future as a result of that action.

Of greater importance as a goal in the reservation of agricultural lands is that of minimizing the cost of producing the needed food and fiber at any point in time. Allowing the better grade lands to be appropriated for urban uses (and leaving the poorer grades to agriculture) will increase the cost to society of obtaining its food supply. Here is a problem worth considering in connection with land use regulation. There are savings in the costs to society that can be achieved by reserving the good agricultural lands. This should furnish more of an

incentive than attempting to justify the regulation of the various uses of land on the basis of urbanization's threat to the future food supply.

Another goal of regulation includes the orderly development of urban areas. Urban communities have generally accepted as a necessity such regulations as building codes, rules for street layout, building set-back, zoning by type of urban use, etc. These regulatory practices are intended to make for more efficient utilization of land and conformity with already developed areas.

In the rural area, zoning of land uses has been applied in a number of different regions. Rural zoning may be applied to prevent low-quality residences from being built which may have a high probability of leading to slum conditions. Zoning may also be applied to regulate the type of agricultural use to which certain lands may be put. These forms of regulation over land use have had some application over a long period of years.

Suggestions for further research. This study has been hampered by a lack of data available at the township level. Especially because of this shortage of data, the objective of determining the impact of part-time farming upon agriculture in the study area has not been met very adequately.

A more specific assessment of the impact of urbanization upon study area farms would have been possible had cost data for these farms been available. The general impact is shown in the way study area farms have adjusted in the face of the conditions within which they operated.

Such a study would require a survey to be made at the farm level for samples of farms which would analyze the costs and returns from farming. Sample areas would need to be selected according to various non-farm population densities within these sample areas. Classification of these areas could be done quite satisfactorily by using the same basis as was used in this study. Differences in costs and returns could then be attributed to the relative degrees of urbanization for each of the different areas, with the measure of impact being the net income of the samples of farms.

A further question of importance is the land that is held by rural non-farm residents. This type of land use could be determined by much fuller access to census work-sheets. It could also be determined by a sampling method such as that used by Moore, but including many more sample areas. A very careful selection of sample areas would have to be made in order that the areas selected would be quite accurately representative of the total area.

Either of the above methods could then furnish answers to important questions about the land in residential holdings. How this land is held carries an implication of some importance to the potential output of Michigan agriculture. The pattern of land ownership will determine to a large extent, whether it will be usable land or remain idle. Many small, fragmented holdings, each fenced in by itself, would make it difficult and unattractive to a farm operator who may wish to increase the size of his farm by renting nearby parcels of land.

The additional information obtained in such studies as suggested above could add considerably to the knowledge regarding the effects of urbanization upon Michigan agriculture.

BIBLIOGRAPHY

- Anderson, W. A., Fringe Families and Their Social Participation, Cornell University Agricultural Experiment Station Bulletin 909, Ithaca, April, 1955.
- Andrews, Richard B., "Elements in the Urban-Fringe Pattern," The Journal of Land and Public Utility Economics, Vol. 18, No. 2, May, 1942.
- Andrews, Richard B., "Urban Fringe Studies of Two Wisconsin Cities: A Summary," The Journal of Land and Public Utility Economics, Vol. 21, No. 4, November, 1945.
- Arnold, J. H., and F. Montgomery, Influence of a City on Farming, United States Department of Agriculture Bulletin 678, United States Government Printing Office, Washington, D. C., 1918.
- Arpke, Fredrick, "Land Use Control in the Urban Fringe of Portland, Oregon," Journal of Land and Public Utility Economics, Vol. 18, No. 4, November, 1942.
- Barlowe, Raleigh, and Othmar Limberger, "Relationship of Tax Assessed Valuations to the Sales Values of Real Properties, Ingham County, Michigan, 1950-53," Quarterly Bulletin, Michigan Agricultural Experiment Station, Michigan State University, East Lansing, Vol. 39, No. 1, August, 1956.
- Beegle, J. Allen, "Characteristics of Michigan's Fringe Population," Rural Sociology, Vol. 12, No. 3, September, 1947.
- Beegle, J. Allen, Social Organization in the North Lansing Fringe, Michigan Agricultural Experiment Station Technical Bulletin 251, East Lansing, September, 1955.
- Black, John D., "Coming Readjustments in Agriculture - Domestic Phases," Journal of Farm Economics, Vol. 31, No. 1, part 1, February, 1947.
- Black, John D., Bushrod Allin, and Charles C. Colby, "The Soil and the Sidewalk," American Planning and Civic Annual, Rural Sociology, Vol. 18, No. 2, June, 1953, p. 118.
- Blizzard, Samuel W., "The Social Significance of the Rural-Urban Fringe," Rural Sociology, Vol. 18, No. 2, June, 1953, p. 118.
- Blizzard, Samuel W., and W. F. Anderson II, Problems in Rural-Urban Fringe Research: Conceptualization and Delineation, Pennsylvania Agricultural Experiment Station Progress Report No. 89, State College, 1952.

- Bromage, A. W., and J. A. Perkins, "Willow Run Produces Bombers and Inter-Governmental Problems," The American Political Science Review, Vol. 36, No. 4 August, 1942.
- Conklin, Howard E., "The Rural-Urban Economy of the Elmira-Corning Region," The Journal of Land and Public Utility Economics, Vol. 20, No. 1, February, 1944.
- Croxton, F. E., and D. J. Cowden, Applied General Statistics, (2nd ed.), Prentice-Hall, Inc., Englewood Cliffs, 1955.
- Dewey, Richard, "Peripheral Expansion in Milwaukee County," The American Journal of Sociology, Vol. 54, No. 2, September, 1948.
- Diehl, L. F., "Major Aspects of Urbanization in the Philadelphia Metropolitan Area," The Journal of Land and Public Utility Economics, Vol. 19, No. 3, August, 1943.
- Diehl, L. F., "Problems of Suburbia," Land Policy Review, Vol. 4, No. 8, August, 1941.
- Doneth, John C., and others, Farming Today, Cooperative Extension Service, Department of Agricultural Economics, Michigan State College, East Lansing, A. Ec. 538, Economic Areas 1, 2, 3, 4, 5, 6, 7 and 8, 1954.
- Ely, Richard T., and George S. Wehrwein, Land Economics, The Macmillan Company, New York, 1940.
- Fellman, J. E., "Urban Geographic Concepts at the Elementary and Secondary Levels," The Journal of Geography, Vol. 56, No. 6, September, 1957.
- Firey, Walter, "Ecological Considerations in Planning for Rural-Urban Fringes," American Sociological Review, Vol. 11, No. 4, August, 1946.
- Firey, Walter, Social Aspects to Land Use Planning in the Country-City Fringe, Michigan Agricultural Experiment Station Special Bulletin 339, East Lansing, June, 1946.
- Funk, W. C., Value of a Small Plot of Ground to a Laboring Man, United States Department of Agriculture Bulletin 602, United State Government Printing Office, Washington, D. C., 1918.
- Gibson, W. L., Jr., and S. Bell, Jr., Land Utilization in Henry County, Virginia Agricultural Experiment Station Technical Bulletin 93, Blacksburg, 1944.
- Gist, Noel P., "Ecological Decentralization and Rural-Urban Relationships," Rural Sociology, Vol. 17, No. 4, December, 1952.

