SOME RURAL LAND USE PATTERNS AND PROBLEMS OF MORGAN COUNTY, INDIANA

By

James R. Anderson

Thesis submitted to the Faculty of the Graduate School of the University of Maryland in partial fulfillment of the requirements for the degree of Doctor of Philosophy

1950

UMI Number: DP70259

All rights reserved

INFORMATION TO ALL USERS
The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript
and there are missing pages, these will be noted. Also, if material had to be removed,
a note will indicate the deletion.

UMI DP70259

Published by ProQuest LLC (2015). Copyright in the Dissertation held by the Author.

Microform Edition © ProQuest LLC.
All rights reserved. This work is protected against
unauthorized copying under Title 17, United States Code

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

ACKNOWLEDGEMENTS

The author is deeply grateful to all who in numerous ways have assisted in the preparation of this dissertation. To the late Dr. O. E. Baker who gave unstintingly of his time, I am especially indebted; for it was under his direction that this study was undertaken and brought to the final phases of completion. The week he spent with me in Morgan County will long be remembered. Also to Mr. Hugh H. Wooten and Mr. Francis J. Marschner of the Bureau of Agricultural Economics, United States Department of Agriculture, the author is very grateful for their kindness in assuming the task of directing this thesis after Dr. Baker's death. The author is most appreciative of the many helpful criticisms and suggestions made by Professors Raymond E. Crist, Charles Y. Hu, John A. Morrison, and William Van Royen of the Department of Geography, University of Maryland. Likewise the author wishes to express his gratitude to Dr. Lynn S. Robertson, Mr. J. B. Kohlmeyer, Mr. O. G. Lloyd, and others at Purdue University who made numerous valuable suggestions.

Certainly without the splendid cooperation of the people of Morgan County this study would not have been possible. Many others, particularly those in various county, state, and federal government services have helped in numerous ways.

For the typing of the manuscript the author is indebted to his wife, Joy, for her patient and faithful assistance. To Charles W. Porter for his aid in the preparation of some of the maps, the author also wishes to express his thanks.

TABLE OF CONTENTS

Page

Acknowledgements . . . . . .

List of Tables. . . . . .

List of Figures (Maps and Graphs). . . . . .

List of Photographs. . . . . .

INTRODUCTION 1

CHAPTER I. PHYSICAL PATTERNS. 5

Introduction. 5

Landforms 5

Till Plain 7

Older Uplands. 7

Valley Lands 12

Land Values. 14

Drainage Pattern. 14

Soils 17

General Characteristics. 17

Parent Materials 17

Soil Classification. 18

Soil Reaction 22

Erosion Susceptibility 24

Productivity and Use Limitations 27

Problems in Agricultural Use 31

Climate 41

Natural Vegetation. 47

Summary 49

CHAPTER II. EVOLVING CULTURAL PATTERNS. 51

Settlement and Agriculture to the Civil War (1818-1860) . . 51

Agricultural Land Use After the Civil War (1865-) . . . 56

CHAPTER II (Cont'd) Page

Population Patterns 64

Population Growth. 65

Distribution 67

Migration. 70

Evolving Transportation Patterns. 72

Present Routes 72

Evolving Patterns. 73

Growth of Non-Farm Industries 77

Community Institutions and Attitudes. 81

The Small Town or Village. 81

Church 82

Schools. 83

Organized Farm Groups -- Farm Bureau, 4-H Clubs, Future Farmers of America, and Others 83

Governmental Agencies -- Agricultural Conservation Program, County Agent, Soil Conservation Service, Extension Service, and Others 84

Summary 84

CHAPTER III. RIVER VALLEY AND UPLAND FRINGE 86

Introduction. 86

Extent and Physical Characteristics 86

Unique Cultural Features. 88

Evolution of Land Use 94

Present Land Use Patterns 97

Major Uses of Land in Farms and Type of Operator and Owner. 97

Major Crops. 103

Lime and Fertilizers 105

Rotations. 107

Livestock. 109

CHAPTER III (Cont'd) Page

Problems Associated with Rented Land 109

Renting Land 110

Changing Patterns of Ownership. 112

CHAPTER IV. LAND USE CONTRASTS ON THE TILL PLAIN 115

Location, Extent, and Subdivisions 115

Cultural Contrasts Related to Land Use 116

The Corn Belt 116

The Northeast Dairying Segment. 119

The General Farming Segment 122

Land Use Patterns. 124

Status of Operator and Size of Farm 124

Major Uses of Land in Farms 128

Major Crops 128

Livestock 128

Land Use Problems of the Till Plain. 134

Fundamental Problems. 134

Problems of the Corn Belt Segment 134

Dairying Segment 139

General Farming Segment 148

CHAPTER V. STABILIZING LAND USE ON THE OLDER UPLANDS 152

Introduction 152

Location, Extent, and Subdivisions 154

Agricultural Patterns and Problems 154

General Use Characteristics 154

Use Patterns on Individual Farms. 158

Part-Time Farming, Residential, and Resort Patterns and Problems 163

Growth. 165

Subdivision of Tracts 167

CHAPTER V (Cont'd) Page

Motivation Behind the Influx 168

Type of Residence 169

Background of Residents Over 18 Years of Age 171

Place and Kind of Employment 171

Commuting 173

Tenure, Size, and Use of Holdings. 174

Toward More Effective Utilization of Residential and Part-Time Farming Tracts 176

Forestry 179

Summary 182

CHAPTER VI. SUMMARY 183

Summary of Geographic Facts. 183

Landforms 183

Soils 184

Climate 185

Natural Vegetation. 185

Evolution of Land Use 186

Cultural Features Significant to Land Use 187

Areal Differences in Land Use Patterns. 190

Summary of Problems and Recommendations. 197

Corn Belt and River Valley-Upland Fringe Areas. 198

Dairying Area 200

General Farming Areas of the Till Plain and Older Uplands 201

Part-Time Farming and Residential Areas 201

Forestry Areas. 202

Concluding Note 202

BIBLIOGRAPHY 204

LIST OF TABLES

TABLE		Page
I.	Some Use Limitations of Major Soils of Morgan County, Indiana	30
II.	Soil Improvement Programs on Recently Established Progressive Farms on Highly Leached Soils	38
III.	Summary of Climatic Data for Three Stations Adjacent to Morgan County	43
IV.	Background and Present Occupational Status of 312 Paragon High School Graduates, 1917-1946	72
V.	Size of Farms (1920-1945)	77
VI.	Major Uses of Land in Farms and Status of Operator	98
VII.	Areal Contrasts in Size of Farm and Status of Operator	104
VIII.	Major Crops of the River Valley and Upland Fringe	105
IX.	Number of Horses and Tractors on Till Plain Farms	123
X.	Contrasts in Size of Farm and Status of Operator on the Till Plain, 1935-45	126
XI.	Major Uses of Land in Farms, 1945	127
XII.	Major Crops of the Till Plain, 1945	129
XIII.	Livestock on the Till Plain, 1945	130
XIV.	Patterns of Use on the Older Uplands, Ashland Township	155
XV.	Land Use and Livestock Kept in 1949 on Four Large Farms of the Rough Uplands	164
XVI.	Replies to the Question: "Why did you move to this location?"	169
XVII.	Type and Place of Employment of 43 Gainfully Employed Rural Non-Farm Residents	172
XVIII.	Size of Holding Among 51 Rural Non-Farm Residents and Part-Time Farmers	174
XIX.	Retail Price and Cost of Producing Commodities on a Four-Acre Part-Time Farm in 1949	178
XX.	Lumber Production in Indiana (1909-1939)	181
XXI.	Areal Contrasts in Size of Farm, Status of Operator, Major Use of Land, Major Crops, and Livestock	192

LIST OF FIGURES

Figure			Page
1	Morgan County in Indiana	(Map)	2
2	General Location and Index Map of Morgan County, Indiana	(Map)	4
3	Landforms of Morgan County, Indiana.	(Map)	6
4	Average 1932 Rural Land Assessment Values. . . .	(Map)	15
5	Soils of Morgan County, Indiana.	(Map)	19
6	General Soil Reaction.	(Map)	23
7	Susceptibility of Major Soils to Erosion under Cultivation.	(Map)	25
8	General Soil Productivity.	(Map)	28
9	Climograph for Bloomington, Indiana.		45
10	Precipitation and Potential Evapotranspiration at Bloomington, Indiana		46
11	July Rainfall at Bloomington, Indiana and Average Yearly Corn Yields in Morgan County, Indiana (1924-1948).		48
12	Federal Land Sales in Morgan County, Indiana . .	(Map)	53
13	Changes in Utilization of Farm Land.		57
14	Acreage and Value of Crops		59
15	Changes in Livestock on Farms.		60
16	Soybean Acreage, 1926-1947		61
17	Changes in Total Population.		66
18	Distribution of Population Classes	(Map)	68
19	Major Non-Agricultural Industries (1949)	(Map)	80
20	Land Use Areas	(Map)	87
21	Farmsteads and Non-Farm Dwellings in Southwestern Morgan County, Indiana	(Map)	90
22	Broken Farms of the River Valley and Upland Fringe	(Map)	93

Figure			Page
23	Status of Land Ownership in Southwestern Morgan County, Indiana ...	(Map)	101
24	Status of Farm Operator in Southwestern Morgan County, Indiana	(Map)	102
25	Grade "A" Milk Producers in Morgan County, Indiana	(Map)	131
26	The Indianapolis Milkshed	(Map)	133
27	Distribution of Dwellings on the Rough Uplands in Central Morgan County, Indiana.	(Map)	166

LIST OF PHOTOGRAPHS

Photograph		Page
1	The Flat Fertile Lakebed of Glacial Lake Eminence. .	8
2	The Wisconsin Glacial Boundary Southeast of Monrovia	8
3	The Till Plain West of Mooresville	8
4	Unglaciated Topography in South-Central Morgan County	11
5	The Karst Plain in Western Morgan County	11
6	A Sinkhole on the Karst Plain.	11
7	The Fertile White River Valley Southwest of Paragon.	11
8	An Abandoned Field Situated on a Ridge Top with Sheet Erosion and Sassafras Trees now in Charge. .	26
9	An Abandoned Farmstead on Ill-Treated Moderately Rough Land	26
10	An Aerial Photograph of White River Valley and Upland Fringe.	99
11	Late Summer View of White River Floodplain	106
12	Aerial Photograph of Land Use in the Corn Belt . . .	117
13	Aerial Photograph of Land Use in the Dairying Area .	121
14	Aerial Photograph of Land Use in the General Farming Area	125
15	Disintegrating Farmsteads in the General Farming Area	149
16	A Well-Kept Farm on the Till Plain	159
17	An Ill-Kept Farm on the Rough Uplands.	159
18	An Infertile Hill Farm in Southern Morgan County . .	159
19	Rural Residence -- First Class	170
20	Rural Slums.	170
21	The Old "Homestead" now Occupied by Urban-Employed Dweller.	170
22	Small Well-Kept Cottage on the Rough Uplands	170

INTRODUCTION

This is a study of areal differences in rural land use within the arbitrary limits of a county to ascertain and analyze patterns of adjustment and maladjustment to the physical environment under existing economic and social institutions. Greater permanency and stability in land use on a wider scale is assumed to be highly desirable. Since Morgan County is situated where the fertile central till plain meets the rough unglaciated upland of south-central Indiana (Fig. 1), there are sharp differences in land use patterns and problems. Within this county are land use conditions characteristic of a large area of the United States. The northern one-third of the county is a glacial plain, the northwestern part of which plain belongs to the highly productive eastern Corn Belt. It is an area of commercial agriculture with the problems of maintaining soil resources, a high level of agricultural production, and the conservation of wealth within the farm community. The northeastern part of this plain has long been strong in dairy farming, while the eastern segment with its thinner till and less level land has retained a more self-sustained general farming pattern. The older uplands, only once or not at all glaciated, are distinctly less fertile than the area covered by Wisconsin till. These predominate in the central, west-central, and south-central parts of the county. Land use problems on these uplands are representative of many areas of rough terrain in eastern United States, especially those of southern Ohio, Indiana, and Illinois. Here limitations imposed by topography and soil depletion have made it a region of farms with little cropland per farm that handicaps them in the use of machinery and competition with farms that can reduce labor costs by use of more power per man. The occupants of these areas are still struggling to make land use adjustments that

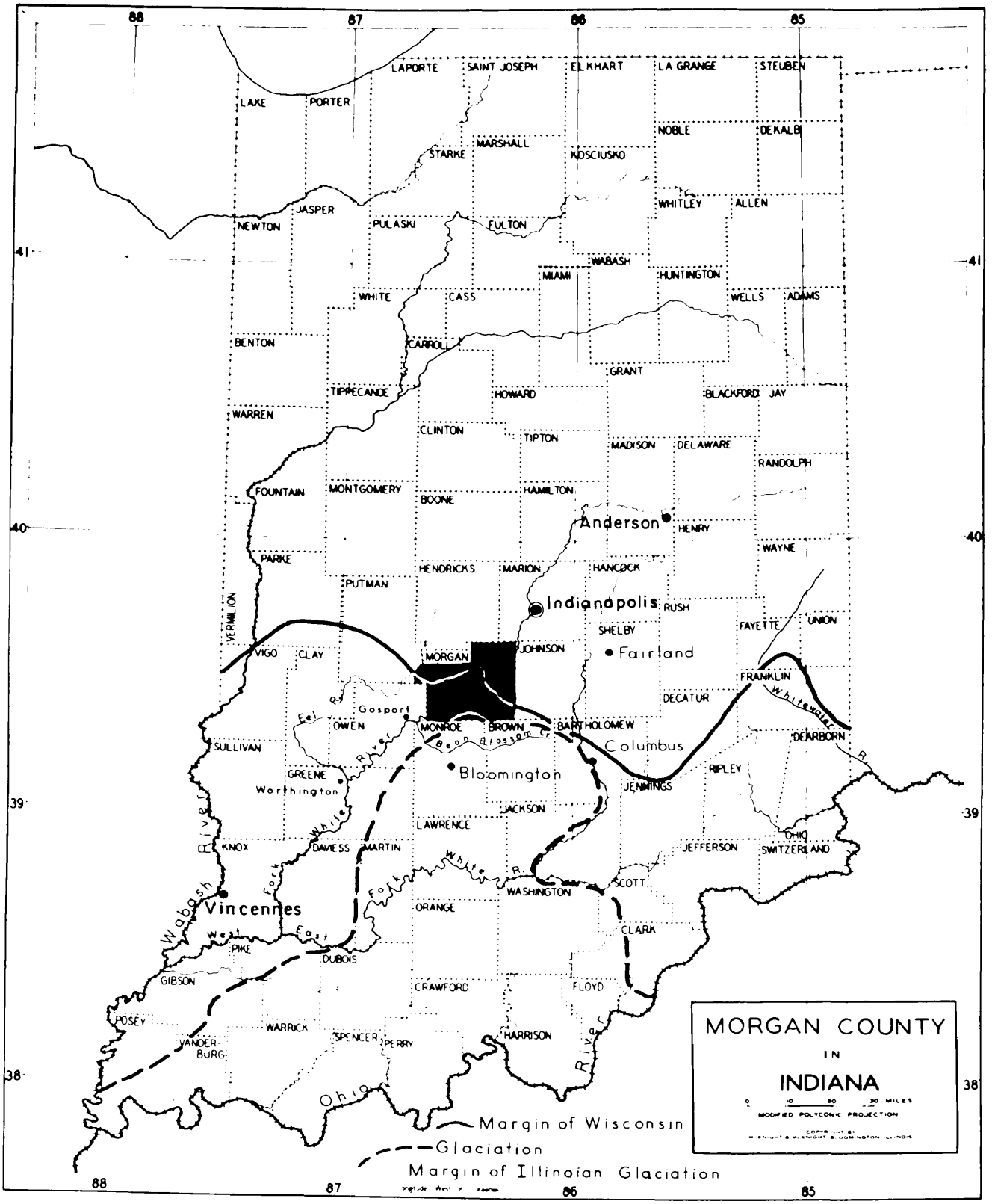

MORGAN COUNTY
IN
INDIANA
MODIFIED POLYCONIC PROJECTION
Margin of Wisconsin
Glaciation
Margin of Illinoian Glaciation
Anderson
Indianapolis
Fairland
Columbus
Bloomington
Gosport
Worthington
Vincennes
LAPORTE
SAINT JOSEPH
ELKHART
LA GRANGE
STEUBEN
LAKE
PORTER
NOBLE
DEKALB
STARKE
MARSHALL
KOSCIUSKO
WHITLEY
ALLEN
JASPER
NEWTON
PULASKI
FULTON
WABASH
MIAMI
HUNTINGTON
WHITE
CASS
WELLS
ADAMS
BENTON
CARROLL
GRANT
TIPPECANOE
HOWARD
BLACKFORD
JAY
WARREN
CLINTON
TIPTON
MADISON
DELAWARE
RANDOLPH
FOUNTAIN
MONTGOMERY
BOONE
HAMILTON
HENRY
WAYNE
PARKE
HENDRICKS
MARION
HANCOCK
PUTMAN
RUSH
VERMILION
SHELBY
FAYETTE
UNION
VIGO
CLAY
MORGAN
JOHNSON
FRANKLIN
DECATUR
OWEN
MONROE
BROWN
BARTHOLOMEW
DEARBORN
SULLIVAN
GREENE
RIPLEY
JENNINGS
JACKSON
LAWRENCE
OHIO
KNOX
DAVIESS
MARTIN
JEFFERSON
SWITZERLAND
SCOTT
WASHINGTON
ORANGE
CLARK
PIKE
DUBOIS
GIBSON
CRAWFORD
FLOYD
POSEY
WARRICK
SPENCER
PERRY
HARRISON
VANDERBURG
Wabash River
Ohio River
Whitewater R.
Eel R.
Bean Blossom Cr.
White River
Fork White R.
West Fork White R.
East Fork White R.
88
87
86
85
41
40
39
38

FIG. 1

will bring them a higher level of living and the conservation of soil resources. Running diagonally from northeast to southwest is the broad fertile West Fork of White River valley (hereafter referred to as White River), the alluvial and terrace soils of which are among the most valuable resources of the county (Fig. 2). These soils are under a system of farming that tends to deplete soil fertility. There is a high percentage of tenant-operated land on the floodplain with corn and soybeans as major crops.

As shown in Fig. 1, Morgan County is located in south-central Indiana, fifteen miles southwest of Indianapolis. It has predominantly straight boundaries which reflect the use of the rectangular land survey in laying out the county. It has a total of 406 square miles. The 1940 census of population revealed that the number living on the open countryside approximately equalled those living in Martinsville (the only city) and in towns with a population over 100.

The author's interest springs from long standing acquaintance with the area, having been reared in the western part of the county. Field work during the summers of 1946 and 1949 constitutes the primary source of data for this study.

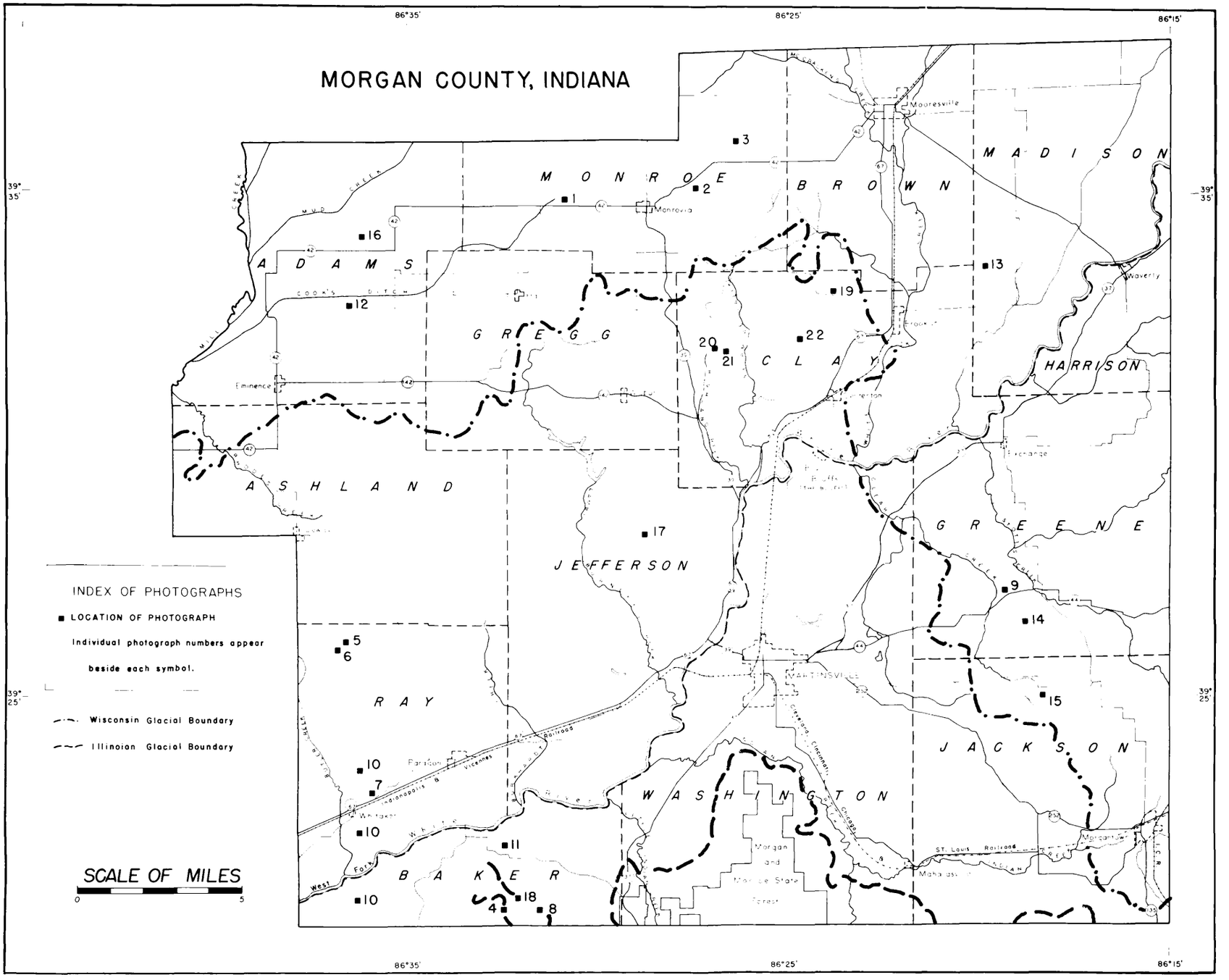

MORGAN COUNTY, INDIANA
86°35'
86°25'
86°15'
39°35'
39°25'
M O N R O E
B R O W N
M A D I S O N
A D A M S
G R E E G G
C L A Y
HARRISON
A S H L A N D
J E F F E R S O N
G R E E N E
R A Y
J A C K S O N
W A S H I N G T O N
B A K E R
Monrovia
Mooresville
Eminence
Martinsville
Waverly
Morgantown
Morgan and Monroe State Forest
INDEX OF PHOTOGRAPHS
LOCATION OF PHOTOGRAPH
Individual photograph numbers appear beside each symbol.
Wisconsin Glacial Boundary
Illinoian Glacial Boundary
SCALE OF MILES
0
5

FIG. 2

CHAPTER I

PHYSICAL PATTERNS

Introduction

Sharp contrasts in soils and topography are of major significance in accounting for land use patterns and problems in Morgan County. While overall influences of climate upon agriculture are not to be denied, major local climatic differences are absent. Changes in natural vegetation reflect primarily variations in soil and topography. Amount and time of glaciation and parent materials are dominant factors making for prominent soil and topographic contrasts. Inherently fertile soils lie in close juxtaposition with very infertile soils. A prominent till plain, floodplain, and karst plain, all largely cleared of native hardwood forests are separated by highly dissected uplands that still remain largely forested. A description and areal delimitation of these contrasts must necessarily precede any discussion of land use patterns and problems.

Landforms

Glaciation has been the major factor in creating the landforms of Morgan County. Much of the best agricultural land coincides closely with the areal extent of Wisconsin glaciation. The poorest agricultural land results from lack of glaciation, while the remaining part of the county was glaciated during the Illinoian age. Fig. 3 indicates the extent of glaciation and glacial features significant to agricultural production and outlines the present landforms. These may be described under three major headings: (1) till plain, (2) older uplands, and (3) valley lands.

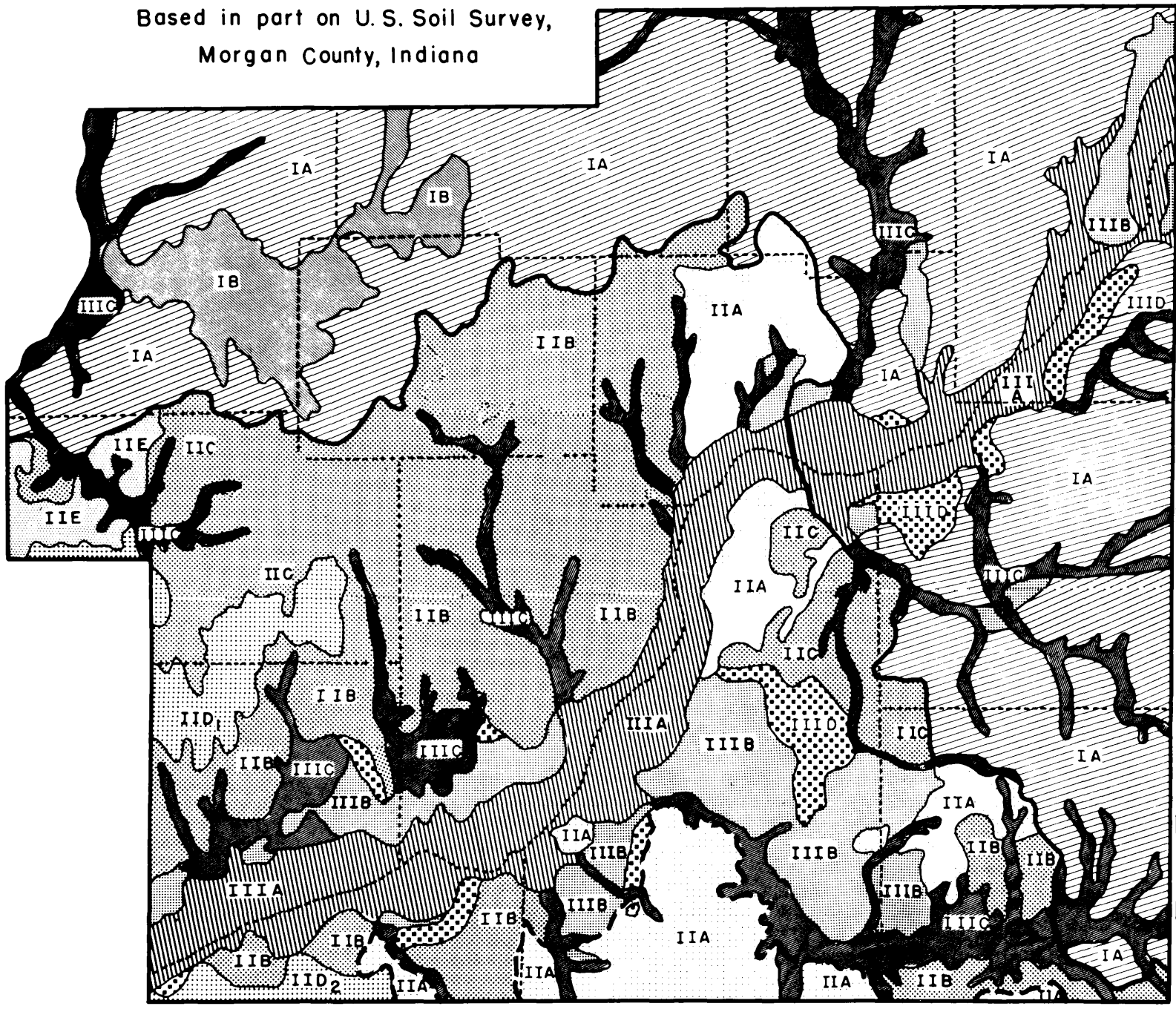
EXPLANATION OF DESCRIPTIVE TERMS

The following terms which are used to describe topographic contrasts in this study have the following general meanings.

Rough:	Local relief varying from 175 to 225 feet. Slopes of 20 to 30 percent are common. Many narrow ridges and "hemmed-in" small stream valleys
Moderately rough:	Local relief ranging from 75 feet to 175 feet Slopes of 10 to 20 percent prevail. Hills more rounded and valleys wider than for rough areas
Level to rolling:	Local relief generally less than 75 feet Slopes of less than 10 percent predominate. Areas of undissected upland are conspicuous.

LANDFORMS OF MORGAN COUNTY, INDIANA

Based in part on U. S. Soil Survey,
Morgan County, Indiana



MAJOR LANDFORMS

I TIPTON TILL PLAIN
(Wisconsin Age)

- IA Level to Rolling Upland
- IB Lacustrine Plain (Lake Eminence)

II OLDER UPLANDS
(Illinoian Age & Non-Glaciated)

- IIA Rough
- IIB Moderately Rough
- IIC Level to Rolling
- IID Karst (Mitchell) Plain
- IID_1 Affected by Illinoian Glaciation
- IID_2 Unaffected by Glaciation
- IIE Lacustrine Plain (Lake Quincy)

III VALLEY LANDS

- IIIA Floodplain
- IIIB Terrace
- IIIC Lesser Stream Valleys
- IIID Aeolian Sands

FIG. 3

Till Plain. About one-half of the county belongs to what Malott has designated as the Tipton Till Plain which covers much of central Indiana (7, p. 66). In Morgan County this plain is more rolling than in the counties immediately to the north, as might be expected near the glacial margin; however, terminal moraine features are inconspicuous. Likewise, thinner till near the Wisconsin glacial boundary has resulted in less fertile soils than for the more deeply covered areas to the north. Yet this Wisconsin till is of great importance and constitutes the parent material of some of the best soils. In the northwestern part of the county a lacustrine plain known as Lake Eminence is particularly fertile (Fig. 3). This former glacial lake has poor natural drainage, but artificial ditching and tiling has opened it to farming (Photograph 1). The calcareous lacustrine deposits are leached to a depth of only five to six feet (20). This lakebed, covering about 8,000 acres, is one of the two most fertile parts of the county; the other is the White River valley. Around this glacial lakebed the thickest deposits of Wisconsin till occur, well records and other evidence indicating a depth of 100 feet or more in some places (20). The eastern part of the till plain has a covering generally less than 50 feet thick. Heavier deposition in the northwestern part of the county has created more level terrain than elsewhere (Photographs 2 and 3). This condition, coupled with the dark soils high in organic matter, has made the northwestern part of the county a portion of the Corn Belt. Other parts of the till plain have experienced only moderate dissection since Wisconsin glaciation. Of all upland areas in the county the least dissection has taken place on the till plain. Hazards of accelerated erosion are greater in this more rolling part of the till plain than in the more level northwestern part.

Older Uplands. This term is used to designate more highly dissected and severely leached uplands that have been glaciated only once or

PHOTOGRAPH 1
(Lower)

The flat fertile lakebed of glacial Lake Eminence west of Monrovia.

PHOTOGRAPH 2
(Center)

Looking south just east of Monrovia to where the till plain and the rough upland meet along the Wisconsin glacial boundary.

PHOTOGRAPH 3
(Upper)

The till plain west of Mooresville. Level to rolling, this fertile plain has much of its area in crops.

not at all. They are old relative to Wisconsin glaciation. These older uplands are conveniently discussed under the headings: (1) rough and moderately rough upland, (2) level to rolling upland, (3) lacustrine

(1) Rough and Moderately Rough Upland. Fig. 2 indicates that there are four particularly rough to moderately rough areas[1] which are at

there are four particularly rough to moderately rough areas[1] which are separated by major stream valleys. (a) Including moderately rough terrain the largest of these is a northeast-southwest trending central area averaging five to six miles in width and approximately fifteen miles in length. (b) A north-south trending ridge approximately five miles long is separated from the central rough area by the White River valley. The north end of this ridge terminates in steep bluffs at the river's edge just south of Centerton. Across the river to the northwest are less pronounced bluffs terminating several north-south trending ridges of the central upland. (c) A third area lies south of the White River and Indian Creek valleys (Photograph 4). Here Illinoian glacial drift is very thin or non-existent. This area is much dissected, and except for small stream valleys is largely forested. Formerly there were more agricultural clearings than there are today. Some of the area is now the Morgan-Monroe State Forest Preserve. (d) The other area is north of Indian Creek near the Wisconsin glacial boundary in the southeastern corner of the county.

The resistant formation which caps the ridges in these rough areas is a fine grained, evenly stratified sandstone. In some places this sandstone grades laterally into shale which has been somewhat less resistant to weathering and stream action. On the higher ridges Illinoian drift is absent. It is probable that this moderately resistant

---

[1] These areas are designated as rough and moderately rough relative to the adjacent till plain.

sandstone in south-central Indiana presented a greater obstacle to the southward advance of the glaciers than did the Wabash and Whitewater valleys; consequently this part of the state remained unglaciated (7, p. 149).

The scarcity of level land in these rough areas limits favorable agricultural use. If the farm unit is sufficiently large to combine some tillable small valleys with ridge crests suitable for grazing and feeding livestock, then some profitable agricultural utilization may be possible. The slopes generally must be kept in forests for the best land use adjustment. The fields on the ridges are generally so small and broken by gullies that they are best used for pasture and feed lots. The small valleys can be used to produce part of the feed, but this is generally inadequate for the livestock feeding program needed on such farms. The deficiency is made up by purchase from adjacent river valley and till plain. Some successful farm units are located in the rough parts of the county and their land use patterns and problems will be discussed in Chapter V.

(2) Level to Rolling Upland. In contrast to these relatively rough portions of this older upland, there are two parts of it that are distinctly less dissected (Fig. 3). The largest of these areas lies east of Lewisville in the west-central part of the county, and the other is east and southeast of the north-south trending ridge north of Martinsville. In these two areas a greater leveling by deposition was exerted by the Illinoian glaciation. In some places the till is 100 feet thick (20).

(3) Lacustrine Plain. Particularly level is the poorly drained and little dissected lacustrine plain of Illinoian age lying primarily west of Lewisville. The area is referred to locally as the "flats" and has been named Lake Quincy by geologists (Fig. 3) (18, p. 132). It has very shallow valleys with relief generally less than 30 feet.

PHOTOGRAPH 4
(Lower Right)

Unglaciated topography in south-central Morgan County. Largely woodland and woodland pasture, little of this area is suitable for crops.

PHOTOGRAPH 5
(Upper Left)

The karst plain in western Morgan County is more rolling and less fertile than the till plain.

PHOTOGRAPH 6
(Upper Right)

A sinkhole on the karst plain. The eroded brim of the hole is suggestive of accelerated erosion damage. Fifteen such sinkholes were counted in the 20-acre field.

PHOTOGRAPH 7
(Lower Left)

The fertile White River valley southwest of Paragon. The hills in the background are near the Illinoian Glacial Boundary. The railroad in the foreground marks the northern edge of the floodplain.

Leaching to depths of 12 to 15 feet has occurred (20). Poor drainage presents a major problem to local farmers with land often left idle because a wet spring prevents getting a crop planted on improperly tiled fields. Many of the farms are small, and are hardly more than subsistence units; however, there are some very productive larger farms. There is an apparent need for consolidation of some of the smaller units if proper land use adjustments are to be made. A decidedly stronger livestock program with accompanying increase in legumes and pasture improvement is correctly recommended by the local land use planning committee (9).

(4) Karst Plain. South of this lacustrine plain there is a limestone plain which is covered by a relatively thin layer of Illinoian till. There are also two smaller karst areas that are unaffected by Illinoian glaciation along the southern edge of the county (Fig. 3). These plains are marked by typical solution sinkholes which are numerous enough to reduce the tillable acreage of many otherwise good fields by as much as one-third (Photograph 5). Erosion is rapid on the steep slopes bordering the sinkholes. In plowed fields many farmers do not leave these slopes adequately covered with grass; consequently loss of topsoil is aggravated (Photograph 6). This upland limestone plain is underlain by a coarse limestone formation and the small area in Morgan County represents a part of the much larger north-south trending Mitchell Plain (7, p. 66) which for the most part lies to the south of the county.

Valley Lands. The river and larger creek valleys are particularly important from an agricultural point of view. Partly because of the diagonal course of White River, the county has about 10 percent of the area in floodplain and terrace land. Its breadth reflects the position of White River in relation to melting Wisconsin ice sheets. White River was located so that it received much of the tremendous volume of melt-

water flowing away from the glacier in this central part of Indiana. Looking at the Morgan County portion of the White River valley and its relation to the Wisconsin glacial boundary (Fig. 3), the sudden widening of the valley below the glacial margin gives considerable support to the conclusion that melting ice was most significant in the formation of a broad fertile valley in the southwestern part of the county.

There are some particularly broad floodplain and terrace areas along White River that have high agricultural productivity. Such an area at the confluence of White Lick Creek and White River in the vicinity of Centerton is about five miles long and two miles wide. Southeast of the river, at the point where Stott's Creek joins White River, there is a less extensive area. Southwest of the Wisconsin glacial boundary the valley widens out, reaching its greatest width of about four miles in the vicinity of Paragon (Photograph 7). Here there is a sharp line of demarkation where lowland and upland meet. This is in contrast to a much less abrupt transition between valley and upland in the till plain northeast of the Wisconsin glacial boundary.

Three creek valleys that are extensive enough to be of considerable agricultural value penetrate a considerable distance into the upland. These are the White Lick, Stott's, and Indian creek valleys. Several lesser creeks have ribbons of floodplain and terrace that provide tillable land where rough uplands are especially unsuitable for cultivation, and make possible several farms that would otherwise be uneconomical.

For the most part there is no sharp break between terrace and floodplain, the difference in general elevation being less than 10 feet. The separation is commonly based on a line marking the widest extent of floods. The farmsteads and pastures for most of the farmers renting first bottom fields are on the terrace. Creeks winding across the river terrace formerly overflowed the land adjacent to their courses. Most of these creek courses have now been dredged and straightened,

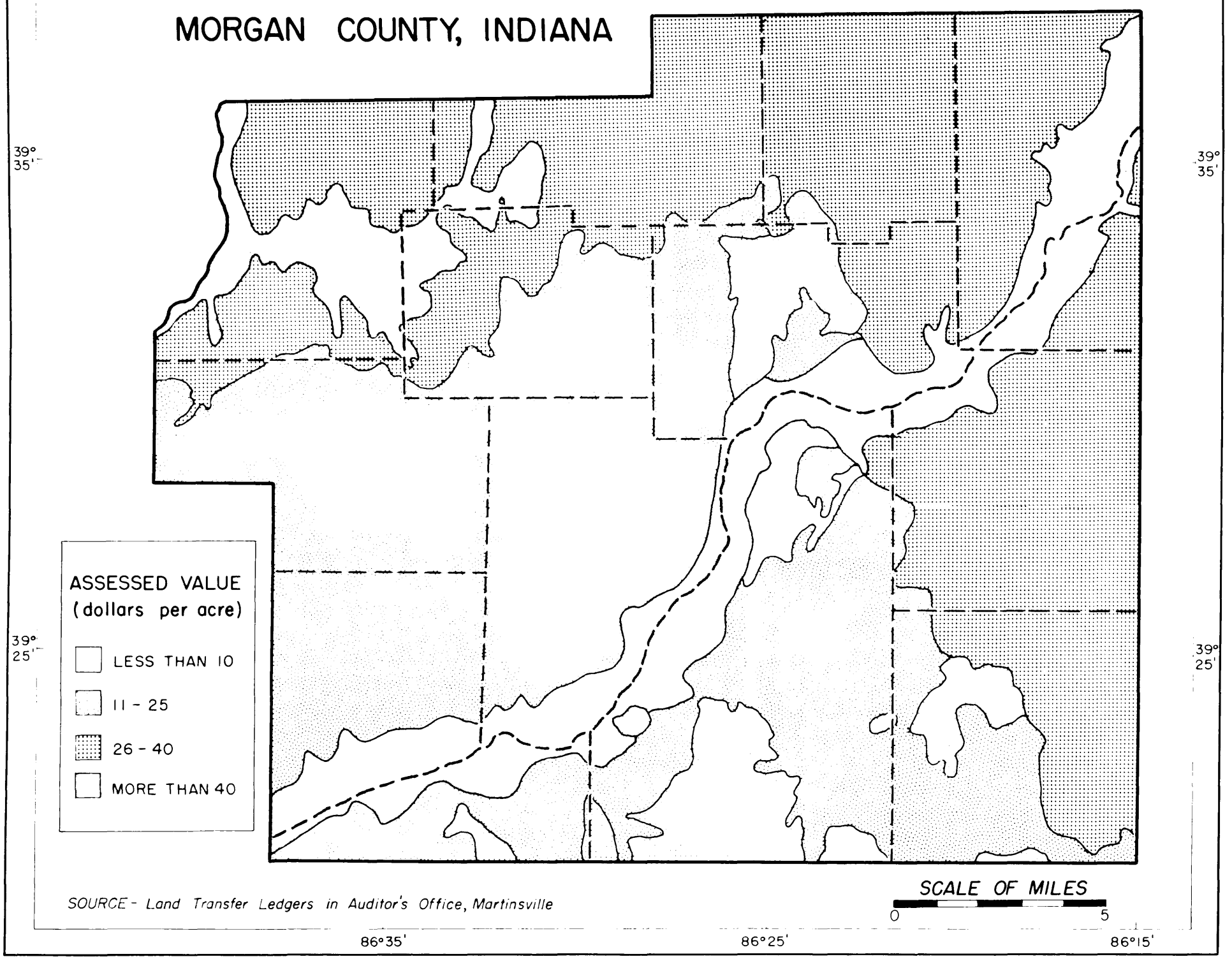
which has practically eliminated flood damage along the lower creek courses. The higher parts of the terrace are more gravelly and sandy than are the lower parts where silts and clays predominate. This means that the water holding capacity is poor on these higher parts and droughts are particularly damaging there. Several areas composed primarily of aeolian sands of post-Wisconsin age are also characterized by drought hazards. These areas are slightly higher than the terrace level.

Land Values. In order to obtain some tangible means of comparing the approximate agricultural worth of various landforms, a study of land assessment values was made. The average per acre 1932 values (the last official land assessment) are of course very low, but they serve to indicate how significantly topography and related soil conditions affect land values. The contrasts are shown in Fig. 4. The White River valley and the Lake Eminence plain command the highest valuations. These are approximately eight times that placed upon the rough unglaciated south-central area, now largely included in Morgan-Monroe State Forest Preserve. The per acre values on the till plain as a whole are about three times those for the older uplands. This comparison raises a basic question as to possible alternatives of improving values through better land use adjustments on some of this low value land. Is all of this land to be written off as being agriculturally worthless or can some of it be made economically useable again? Recent observations indicate that some important adjustments toward better land use are taking place. These will be discussed in Chapter V.