- Greeley, Roland B., "Recreational Land Use in New England," Economic Geography, Vol. 18, No. 2, April, 1942.
- Hood, Kenneth, An Economic Study of Part-Time Farming in the Elmira and Albany Areas of New York, 1932 and 1933, Cornell Agricultural Experiment Station Bulletin 647, Ithaca, 1936.
- Hoover, Edgar M., Jr., Location Theory and the Shoe and Leather Industries, Harvard University Press, Cambridge, 1937.
- Lee, A. T. M., and J. F. Hauck, "Excessive Land Subdivision in the New Jersey Pine Area," The Journal of Land and Public Utility Economics, Vol. 19, No. 2, May, 1943.
- McCain, W. C., Jr., and R. G. Burnright, "The Social Significance of the Rural-Urban Fringe: From the Rural Point of View," Rural Sociology, Vol. 18, No. 2, June, 1953.
- Melamid, A., "Geography and Planning: An Example from Cleveland, Ohio," The Journal of Geography, Vol. 56, No. 4, April, 1957.
- Michigan Department of Conservation, County Maps, Lansing, 1955.
- Michigan State Highway Department, General Highway Maps, Lansing, 1940.
- Michigan State Highway Department, State Trunkline Mileages - Rural, Lansing, 1955.
- Michigan State Highway Department, Third Annual Progress Report, County Road Commissions, Lansing, December, 1954.
- Moore, Elon H., and Raleigh Barlowe, Effects of Suburbanization on Rural Land Use, Michigan Agricultural Experiment Station Technical Bulletin 253, East Lansing, September, 1955.
- Moore, Elon H., The Effects of Suburbanization on Land Use in a Selected Segment of the Lansing Rural-Urban Fringe, Unpublished Ph. D. Thesis, Michigan State University, East Lansing, 1953.
- Nielson, James, and others, Farm Management Facts and Figures, Agricultural Economics Department, Cooperative Extension Service, Michigan State College, East Lansing, Ag. Econ. 529, October, 1953.
- Pearson, F. A., and K. R. Bennett, Statistical Methods, John Wiley and Sons, Inc., New York, 1942.
- Perkins, J. A., "The Government of 'Rurban' Areas," The American Political Science Review, Vol. 37, No. 2, April, 1943.

- Reeder, L. J., "Industrial Decentralization as a Factor in Rural-Urban Fringe Development," Land Economics, Vol. 31, No.3, August, 1955.
- Renne, Roland R., Land Economics, Harper and Brothers, New York, 1947.
- Robertson, Lynn, Changes in Farming in Lake and Porter Counties, Indiana, As a Result of Nearness to Industrial Cities, Purdue Agricultural Experiment Station Bulletin 365, Lafayette, 1932.
- Robertson, Lynn, The Economic Significance of the Non-Farming Rural Population in Northwestern Indiana, Purdue Agricultural Experiment Station Bulletin 388, Lafayette, 1934.
- Rodehaver, Myles, W., "Fringe Settlement as a Two Directional Movement," Rural Sociology, Vol. 12, No. 1, March, 1947.
- Rozeman, D., Part-Time Farming in Massachusetts, Massachusetts Agricultural Experiment Station Bulletin 266, Amherst, 1930.
- Salter, Leonard A., "Land Classification Along the Rural-Urban Fringe," Proceedings of the First National Conference on Land Classification, Missouri Agricultural Experiment Station, Bulletin 421, Columbia, 1940.
- Salter, Leonard A., Land Economics, The University of Minnesota Press, Minneapolis, 1948.
- Salter, Leonard A., and H. D. Darling, Part-Time Farming in Connecticut -- A Socio-Economic Study of the Lower Naugatuck Valley, Storrs Agricultural Experiment Station Bulletin 204, Storrs, 1935.
- Salter, Leonard A., and L. F. Diehl, "Part-Time Farming Research," Journal of Farm Economics, Vol. 22, No. 3, August, 1940.
- Thompson, Warren S., Population Problems, McGraw-Hill Book Co., Inc., New York, 1942.
- United States Department of Agriculture, 1957 Agricultural Outlook Charts, Agricultural Marketing Service and Agricultural Research Service, Washington, D. C., November, 1956.
- United States Department of Agriculture, Basic Land Use Statistics, 1950, Supplement to "Major Uses of Land in the United States," Technical Bulletin 1082, United States Department of Agriculture, Bureau of Agricultural Economics, Washington, D. C., September, 1953.
- United States Department of Agriculture, Changes in Farm Production and Efficiency: 1955 Summary, Agricultural Research Service, Washington, D. C., ARS 43-33, June, 1956.
- United States Department of Commerce, 1930 United States Census of Agriculture: The Northern States, Bureau of the Census, United States Government Printing Office, Washington, D. C., Vol. II, part 1, 1932.

- United States Department of Commerce, 1930 United States Census of Agriculture: Minor Civil Divisions, Michigan, Bureau of the Census, Washington, D. C., 1932.
- United States Department of Commerce, 1940 United States Census of Agriculture: Minor Civil Divisions, Michigan, Bureau of the Census, Washington, D. C., 1942.
- United States Department of Commerce, 1940 United States Census of Agriculture: Statistics for Counties, Bureau of the Census, United States Government Printing Office, Washington, D. C., Vol. I, part 1, 1942.
- United States Department of Commerce, 1950 United States Census of Agriculture: General Report, Bureau of the Census, Washington, D. C., Vol. II, 1952.
- United States Department of Commerce, 1950 United States Census of Agriculture: Michigan, Bureau of the Census, United States Government Printing Office, Washington, D. C., Vol. II, part 22, 1952.
- United States Department of Commerce, 1950 United States Census of Agriculture: Minor Civil Divisions, Michigan, Bureau of the Census, United States Government Printing Office, Washington, D. C., 1952.
- United States Department of Commerce, 1950 United States Census of Population: General Characteristics, Michigan, Bureau of the Census, United States Government Printing Office, Washington, D. C., 1952.
- Usoem, John, "Does Decentralization Industry Mean Greater Security? The Case of Massachusetts," Rural Sociology, Vol. 6, No. 1, March, 1941.
- Wehrwein, George S., "The Rural-Urban Fringe," Economic Geography, Vol. 18, July, 1942.
- Wehrwein, George S., "Land Classification for Rural Zoning," Proceedings of the First National Conference on Land Classification, Missouri Agricultural Experiment Station Bulletin 421, Columbia, 1940.
- Wooten, H. H., Major Uses of Land in the United States, Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C., Technical Bulletin 1082, October, 1953.
- Zimmerman, Erich W., World Resources and Industries, Harper and Brothers, New York, 1951.

APPENDIX

Appendix Table A

Motor Vehicles and Specified Machines on Farms,
United States, January 1, 1910-1955^a

Year	Tractors ^b	Motor trucks	Auto-mobiles	Grain combines	Corn pickers	Farms with milking machines	Pickup balers	Field forage harvesters
	(000)	(000)	(000)	(000)	(000)	(000)	(000)	(000)
1910	1	0	50	1	--	12	--	--
1920	246	139	2,146	4	10 ^c	55	--	--
1930	920	900	4,135	61	50	100	--	--
1940	1,545	1,047	4,144	190	110	175	--	--
1941	1,665	1,095	4,330	225	120	210	--	--
1942	1,860	1,160	4,670	275	130	255	25 ^c	--
1943	2,055	1,280	4,350	320	138	275	31	--
1944	2,160	1,385	4,185	345	146	300	34	--
1945	2,354	1,490	4,148	375	168	365	42	20 ^c
1946	2,480	1,550	4,260	420	203	440	54	25
1947	2,617	1,700	4,350	465	236	525	65	30
1948	2,821	1,900	4,225	535	299	575	90	45
1949	3,123	2,065	4,290	620	372	610	135	60
1950	3,394	2,207	4,199	714	456	636	196	81
1951	3,678	2,310	4,220	810	522	655	240	102
1952	3,907	2,410	4,230	887	588	675	298	124
1953	4,100	2,520	4,240	930	630	690	345	148
1954	4,243	2,610	4,250	965	660	705	395	175
1955	4,345	2,701	4,258	980	688	712	448	202

^aSource: Changes in Farm Production and Efficiency: 1955 Summary, United States Department of Agriculture, Agricultural Research Service, Washington, D. C., ARS 43-33, June, 1956, Table 16, pp. 38-39.