Drainage Pattern

All of Morgan County is drained by White River. With the exception of the northwestern part and the southern margin, tributary streams reach the river within the county (Fig. 2). Mill Creek and tributaries drain into Mel River which reaches White River southwest of Morgan

AVERAGE 1932 RURAL LAND ASSESSMENT VALUES
MORGAN COUNTY, INDIANA



SOURCE - Land Transfer Ledgers in Auditor's Office, Martinsville

FIG. 4

County (Fig. 1). A few small streams along the southern margin flow into Bean Blossom Creek and then into White River downstream from Morgan County.

Significant to rural land use is the degree of dissection that has occurred. In Morgan County this varies primarily with length of time since glaciation and secondarily with contrasts in bedrock. There is a marked difference in degree of dissection between the till plain of Wisconsin age and the older Illinoian and non-glaciated areas which latter areas have been exposed to stream action for a much longer period of time. The influence of limestone bedrock is evident in the southwestern corner and west-central part which have many sharp ridges and narrow creek valleys. Conspicuous V-shaped depressions, known locally as "hollows", are tributaries to these creeks. Local relief in this central part reaches 200 feet in several places. Steep slopes are common. Cropland has been restricted to the narrow ridge tops which erode badly when cultivated and to scattered small fields in the narrow stream valleys. Where the major creeks enter White River valley they broaden out to make possible larger fields, which however were subject to severe overflow until lower creek courses were straightened by dredging.

On the till plain there is a distinct contrast between the poorly drained northwestern part where much artificial open ditching and underssurface tiling has been necessary and the eastern part which is more dissected and much better drained. Transitional between these two areas is the northeastern part of the till plain with relatively flat undissected uplands. Local relief in the northwestern part of the till plain does not exceed 25-50 feet. In the eastern part some places have a local relief somewhat in excess of 100 feet. Slopes here are not sufficiently steep to prevent cultivation, but are steep enough to result in serious accelerated erosion if brought under cultivation and not

carefully managed.

Soils

General Characteristics. Morgan County has great soil diversity. This diversity is largely due to: (1) extent, depth, characteristics of glacial deposits, and differences in bedrock, (2) length of time that soil forming processes have been at work, and (3) differences in drainage conditions during the period of soil formation. Yet there are important common general soil characteristics: (1) All soils have been formed under deciduous forests making them generally light in color and low in organic matter. (2) Moderately heavy rainfall has led to considerable leaching, particularly of lime. (3) The soils are practically all relatively low in nitrogen, phosphorus, and available potash. (4) Fine texture is a common characteristic, 85 percent being silt loams, 10 percent silty clay loams, and five percent relatively sandy (20). Sandy soils are found principally on the White River terrace and also on the floodplain in places where velocity is lost as the river leaves its channel in floodstage. Silty clay loams are found in some of the more poorly drained parts of the White River floodplain. (5) Three-fourths of the soils are naturally well-drained; about one-fifth are poorly drained and the rest very poorly drained (20).

Parent Materials. Six principal kinds of parent materials have entered into the development of Morgan County's soils: (1) calcareous Late Wisconsin glacial drift, (2) calcareous Early Wisconsin drift[2], (3) calcareous Illinoian drift, (4) cherty limestone, (5) medium-grained sandstone and shale, and (6) calcareous loessial deposits of Wisconsin

---

[2]The use of the terms "Late" and "Early" Wisconsin are in accordance with the soil survey report. According to some studies both "Late" and "Early" Wisconsin in Morgan County might be combined into one substage.

age along White River (20). The various glacial deposits are similar in character and the differences in the soils that have developed from these deposits are principally due to the varying time interval that soil forming processes have been at work on them. This has resulted in greater leaching of the older materials. Soils derived from Late Wisconsin drift have been leached to an average depth of three feet, those from the Early Wisconsin to a depth of 4 to 6 feet, and those from the Illinoian to a depth of 10 feet or more (20). The depth of leaching has greatly affected soil fertility and hence the need for lime and fertilizers.

Soil Classification. The distribution of the soils of Morgan County is shown in Fig. 5. They may be conveniently classified as (1) upland, (2) terrace and lacustrine, and (3) alluvial. The parent materials from which the various soils are derived are indicated in the legend to Fig. 5.

(1) Upland Soils. The upland soils belong principally to four great soil associations:

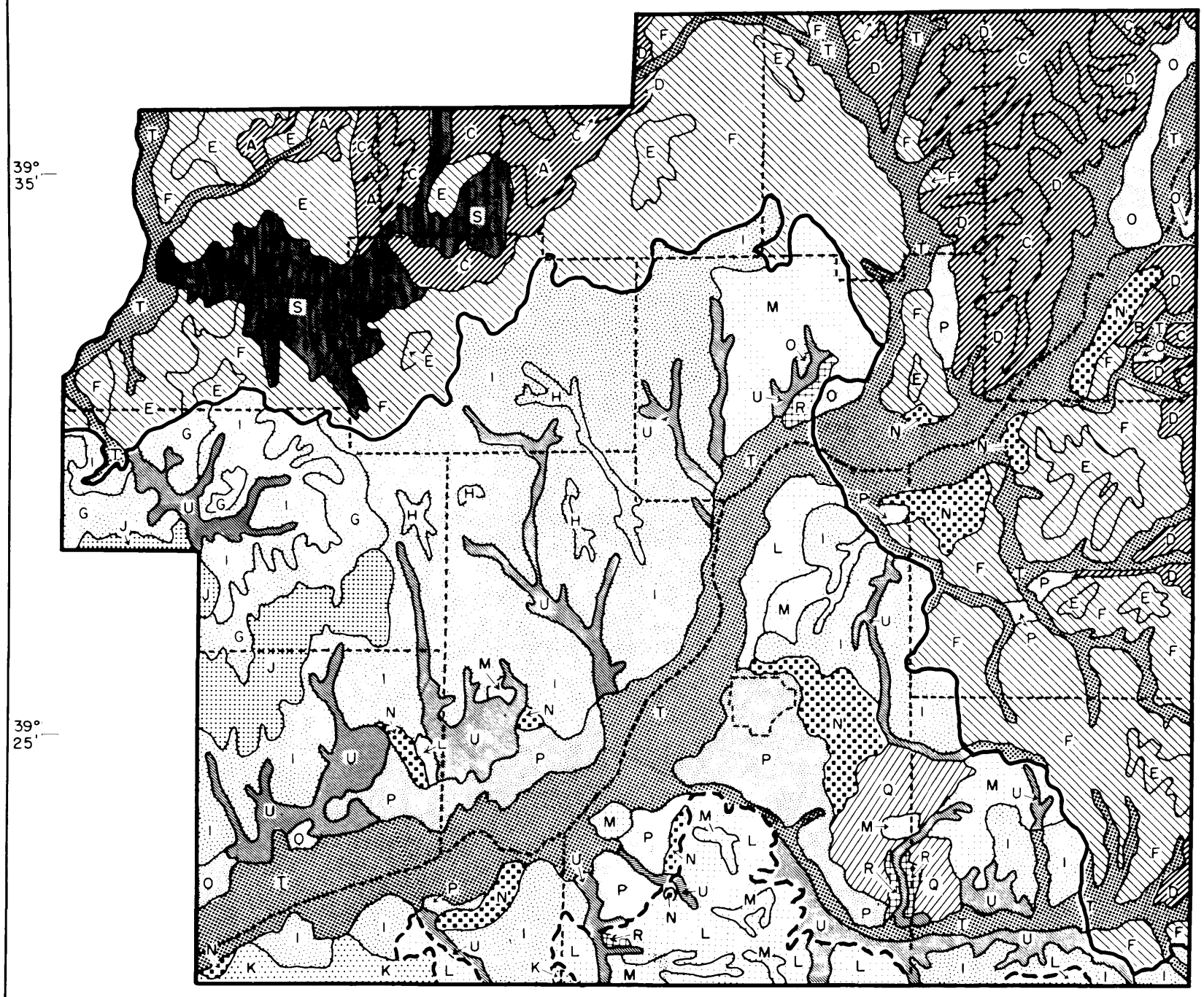
(a) Lithosols (shallow soils) are upland soils situated primarily on steep slopes. The surface soil is brown in color, the subsurface soil is a grayish brown, and the subsoil a yellow-brown. The Muskingum soils, found principally in the rough central and south-central parts of the county, are in this group. The parent material is the medium-grained sandstone and shale of the Borden formation.[3]

(b) Gray-Brown Podzolic soils are found on flat to rolling terrain. The surface soils vary from a light brown to a grayish brown. About three-fifths of the soils of the county are in this group, which includes the following upland soils: Bellefontaine, Russell, Miami, Cincinnati, Grayford, Frederick, Zanesville, Wellston, and Prince-

---

[3]The Borden or Knobstone formation is early Mississippian.

SOILS OF MORGAN COUNTY, INDIANA



SOILS AND THEIR PARENT MATERIALS

UPLAND SOILS-

Late Wisconsin Drift
- A- Brookston
- B- Bellefontaine
- C- Crosby
- D- Miami

Early Wisconsin Drift
- E-Fincastle
- F-Russell

Illinoian Drift
- G-Vigo
- H-Gibson
- I- Cincinnati

Limestone Influenced by Illinoian Drift
- J- Grayford

Limestone Residual
- K- Frederick

Sandstone & Shale (residual)
- L- Zanesville & Wellston
- M- Muskingum

Loessial (wind blown sands)
- N- Princeton

TERRACE & LACUSTRINE SOILS

Wisconsin Outwash
- O- Fox
- P- Martinsville, Whitaker, & Mahalasville

Illinoian Outwash
- Q- Morgantown

Low Illinoian Terraces
- R- Bartle

Wisconsin Lacustrine
- S- Monroviu & Gregg

ALLUVIAL SOILS

Wisconsin Drift (source material)
- T- Genesee, Ross, & Eel

Sandstone - Illinoian Drift (source material)
- U- Pope, Philo, Stendal

WISCONSIN GLACIAL BOUNDARY

ILLINOIAN GLACIAL BOUNDARY

SOURCE- U.S. Soil Survey Morgan County, Indiana

SCALE OF MILES
0 5

FIG. 5

ton. The Russell, Miami, and Bellefontaine soils are derived from Wisconsin drift. Some phases have been badly leached while others have been leached only to a depth of two or three feet. The Cincinnati soils have been formed from deeply leached Illinoian till. A claypan is typical of these soils. The parent material of the Grayford series is limestone altered by leached Illinoian drift. The Frederick soils are derived from cherty limestone of the Harrodsburg formation.[4] The relatively infertile Zanesville (developed on undulating to sloping relief on ridge tops and upper slopes) and Wellston (developed on narrow ridges) series are from medium-grained sandstone and shale of the Borden formation. Princeton soils, derived form loessial deposits, are sandy loams and loams with a low moisture holding capacity.

(c) Planosols are found on flat to undulating terrain. The surface soils in this group are brownish-gray to brownish-light gray; the subsurface is a light gray, while the subsoil is often a rusty gray. The Crosby and Fincastle soils, derived from Wisconsin drift, belong to this group. The Crosby soils are leached to a depth of 2 to 3 feet and the Fincastle from 4 to 6 feet (20). The Vigo and Gibson soils have originated from Illinoian drift now leached 10 feet or more (20). The Gibson soils are slightly better drained than the Vigo series.

(d) Half-Bog soils are found in two principal areas: (1) in the northwestern depressional areas and (2) in old river beds in the White River valley. These are fertile dark soils occurring on flat terrain or in depressions. The principal upland soil in this group is the Brookston from Wisconsin drift. This soil has a relatively high organic content.

(2) Terrace and Lacustrine Soils. These are important agricultural soils. The Fox, Martinsville, and Morgantown series are Gray-Brown

---

[4] The Harrodsburg formation belongs to the early Mississippian Period.

Podzolic soils situated on terraces in White River valley. The Martinsville (good to excessive drainage), Whitaker (imperfectly drained), and Mahalasville (poorly drained) soils are from calcareous stratified silt, sand, and gravel of Wisconsin age. The Fox soils are from calcareous gravel of Wisconsin age. The Morgantown soils are derived from noncalcareous outwash sand, silt, and gravel of Illinoian age. The Bartle soils originate from noncalcareous clay, silt, and sand. They are found on low terraces in association with soils developed on sandstone, shale, and Illinoian drift. Bartle soils have been highly leached of lime carbonates; they are light colored and low in organic matter (20).

The Monrovia and Gregg soils are developed from assorted and stratified calcareous lacustrine silts and clays of Wisconsin age. The Monrovia soils have been developed under nearly permanent saturation while the Gregg soils are found on slight knolls 3 to 4 feet above the lower depressions. These soils are of dark color to a depth of 10 to 18 inches with a high organic matter content (20).

(3) Alluvial Soils. There are six principal alluvial soils (Genesee, Ross, Bel, Pope, Philo, and Stendal). The Genesee, Ross (high bottom position on the floodplain), and Bel (small stream valleys in Wisconsin drift areas and in abandoned White River channels) soils originated from materials that are neutral to slightly alkaline which have been washed from the Wisconsin drift region. They are subject to frequent overflow. The Bel soils are imperfectly drained. The Pope, Philo, and Stendal soils are formed from acid alluvium derived largely from Illinoian drift. The Genesee and Bel soils are found in the overflow portions of the White River valley and on the lower floodplains of small streams originating in and flowing through areas covered by Wisconsin drift. Pope (well-drained), Philo (moderately well-drained), and Stendal (imperfectly drained) soils are found on the floodplains along creeks originating in and flowing through areas covered with Illinoian drift or non-glaciated

areas. These relationships are brought out in Fig. 5.

Soil Reaction. The soils of Morgan County range widely from mildly alkaline in reaction to very strongly acid. Fig. 6 indicates the distribution of soil reaction. The mildly alkaline, neutral, and slightly acid soils are primarily (1) soils of the floodplain of White River and of creek valleys with watersheds in areas of Wisconsin till (Genesee, Ross, Eel, and Mahalasville (depressions on low terraces), and (2) poorly drained lacustrine and low depressional soils of the till plain in the northwestern part of the county (Monrovia, Gregg, and Brookston). The relatively brief time that these soils have been exposed to leaching and their replenishment through overflow has been responsible for the nearly neutral condition. Little or no lime amendment is needed on these soils which comprise nearly one-fourth of the total area.

Soils of medium acidity are situated (1) on terraces built from Wisconsin glacio-fluvial and aeolian materials (Fox, Martinsville, Whitaker, Princeton) and (2) on the better drained uplands of Wisconsin drift (Miami, Crosby, Bellefontaine, Russell, Fincastle). Of these soils the Russell and Fincastle soils, developed on Early Wisconsin drift, are more acid than the Miami, Bellefontaine, and Crosby soils on Late Wisconsin drift. Lime application to these soils is desirable in order to establish better legume crops and to obtain maximum utilization of fertilizers. Soils with medium acidity constitute over one-third of the total area.

Strongly acid and very strongly acid soils are found on uplands, terraces, and floodplains made up of Illinoian glacial drift, limestone, sandstone, and shale materials. The relatively long time that these soils have been exposed to leaching in a humid climate and the noncalcareous composition of the sandstone and shale mean strong acidity. Before these soils can be used successfully for agriculture, heavy application of lime must necessarily precede other improvement measures.

GENERAL SOIL REACTION

SOURCE - U.S. Soil Survey, Morgan Co., Indiana

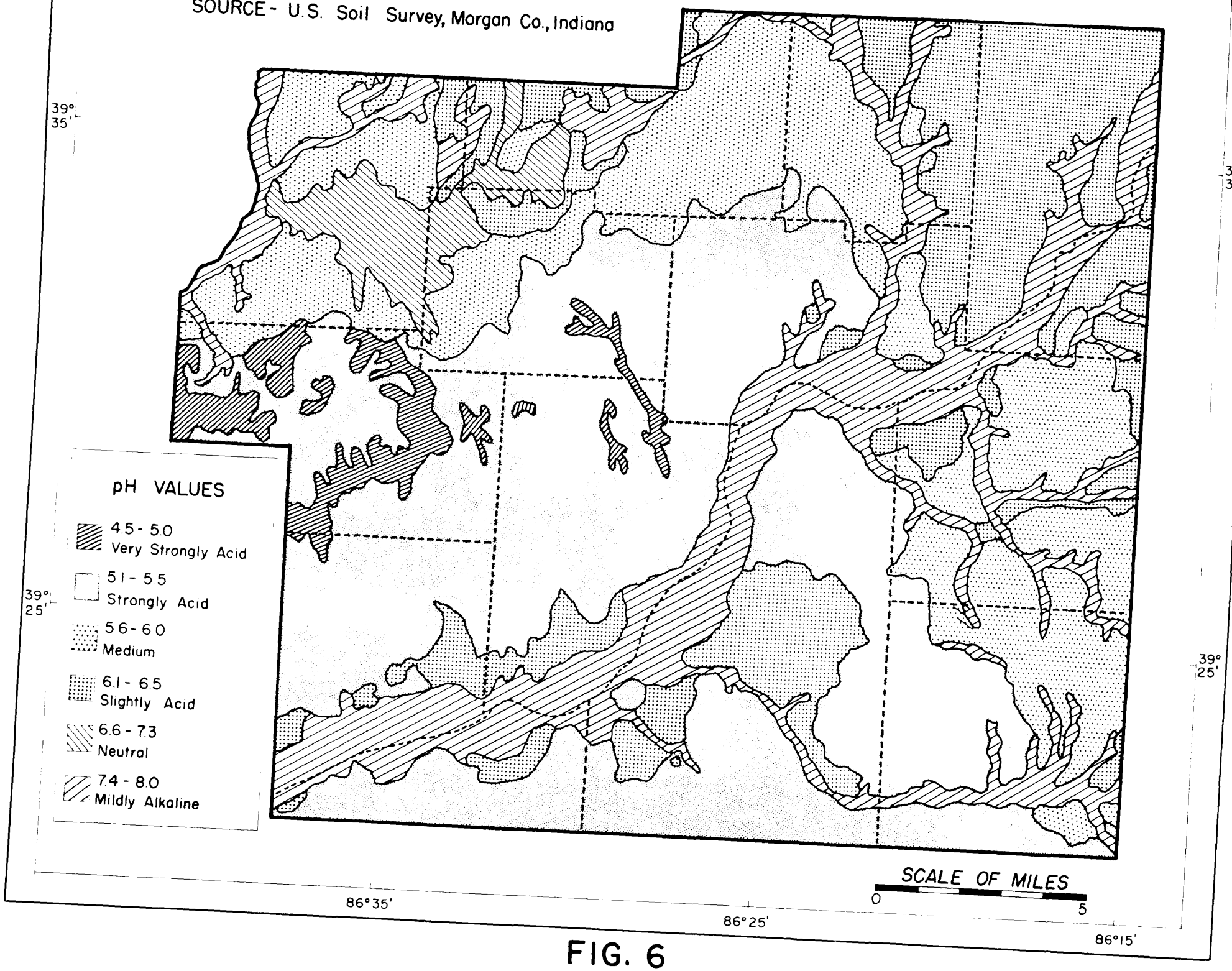


FIG. 6

These strongly acid soils make up nearly two-fifths of the total area.

Erosion Susceptibility. Fig. 7 indicates the degree of erosion that can be expected on various soils under cultivation without protective erosion measures. The susceptibility to erosion places various limitations on use if the topsoil is to be retained. Without adequate care accelerated erosion is menacing approximately to the degree indicated in Fig. 7. The greatest erosion hazard is present on the Muskingum and Wellston soils situated on steep slopes. The Cincinnati soils are also subject to severe to very severe erosion when cultivated. Thus somewhat more than one-fifth of the county, most of which is situated in the central and southern parts must be carefully managed to save topsoil. A considerable part of this area is forested; however, there are numerous examples of abandoned and badly eroded fields where cultivation has been attempted on narrow ridge tops and in some places on slopes suitable only for forests and limited grazing. Photographs 8 and 9 indicate severe erosion on improperly managed fields on these soils.

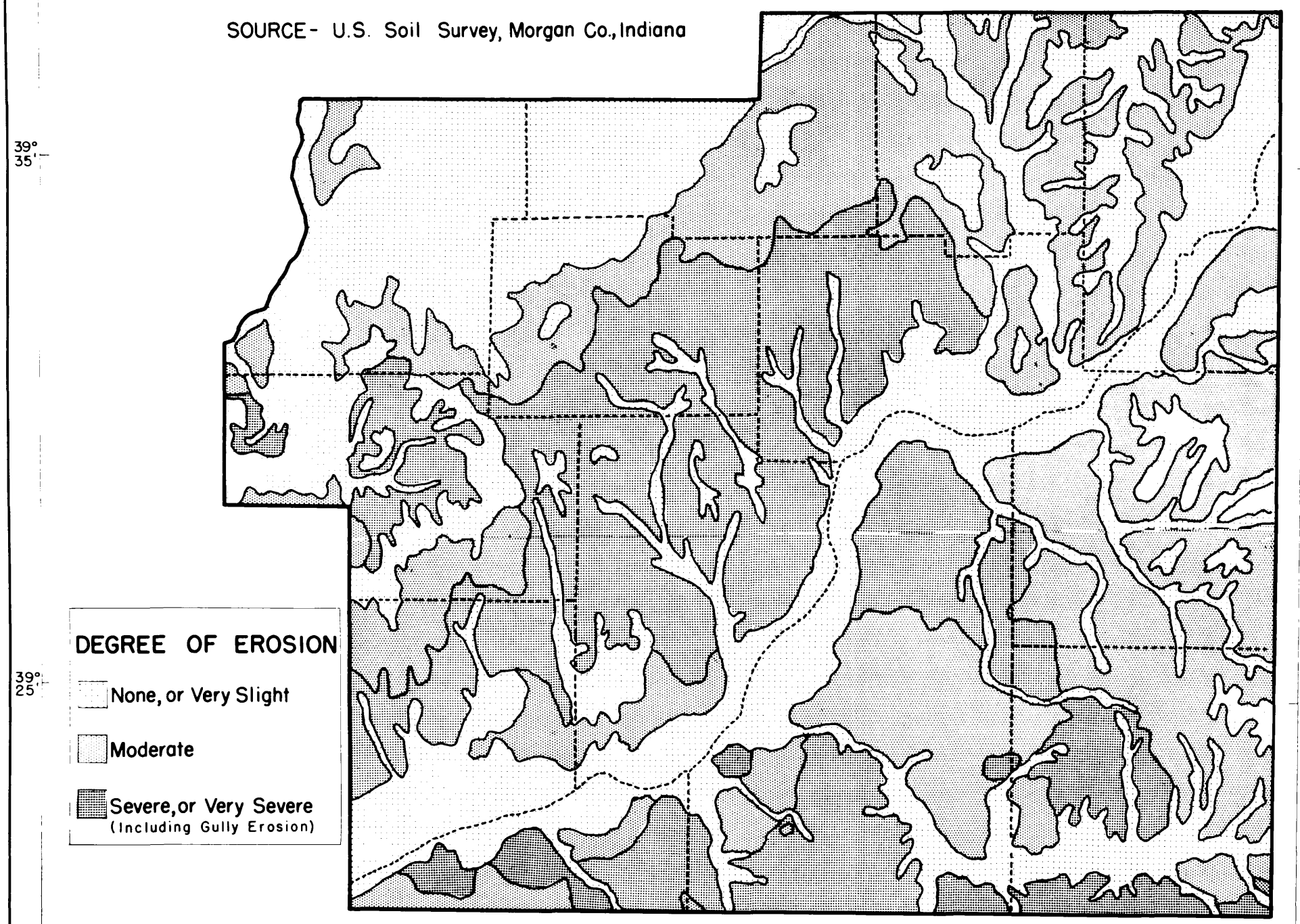
On the soils susceptible to moderate erosion under cultivation, there is much more of the land actually being cultivated, hence the threat of damage is as great or greater than on the Muskingum, Wellston, and Cincinnati soils with their high percentage of forest cover. Recently through the work of the Soil Conservation Service, the county agent, high school agricultural teachers, and extension workers, many farmers are becoming aware of the necessity to combat accelerated erosion on moderate slopes under cultivation. The northeastern and eastern parts of the county have a particularly high proportion of soils that are in this category. About three-tenths of the county's area is susceptible to moderate erosion.

The soils only slightly susceptible to erosion are concentrated on the northwestern lacustrine plains and on creek and river floodplains and terraces. Altogether these make up over two-fifths of the total

86°35' 86°25' 86°15'

SUSCEPTIBILITY OF MAJOR SOILS TO EROSION UNDER CULTIVATION

SOURCE- U.S. Soil Survey, Morgan Co., Indiana



86°35' 86°25' 86°15'

FIG. 7

PHOTOGRAPH 8
(Lower)

An abandoned field situated on a ridge top with sheet erosion and sassafras trees now in charge. The owner hopes to return it to meadow pasture by the use of manure and grazing of sheep to keep down the bushes. It is little wonder that this hapless farmer told me he would rather do anything else than sell a load of manure off his farm.

PHOTOGRAPH 9
(Upper)

An abandoned farmstead on ill-treated moderately rough land.

area of the county.

Productivity and Use Limitations. Table 1 lists the principal soils of Morgan County as to extent and use limitations. Productivity data collected in conjunction with the soil survey of 1937 has been used as the basis for a map of general productivity (Fig. 8). The soils fall rather sharply into four general productivity groups: (1) Those of high productivity are the alluvial, lacustrine, and depressional soils derived from Wisconsin glacial materials. Those of glacial Lake Eminence (Monrovia) and of depressions on the till plain (Brookston) along with depressions on terraces (Mahalasville) and floodplain (Eel) have required drainage to attain a high level of productivity. Genesee soils, which belong to this group, have required no drainage. (2 and 3) Medium and medium to low productivity characterizes soils derived from Early and Late Wisconsin and from Illinoian drift, aeolian deposits, and glaciofluvial materials along with topographically better situated soils derived from residual limestone, sandstone, and shale. (4) Excessively drained steep slopes with highly leached shallow soils have a very low productivity.

Six agricultural use limitations for various soils listed in Table 1 are especially significant: low organic content, erosion menace and erosion damage already inflicted, acidity, poor drainage, excessive drainage and droughtiness, and overflow. In areal extent the most widespread soil factor limiting agricultural production is low organic matter. Over two-thirds of the total area is so handicapped. Only lacustrine, alluvial, and depressional soils derived from Wisconsin glacial materials have fairly adequate organic matter. Erosion menace and damage and acidity each affect about one-third of the area. About one-fifth of the total area is strongly acid (Fig. 6). Excessive drainage with accompanying susceptibility to drought is a significant limitation on one-tenth of the soil area. Poor drainage affects about

GENERAL SOIL PRODUCTIVITY

SOURCE - U. S. Soil Survey Morgan Co., Indiana

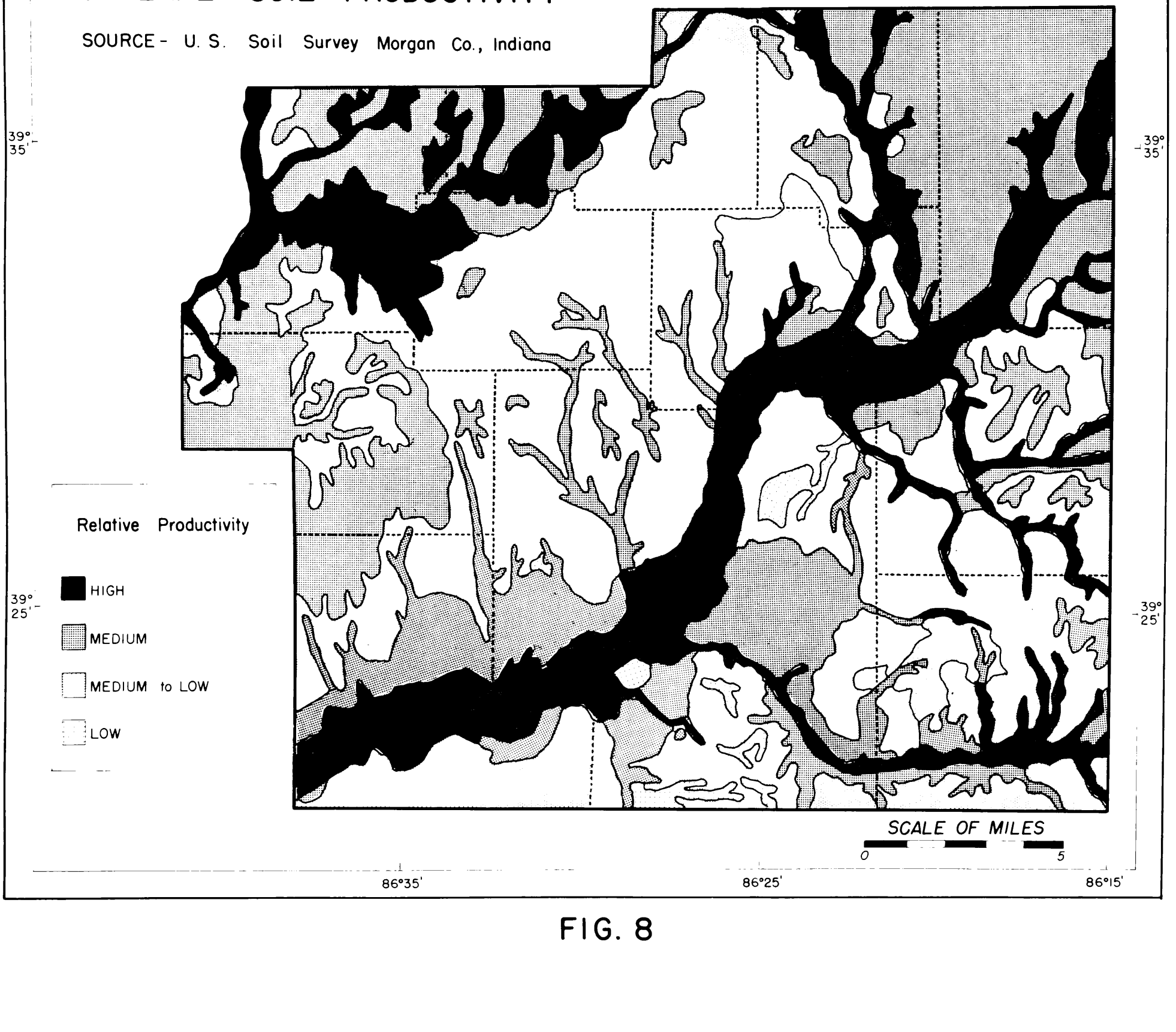


FIG. 8

TABLE I

Some Use Limitations of Major Soils of Morgan County, Indiana.
(Source: U. S. Soil Survey Morgan County, Indiana)

Soil	Acres	Percent	Limitations
Brookston	8,320	3.2	Very poor drainage.
Bellefontaine	1,408	.6	Erosion, drought, low organic content.
Crosby	7,552	2.9	Excessive drainage, low organic content.
Miami	11,712	4.6	Erosion, low organic content.
Fincastle	13,824	5.4	Poor to imperfect drainage, low organic content.
Russell	37,696	14.6	Erosion, low organic content (steep phase — 9,344 acres — erosion and non-arable; gullied sloping phase — 3,904 acres — non-arable, destroyed for present agricultural use).
Vigo	4,672	1.8	Puddles and bakes easily, strong acidity, poor drainage, low organic content, low general fertility.
Gibson	7,040	2.7	Strong acidity, low organic content, low general fertility.
Cincinnati	37,056	14.3	Susceptibility to erosion, strong acidity, low organic content, low general fertility. (Gullied sloping phase — 1,728 acres — destroyed for present agricultural use); (Steep phase — 17,728 acres — non-arable, severe erosion, steep slopes, and low general fertility).
Grayford	3,712	1.4	Erosion, acidity, low organic content, and low general fertility.
Frederick	1,536	.5	Erosion, low organic content (steep phase — 576 acres — non-arable).
Zanesville	3,968	1.5	Erosion, acidity, low fertility.
Wellston	4,352	1.7	Non-arable.
Muskingum	19,136	7.4	Largely non-arable steep slopes, acidity, low organic content, stoniness, erosion.

TABLE I (Cont.)

Some Use Limitations of Major Soils of Morgan County, Indiana.
(Source: U. S. Soil Survey Morgan County, Indiana)

Soil	Acres	Percent	Limitations
Princeton	4,860	1.9	Drought, low fertility, low organic content.
Fox	3,008	1.1	Droughtiness, low organic content (sloping phase — 320 acres — slope, and low general fertility).
Martinsville	6,584	2.6	Low organic content (fine sandy loam — 1,536 acres — somewhat droughty and low organic content).
Whitaker	3,200	1.2	Poor drainage, low organic content.
Mahalasville	1,984	.8	Poor drainage.
Morgantown	2,048	.7	Erosion, acidity, low organic content (steep phase — 832 acres — non-arable slopes).
Bartle	1,472	.6	Poor drainage, acidity, low general fertility.
Monrovia	5,760	2.2	Very poor drainage.
Gregg	1,792	.7	Poor drainage, low organic content (silt loam — 1,600 acres — puddles and bakes easily).
Genesee	23,168	9.0	Overflow.
Ross	1,792	.7	Occasional danger from overflow.
Eel	16,896	6.5	Overflow and backwater damage.
Pope	2,432	.9	Overflow, acidity, low fertility.
Philo	5,632	2.1	Overflow, acidity, low fertility.
Stendal	3,840	1.5	Overflow, poor drainage, acidity, low fertility.
Other Minor Soils		4.9	- - - - - - - - - - - - - - - - -

one-eight of the area; however most of these soils have been profitably drained. Danger of overflow affects one-fifth of the soils; these alluvial soils otherwise have relatively few limitations.

Problems in Agricultural Use. The great soil diversity in Morgan County presents a variety of problems in agricultural use. These soils are representative of a considerable part of the United States east of the Mississippi and north of the Ohio rivers. Brookston, Miami, Crosby, and related soils of moderate to high productivity which have been so basic to high production in the eastern part of the Corn Belt are found on the till plain. More highly leached soils such as the Cincinnati and Vigo series, found in the older uplands, are typical of considerable areas of southern Ohio, Indiana, Illinois, and northern Missouri. Also present are the relatively infertile Zanesville and Muskingum soils which occupy many square miles in southern Indiana, western and eastern Kentucky, and southeastern Ohio. Very fertile alluvial soils (Genesee) are of major importance. Problems relating to the agricultural utilization of these various soils are discussed under the following headings: (1) inherently productive till plain soils, (2) highly leached older upland soils, and (3) alluvial soils.

(1) Till Plain Soils. A hundred years of farming has cut heavily into the reserve of natural fertility which has made the northern part of Morgan County a part of the Corn Belt. Probably one-third to one-half of the organic matter stored up under centuries of natural vegetation cover has been removed in little over a century of exploitation farming (3, p. 47). The great error has not been in the using of this native fertility; once the land was cleared and plowed it was inevitable that this depletion should commence. The tragedy lies in the great neglect in replacing the original organic matter through a better balanced farming of these more productive soils. Most farmers have not yet established this balance. They have begun to use fertilizers and

reduce corn acreages. However, a three year rotation of corn, soybeans, and a small grain planted with a legume to plow under the following spring is not maintaining the organic matter of these better soils. This is especially true when soybeans are sold off the farm and often only a part of the corn and small grain is fed on the farm. The telltale signs are coming to the foreground. A few remarks made by farmers interviewed this past summer illustrate what is happening. "A common topic we talk about around here is how much harder the ground is to break in the spring than it used to be." This remark was made by a farmer who was accustomed to seeing fields in corn every other year. Soil structure has naturally suffered serious damage under such a scheme of farming. Several farmers commented on the change in seasons and how summers seemed drier than formerly. The climatic records reveal the truth that summers are not getting progressively drier; farmers are rapidly losing the organic matter which is so vital to the high absorption and retention of moisture in the topsoil.

Here is an example of how mining of the more highly productive soils in the northwest part of the county is taking place. One farmer is farming Crosby silt loams and Monrovia and Plano silty clay loams, all of which are relatively high in organic matter, particularly the latter two types. The Monrovia and Plano silty clay loams had to be artificially drained before they could be farmed. The farm is an exceptionally large one for Corn Belt farms. (This farm is located as #6 in Fig. 20.) The operator owns 233 acres, the soil of which is largely Crosby silt loam. He rents from one landlord an additional 500 acres. The cropland under cultivation on this 733-acre farm is 700 acres. There is not a single head of livestock on the entire farm, not even a chicken. The entire corn, soybean, and wheat crops are taken off the farm. Only the sweet clover sown with the wheat in the three-year rotation is plowed under. The rate of fertilizer application is 200

pounds of 3-9-18 to the acre on each crop in the rotation. Yields in 1948 were as follows: corn — 85 bushels, soybeans — 35 bushels, wheat — 23 bushels. The 1948 corn and soybean yields were about five and three bushels respectively above normal. This is of course an extreme case of mining the inherent fertility of the better soils, for on most farms some livestock are kept, and at least a part of the corn is fed. However, after looking at the farms on the most productive soils in the county, the overall picture appears to be definitely one of taking out more than is being returned.

However, in contrast to this example indicating the loss of organic matter on many farms in the Corn Belt part of the county another story must be told. It is the story of a farmer on Miami and Crosby soils. Forty-nine years ago this man bought some abandoned land of which the tenant had said "it was so near worn out that it didn't pay to tend it any more." That piece of land had been rented for 28 years before the present owner took it over in 1900. Average per acre weighed and recorded corn yields on this farm have been as follows during the past four years:

125	bushels	in	1948
100	"	"	1947
73	"	"	1946
90	"	"	1945

Neighbors, the county agent, soil conservation supervisors, Purdue University extension workers, and others acknowledge and admire the high level of productivity that has been attained on this farm. (This farm is located as #5 in Fig. 20). It has been accomplished through hard work, careful and alert management, and a willingness to experiment. One of the first improvement measures was to haul manure from livery stables in the nearby village of Hall. In 1910 pasture improvement was begun by mixing legumes with bluegrass. There was an early recognition that parts of the farm needed potash badly. This was discovered by ex-

perimenting with wood ashes. In the application of lime the owner has always followed the policy of putting on a ton more than is recommended. Today there are over six miles of terraces on this 275 acre farm. He has tiled and terraced in the same fields because he believes a greater amount of underground drainage is needed on his farm. A three-year rotation was used in the beginning; but the owner did not think this was maintaining the productivity of his farm properly, so for the past several years he has used a four-year rotation of corn — small grain — alfalfa — ladino clover, and alsike clover cut for hay the first year and pastured the second. No grain or hay is sold off the farm except as beef, pork, or mutton. Some grain is even purchased. An average of 300 feeding cattle and 700 hogs are fed out each year. About 50 ewes are kept. But the classic remark illustrating this farmer's attitude toward his farm came near the end of a very pleasant afternoon. Here is what he said: "I've made a little money during the past several years, so three years ago I decided to start putting on an additional 500 lbs. of fertilizer (0-20-20) to the acre. That's my bank account. It will be there as a reserve to draw upon sometime in the future when I may need it." Such a farm as this is a great constructive example for that community. This farmer's approach is basically sound and has resulted in a high income. The farm will be inherited by his son in better condition than when it was taken over 49 years ago. The early realization of need coupled with the courage to carry out an evolving program of improvement, often setting aside the possibility of quick money returns, makes this farm a worthy practical contribution toward a more permanent agriculture.

Here then is a fundamental problem and an apparently great opportunity in land use. First, there is a need to regain the inherent productivity of our better soils. Then perhaps it will be advisable to push these soils to a level of productivity greater than that endowed

by nature. Most farmers of the till plain observed in Morgan County have a long way to go to reach the first objective. A very few such as the one cited above are tackling the second problem.

(2) Older Upland Soils. For many farmers in the county the problem of making the most out of the soil is a different one from that in the Corn Belt. They are farming soils derived from more highly leached Illinoian till often with unfavorable slope conditions. Surrounded by better endowed till plain soils on the one hand and highly productive alluvial soils in the White River valley on the other, there has been a tendency to expect too much from these soils. Farmers have often tried to farm them with rotations and other practices very similar to those used on the better soils in adjacent areas. Many of these soils are worn out and difficult to farm economically. While depletion has taken place it must be kept in mind that the inherent productivity of these soils was not as great as that of the till plain; consequently it has been much easier to ruin farms through poor agricultural practices. It is on such soils that many farmers are apparently unable to better their position. Their farm units are too small and their capital insufficient to carry out needed improvements. With such a prevailing situation matters go from bad to worse and many units end up with farmer and farm both going bankrupt. Will it be economically feasible to restore some of these moderately to highly leached soils to a level of productivity capable of competing with the better soils that surround them or should they be written off as so many more acres wasted in a century of agricultural use and then returned to forestry or some other lower level of land use? This question is now facing governmental taxation units in many parts of the country. The possibilities of revitalizing these soils should be considered carefully in relation to specific physical and economical conditions. The mere physical limitation of doing the job is of course but one aspect of the problem. Other basic

questions that must be raised are: Can a consolidation into larger more efficient farm units be made? Will market conditions be favorable to reinstating a higher level of agricultural production on these soils? Infertile soils located near to market outlets are often more intensively used than better soils more remotely situated. If farmed properly, these soils could be used to prevent overworking our better soils. In the long run this would be economical.

Success in the agricultural utilization of these inherently less productive soils may be possible. Several farmers in Morgan County are making sufficient progress in improvements and the application of new ideas to suggest that the job may be accomplished. However, there are some common problems confronting these more progressive farms and farmers.

In the first place a big handicap to the restoration of some of the leached soils is the fact that too many acres of agriculturally impractical soils may need to be included in order to establish a farm unit. Only where most of the farm has favorable topography and soil possibilities for cropping and open pasture does it appear advisable to undertake restoration of moderately to highly leached soils.

Secondly, there is a more accurate recognition of soil limitations by the more progressive farmers on the more severely leached soils. The realization of need is the first step toward an economic utilization of these soils. The farmer on these leached upland soils can not look to the river valley nor to the till plain for correct practices for his farm; yet many farmers (often with farming experience on adjacent valley lands and till plain) are attempting to do just that, and it leads to low farm incomes that partially result from improper care of soil resources.

Furthermore, available capital for carrying out thorough initial improvements seems essential. It is not enough to buy a farm with moderately to highly leached soils and start farming. There should be

enough capital available to make lime and fertilizer applications sufficient to supply the nutrients necessary for a high level of crop production. An approach commonly used on such soils is to improve them over a period of ten or fifteen years with moderate amounts of fertilizer added once or twice during the rotation. Experiments carried on by the Department of Soils, University of Wisconsin (19, p. 219 ff.) suggest a more rational approach to fertilization of leached soils such as these found in Morgan County. Since basic soil deficiencies and crop requirements can now be established quickly for a specific situation, is it not logical to make heavy initial applications of lime and fertilizer adequate for high yields on these soils? Results indicate that "it is possible under this system to bring depleted soils quickly (often the first year) to a high state of productivity at very low costs for the marked increases in yields obtained."(19, p. 223). This expenditure for lime and fertilizers should be considered as a part of the investment in "going productive land against which annual interest and depreciation or depletion charges are made."(19, p. 222). Many farmers on these depleted soils don't feel they can afford to use heavy applications of fertilizer broadcast and worked into the soil. As a matter of fact from the long range point of view they cannot afford to neglect using a heavy initial application. Thus it is necessary to have capital available for the purchase price and for heavy initial applications of lime and fertilizer in order to launch a successful farming enterprise on the older uplands in Morgan County.