^bEnumeration excludes steam and garden tractors.

^cInformation for earlier years not available.

Appendix Table B

Total Population by Township Location and Tier, All Mapped City Areas^a

Township location, ^b and tier	Total population		Rural non-farm population ^c		Farm population				
	1950 :	1940 :	1950 :	1940 :	1950 :	1940 :			
Center twp's. (10)	66,222	49,630	34,294	61,319	39,000	27,731	4,743	6,848	6,599
First tier									
NE twp's. (18)	127,065	76,028	61,857	91,904	54,636	45,510	15,409	20,086	15,121
E twp's. (13)	76,429	46,807	38,947	36,900	17,416	14,384	10,955	14,446	12,199
SE twp's. (18)	107,624	73,221	63,848	62,685	33,324	30,907	14,086	18,607	14,960
S twp's. (15)	84,770	51,216	42,639	55,878	36,504	32,116	9,496	12,625	9,971
SW twp's. (20)	120,818	76,126	56,171	83,832	53,786	37,421	13,912	16,982	16,215
W twp's. (12)	73,786	41,171	29,329	63,817	29,120	18,616	8,621	10,964	9,657
NW twp's. (17)	72,557	44,007	33,700	57,592	26,645	14,956	12,111	15,989	13,099
N twp's. (12)	66,101	56,649	49,833	47,426	31,197	36,584	7,420	10,993	10,075
Total (125)	729,150	465,225	376,324	500,034	282,728	203,494	92,010	120,692	101,297
Second tier									
NE twp's. (17)	36,440	27,972	22,899	17,096	9,571	6,055	12,285	13,488	12,599
ENE twp's (13)	33,016	25,108	25,761	16,559	8,370	10,237	9,578	11,145	10,545
E twp's. (13)	29,392	22,463	19,097	13,308	4,280	3,522	10,499	13,079	10,857
ESE twp's. (15)	34,362	27,389	23,810	14,967	6,807	4,326	14,039	15,932	13,832
SE twp's. (15)	27,822	22,311	19,610	11,335	4,530	2,736	14,114	15,857	14,516
SSE twp's. (15)	30,068	27,446	23,810	18,124	6,891	5,130	12,855	15,845	14,306
S twp's. (9)	27,740	22,531	16,151	8,626	5,656	1,289	6,517	6,897	6,481

Appendix Table B continued

Township location and tier ^b	Total population			Rural non-farm population ^c			Farm population		
	1950	1940	1930	1950	1940	1930	1950	1940	1930
Second tier cont'd.									
SSW twp's. (16)	39,556	29,969	26,874	17,101	7,985	6,021	14,609	16,353	14,845
SW twp's. (14)	30,376	24,907	23,871	13,561	6,996	7,711	12,961	15,518	13,550
WSW twp's. (15)	47,336	32,039	24,076	24,179	11,091	5,921	14,290	16,833	14,262
W twp's. (9)	65,190	34,667	26,120	35,912	18,088	13,683	6,419	8,175	6,807
WNW twp's. (14)	35,581	25,858	21,226	18,230	6,997	5,634	10,815	13,358	10,564
NW twp's. (15)	22,072	18,295	16,249	7,109	2,428	1,996	11,788	13,463	11,984
NNW twp's (15)	31,773	25,200	21,946	13,928	4,441	4,822	14,226	17,625	14,595
N twp's (12)	26,708	20,804	20,978	8,019	2,636	4,108	8,722	10,250	9,814
NNE twp's (17)	42,545	30,450	25,896	24,632	10,996	9,307	13,435	15,661	13,250
Total (227)	565,977	417,409	358,374	262,686	117,763	92,498	187,152	218,799	192,807

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^aSource: 1950 United States Census of Population: Characteristics of the Population, Michigan, United State Department of Commerce, Bureau of the Census, Washington, D. C., Vol. II, Part 22, 1952.

^bNumbers in parentheses indicate the number of townships in each locational position with respect to the central city.

^cIn this tabulation there are 53 unincorporated town and villages and cities that have incorporated since 1940, with a population total of 128,621 listed for the first time in the 1950 census. Rural non-farm population is therefore overstated by the total population of these cities and villages in 1930 and 1940. In addition, there were a large number of annexations during this period of time. The census does not specify the populations of the annexed areas, which also overstates the rural non-farm population for 1930 and 1940.

Appendix Table C

Farms and Farm Acreages by Township Location
and Tier, All Mapped City Areas^a

Township location and tier ^b	Number of farms			Total acres in farms		
	1950	1940	1930	1950	1940	1930
Center twp's (10)	1,004	1,383	1,621	104,783	107,735	121,234
First tier						
NE twp's.(18)	3,070	4,281	3,423	256,327	278,904	269,763
E twp's.(13)	2,301	2,940	2,442	199,523	215,849	198,812
SE twp's.(18)	3,119	3,649	3,227	267,320	284,172	269,888
S twp's. (15)	1,827	2,611	2,129	172,304	199,167	185,635
SW twp's. (20)	2,859	3,748	3,321	260,775	293,661	287,663
W twp's. (12)	1,838	2,296	2,053	165,850	193,866	188,514
NW twp's. (17)	2,636	3,575	2,698	260,415	288,589	260,824
N twp's. (12)	1,618	2,613	1,806	172,922	190,361	181,376
Total (125)	19,268	25,713	21,099	1,755,436	1,944,569	1,842,475
Second tier						
NE twp's. (17)	2,535	3,064	2,762	280,749	312,595	299,359
ENE twp's. (13)	2,062	2,422	2,018	205,860	219,346	194,768
T twp's. (13)	2,359	2,702	2,484	203,928	212,257	225,609
ESE twp's (15)	2,878	3,215	2,859	259,950	269,540	258,691
SE twp's. (15)	2,836	3,110	3,124	285,941	285,996	294,136
SSE twp's. (15)	2,667	3,803	2,920	272,500	288,679	266,734
S twp's. (9)	1,530	1,721	1,648	168,667	175,705	165,971
SSW twp's. (16)	2,614	3,568	2,789	252,140	295,411	252,357
SW twp's. (14)	2,750	3,436	3,009	245,703	264,346	254,116
WSW twp's. (15)	3,018	3,830	3,290	278,818	282,862	291,873
W twp's. (9)	1,364	1,691	1,593	134,001	153,247	150,650
WNW twp's. (14)	2,368	2,968	2,330	247,152	265,259	247,000
NW twp's. (15)	2,519	2,904	2,744	259,721	280,639	281,405
NNW twp's. (18)	3,065	3,424	2,986	307,125	311,046	297,438
N twp's (12)	1,969	2,206	2,316	205,827	219,005	231,939
NNE twp's. (17)	2,737	3,377	2,647	271,167	306,788	271,637
Total (227)	39,271	47,441	41,517	3,879,249	4,142,721	3,983,683

^aSource: 1930, 1940, and 1950 United States Census of Agriculture:
Minor Civil Divisions, Michigan, United States Department of
Commerce, Bureau of the Census, Washington, D. C.

^bNumbers in parentheses indicate the number of townships in each locational
position with respect to the central city.