A survey of four recently established farms under new operators on depleted soils (Table II) reveals that all had sufficient capital to make heavy initial outlays for lime and fertilizers in addition to buying farms. This capital had been acquired in the following ways: (1) doing custom work for other farmers, (2) inheritance, (3) loan from father, (4) school teaching by both husband and wife. Furthermore, it

TABLE II

Soil Improvement Programs on Recently Established Progressive Farms on Highly Leached Soils.

(Based on Personal Interviews)

Farm**	Years Operated by Present Owner	Per Acre Purchase Price and Year of Purchase	Reported Corn and Wheat Yields on Farms at Time of Purchase (in bushels)	ield of orn Obained ast Year n Corn	Total Per Acre Application of Lime by Present Owner During 1st 4-year Rotation	Total Per Acre Application of Fertilizer (lbs. & Formula) used by Present Owner	Cost of Fertilizer and Lime Applied by Present Owner#
1	2	$94 (1946)	45 (corn) 15 (wheat)	No corn or wheat Harvested##	2½ tons*	*300 lbs. of 3-12-12	6.90 fertilizer 7.00 lime $13.90
2	7	$10 (1942)	26 (corn) 8 (wheat)	60 (1948)	4 tons (gives pH of 5)	750 lbs. of 3-12-12 & 0-12-12	16.88 fertilizer 11.20 lime $28.08
3	3	$58 (1946)	20-25 (corn)	100 (1948)	6 ton	1300 lbs. of 3-18-9 & 4-12-8	29.54 fertilizer 16.80 lime $46.34
4	9	$20 (1940)	15 (corn)	90 (1945)	6 ton	1650 lbs. of 8-8-8 & 3-12-12	37.95 fertilizer 16.80 lime $54.75

*For only a two year period.

#Lime and fertilizer costs are figured on basis of prices prevailing in June, 1949 in Morgan County. Lime costs include spreading charges.

**See Fig. 20 for the location of these farms.

##Only hay and pasture is grown on this farm.

was noted that these farmers were sacrificing immediate profits in order to build up their farms quickly.

Carefully conducted experiments in Illinois offer convincing evidence that the efficiency of producing crops on most of the soils in that state can be improved (23, p. 1 ff.). A major finding of those experiments made on a wide variety of soils is closely related to the problem faced by farmers on the more highly leached soils of Morgan County. It is summarized as follows:

> "Soil conditions, as is to be expected, caused marked variations in the effects of different treatment systems. There was a strong tendency for the light-colored soils of low productivity to show the largest increases in net income, and for the more productive dark soils to show the smallest increases. The light-colored soils produced, on the average, increases twice as large as those produced on the dark soils." (23, p. 137).

Practical confirmation of these findings is suggested in Table II which gives data on soil treatment programs and returns for four recently rejuvenated farms on light-colored soils. The newly acquired farms were in very poor condition when the present owners purchased them at low prices. These farmers have made heavy applications of lime and fertilizers along with other soil improvements in the brief time they have operated the farms. The heavy applications on Farms 3 and 4 at a cost of about $46 and $55 respectively added to the purchase cost made the respective total per acre investment about $104 and $75. In these two cases corn yields have equalled those obtained on less intensively treated dark soils with a much higher inherent productivity and which are selling for $200 to $250 an acre. However, it must be noted that a shorter rotation is often followed on the dark soils than that used by the soil-conscious farmers listed in Table II. It would seem that on these farms high yields are being obtained without mining soil resources whereas many farmers on the less leached soils still sell their soil fertility capital and call it profit. If the maintenance of fertility of

the dark soils is encouraged by heavier applications of lime and fertilizers, less use of row crops, longer rotations, and other conservation measures, then there is a possibility that the moderately to highly leached soils of the eastern United States may be of increasing importance in the agricultural economy rather than of declining significance. Of course the present high price level for agricultural products is encouraging greater use of our less productive soils, but without some program of subsidization it may not be as economically feasible for the farmer to utilize these highly leached soils. The above experiences of some Morgan County farmers indicate how the rebirth of some of these soils is taking place.

(3) Alluvial Soils. A large part of the river valley in Morgan County have highly productive soils farmed largely by tenants who live on adjacent terrace and upland farmsteads. Frequent flooding encourages a high proportion of tenant-operated land, almost complete absence of livestock, little use of winter cover crops, low rate of fertilizer application, and a short two or three-year rotation with corn and soybeans used almost exclusively. These same floods have deposited topsoil which is now being exploited under the present system of farming in the river valley. However, several farmers who have farmed alluvial soils for a score or more years point out that a decline in fertility is apparent in these valleys. This is probably true for two reasons: In the first place these soils have been exploited by growing corn and soybeans almost continuously and little or no effort has been made to use better rotations, winter cover crops, commercial fertilizers, and other soil conservation measures. Wheat has never been a suitable crop on the floodplain because of winter flooding. Spring oats eliminated this difficulty. In the second place, there is apparent decrease in the amount of alluvium being deposited on these floodplains. The slower rate of deposition is the result of (1) greater effort on the part of the progress-

ive upland farmers to hold their topsoil, and (2) accelerated erosion having already removed a great amount of the better topsoil from the more exposed slopes of the drainage basin.

On the terraces a more conservative cropping program is used. Livestock kept on terrace farms and fed corn grown on the floodplain results in some transfer of fertility. A much greater use of lime and fertilizer, a longer rotation, and more use of cover crops is characteristic of these farms.

Better use of alluvial soils will await such basic corrections as flood control and a change in the system of farming. Problems incident to the establishment of a more permanent agriculture with better conservation of soil resources will be discussed in Chapter III.

Climate

The climate of Morgan County has few observed local differences significant to agricultural land use. Probably the most noticeable climatic contrast existing within the county is a marked difference of one to two weeks in length of frost-free season. On the high ridges (highest elevation 915 feet) in the central part of the county good air drainage gives marked frost protection which has been a factor encouraging commercial apple orchards. Corn and soybeans are damaged by early autumn frosts more frequently in the valleys than on the uplands. The White River valley (lowest elevation of 560 feet where the river leaves the county at the southwest corner) undoubtedly has a shorter frost-free season. Local observations have repeatedly attested to this marked contrast; however, climatic records do not exist. There is also probably a slight decrease in precipitation amounting to an inch or so from the southwest to northeast corners of the county. Records along the White River valley from Vincennes to Anderson indicate this to be probable.

Although local differences are of little significance, some overall

influences of climate upon agriculture are worthy of noting. General climatic characteristics for three peripheral stations are presented in Table III. With the exception of short rainfall records at Martinsville and Eminence no data are available within the county itself. Fig. 9 is a climograph presenting the annual march of temperature and precipitation at Bloomington located about 10 miles south of Morgan County. The following climatic aspects are especially significant to agricultural land use:

(1) The tropic-like summers with average temperatures of about 74°F are favorable for corn. Night temperatures are frequently high which is favorable to corn production.

(2) The frost-free season is sufficiently long for the crops generally grown (179 days at Bloomington). Only twice since 1896 has the frost-free season been shorter than 150 days at Bloomington. Major frost damage on the oldest commercial orchard in the county has occurred only once in 32 years. The tomato crop which was more important formerly than now is severely damaged by early autumn frosts, particularly in the valleys.

(3) Winters with mean temperatures slightly below freezing are cold enough to aid in conservation of soil nitrogen, protection from erosion, and in control of the corn borer.

(4) Snow cover is of short duration which permits winter pasturing of livestock.

(5) Evapotranspiration exceeds precipitation from about mid-June until the first part of September under average conditions. Water stored in the soil is used up by the end of July which means that under average conditions there is a deficient supply of moisture at a critical period when corn and soybeans particularly need adequate rainfall for high yields and good quality. This critical deficiency is best shown by the Thornthwaite climatic graph presenting the relationship between rainfall and evapotranspiration. This graph for Bloomington is presented in Fig. 10.

TABLE III

Summary of Climatic Data for Three Stations Adjacent to Morgan County.
(Source: U. S. Weather Bureau Data)

	Bloomington	Indianapolis	Greencastle
Latitude	39°9' N	39°45' N	39°38' N
Elevation	800 ft.	822 ft.	860 ft.
Length of Record	35 yrs. for rainfall (1896-1930)	60 yrs. for rainfall (1871-1930)	28 yrs. for rainfall (1900-1930)
	35 yrs. for temperature (1896-1930)	60 yrs. for temperature (1871-1930)	24 yrs. for temperature (1907-1930)
Mean Temperatures	(°F)	(°F)	(°F)
July	76.2	76.0	76.0
Summer	74.1	73.9	73.8
January	29.8	28.4	27.6
Winter	31.2	30.4	29.6
Precipitation	**Inches**	**Inches**	**Inches**
Mean:			
Annual	44.35	40.44	43.03
Spring	12.62	11.40	12.51
Summer	11.76	11.13	12.66
Autumn	9.65	9.21	9.75
Winter	10.22	8.70	8.11
Snowfall	23.60	22.30	19.10
Variability:			
Driest year on record	32.95 (1914)	24.97 (1934)	29.66 (1930)
Wettest year on record	57.79 (1937)	57.65 (1876)	53.73 (1929)
Average of driest 5 years	33.50	28.57	33.15
Average of wettest 5 years	56.05	55.53	52.24
Frost			
Average date of last killing frost in spring	Apr. 22	Apr. 16	Apr. 22
Average date of first killing frost in autumn	Oct. 18	Oct. 20	Oct. 18

TABLE [illegible] (Cont.)

Summary of Climatic Data for Three Stations Adjacent to Morgan County.
(Source: U. S. Weather Bureau Data)

	Bloomington	Indianapolis	Greencastle
Frost (cont.)			
Earliest date of first frost in autumn	Sept. 14 (1923)	Sept. 21 (1897)	Sept. 16 —
Latest date of last frost in spring	May 25 (1925)	May 25 (1925)	May 26 —
Average length of frost-free season	179 days	187 days	179 days
Shortest frost-free season	138 days (1925)	132 days (1895)	—
Longest frost-free season	231 days (1931)	229 days (1902)	—

Fig. 9. CLIMOGRAPH FOR BLOOMINGTON, INDIANA. (Based on U. S. Weather Bureau records of 35 years duration for temperature; 44 years for precipitation.)

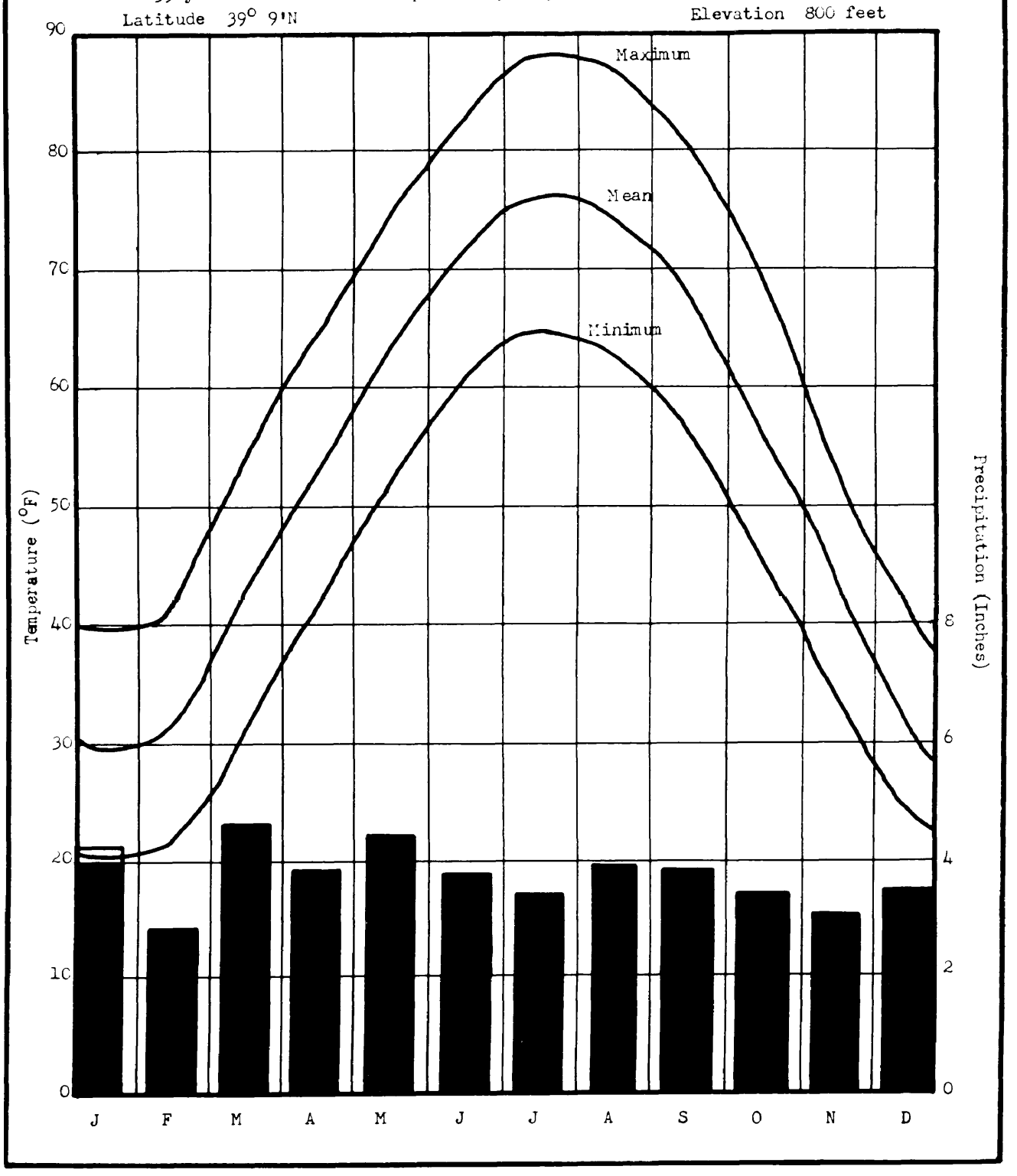
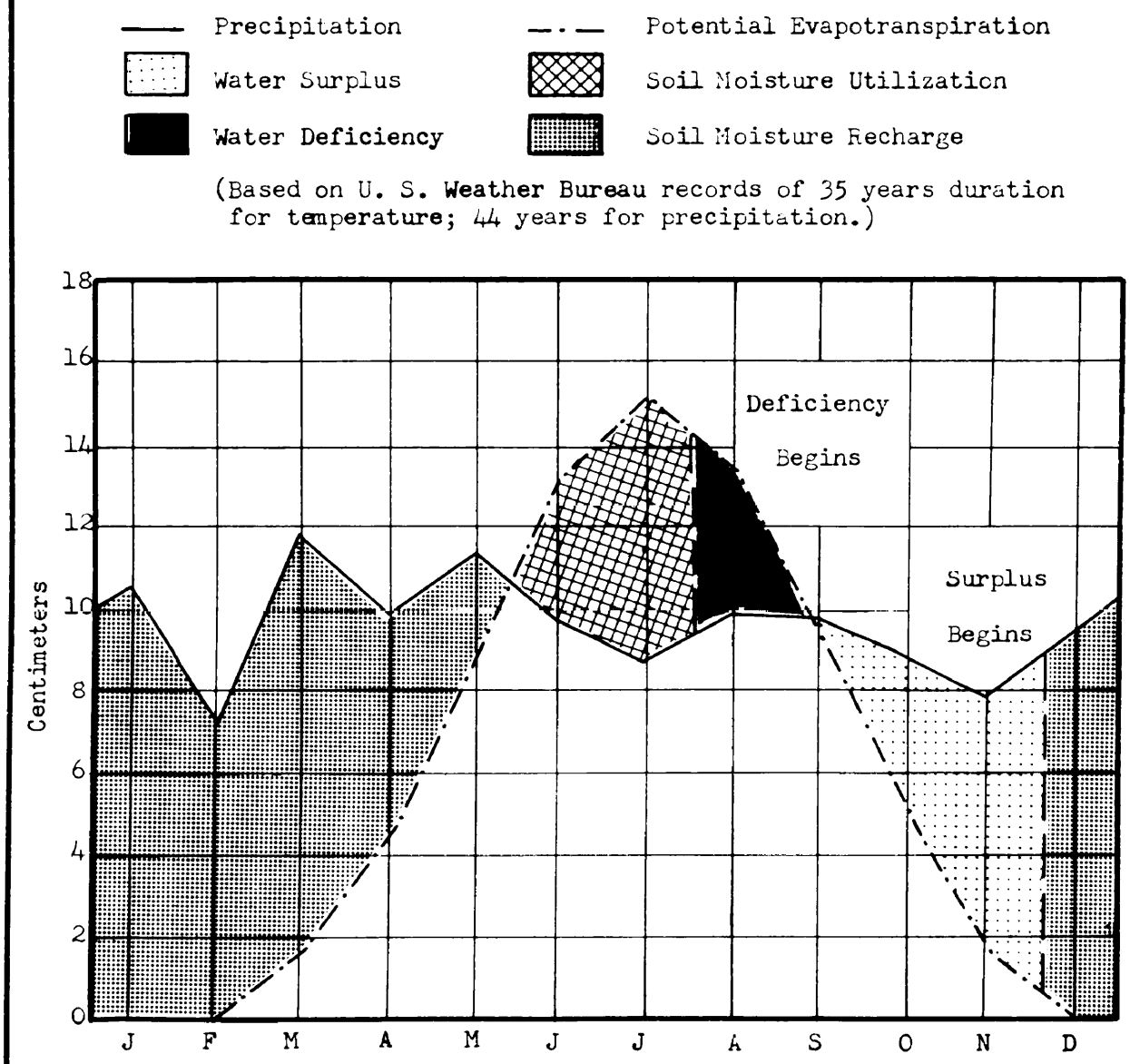


Fig. 10. PRECIPITATION AND POTENTIAL EVAPOTRANSPIRATION AT BLOOMINGTON, INDIANA



This late summer rainfall deficiency is not severe enough to cause complete crop failures but is definitely great enough to limit yields.

(6) More than average rainfall during the late summer (especially during the latter part of July and the first part of August) results in marked improvement in corn yields; while less than average rainfall during this period means below average yields. The relationship of July rainfall to corn yields is shown in Fig. 11. It is not as close for years where high August rainfall follows low July rainfall.

(7) Rainfall variation from year to year, while not comparable in its effect to that in subhumid and semiarid climates, works a significant hardship on Morgan County farmers. In one year out of every five the summer precipitation is less than 8 inches, which is generally considered necessary for average corn yields under the temperature regime of the county. In about one summer out of every eight low precipitation reduces the corn crop notably.

(8) Formerly wet springs were a particularly important handicap in the planting of crops on the floodplains and lacustrine plains. Often the delay in planting due to floods and wet ground was sufficiently great to necessitate letting the fields lie idle for the summer. The tractor and increased use of soybeans which mature in a shorter period than corn have greatly helped solve this problem. However, particularly wet springs may still mean idle fields in these locations, particularly if the first corn planting is drowned out by floods.

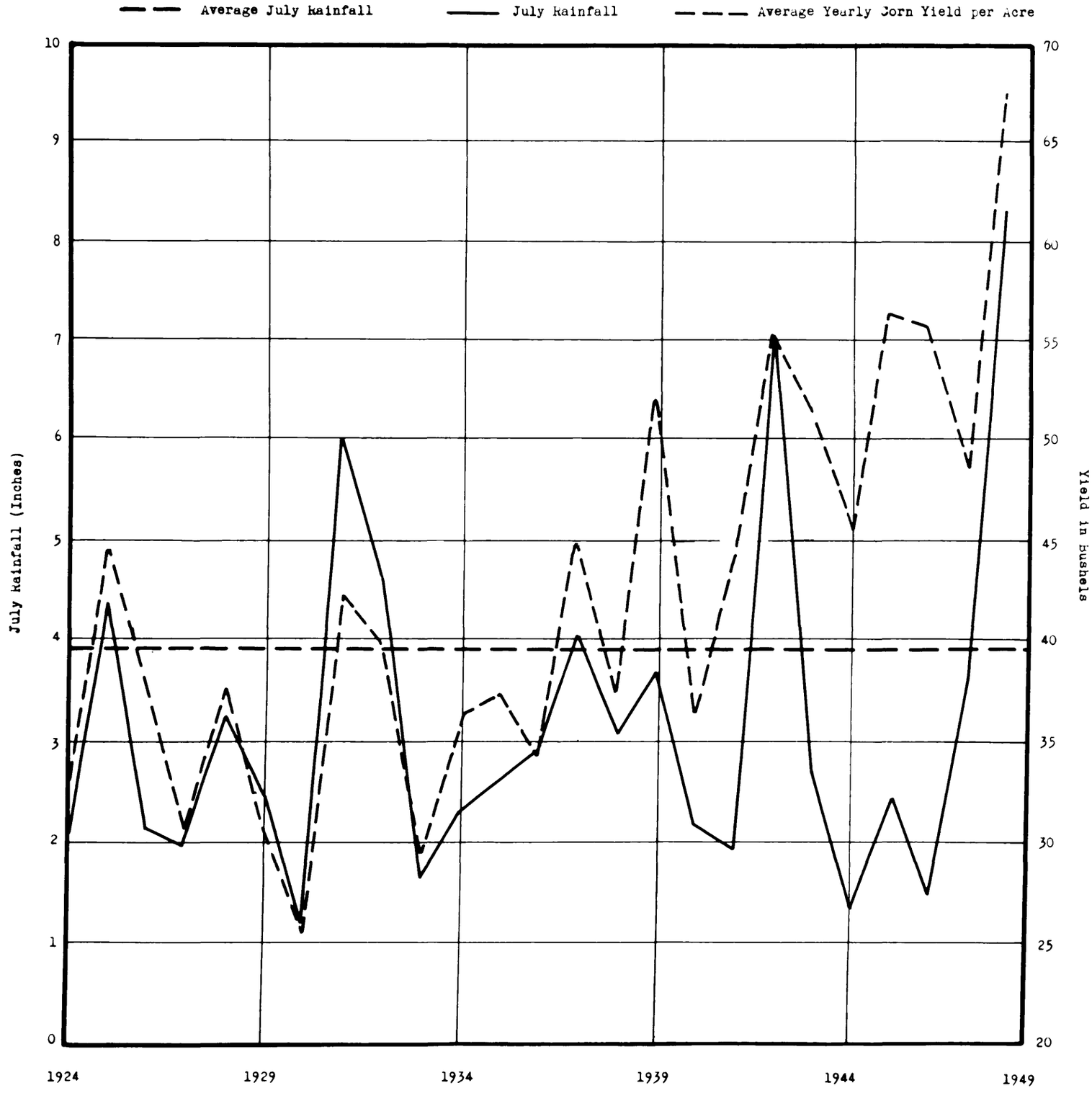
(9) Pastures suffer materially in late summer and autumn. More than average precipitation during this part of the year is especially conducive to maintaining milk production during that period. A drier than average autumn severely limits pasture available for winter grazing.

Natural Vegetation

The natural vegetation of Morgan County was almost entirely forests.

Fig.11. JULY RAINFALL AT BLOOMINGTON, INDIANA AND AVERAGE YEARLY CORN YIELDS IN MORGAN COUNTY, INDIANA (1924-1948)

Sources: (1) U. S. Department of Commerce, Weather Bureau, Climatological Data (1924-1948).
(2) Purdue University, Department of Agricultural Statistics, Indiana Crops and Livestock--Annual Crop Summary (1925-1949).



Of these dense luxuriant forests no original stands are left. Second and third growth forests along with wasteland still occupy nearly a third of the county. Three main types of forests made up the natural vegetation cover: (1) beech-maple, (2) oak-hickory, and (3) sycamore-willow-soft maple (20). The beech-maple forests, which were the most valuable, occupied roughly the northeastern part of the county, where Crosby-Miami soils predominated. These species were also scattered throughout the county, but elsewhere were not predominant. A small area which also had this type of natural vegetation was that underlain with limestone in the west central part of the county. These more fertile soils on level terrain have been largely cleared and today less than 10 percent of the area is wooded.

The oak-hickory forest cover was the most extensive. It was concentrated in the knobstone regions south of Martinsville. Here were such species as the white and red oak, pig-nut and shell bark hickory, with some ash, sugar maple, elm, and black gum on the moist lower slopes. Important stands of oak-hickory forests also covered the Illinoian drift area north of White River. The ridges and slopes of these oak-hickory areas are still predominantly forested. Some of the ridge tops which were cleared for farming are being abandoned and are growing up in sassafras and briars. The remaining forest is on slopes unsuited for farming.

Forests along White River and creeks were made up of sycamores, birches, willows, black gum, and soft maples. Today only about two percent of the valleys are forested.

Summary

Among the physical features climate sets the broad pattern of land use in Morgan County but soil and topographic differences are much more significant in accounting for prominent local variations. The till

plain, the older uplands, and the White River valley are the major landform areas which along with respective soil contrasts give a starting point for dividing the county into land use regions. Further detail in contrasting land use patterns and problems is suggested by soil differences in productivity, susceptibility to erosion and soil reaction along with pertinent evolving cultural patterns.

CHAPTER II

EVOLVING CULTURAL PATTERNS

Settlement and Agriculture to the Civil War (1818-1860)

The period between 1816 and 1825 saw a great inpouring of many thousands of families into Indiana from states to the East and from the South. Many came down the Ohio River in flatboats; others came overland when roads were opened. The central portion of Indiana was the nearest large unsettled area of land open to these immigrants, so that area received many settlers during this period.

Officially organized and named after General Daniel Morgan, in 1822, Morgan County received her share of the many who came seeking homes on the frontier; for in 1822 Morgan County was on the fringe of settlement between the settled counties of the south and the wilderness of the north. The early settlers came principally from Kentucky, North Carolina, Ohio, Tennessee, and Virginia; and the greater number were of English and German origin (36, p. 351).

These early settlers were not much deterred by the fact that Indians still roamed in the forests till after 1820. The settlers entered the county from three directions — from the east, the southwest, and the south. An adventurous pioneer, Jacob Whetzel, was responsible for blazing a much used and important avenue of entrance. Cut in 1818 and little more than a narrow, unimproved, cleared path wide enough for a wagon, this trail was known as Whetzel's Trace. It connected the Whitewater River with the West Fork of White River. It ended at what was then known as The Bluffs.[1]

---

[1]Earlier it had been Fort Royal, named by Frenchmen who came up White River before the War of 1812 to trade with the Indians.

White River was another important highway by which the pioneers entered Morgan County during the early period of settlement. The counties along its lower course had already been settled and it was from these that many of the early inhabitants came. The rivers and larger creeks were the principal roads then, for land travel through the dense forests of central Indiana was hard indeed in 1820 (29, p. 111).

A less important avenue of entrance was directly from the south via Monroe County. No early well-known trail connected Morgan County with the southern counties (except for a much less used trace southeastward toward where Columbus, Indiana is now located); but settlement had extended north into Monroe County and these settlements were nearest, since Johnson and Brown counties had few people in 1820 (29, p. 146).

Practically all land in Morgan County passed from federal to private ownership between 1818 and 1853. The settlement pattern of the county is reflected in the map of federal land sales (Fig. 12). Dates of original disposition of land were placed on a map to locate areas of early (1818-1825), intermediate (1826-1844), and late (after 1845) settlement. During the period of 1818-1825 Morgan County was on the fringe of settlement when an inpouring of new settlers accounted for most of the land sales. In the intermediate period the influx was less rapid and many of the sales during this period were made to settlers already in the county who were wanting additional tracts to expand their farms. The passing of the flatboat era in transportation and the coming of the railroad encouraged the purchase of the remaining land. Some significant relationships existed between settlement and various physical conditions. Upon entering Morgan County the early settlers fanned out in groups and located in what appeared to be suitable places for settlement. Nearness to a stream or river was an important consideration in locating a farm in the wilderness; hence the first settlements were made on the level but well-drained land along White River and on the larger creeks. The streams

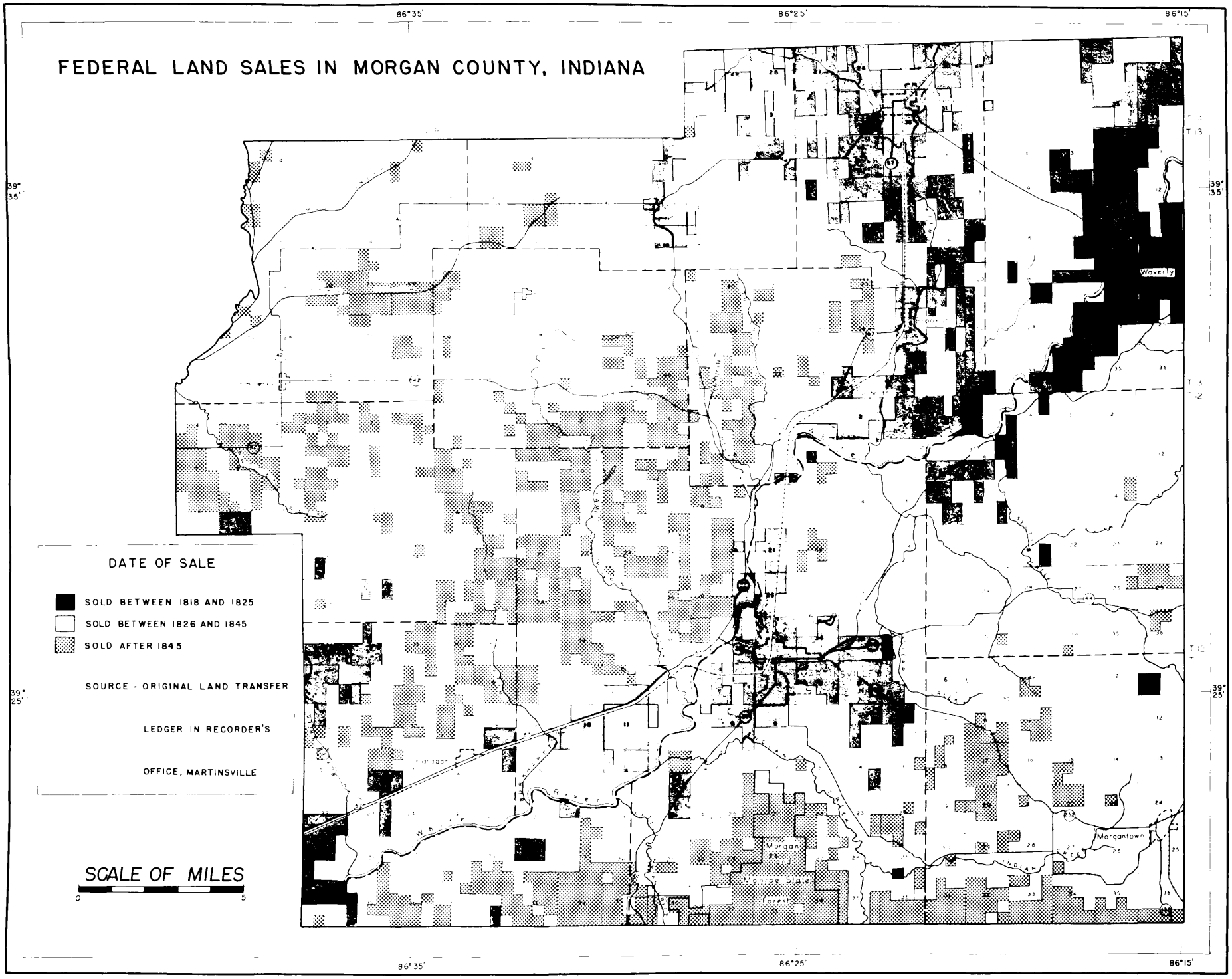

FEDERAL LAND SALES IN MORGAN COUNTY, INDIANA
86°35'
86°25'
86°15'
39°35'
39°25'
DATE OF SALE
SOLD BETWEEN 1818 AND 1825
SOLD BETWEEN 1826 AND 1845
SOLD AFTER 1845
SOURCE - ORIGINAL LAND TRANSFER LEDGER IN RECORDER'S OFFICE, MARTINSVILLE
SCALE OF MILES
0
5
Waverly
Morgantown
White River
Indian Creek

FIG. 12

were also important as a source of power for local mills set up for grinding grain into flour and meal. Good springs were much prized by the early farmers not only for the water, but as crude "ice boxes" in hot weather. The "lay of the land" and the presence of any small unforested spots were also influential in locating farms. The predominant concentration of early settlement was on the terrace lands of White River and the well-drained parts of creek valleys. Land on the lower river floodplain was purchased largely as additions to already established farms on the terrace and adjacent upland margins. Especially poorly drained soils were avoided by the early farmers who were without means to drain them satisfactorily. Rough areas (even those relatively near to the river) remained largely unpurchased until the lumbering industry became well established in the county.

As the early settlers usually came in groups, small clusters of farmsteads developed that encouraged the establishment of small villages as trading centers. The first early clusters of people were all near White River, often near the mouth of one of the creeks. The earliest settlement was located on Lamb's Creek in the central part of the county. The families who formed it came late in 1819. The second settlement was in the eastern part of the county along what is now Stott's Creek. James Stott and six others, coming up from Lawrence County, located farms in this vicinity in 1819. Another early settlement was made on Butler Creek about one mile north of White River in the southwestern corner of the county near the present village of Whitaker. None of these early communities developed into towns, but they served as important centers for further settlement (29, p. 146 ff.).

Somewhat later in origin were the settlements that grew into the two most important populated centers, Martinsville, and Mooresville. Both were favored in their growth by conditions not entirely geographic. Martinsville owes much of its early growth and subsequent development

to the choice of the commissioners appointed by the state legislature to select a county seat. Two sites were under consideration, the present site of Martinsville and a site in Clay Township just north of the river where Centerton is now situated (Fig. 2). The Centerton site is nearer the geographic center of the county which with its location near the junction of a major creek and White River gave it geographical precedence. However, the longer established residents near the Martinsville site had more money and were free in offering some of their land; consequently Martinsville (named after the oldest member of the board of commissioners) was established as the county seat in 1822 (29, p. 81).

Mooresville owes much to the man in whose honor it was named, Samuel Moore. This ambitious trader and merchant realized the advantages of having a trading center near the confluence of the main branch and the East Fork of White Lick Creek, then a navigable stream (by flatboat) for part of the year. The immediate vicinity of Mooresville was one where good farms could develop. While not so fertile as the Lake Eminence area and the Lower White River floodplain, the early farmer thought it much better for farming than the poorly drained areas.

After the early pioneer farmer had selected what he considered a favorable location and after he had erected a simple log cabin, he was faced with the immediate problem of getting enough land cleared upon which to plant his first crops. The trees were numerous and large, and many long hours of labor were required to clear a plot. Many of the trees were simply deadened; others were felled and the logs rolled into huge piles for burning. Destruction of the now precious Indiana hardwoods seemed a necessity to the pioneer intent upon getting enough land cleared to support a family. Each spring the farmer would spend weeks clearing new tracts of land so that he could increase the tillable acreage of his farm. Blanchard writing in 1883 gives this description of pioneer agriculture in Morgan County:

> Corn was planted and almost wholly cultivated with the hoe. A man who could raise eight or ten acres of corn had a large field. If he had three or four boys and as many women, he could manage to cultivate successfully about that number of acres. Even the hoes were not as bright and hard as now. Often they were wooden. The birds and squirrels were a nuisance. Wheat was sown broadcast and very often harrowed in by hand or by brush pulled around by horses or oxen. All reaping was done with the historic sickle (29, p. 159).

In summary, pre-Civil War agriculture was highly self-sustaining with only a relatively small part of the farm produce being sold. What could be sent to market was used to purchase necessities that could not be produced on the farm. During the flatboat era produce went south and necessities came in primarily from Cincinnati and New Orleans. The decline of the flatboat and the Civil War, along with the advent of the railroad caused a reorientation of Morgan County trade. After the Civil War a gradual commercialization of agriculture commenced.

Agricultural Land Use After the Civil War (1865-)

By 1880 about 95 percent of the total area of the county was in farms; since 1920 a decline in land in farms has been taking place (Fig. 13). By 1910 most of the best timber had been removed, and the woodland in farms steadily declined. The peak acreage in cropland came in 1920, current high prices not being sufficient to stimulate any appreciable return to the 1920 acreage. Sharp reductions in wheat and corn acreages without appreciable replacement by other crops make up this decline in the cropland between 1920 and 1930. This resulted from a marked decline in the number of farms during this decade (2492 to 1972). The population of the county declined, with many moving to Indianapolis and others going off the farms to Martinsville, the county seat. The attractions in industry were greater than they were on the farms. Much agriculturally marginal land retired from use since 1920 was not returned to crops during recent high prices for agricultural produce, but rather it has remained

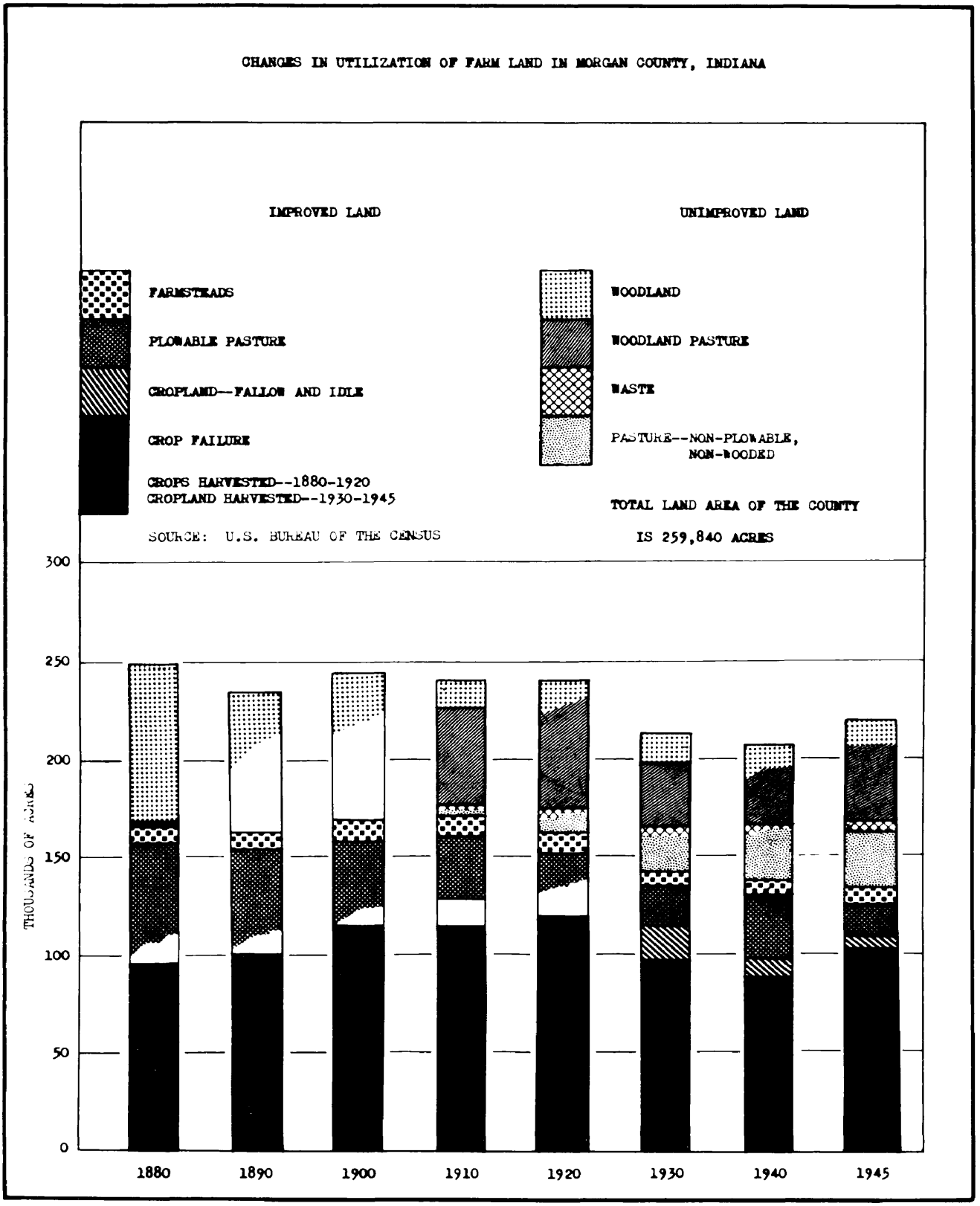

CHANGES IN UTILIZATION OF FARM LAND IN MORGAN COUNTY, INDIANA
IMPROVED LAND
FARMSTEADS
PLOWABLE PASTURE
CROPLAND--FALLOW AND IDLE
CROP FAILURE
CROPS HARVESTED--1880-1920
CROPLAND HARVESTED--1930-1945
SOURCE: U.S. BUREAU OF THE CENSUS
UNIMPROVED LAND
WOODLAND
WOODLAND PASTURE
WASTE
PASTURE--NON-PLOWABLE, NON-WOODED
TOTAL LAND AREA OF THE COUNTY IS 259,840 ACRES
THOUSANDS OF ACRES
300
250
200
150
100
50
0
1880
1890
1900
1910
1920
1930
1940
1945

Fig. 13

in forest or pasture. Farmers were beginning to concentrate their efforts on the better lands.

As indicated by Fig. 14, corn in no census year has occupied less than 42 percent of the cropland harvested and in 1880 slightly more than half of the cropland harvested was in that crop. The decline in wheat had started prior to World War I, but this was temporarily halted by high wheat prices during the war. The decline is attributable to competition from the Great Plains, the advent of highly advertised brand name flour, the trend toward commercial agriculture, and the decline in the per capita consumption of wheat flour in the United States. Recent high prices have not revived wheat. The average yearly wheat acreage since 1940 has been only one-half the average for the five census years of 1880 through 1920.

Before 1940 most of the soybeans were produced for hay, but the great need for vegetable oils during and since the war resulted in a rapid and almost complete shift to the production of soybeans for beans in Morgan County (Fig. 16). The introduction of the small combine during the thirties made this shift profitable for small farmers as well as large ones.

Soybeans as a major cash crop, particularly on the alluvial, terrace, and lacustrine soils have not been conducive to the maintenance of soil fertility. Especially on alluvial and lacustrine soils a two-year rotation of corn and soybeans is often followed. In many instances neither of these crops are fed to livestock on the soils on which they are grown; consequently crop residues are often the only replenishment. Furthermore, soybeans on slopes and on floodplains subject to frequent overflow have exposed the topsoil to a greater erosion hazard because the roots leave the topsoil very friable in autumn.