Appendix Table C continued

Township location and tier	Acres of cropland harvested			Acres of cropland idle		
	1950	1940	1930	1950	1940	1930
Center twp's. (10)	52,327	52,633	60,455	48,716	6,427	13,610
First tier						
NE twp's. (18)	133,744	136,346	139,450	24,411	23,022	24,602
E twp's. (13)	110,942	112,878	105,313	13,431	15,369	17,815
SE twp's. (18)	148,363	152,637	144,492	20,682	15,286	20,968
S twp's. (15)	84,330	94,534	88,369	14,882	15,606	19,494
SW twp's. (20)	138,528	141,462	143,794	17,389	25,132	25,692
W twp's. (12)	85,773	94,240	93,381	15,092	13,169	14,868
NW twp's. (17)	132,384	139,739	127,080	22,834	24,402	26,422
N twp's. (12)	89,037	124,683	89,455	14,407	12,874	17,722
Total (125)	923,101	996,519	931,334	142,128	144,860	167,583
Second tier						
NE twp's. (17)	141,749	140,584	139,518	19,479	20,995	23,297
ENE twp's. (13)	103,300	102,968	96,998	14,731	16,146	17,358
E twp's. (13)	116,171	112,369	115,481	14,110	15,229	20,508
ESE twp's. (15)	143,027	141,305	138,461	20,200	14,237	18,350
SE twp's. (15)	160,705	140,085	152,069	20,033	15,821	23,319
SSE twp's. (15)	156,379	152,772	140,840	17,196	13,647	21,933
S twp's. (9)	88,154	93,830	82,307	12,787	9,248	15,766
SSW twp's. (16)	139,436	147,827	127,425	18,165	23,308	21,158
SW twp's. (14)	131,790	134,134	131,581	19,675	20,068	21,150
WSW twp's. (15)	143,915	138,635	147,000	21,762	22,942	23,322
W twp's. (9)	68,115	86,735	73,085	11,334	8,961	13,844
WNW twp's. (14)	123,733	130,876	119,510	19,495	17,471	19,439
NW twp's. (15)	128,869	132,446	135,826	20,854	17,762	22,271
NNW twp's. (18)	159,313	148,634	147,065	20,798	23,275	27,317
N twp's. (12)	102,929	102,497	111,051	13,741	16,903	20,722
NNE twp's. (17)	132,440	140,025	132,508	20,922	23,207	24,468
Total (227)	2,040,025	2,035,722	1,990,725	285,282	279,220	334,222

APPENDIX TABLE D-1

Per Cent Rural Non-Farm Population (X) and Average
Acres Per Farm (Y), by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	124.6	234.09	15,525.16	1,906.38
Huron	19.9	129.6	396.01	16,796.16	2,579.04
Montcalm	27.3	116.4	745.29	13,548.96	3,177.72
Van Buren	27.6	82.4	761.76	6,789.76	2,274.24
Hillsdale	31.5	103.5	992.25	10,712.25	3,260.25
Shiawassee	31.8	108.5	1,011.24	11,772.25	3,450.30
Isabella	32.7	127.9	1,069.29	16,358.41	4,182.33
Tuscola	32.8	110.2	1,075.85	12,144.04	3,614.56
Gratiot	33.0	114.8	1,089.00	13,179.04	3,788.40
Barry	35.2	115.3	1,239.04	13,294.09	4,058.56
Eaton	36.5	107.5	1,332.25	11,556.25	3,823.75
St. Joseph	36.8	132.2	1,354.24	17,476.84	4,864.96
Allegan	37.7	84.9	1,421.29	7,208.01	3,200.73
Branch	38.2	119.9	1,459.24	14,376.01	4,580.18
Clinton	40.8	121.0	1,664.64	14,641.00	4,936.80
Lapeer	40.8	116.6	1,664.64	13,595.56	4,757.28
Ionia	40.8	125.5	1,664.64	15,750.25	5,120.40
Lenawee	45.5	112.7	2,070.25	12,701.29	5,127.85
Cass	45.6	111.3	2,079.36	12,387.69	5,075.28
Livingston	50.5	135.9	2,550.25	18,468.81	6,862.95
Ottawa	52.0	72.2	2,704.00	5,212.84	3,754.40
Berrien	53.4	60.1	2,851.56	3,612.01	3,209.34
St. Clair	54.0	94.5	2,916.00	8,930.25	5,103.00
Monroe	54.4	81.0	2,959.36	6,561.00	4,406.40
Bay	54.9	81.3	3,014.01	6,609.69	4,463.37
Calhoun	55.5	120.4	3,080.25	14,496.16	6,682.20
Midland	56.1	101.3	3,147.21	10,261.69	5,682.93
Jackson	64.1	123.5	4,108.81	15,252.25	7,916.35
Saginaw	64.5	94.4	4,160.25	8,911.36	6,088.80
Ingham	72.7	115.0	5,285.29	13,225.00	8,360.50
Washtenaw	75.9	124.2	5,760.81	15,425.64	9,426.78
Kent	77.8	90.2	6,052.84	8,136.04	7,017.56
Kalamazoo	80.2	105.9	6,432.04	11,214.81	8,493.18
Genessee	81.9	79.4	6,707.61	6,304.36	6,502.86
Macomb	83.8	63.2	7,022.44	3,994.24	5,296.16
Muskegon	84.8	81.6	7,191.04	6,658.56	6,191.68
Oakland	90.6	91.9	8,208.36	8,445.61	8,326.14
Wayne	90.7	48.0	8,226.49	2,304.00	4,352.60
Totals	1,947.6	3,928.8	115,702.98	423,837.34	192,745.21

^aSource: See Page 196.

APPENDIX TABLE D-2

Per Cent Rural Non-Farm Population (X) and Per Cent of
Total Farm in Cropland (Y), by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	57.5	234.09	3,306.25	879.75
Huron	19.9	64.0	396.01	4,096.00	1,273.60
Montcalm	27.3	43.5	745.29	1,892.25	1,187.55
Van Buren	27.6	46.0	761.76	2,116.00	1,269.60
Hillsdale	31.5	51.5	992.25	2,652.25	1,622.25
Shiawassee	31.8	57.1	1,011.24	3,260.41	1,815.78
Isabella	32.7	48.2	1,069.29	2,323.24	1,576.14
Tuscola	32.8	59.0	1,075.84	3,481.00	1,935.20
Gratiot	33.0	60.8	1,089.00	3,696.64	2,006.40
Barry	35.2	44.3	1,239.04	1,962.49	1,559.36
Eaton	36.5	53.0	1,332.25	2,809.00	1,934.50
St. Joseph	36.8	48.9	1,354.24	2,391.21	1,799.52
Allegan	37.7	50.9	1,421.29	2,590.81	1,918.93
Branch	38.2	52.6	1,459.24	2,766.76	2,009.32
Clinton	40.8	56.0	1,664.64	3,136.00	2,284.80
Lapeer	40.8	47.9	1,664.64	2,294.41	1,954.32
Ionia	40.8	51.6	1,664.64	2,662.56	2,105.28
Lenawee	45.5	64.6	2,070.96	4,044.96	3,893.80
Cass	45.6	46.5	2,079.36	2,162.25	2,120.40
Livingston	50.5	43.8	2,550.25	1,918.44	2,211.90
Ottawa	52.0	52.5	2,704.00	2,756.25	2,730.00
Berrien	53.4	57.4	2,851.56	3,294.76	3,065.16
St. Clair	54.0	51.0	2,916.00	2,601.00	2,754.00
Monroe	54.4	69.1	2,959.36	4,774.81	3,759.04
Bay	54.9	59.3	3,014.01	3,516.49	3,255.57
Calhoun	55.5	47.4	3,080.25	2,246.76	2,630.70
Midland	56.1	41.7	3,147.21	1,738.89	2,339.37
Jackson	64.1	44.0	4,108.81	1,936.00	2,820.40
Saginaw	64.5	57.9	4,160.25	3,352.41	3,734.55
Ingham	72.7	51.4	5,285.29	2,641.96	3,736.78
Washtenaw	75.9	51.2	5,760.81	2,621.44	3,886.08
Kent	77.8	45.3	6,052.84	2,052.09	3,524.34
Kalamazoo	80.2	49.2	6,432.04	2,420.64	3,945.84
Genesee	81.9	52.4	6,707.61	2,745.76	4,291.56
Macomb	83.8	56.8	7,022.44	3,225.24	4,759.84
Muskegon	84.8	38.2	7,191.04	1,459.24	3,239.36
Oakland	90.6	40.8	8,208.36	1,664.64	3,696.48
Wayne	90.7	54.6	8,226.49	2,981.16	4,952.22
Totals	1,947.6	1,966.9	115,702.98	103,593.47	99,479.69

^aSource: See page 196.

APPENDIX TABLE D-3

Per Cent Rural Non-Farm Population (X) and Per Cent of
Cropland in Grain Crops (Y), by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	44.1	234.09	1,944.81	674.73
Huron	19.9	42.6	396.01	1,814.76	847.74
Montcalm	27.3	41.9	745.29	1,755.61	1,143.87
Van Buren	27.6	37.5	761.76	1,406.25	1,035.00
Hillsdale	31.5	63.7	992.25	4,057.69	2,006.55
Shiawassee	31.8	57.2	1,011.24	3,271.84	1,818.96
Isabella	32.7	51.5	1,069.29	2,652.25	1,684.05
Tuscola	32.8	47.4	1,075.84	2,246.86	1,554.72
Gratiot	33.0	58.5	1,089.00	3,422.25	1,930.50
Barry	35.2	53.9	1,239.04	2,905.21	1,897.28
Eaton	36.5	62.1	1,332.25	3,856.41	2,266.65
St. Joseph	36.8	58.0	1,354.24	3,364.00	2,134.40
Allegan	37.7	52.2	1,421.29	2,724.84	1,967.94
Branch	38.2	66.7	1,459.29	4,448.89	2,547.94
Clinton	40.8	62.2	1,664.64	3,868.84	2,537.76
Lapeer	40.8	49.8	1,664.64	2,480.04	2,031.84
Ionia	40.8	63.0	1,664.64	3,969.00	2,570.40
Lenawee	45.5	69.7	2,070.25	4,858.09	3,171.35
Cass	45.6	57.2	2,079.36	3,271.84	2,608.32
Livingston	50.5	52.4	2,550.25	2,745.76	2,646.20
Ottawa	52.0	58.2	2,704.00	3,387.24	3,026.40
Berrien	53.4	35.1	2,851.56	1,232.01	1,874.34
St. Clair	54.0	47.9	2,916.00	2,294.41	2,586.60
Monroe	54.4	62.1	2,959.36	3,856.41	3,378.24
Bay	54.9	40.0	3,014.01	1,600.00	2,196.00
Calhoun	55.5	60.6	3,080.25	3,672.36	3,363.30
Midland	56.1	44.4	3,147.21	1,971.36	2,490.84
Jackson	64.1	53.4	4,108.81	2,851.56	3,522.94
Saginaw	64.5	50.4	4,160.25	2,540.16	3,250.80
Ingham	72.7	58.5	5,285.29	3,422.25	4,252.95
Washtenaw	75.9	60.9	5,760.81	3,708.81	4,622.31
Kent	77.8	45.9	6,052.84	2,106.81	3,571.02
Kalamazoo	80.2	56.2	6,423.04	3,158.44	4,507.24
Genesee	81.9	52.8	6,707.61	2,787.84	7,324.32
Macomb	83.8	52.2	7,022.44	2,724.84	4,374.36
Muskegon	84.8	42.0	7,191.04	1,764.00	3,561.60
Oakland	90.6	44.8	8,208.36	2,007.04	4,058.88
Wayne	90.7	50.5	8,226.49	2,550.25	4,580.35
Totals	1,947.6	2,007.5	115,702.98	108,700.93	102,518.69

^aSource: See page 196.

APPENDIX TABLE D-4

Per Cent Rural Non-Farm Population (X) and Per Cent of
Cropland in Hay and Legumes (Y), by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	41.3	234.09	1,705.69	631.89
Huron	19.9	47.0	396.01	2,209.00	935.30
Montcalm	27.3	32.7	745.29	1,069.69	892.71
Van Buren	27.6	16.7	761.76	278.89	460.92
Hillsdale	31.5	23.7	992.25	561.69	746.55
Shiawassee	31.8	29.1	1,011.24	846.81	925.38
Isabella	32.7	33.2	1,069.29	1,102.24	1,085.64
Tuscola	32.8	38.0	1,075.84	1,444.00	1,246.40
Gratiot	33.0	30.6	1,089.00	936.36	1,009.80
Barry	35.2	24.0	1,239.04	576.00	844.80
Eaton	36.5	22.6	1,332.25	510.76	824.90
St. Joseph	36.8	19.6	1,354.24	384.16	721.28
Allegan	37.7	20.2	1,421.29	408.04	761.54
Branch	38.2	23.0	1,459.24	529.00	878.60
Clinton	40.8	22.6	1,664.64	510.76	922.08
Lapeer	40.8	33.5	1,664.64	1,122.25	1,366.80
Ionia	40.8	23.3	1,664.64	542.89	950.64
Lenawee	45.5	20.0	2,070.25	400.00	910.00
Cass	45.6	17.6	2,079.36	309.76	802.56
Livingston	50.5	26.0	2,550.25	676.00	1,313.00
Ottawa	52.0	22.5	2,704.00	506.25	1,170.00
Berrien	53.4	11.7	2,851.56	136.89	624.78
St. Clair	54.0	34.1	2,916.00	1,162.81	1,841.40
Monroe	54.4	24.4	2,959.36	595.36	1,327.36
Bay	54.9	34.7	3,014.01	1,204.09	1,905.03
Calhoun	55.5	20.9	3,080.25	436.81	1,159.95
Midland	56.1	37.0	3,147.21	1,369.00	2,075.70
Jackson	64.1	24.7	4,108.81	610.09	1,583.27
Saginaw	64.5	35.1	4,160.25	1,232.01	2,263.95
Ingham	72.7	22.1	5,285.29	488.41	1,607.67
Washtenaw	75.9	25.3	5,760.81	640.09	1,920.27
Kent	77.8	26.5	6,052.84	702.25	2,061.70
Kalamazoo	80.2	19.9	6,432.04	396.01	1,595.98
Genessee	81.9	27.9	6,707.61	778.41	2,285.01
Macomb	83.8	24.4	7,022.44	595.36	2,044.72
Muskegon	84.8	27.8	7,191.04	772.84	2,357.44
Oakland	90.6	26.0	8,208.36	676.00	2,355.60
Wayne	90.7	21.8	8,226.49	475.24	1,977.26
Totals	1,947.6	1,011.5	115,702.98	28,901.91	50,387.88

^aSource: See page 196.