In addition to stimulation of high prices another factor has contributed to the shift to soybeans by many farmers. With the passing

ACREAGE AND VALUE OF CROPS IN MORGAN COUNTY, INDIANA

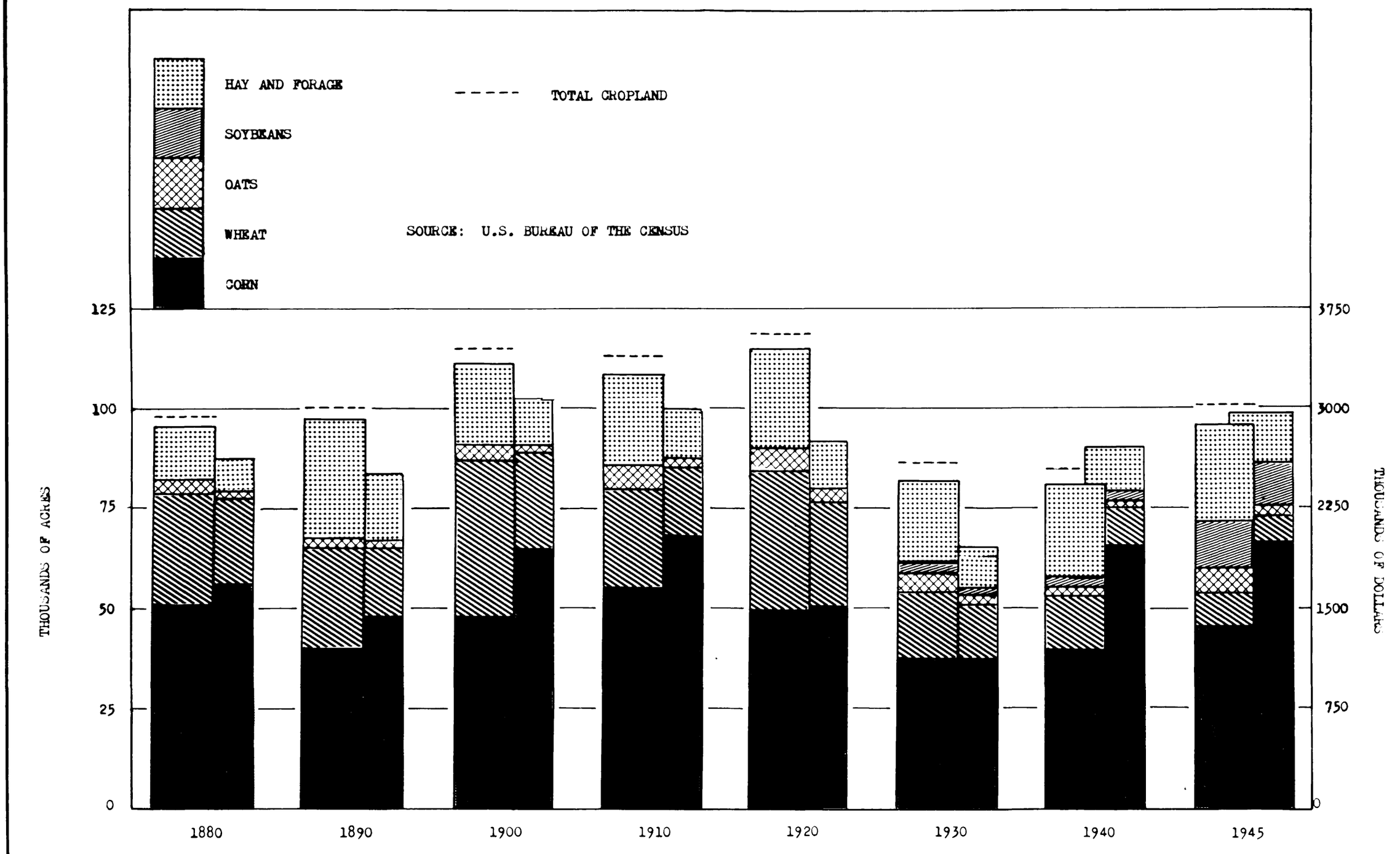


Fig. 14

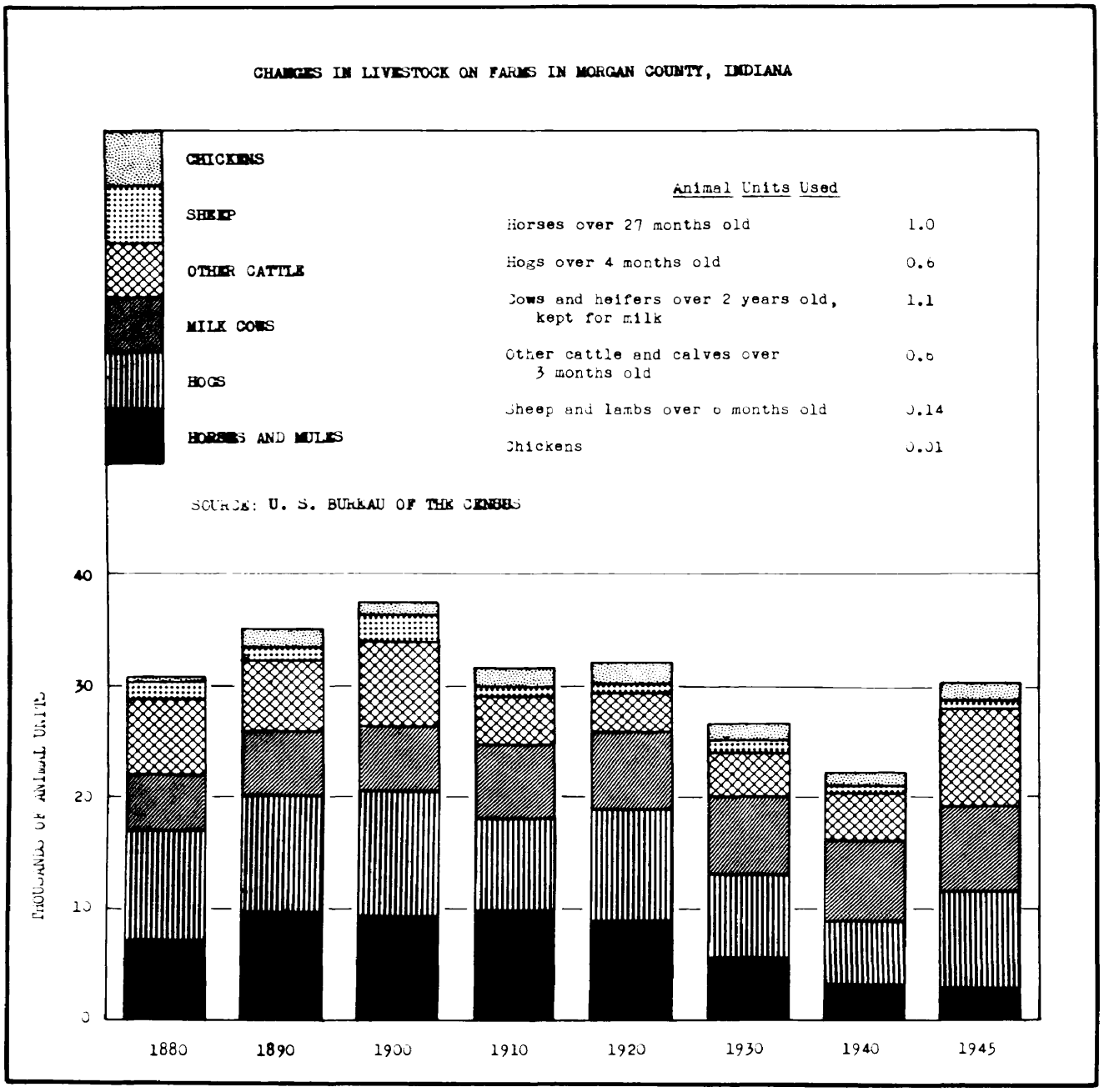
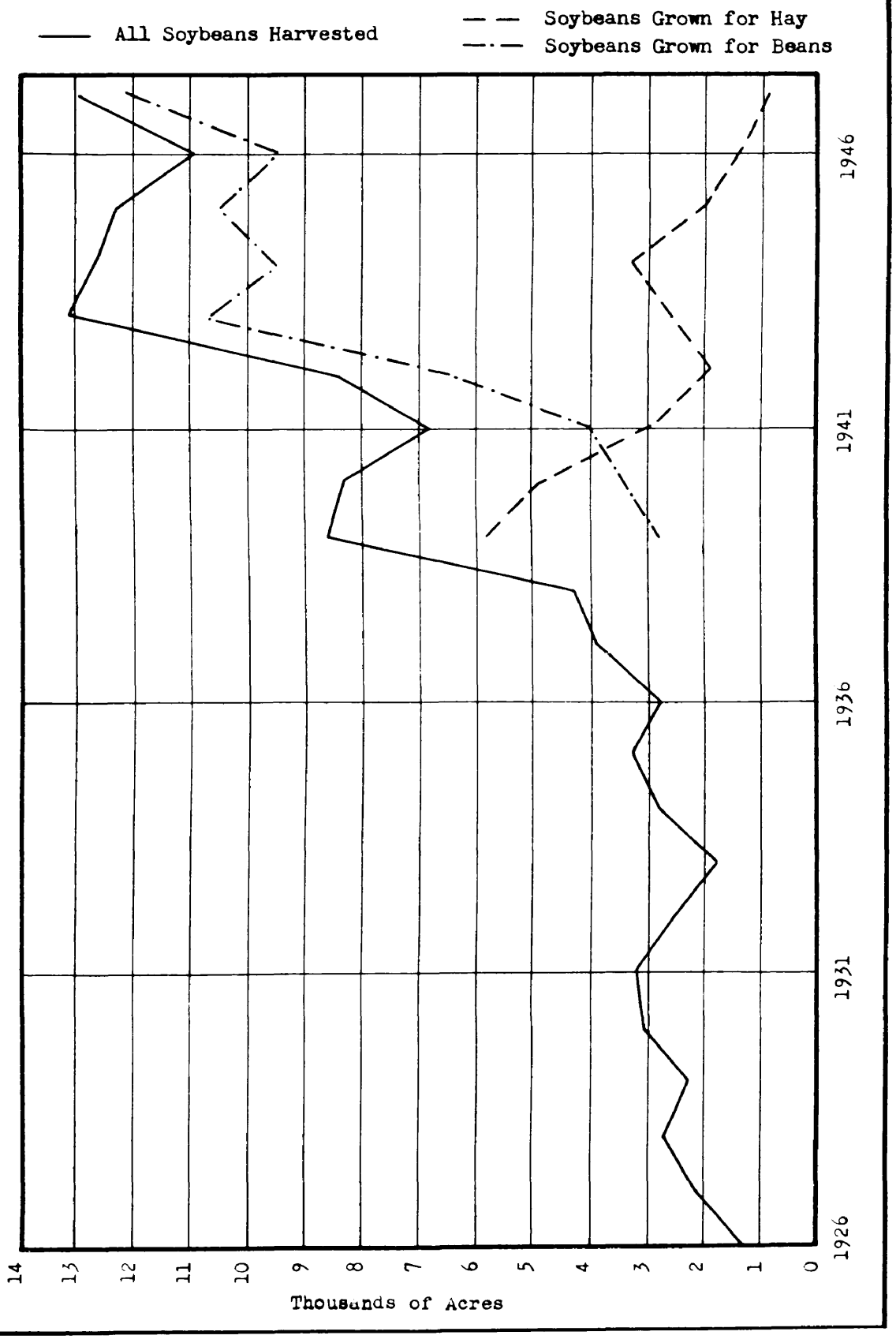

CHANGES IN LIVESTOCK ON FARMS IN MORGAN COUNTY, INDIANA
CHICKENS
SHEEP
OTHER CATTLE
MILK COWS
HOGS
HORSES AND MULES
Animal Units Used
Horses over 27 months old 1.0
Hogs over 4 months old 0.6
Cows and heifers over 2 years old, kept for milk 1.1
Other cattle and calves over 3 months old 0.6
Sheep and lambs over 6 months old 0.14
Chickens 0.01
SOURCE: U. S. BUREAU OF THE CENSUS
40
30
20
10
0
1880
1890
1900
1910
1920
1930
1940
1945

Fig. 15

Fig.16. SOYBEAN ACREAGE IN MORGAN COUNTY, INDIANA, 1926-1947. (Based on data from "Assessor's Enumeration of Crops," Department of Agricultural Statistics, Purdue University.



of the horse, there has been no suitable substitute for the one-horse wheat drill which made it possible to follow corn with fall wheat and spring-sown clover (usually red or Big English). Because of their short growing season, soybeans can generally be harvested soon enough to plant a winter cover crop (wheat or rye), although many farmers on alluvial and lacustrine soils are following soybeans with corn.

Among the comparatively new crops that are now grown in Morgan County, alfalfa, lespedeza, and ladino clover are of distinct importance. Legumes used for hay and pasture have helped maintain soil productivity and repair damage to several soils which have suffered from improper rotation practices with too much emphasis upon corn and wheat. Not only are legumes good soil builders in themselves; but since an alkaline or neutral soil is needed for their growth, the raising of legumes encourages the liming and fertilization of acid soils. Since alfalfa and clovers are useful on slopes to discourage erosion, the growing of more of these crops is desirable.

A most significant point in Fig. 14 is the marked increase in the per acre value of crops as shown by the production bar exceeding the acreage bar in 1940 and 1945. Several factors explain this increased production on fewer acres.

(1) There has been an improvement in yields, particularly corn. About 1934 hybrid corn began to appear on farms in Morgan County and within 10 years it had swept open pollinated corn almost completely off the farms. This advance alone has been the most significant single reason for the increased crop production. Average corn yields for a number of years before and after 1934 roughly tell the story. The average for the years 1924 to 1934 inclusive was 35.5 bushels per acre. The average for the years 1935 to 1945 inclusive was 45.2 bushels per acre which represents better than a 25 percent increase in corn yields, which can be largely attributed to the introduction of hybrid corn, increased

use of lime, more legumes in rotation, and some increase in the use of fertilizers.

(2) Increased use of agricultural crushed limestone and green manure crops have been encouraged by the government crop restriction and subsidy programs.

(3) There has been some shift from the less productive to the more productive crops. Alfalfa substituted for timothy on some soils generally yields as great or nearly as great feeding value per acre as corn. Soybeans are more productive than wheat on Morgan County farms as shown by Fig. 14. In no census year did wheat yield a $30 standard return per acre, while soybeans have done consistently better.[2]

(4) Until about 1940 lime, better use of manures, commercial fertilizers, mechanized equipment, and other better practices have been generally applied to the better farm land rather than to the marginal or near marginal land under agricultural prices of the thirties. However, during and since World War II considerably increased effort and experimentation has been put forth by farmers in the use of lime, fertilizers, and other improved methods on some of the more highly leached soils which are topographically suited to the use of mechanized equipment.

Fig. 15 indicates livestock trends since 1880. Some significant points brought out by this graph are: Horses have decreased sharply with the introduction of machinery. The decrease in draft animals has made possible increased numbers of other animals raised with the same cropland and pasture acreage. Hogs have had an important place in the livestock picture, but are declining relative to cattle. Milk cattle have generally been a little more important than beef cattle; however, it is only recently that more emphasis has been placed on milk production,

---

[2]In order to make comparison of total production for various census years possible, a standard price was arrived at by taking an average of individual crop prices for a base period, 1917-26.

with most of the cattle being on general farms. During the past 15 years there has been a steady decline in cream sold off farms and a steady increase in fluid milk sales generally through farm to farm pick-ups. Chickens and poultry products find a market in Indianapolis in addition to supplying the local demand. Sheep while never of major importance have declined partly because of the menace of dogs.

Mechanization has gone forward rapidly. The tractor, combine, hay-loader, corn picker, and other machinery have greatly altered the Morgan County farm within a score of years. Formerly a farmer could break only 1½ to 2½ acres of ground a day compared with 7 to 10 acres now. He could cultivate only 4 to 6 acres of corn per day, but today he easily cultivates 30 to 35 acres. Likewise corn husking is much cheaper with the corn picker. All this and much more has meant that both the horse and the hired hand are largely gone. Horses were only one-fourth as numerous in 1945 as in 1920 (Fig. 15). On the other hand there were nearly 3½ times as many tractors in 1945 as ten years before. Slightly more than half of the farms had tractors in 1945. The farmer gets his crops planted, cultivated, and harvested at more opportune periods. To the more level and productive areas of the county, the till plain and White River valley, these changes in techniques have come first and most completely.

Thus the most significant recent developments in land use in Morgan County are the reduced acreage in crops and the rising production per acre. The retirement of marginal farm land from crops during the period of low prices in the thirties has been an important step forward in stabilizing agricultural land use in this county. Less emphasis on corn in all parts of the county and more pasture and hay crops on the more rolling areas now in crops are needed to maintain soil fertility.

Population Patterns

In 1940 the population of Morgan County was 19,801 which represents

a slight gain over the previous census but is not equal to the population in 1900, 1910, or 1920. The total rural population, including places having less than 100 population, was 10,038 in 1940, or slightly more than one-half the total, while the urban (Martinsville) and town and village (Mooresville, Morgantown, Paragon, Monrovia, Centerton, Eminence, Hall, and Waverly) total was 9,763. While Martinsville was the only urban center in 1940, the 1950 census will undoubtedly indicate the rise of Mooresville to the urban class. Many Indianapolis employed workers have built new homes in this community, which is only 15 miles from downtown Indianapolis. With fast automobiles and a good highway these workers can commute easily and at the same time (1) benefit by lower taxes, rents, and food costs, (2) have a better place to rear their children, and (3) enjoy the amenities of the small city.

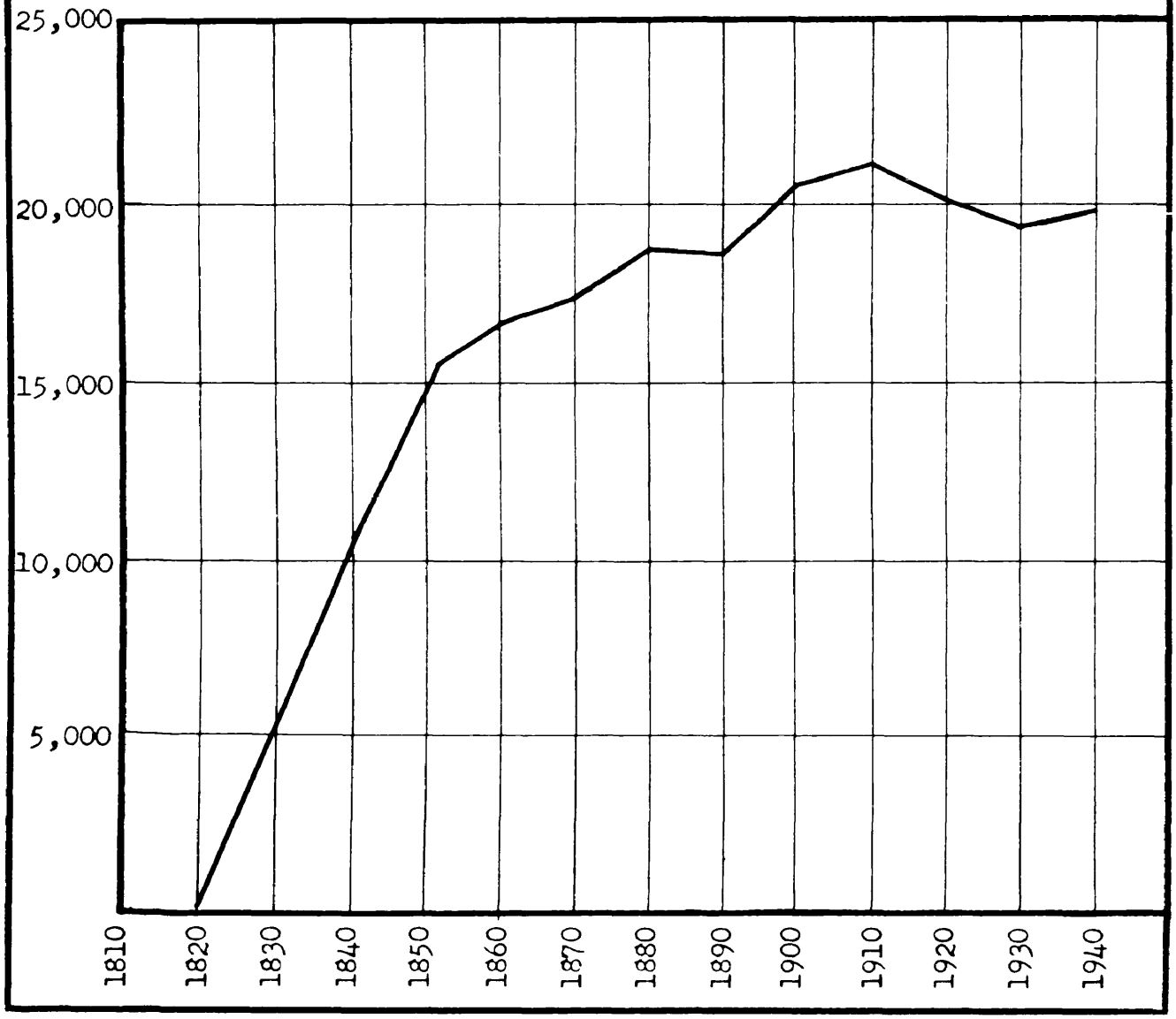
The racial composition of the population is markedly uniform. There were only 14 negroes and 58 foreign born whites in the county in 1940.