APPENDIX TABLE D-5

Per Cent Rural Non-Farm Population (X) and Per Cent of
Cropland in Other Crops (Y), by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	6.7	234.09	44.89	102.51
Huron	19.9	6.0	396.01	36.00	119.40
Montcalm	27.3	7.4	745.29	54.76	202.02
Van Buren	27.6	20.2	761.76	408.04	557.52
Hillsdale	31.5	1.8	992.25	3.24	56.70
Shiawassee	31.8	3.0	1,011.24	9.00	95.40
Isabella	32.7	4.6	1,069.29	21.16	150.42
Tuscola	32.8	7.4	1,075.84	54.76	242.72
Gratiot	33.0	4.3	1,089.00	18.49	141.90
Barry	35.2	3.4	1,239.00	11.56	119.68
Eaton	36.5	4.5	1,332.25	20.25	164.25
St. Joseph	36.8	4.1	1,354.24	16.81	150.88
Allegan	37.7	9.3	1,421.29	86.49	350.61
Branch	38.2	2.8	1,459.24	7.84	106.96
Clinton	40.8	5.6	1,664.64	31.36	228.48
Lapeer	40.8	4.6	1,664.64	21.16	187.68
Ionia	40.8	2.5	1,664.64	6.25	102.00
Lenawee	45.5	4.5	2,070.25	20.25	204.75
Cass	45.6	5.3	2,079.36	28.09	241.68
Livingston	50.5	4.8	2,550.25	23.04	242.40
Ottawa	52.0	5.5	2,704.00	30.25	286.00
Berrien	53.4	37.3	2,851.56	1,391.29	1,991.82
St. Clair	54.0	4.9	2,916.00	24.01	246.60
Monroe	54.4	6.6	2,959.36	43.56	359.04
Bay	54.9	15.9	3,014.01	252.81	872.91
Calhoun	55.5	5.0	3,080.25	25.00	277.50
Midland	56.1	6.2	3,147.21	38.44	347.82
Jackson	64.1	5.7	4,108.81	32.49	365.37
Saginaw	64.5	5.5	4,160.25	30.25	254.75
Ingham	72.7	5.8	5,285.29	33.64	421.66
Washtenaw	75.9	4.1	5,760.81	16.81	311.19
Kent	77.3	9.4	6,052.84	88.36	731.32
Kalamazoo	80.2	5.6	6,432.04	31.36	449.12
Genesee	81.9	4.7	6,707.61	22.09	384.93
Macomb	83.8	11.8	7,022.44	139.24	988.84
Muskegon	84.8	9.1	7,191.04	82.81	771.68
Oakland	90.6	8.5	8,208.36	72.25	770.10
Wayne	90.7	13.0	8,226.49	169.00	1,179.10
Totals	1,947.6	277.4	115,702.98	3,447.10	14,895.71

^aSource: See page 196.

APPENDIX TABLE D-6

Per Cent Rural Non-Farm Population (X) and Per Cent
of Cropland Idle (Y), by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	8.0	234.09	64.00	122.40
Huron	19.9	4.4	396.01	19.36	87.56
Montcalm	27.3	18.0	745.29	324.00	491.40
Van Buren	27.6	25.5	761.76	650.25	703.80
Hillsdale	31.5	10.7	992.25	114.49	337.05
Shiawassee	31.8	10.7	1,011.24	114.49	340.26
Isabella	32.7	10.6	1,069.29	112.36	346.62
Tuscola	32.8	7.1	1,075.84	50.41	232.88
Gratiot	33.0	6.3	1,089.00	39.69	207.90
Barry	35.2	17.0	1,239.04	289.00	598.40
Eaton	36.5	10.7	1,333.25	114.49	390.55
St. Joseph	36.8	18.3	1,354.24	334.89	673.44
Allegan	37.7	17.7	1,421.29	313.29	667.29
Branch	38.2	7.6	1,459.24	57.76	290.32
Clinton	40.8	9.5	1,664.64	90.25	387.60
Lapeer	40.8	12.0	1,664.64	144.00	489.60
Ionia	40.8	11.2	1,664.64	125.44	456.96
Lenawee	45.5	5.7	2,070.25	32.49	259.35
Cass	45.6	20.0	2,079.36	400.00	912.00
Livingston	50.5	16.8	2,550.25	282.24	848.40
Ottawa	52.0	13.9	2,704.00	193.21	722.80
Berrien	53.4	15.9	2,851.56	252.81	849.06
St. Clair	54.0	13.2	2,916.00	174.24	712.80
Monroe	54.4	7.0	2,959.36	49.00	380.80
Bay	54.9	9.6	3,014.01	92.16	527.04
Calhoun	55.5	13.5	3,080.25	182.25	749.25
Midland	56.1	12.3	3,147.21	151.29	690.03
Jackson	64.1	17.1	4,018.81	292.41	1,096.11
Saginaw	64.5	9.0	4,160.25	81.00	580.50
Ingham	72.7	13.6	5,285.29	184.96	988.72
Washtenaw	75.9	9.7	5,760.81	94.09	736.23
Kent	77.8	18.3	6,052.84	334.89	1,423.74
Kalamazoo	80.2	18.5	6,432.04	342.25	1,483.70
Genesee	81.9	14.6	6,707.61	213.16	1,195.74
Macomb	83.8	11.6	7,022.44	134.56	972.08
Muskegon	84.8	21.0	7,191.04	441.00	1,780.08
Oakland	90.6	20.7	8,208.36	428.49	1,875.42
Wayne	90.7	14.7	8,226.49	216.09	1,333.29
Totals	1,947.6	502.0	115,702.98	7,530.76	26,941.17

^aSource: See page 196.

APPENDIX TABLE D-7

Per Cent Rural Non-Farm Population (X) and Per Cent
of Farmland in Pasture (Y), by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	28.2	234.09	795.24	431.46
Huron	19.9	23.1	396.01	533.61	459.69
Montcalm	27.3	29.0	745.29	841.00	791.70
Van Buren	27.6	20.4	761.76	416.16	563.04
Hillsdale	31.5	28.3	992.25	800.89	891.45
Shiawassee	31.8	21.8	1,011.24	475.24	693.24
Isabella	32.7	33.0	1,069.29	1,089.00	1,079.10
Tuscola	32.8	22.5	1,075.84	506.25	738.00
Gratiot	33.0	24.9	1,089.00	620.01	821.70
Barry	35.2	29.1	1,239.04	846.81	1,024.32
Eaton	36.5	27.4	1,332.25	750.76	1,000.10
St. Joseph	36.8	22.3	1,354.24	497.29	820.64
Allegan	37.7	17.4	1,421.29	302.76	655.98
Branch	38.2	29.6	1,459.24	876.16	970.88
Clinton	40.8	24.5	1,664.64	600.25	999.60
Lapeer	40.8	29.8	1,664.64	888.04	1,215.84
Ionia	40.8	29.4	1,664.64	864.36	1,199.52
Lenawee	45.5	20.0	2,070.25	400.00	910.00
Cass	45.6	22.4	2,079.36	501.76	1,021.44
Livingston	50.5	27.5	2,550.25	756.25	1,388.75
Ottawa	52.0	26.2	2,704.00	686.44	1,362.40
Berrien	53.4	16.1	2,851.56	259.21	859.74
St. Clair	54.0	29.2	2,916.00	852.64	1,576.80
Monroe	54.4	11.6	2,959.36	134.56	631.04
Bay	54.9	24.4	3,014.01	595.36	1,339.56
Calhoun	55.5	29.4	3,080.25	864.36	1,631.70
Midland	56.1	35.3	3,147.21	1,246.09	1,980.33
Jackson	64.1	27.9	4,108.81	778.41	1,788.39
Saginaw	64.5	22.6	4,160.25	519.76	1,457.70
Ingahm	72.7	27.0	5,285.29	729.00	1,962.90
Washtenaw	75.9	28.1	5,760.81	789.61	2,132.79
Kent	77.8	21.7	6,052.84	470.89	1,688.26
Kalamazoo	80.2	24.0	6,432.04	576.00	1,924.80
Genesee	81.9	24.2	6,707.61	585.64	1,981.98
Macomb	83.8	23.1	7,022.44	533.61	1,935.78
Muskegon	84.8	28.4	7,191.04	806.56	2,408.32
Oakland	90.6	26.3	8,208.36	691.69	2,382.78
Wayne	90.7	19.0	8,226.49	361.00	1,723.30
Totals	1,947.6	955.10	115,702.98	24,833.67	48,445.02

^aSource: See page 196.

APPENDIX TABLE D-8

Per Cent Rural Non-Farm Population (X) and Animal Units
Per Acre of Pasture by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	.30	234.09	.090	4.59
Huron	19.9	.31	396.01	.096	6.17
Montcalm	27.3	.23	745.29	.053	6.28
Van Buren	27.6	.24	761.76	.058	6.62
Hillsdale	31.5	.31	992.25	.086	9.77
Shiawassee	31.8	.35	1,011.24	.123	11.13
Isabella	32.7	.23	1,069.29	.053	7.52
Tuscola	32.8	.27	1,075.84	.073	8.86
Gratiot	33.0	.30	1,089.00	.090	9.90
Barry	35.2	.24	1,239.04	.058	8.45
Eaton	36.5	.28	1,332.25	.078	10.22
St. Joseph	36.8	.25	1,354.24	.063	9.20
Allegan	37.7	.51	1,421.29	.260	19.23
Branch	38.2	.27	1,459.24	.073	10.31
Clinton	40.8	.30	1,664.64	.090	12.24
Lapeer	40.8	.28	1,664.64	.078	11.42
Ionia	40.8	.27	1,664.64	.073	11.02
Lenawee	45.5	.33	2,070.25	.109	15.02
Cass	45.6	.24	2,079.36	.058	10.94
Livingston	50.5	.24	2,550.25	.058	12.12
Ottawa	52.0	.41	2,704.00	.168	21.32
Berrien	53.4	.30	2,851.56	.090	16.02
St. Clair	54.0	.29	2,916.00	.084	15.66
Monroe	54.4	.48	2,959.36	.230	26.11
Bay	54.9	.26	3,014.01	.068	14.27
Calhoun	55.5	.23	3,080.25	.053	12.77
Midland	56.1	.15	3,147.21	.023	8.42
Jackson	64.1	.23	4,108.81	.053	14.74
Saginaw	64.5	.28	4,160.25	.078	18.06
Ingham	72.7	.27	5,285.29	.073	19.63
Washtenaw	75.9	.29	5,760.81	.084	22.01
Kent	77.8	.36	6,052.84	.130	28.01
Kalamazoo	80.2	.22	6,432.04	.048	17.64
Genessee	81.9	.30	6,707.61	.090	24.57
Macomb	83.8	.44	7,022.44	.194	36.87
Muskegon	84.8	.25	7,191.04	.063	21.20
Oakland	90.6	.24	8,208.36	.058	21.74
Wayne	90.7	.37	8,226.49	.137	33.56
Totals	1,947.6	11.12	115,702.98	3.454	573.61

^aSource: See page 196.

APPENDIX TABLE D-9

Per Cent Rural Non-Farm Population (X) and Per Cent of all
Farms Less Than Fifty Acres, by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	15.8	234.09	249.64	241.74
Huron	19.9	13.5	396.01	182.25	268.65
Montcalm	27.3	19.2	745.29	368.64	524.16
Van Buren	27.6	42.7	761.76	1,823.29	1,178.52
Hillsdale	31.5	26.3	992.25	691.69	828.45
Shiawassee	31.8	25.0	1,011.24	625.00	795.00
Isabella	32.7	20.3	1,069.29	412.09	663.81
Tuscola	32.8	21.9	1,075.85	479.61	718.32
Gratiot	33.0	22.9	1,089.00	524.41	755.70
Barry	25.2	23.2	1,239.04	538.24	816.64
Eaton	36.5	28.2	1,332.25	795.24	1,029.30
St. Joseph	36.8	23.2	1,354.24	538.24	853.76
Allegan	37.7	34.0	1,421.29	1,156.00	1,281.80
Branch	38.2	24.3	1,459.24	590.49	928.26
Clinton	40.8	22.5	1,664.64	506.25	918.00
Lapeer	40.8	21.3	1,664.64	453.69	869.04
Ionia	40.8	21.7	1,664.64	470.89	885.36
Lenawee	45.5	24.4	2,070.25	595.36	1,110.20
Cass	45.6	28.7	2,079.36	823.69	1,308.72
Livingston	50.5	20.2	2,550.25	408.04	1,020.10
Ottawa	52.0	39.5	2,704.00	1,560.25	2,054.00
Berrien	53.4	62.6	2,851.56	3,916.76	3,342.84
St. Clair	54.0	29.9	2,916.00	894.01	1,614.60
Monroe	54.4	41.1	2,959.36	1,689.21	2,235.84
Bay	54.9	33.7	3,014.01	1,135.69	1,850.13
Calhoun	55.5	26.5	3,080.25	702.25	1,470.75
Midland	56.1	28.7	3,147.21	823.69	1,610.07
Jackson	64.1	26.2	4,108.81	686.44	1,679.42
Saginaw	64.5	30.6	4,160.25	936.36	1,973.70
Ingham	72.7	28.8	5,285.29	829.44	2,093.76
Washtenaw	75.9	26.4	5,760.81	696.96	2,003.76
Kent	77.8	36.6	6,052.84	1,339.56	2,847.48
Kalamazoo	80.2	37.3	6,423.04	1,391.29	2,991.46
Genesee	81.9	46.5	6,707.61	2,162.25	3,808.35
Macomb	83.8	53.0	7,022.44	2,809.00	4,441.40
Muskegon	84.8	45.7	7,191.04	2,088.49	3,875.36
Oakland	90.6	48.1	8,208.36	2,313.61	4,357.86
Wayne	90.7	80.9	8,226.49	5,026.81	6,430.63
Totals	1,947.6	1,191.4	115,702.98	43,236.82	67,676.94

^aSource: See page 196.

APPENDIX TABLE D-10

Per Cent Rural Non-Farm Population (X) and Per Cent of all Farms With Less Than \$1,000 Value of Products Sold (Y), by County, 1950^a

County	X	Y	x ²	y ²	XY
Sanilac	15.3	18.9	234.09	357.21	289.17
Huron	19.9	13.3	396.01	176.89	264.67
Montcalm	27.3	32.8	745.29	1,075.84	895.44
Van Buren	27.6	42.6	761.76	1,814.76	1,175.76
Hillsdale	31.5	32.3	992.25	1,043.29	1,017.45
Shiawassee	31.8	27.1	1,011.24	734.41	861.78
Isabella	32.7	25.7	1,069.29	660.49	840.39
Tuscola	32.8	27.3	1,075.84	745.29	895.44
Gratiot	33.0	20.8	1,089.00	432.64	686.40
Barry	35.2	36.3	1,239.04	1,317.69	1,277.76
Eaton	36.5	30.8	1,332.25	948.64	1,124.20
St. Joseph	36.8	30.7	1,354.24	942.49	1,129.76
Allegan	37.7	33.8	1,421.29	1,142.44	1,274.26
Branch	38.2	28.2	1,459.24	795.24	1,077.24
Clinton	40.8	25.8	1,644.64	665.64	1,052.64
Lapeer	40.8	27.8	1,664.64	772.84	1,134.24
Ionia	40.8	29.1	1,664.64	846.81	1,187.28
Lenawee	45.5	22.9	2,070.25	524.41	1,041.95
Cass	45.6	40.5	2,079.36	1,640.25	1,846.80
Livingston	50.5	36.1	2,550.25	1,303.21	1,823.05
Ottawa	52.0	35.4	2,704.00	1,253.16	1,840.80
Berrien	53.4	14.2	2,851.56	201.64	758.28
St. Clair	54.0	40.3	2,916.00	1,624.09	2,176.20
Monroe	54.4	38.6	2,959.36	1,489.96	2,099.84
Bay	54.9	28.5	3,014.01	812.25	1,564.65
Calhoun	55.5	39.4	3,080.25	1,552.36	2,186.70
Midland	56.1	53.1	3,147.21	2,819.61	2,978.91
Jackson	64.1	40.7	4,108.81	1,656.49	2,608.87
Saginaw	64.5	31.0	4,160.25	961.00	1,999.50
Ingham	72.7	32.6	5,285.29	1,062.76	2,370.02
Washtenaw	75.9	32.7	5,760.81	1,069.29	2,481.93
Kent	77.8	40.2	6,052.84	1,616.04	3,127.56
Kalamazoo	80.2	42.8	6,432.04	1,831.84	3,432.56
Genesee	81.9	51.9	6,707.61	2,693.61	4,250.61
Macomb	83.8	42.5	7,022.44	1,806.25	3,561.50
Muskegon	84.8	52.5	7,191.04	2,756.25	4,452.00
Oakland	90.6	56.0	8,208.36	3,136.00	5,073.60
Wayne	90.7	64.5	8,226.49	4,160.25	5,850.15
Totals	1,947.6	1,319.7	115,702.98	50,443.33	73,709.36

^a Source: See page 196.

APPENDIX TABLE D-11

Per Cent Rural Non-Farm Population (X) and Part-Time Farms
as a Percentage of all Farms (Y), by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	18.24	234.09	332.70	279.07
Huron	19.9	12.30	396.01	151.29	244.77
Montcalm	27.3	24.08	745.29	579.85	657.38
Van Buren	27.6	33.65	761.76	1,132.25	928.74
Hillsdale	31.5	24.86	992.25	618.02	783.09
Shiawassee	31.8	32.69	1,011.24	1,068.64	1,039.54
Isabella	32.7	20.19	1,069.29	407.64	660.21
Tuscola	32.8	22.55	1,075.84	508.50	739.64
Gratiot	33.0	17.83	1,089.00	317.91	588.39
Barry	35.2	33.51	1,239.04	1,122.92	1,179.55
Eaton	36.5	31.93	1,332.25	1,019.52	1,165.45
St. Joseph	36.8	30.33	1,354.24	919.91	1,116.14
Allegan	37.7	31.64	1,421.29	1,001.09	1,192.83
Branch	38.2	14.98	1,459.24	224.40	572.24
Clinton	40.8	26.39	1,664.64	696.43	1,076.71
Lapeer	40.8	27.72	1,664.64	768.40	1,130.98
Ionia	40.8	25.73	1,664.64	662.03	1,049.78
Lenaswee	45.5	25.03	2,070.25	626.50	1,138.87
Cass	45.6	35.43	2,079.36	1,255.28	1,615.61
Livingston	50.5	28.48	2,550.25	811.11	1,438.24
Ottawa	52.0	38.12	2,704.00	1,453.13	1,982.24
Berrien	53.4	35.86	2,851.56	1,285.94	1,914.92
St. Clair	54.0	35.14	2,916.00	1,234.82	1,897.56
Monroe	54.4	40.22	2,959.36	1,617.65	2,187.97
Bay	54.9	31.03	3,014.01	962.86	1,703.55
Calhoun	55.5	39.42	3,080.25	1,553.94	2,187.81
Midland	56.1	41.91	3,147.21	1,756.45	2,351.15
Jackson	64.1	39.38	4,108.81	1,550.78	2,524.26
Saginaw	64.5	31.27	4,160.25	977.81	2,016.92
Ingham	72.7	33.39	5,285.29	1,114.89	2,427.45
Washtenaw	75.9	32.14	5,760.81	1,032.98	2,439.43
Kent	77.8	36.91	6,052.84	1,362.35	2,871.60
Kalamazoo	80.2	43.25	6,432.04	1,870.56	3,468.65
Genessee	31.9	52.89	6,707.61	2,797.35	1,687.19
Macomb	83.3	37.92	7,022.44	1,437.93	3,158.74
Muckegon	84.8	42.59	7,191.04	1,813.91	3,611.63
Oakland	90.6	49.21	8,208.36	2,421.62	4,458.43
Wayne	90.7	54.99	8,226.49	3,023.90	4,987.59
Totals	1,947.6	1,233.20	115,702.98	43,493.26	66,474.32

^aSource: See page 196.

APPENDIX TABLE D-12

Per Cent Rural Non-Farm Population (X) and Per Cent of
Total Farmland Rented Out (Y), by County, 1950^a

County	X	Y	X ²	Y ²	XY
Sanilac	15.3	24.74	234.09	612.07	378.52
Huron	19.9	25.67	396.01	658.95	510.83
Montcalm	27.3	22.51	745.29	506.70	614.52
Van Buren	27.6	19.34	761.76	374.04	533.78
Hillsdale	31.5	31.82	992.25	1,012.51	1,002.23
Shiawassee	31.8	29.96	1,011.24	897.60	952.73
Isabella	32.7	31.41	1,069.29	986.59	1,027.11
Tuscola	32.8	28.47	1,075.84	810.54	933.82
Gratiot	33.0	37.81	1,089.00	1,429.60	1,247.30
Barry	25.2	21.28	1,239.04	486.11	749.06
Eaton	36.5	26.44	1,332.25	699.07	965.06
St. Joseph	36.8	30.33	1,354.24	919.91	1,116.14
Allegan	37.7	17.89	1,421.29	320.05	674.45
Branch	38.2	36.39	1,459.24	1,324.23	1,390.10
Clinton	40.8	29.35	1,664.64	861.42	1,197.48
Lapeer	40.8	25.60	1,664.64	655.36	1,044.48
Ionia	40.8	27.73	1,664.64	768.95	1,131.38
Lenaswee	45.5	37.55	2,070.25	1,410.00	1,708.53
Cass	45.6	30.02	2,079.36	901.20	1,368.91
Livingston	50.5	24.96	2,550.25	623.00	1,260.48
Ottawa	52.0	15.52	2,704.00	240.87	807.04
Berrien	53.4	18.31	2,851.56	335.26	977.75
St. Clair	54.0	19.98	2,916.00	399.20	1,078.92
Monroe	54.4	30.75	2,959.36	945.56	1,672.80
Bay	54.9	16.52	3,014.01	272.91	906.95
Calhoun	55.5	27.20	3,080.25	739.84	1,509.60
Midland	56.1	23.56	3,147.21	555.07	1,321.72
Jackson	64.1	23.10	4,108.81	533.61	1,480.71
Saginaw	64.5	20.43	4,160.25	417.38	1,317.34
Ingham	72.7	27.65	5,285.29	764.52	2,010.16
Washtenaw	75.9	28.20	5,760.81	795.24	2,140.38
Kent	77.8	20.50	6,052.84	420.25	1,594.90
Kalamazoo	80.2	26.65	6,432.04	710.22	2,137.33
Genessee	31.9	24.39	6,707.61	595.87	778.04
Macomb	83.3	22.67	7,022.44	513.93	1,888.41
Muckegon	84.8	15.03	7,191.04	255.90	1,274.54
Oakland	90.6	26.99	8,208.36	728.46	2,445.29
Wayne	90.7	35.22	8,226.49	1,240.45	3,194.45
Totals	1,947.6	981.94	115,702.98	26,712.44	48,343.24

^aSource: See page 196.

Source for all Appendix Tables D-1 through D-12: 1950 United States Census of Agriculture: Michigan, United States Department of Commerce, Bureau of the Census, United States Government Printing Office, Washington, D. C., Vol. I, part 6, 1952; and 1950 United States Census of Population: Michigan, United States Department of Commerce, Bureau of the Census, United States Government Printing Office, Washington, D. C., Vol. II, part 22, 1952.

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~~JUN 10 1961~~

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