Population Growth. Fig. 17 indicates that there have been three rather distinct periods of population development: (1) a period of rapid settlement and development (1820-1850), (2) a period of steady population increase (1850-1910), and (3) a period of decline (1910-) except for an increase during the last two decades. In the early period the population increased rapidly as long as there were abundant opportunities for incoming settlers. Agricultural development was the keynote and the availability of good farm land largely determined the population. By 1850 most of the good land was taken; consequently fewer and fewer new settlers stopped in Morgan County.

The second period reflects the coming of manufacturing industries which kept the county's population increasing. Although these industries were relatively small they offered opportunity to many young people not needed on the farms. Morgan County started to slump in population in 1880, but "a comeback" was made from 1890-1900 partly because of the

Fig. 17. CHANGES IN TOTAL POPULATION IN MORGAN COUNTY, INDIANA

(U. S. Bureau of the Census)



Martinsville mineral springs. Several important industries also had their origin in this period. That Martinsville's mineral springs and industries were largely responsible for the renewed population increase is indicated by the fact that between 1890-1910 the population for the county exclusive of Martinsville increased only 14 percent while for Martinsville the increase was 73 percent.

With the declining importance of the mineral springs after 1910 and with new industries finding fewer opportunities favorable to locating in Morgan County, the population started to decline slowly but decidedly in the third period. Mechanization on the farm was an essential factor in this decline. With the use of machinery, farm production could be maintained with much less labor; consequently there was much migration from the farms. Since the county had relatively few industries to absorb this migrating labor supply, it moved into other areas, notably Indianapolis which has long been the outlet for many young people seeking jobs and greater opportunities. The slight increase in population between 1930-1940 was apparently due to the "back to the land" movement that set in during the depression; for all of the predominantly rural townships which had lost in population in the previous decade except Greene made small gains between 1930 and 1940.

Distribution. The present distribution of rural population in Morgan County is of considerable significance in the understanding of specific rural land use problems to be discussed in succeeding chapters. In order to appreciate the relationship of the rural population pattern to rural land use, three groups must be recognized: (1) the small town and village group, (2) the non-farm group living on the open countryside, and (3) the farm group. Distributional patterns of these groups are shown in Fig. 18.

The small towns and villages are all long established centers that were an integral part of the early settlement pattern. Today their

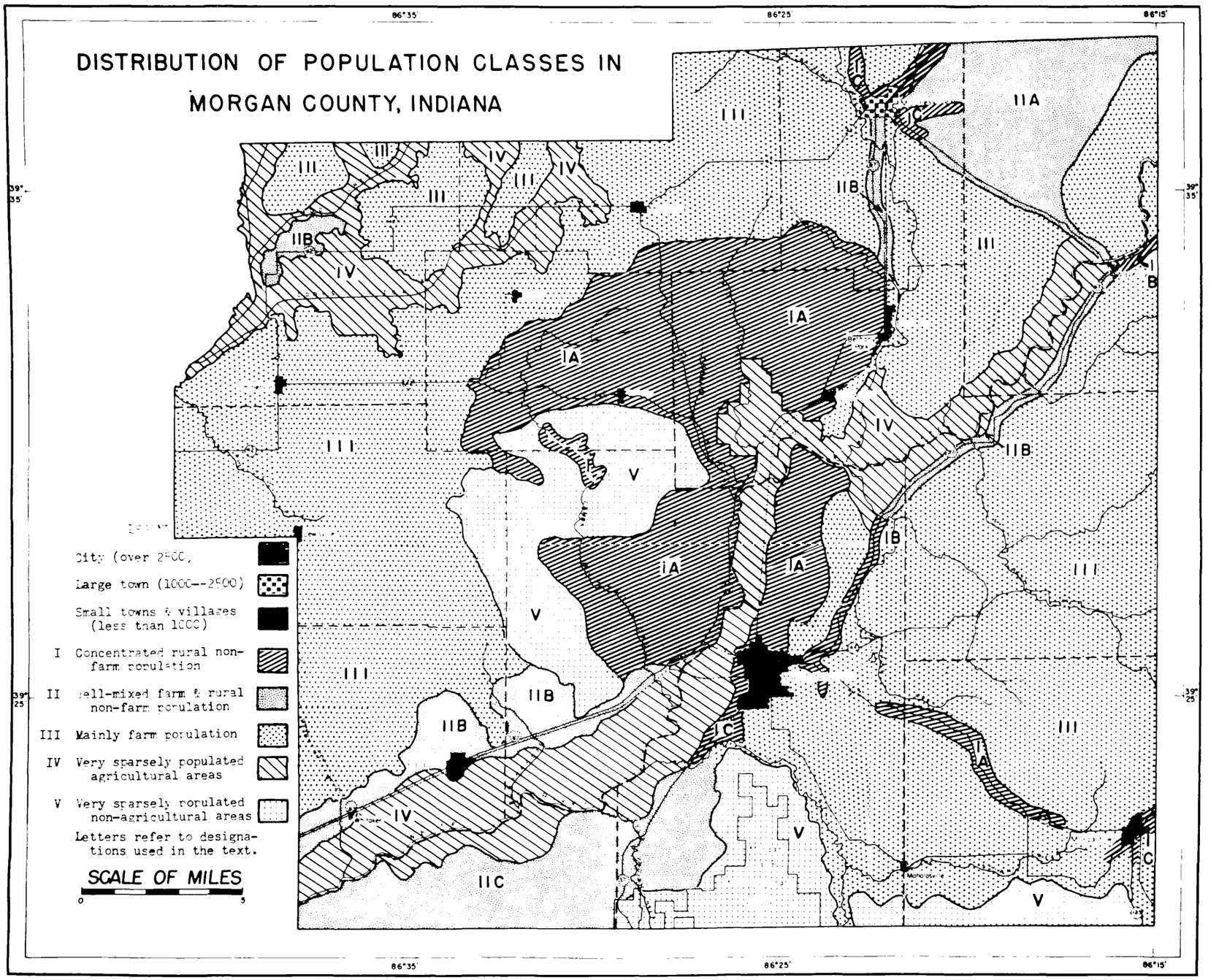

DISTRIBUTION OF POPULATION CLASSES IN
MORGAN COUNTY, INDIANA
86°35'
86°25'
86°15'
39°35'
39°25'
City (over 2500)
Large town (1000--2500)
Small towns & villages (less than 1000)
I Concentrated rural non-farm population
II Well-mixed farm & rural non-farm population
III Mainly farm population
IV Very sparsely populated agricultural areas
V Very sparsely populated non-agricultural areas
Letters refer to designations used in the text.
SCALE OF MILES
0
5

FIG. 18

functions have changed and are generally more restricted than formerly. Particularly have the more accessible villages become residential centers for people commuting to jobs in Indianapolis and in other parts of the county. The occupational composition and functional patterns of these small towns and villages are discussed elsewhere in this chapter.

Within the past fifteen years the non-farm population living on the open countryside has greatly increased in numbers. The "back to the land" movement during the depression years of the early thirties marked a reversal in net migration from Morgan County. Many who had taken jobs in Indianapolis and elsewhere during the twenties came back to their families during the depression and others moved in to fill up empty houses that could be rented along with some tillable land. The marked increase in small farm units shown by the 1935 census indicates what was happening (Table V). Many of those who came to Morgan County under these circumstances remained after they had again found urban or other non-farm employment. Then the war and post-war years brought additional numbers of non-farm families. Factors accounting for this recent movement are to be analyzed in Chapter V.

These non-farm groups are concentrated in three different types of locations: (1) There is a marked concentration in rough areas where abandoned farms on ridges and cut over woodland have been offered for sale at prices that prospective owners can afford. Areas designated as IA in Fig. 18 are of this kind. (2) Narrow strips along main roads not suitable for cropland have been well occupied by non-farm families; those having unusable farmland have sold plots at high prices. Areas shown as IB are so situated. (3) Strips along roads radiating out of Martinsville, Mooresville, and Morgantown are also occupied very largely by non-farm people (IC). These strips have not yet been incorporated. Developing around a small artificial lake in the central part of the county is another concentration of the non-farm group; however, this is

yet largely resort rather than permanent occupancy.

In addition to these concentrations of non-farm population there is a general scattering of this occupant group in all parts of the county, but particularly in areas designated in Fig. 18 as "well mixed farm and non-farm population." Nearness to Indianapolis accounts for area IIA. Location along main highways is largely responsible for area IIB, and intermixture of good and poor farmland in part explains IIC.

Predominantly farm areas have a number of non-farm families generally settled along (1) main roads, (2) on less usuable agricultural tracts, or (3) very commonly on "old homeplaces" with the cropland rented out to neighborhood farmers. However, the farm element is definitely in the majority in these areas, particularly in the northwestern part of the till plain, more non-farm population being found (1) on relatively less productive till plain soils in the northeastern and eastern parts of the county, and (2) nearer to Indianapolis, Martinsville, and Mooresville.

Some of the most productive and least productive land is sparsely populated. Two very productive areas, the floodplain of White River and the lower part of the Lake Eminence plain have very few people. Because of flood hazard and soil dampness these are not occupied; however, there is a concentration of farmsteads on their margins. Two rough non-agricultural areas have very few people. The one along the southern margin of the county is largely in a state forest preserve (Fig. 18). The central area is largely privately owned forested land. It is less accessible than other parts of this central rough upland that have considerable non-farm population elements.

Migration. The net migration out of Morgan County during the twenties followed by a net migration into the county in the thirties and probably during the forties has been of considerable significance in changing rural land use patterns. For example, nearness to Indiana-

polis and the competition with union labor has adversely affected dairying in the northeastern part of the county. The unwillingness and lack of opportunity for farm youth to remain on the farm has been a critical drain on rural wealth. Little available land and lack of capital necessitate many youth seeking urban employment. The materialism and glamour of urban life is a very potent force attracting youth to the cities where many jobs offer a greater immediate return than most farm employment. Today, ease of movement between Indianapolis and adjacent countryside has made rural youth acutely aware of this urban glamour. Twenty years ago when the author was a boy of 10, the chance of a farm boy getting to the city for a look around was generally limited to a two or three-day visit with a relative once a year. Today, many young people visit the city weekly.

A study of graduates from Paragon, a small high school in a rural area, was made to obtain more specific data relating to migration out of rural areas. The background and present occupational status of 312 graduates was obtained for representative classes graduating between 1917 and 1946. The results as tabulated in Table IV confirm the general trend of outward migration mentioned above. About two-fifths of the male graduates who were reared on farms are currently farmers. Another two-fifths of farm-reared boys left the county principally for Indianapolis jobs. About one-fifth have found non-farm employment within the county. Of the female graduates only one-third became farmwives. Graduates reared in non-farm homes on the open countryside and in Paragon are almost entirely engaged in non-farm jobs. About three out of every four have left the county. This strong outward migration means a dissipation of rural wealth through education of youth who contribute nothing to the community financing a considerable part of their education. They also take from the county much inherited wealth that makes it difficult for remaining youth to establish owner-operated farms.

TABLE IV

Background and Present Occupational Status of 312 Paragon High School Graduates, 1917-1946.

	Farmers or Farmwives	In-County Occupations		Out-of-County Occupations
Present Occupations of Graduates with:				
Farm Background				
Male	40	16		38
Female	23		56	
Rural Non-Farm Background				
Male	2	6		10
Female	1		31	
Paragon (Small Town) Background				
Male	1	11		34
Female	4		39	

Evolving Transportation Patterns

Present Routes. The major transportation routes passing through Morgan County are greatly influenced by two factors: (1) the White River valley and (2) the location of Indianapolis. Two important state highways and one of the railroads use the White River and White Lick valleys as the easiest and most direct approach to Indianapolis from the southwest (Fig. 2). The presence of rough terrain on both flanks of White River in western Morgan County, plus the wideness of the valley in that locality which is subject to frequent flooding, has made a definite natural transportation funnel through most of Ray Township. In locating the two main highways and the railroad, engineers tried to keep away from the rough terrain on the one hand and the treacherous floodplain on the other. This restriction has made for a concentration of

traffic flow.

An intricate system of county roads offer secondary transportation routes linking all parts to the main transportation pattern — the state highways and the railroads. These roads have also been influenced by topography. In the rough parts, the roads follow the creek valleys or the ridge tops as much as possible; whereas on the till plain they are straight, except for many more right-angle turns.

Evolving Patterns. There have been three distinct eras in the transporting of agricultural products to market from Morgan County: (1) the flatboat era (1830-1852); (2) the railroad era (1853-1932); and (3) the truck and automobile era (1933-).[3]

(1) The Flatboat Era (1830-1852). By 1830 the county had a well scattered population, but with more people concentrated in the river valley; consequently White River became the principal artery of trade. The golden era of the flatboat was at hand. Noah Major, a pioneer of Morgan County, writing in his memoirs about 1900 graphically describes the flatboat trade as follows:

> White river, though crooked and turbulent and abounding in snags, drifts, and abrupt cut-offs, was destined to be the great thoroughfare for Morgan county produce, and to convey on its restless bosom many thousands of dollars' worth of pork, corn, wheat, flour, mess beef, and lumber on their way to the Southern markets — generally to the city of New Orleans, a city then of 150,000 inhabitants and one of the best markets in the United States. The distance from Martinsville to New Orleans is computed at 1,800 miles by water.
>
> It was soon learned that lard, bacon, and bulk pork were the most profitable products to ship from Morgan county. Although considerable quantities of corn, wheat, flour, and lumber were shipped in an early day, not much of it was done toward the last. The reason is obvious enough, when a thousand pounds of the pork products would

---

[3]It was in the early thirties that the truck began to play a role in the transportation of agricultural products from Morgan County.

> bring $50 in New Orleans, while the same weight in corn would in no case bring more than $8 or $10.
>
> From 1840 to 1853 was the golden era of flatboats. During that period Morgan county stood third in the State for the production of corn and hogs. Farming was then pre-eminently the business of this county. No succeeding epoch ever proved more satisfactory to our enterprising farmers than this one. ——
>
> The magnitude of flatboating will be better understood by the following estimates which, I think, are within the bounds of reason. Counting an average of fifteen boats per annum from 1829 to 1853, we have a total of 345 for the twenty-three years.
>
> There were not less than 4,500,000 feet of lumber used in constructing these boats, three-fourths of which were of the finest poplar trees that grew near White river. This lumber was worth at least $10 per thousand feet, or $45,000; 345 boats at a cost of $240 per boat, $82,800. The cargoes, estimated at $40,000 each, $1,380,000 (37, pp. 396-403).

From these accounts it is apparent that the flatboat trade was indispensible to the farmers for they were much in need of a market for their surplus pork and grain in order that they could acquire needed supplies of salt, tools, and other articles not produced locally.

(2) Railroad Era (1853-1932). Following the flourishing flatboat trade, the railroads made their appearance. The first railroad, The Martinsville and Franklin Flatbar Railroad, began operation in 1853 after citizens living along the route had spent nearly five years in grading the roadbed and helping to lay the track. It was operated till about 1858 when service was discontinued. After the Civil War the road was extended to Fairland in Shelby County (Fig. 1); however, operation again ceased in a few years (29, p. 33). It finally became part of the Chicago, Cincinnati, Cleveland, and St. Louis Railroad (Fig. 2); but it was never a financial success because its orientation toward Cincinnati was not in keeping with the natural flow of trade. Cincinnati was declining during the second half of the last century as a meat packing

center and at the same time Indianapolis markets were becoming the natural outlet for farm products from Morgan County.

Most important in the county's railroad history has been the Indianapolis and Vincennes road, commonly known as the I. and V. (Fig. 2). It was started by the New Albany and Salem Company in 1853. By about 1875 it had become part of the Pennsylvania Railroad, the present owners (29, p. 33). Until about 1930 this road was a most important transportation facility affording much local freight and passenger service. Town and villages along it thrived as centers of local trade and industry. But with the coming of the automobile and freight truck, the railroad traffic has dwindled, and now this railway is mainly a significant connection between Indianapolis and the coal mines of southwestern Indiana.

The third railroad, the Illinois Central (Fig. 2), passes through the extreme southeastern part of the county, serving expecially Jackson Township, where Morgantown has been a trading center for several decades and has some industry.

(3) Truck and Automobile Era (1933-). The truck has almost completely supplanted the railroad in the handling of certain types of freight. The railroad still hauls wheat and soybeans out of the county, but all livestock are transported to market by truck. The railroad brings in some but by no means all of the farm machinery, fertilizers, and other farm supplies. All local transportation of farm produce within the county is by truck and automobile.

Truck rates on livestock testify as to the advantage of proximity to Indianapolis. Livestock hauling rates for various points southwest of Indianapolis indicate that from the Mooresville community (15 miles from Indianapolis) rates were 15 cents per 100 pounds (as of January, 1950). From Eminence, Martinsville, and Paragon they were 20 cents.

From Gosport, just southwest of Morgan County on State Road 67, the rate was 25 cents for a distance of 48 miles. At Northington (also on State Road 67), 77 miles from Indianapolis, the rate was 30 cents or just double that for Mooresville. Thus there is also a distinct advantage in the sale of livestock products, particularly whole milk because of nearness to Indianapolis. The favorable position in respect to markets for farm produce is further reflected in the price paid for eggs and poultry at points along this highway.

The automobile has also been significant in altering the pattern of land use in the county. While the tractor has increased the number of large farms, the automobile has made many small part-time farms and non-farm rural residences during the past fifteen years. The peripheral location of Morgan County in respect to Indianapolis has meant much commuting to urban jobs from rural areas. Many of these urban-employed workers live on small rural holdings that produce enough to be classified as part-time farms. The total production of these part-time farms and rural residential tracts is relatively insignificant. However, in offering urban employed workers the amenities of rural surroundings, a saving in rent, taxes, and food; and a better place to rear children, these small farms have a sociological significance surpassing their economic contribution.

Table V presents some significant changes in the size of farms that have occurred during the past 25 years. The tractor has made a small to medium farm uneconomical whereas the automobile and the great improvement in highways has encouraged commuting from rural homes to urban employment. The farmer of 25 years ago who farmed 50 to 100 acres with horses and who frequently found supplemental employment in hauling logs and building roads has largely disappeared. This steady increase in the size of farm was interrupted only by the "return-to-the-land"

movement of the mid-thirties. Smaller than 50 acre farms have increased in number because of the significant increase in part-time farms. Increase in the number of larger farms has been in response to the increased use of tractors which makes possible and necessary a larger farm unit.

TABLE V

Size of Farms (1920-1945)
(Source: U. S. Bureau of the Census)

	1920	1925	1930	1935	1940	1945
Under 10 acres (No.)	153	113	97	169	176	166
Percent of all farms	6.3	4.8	5.0	7.2	8.5	8.2
10-49 acres (No.)	762	741	456	677	596	620
Percent of all farms	28.2	28.2	23.1	28.9	28.9	30.7
50-99 acres (No.)	699	659	586	617	505	425
Percent of all farms	28.0	28.2	29.7	26.3	24.4	20.9
100-259 acres (No.)	741	718	711	761	665	657
Percent of all farms	29.7	30.8	36.1	32.5	32.0	32.3
260-499 acres (No.)	117	91	106	97	108	130
Percent of all farms	4.7	3.9	5.4	5.0	5.2	6.4
500-999 acres (No.)	17	11	13	20	17	32
Percent of all farms	.7	.5	.6	.9	.8	1.5
1000 acres or over (No.)	3	1	3	2	2	2
Percent of all farms	.1	.1	.2	.1	.1	.1
Total Number of Farms	2,492	2,334	1,972	2,343	2,069	2,032

Growth of Non-Farm Industries

Non-farm industries became important in Morgan County at a time when agricultural expansion had reached its peak, which meant local non-farm employment opportunities brought a good balance between agriculture

and industry. Much of the industry has always been closely related to agriculture and forestry in the county.

The present industries of Morgan County slowly evolved out of small beginnings. The early mills for the grinding of grain were located on the creeks emptying into White River because water was the primary source of power. Small though these early mills were and insignificant though they seem today, they were of utmost importance to the early pioneer who relied upon them for his flour and meal. The sawmills too were important in furnishing the necessary lumber for the building of houses to take the place of the crude log cabins, the first homes of the pioneer (29, p. 122 ff).

The forests offering a good range for hogs, nearness to the river, a good market in New Orleans and in the East, and fair flatboat transportation made the pork slaughtering business a significant early industry in Martinsville. Hogs were purchased widely and driven to the county seat (and a lesser number to Mooresville) to be slaughtered and packed on flatboats bound for New Orleans. For some years in the forties the average number of hogs killed for flatboat shipment probably exceeded 10,000. The business attracted such subsidiary activities as cooperage making, and greatly stimulated retail merchandising; for those who took farm products down the river would bring back what they could, by steamboat to Madison and by wagon from there, to sell or barter.

Following the Civil War a more varied economy began to appear in Morgan County. Agriculture still remained the dominant industry but declined in relative importance. Sawmilling was an especially significant industry after 1870. Then in the 1890's Martinsville became aware of its mineral waters and their commercial possibilities were soon realized. Other industries, including a goldfish hatchery, also were founded giving the city a notable increase in population. The clay products industry at Brooklyn and Martinsville was also developing near

the turn of the century. Furniture and cooperage plants along with milling in small mills rounded out the picture of Morgan County's industries at the turn of the century. Somewhat later vegetable and tomato canneries were established to give the county a well-rounded economy with agricultural and manufacturing goods of about equal value. These developments essentially completed the diversification of the county's economy, which has more recently undergone change but has experienced no expansion comparable to that between 1890 and 1910. The distribution of present industries shown in Fig. 19 indicates that the manufacturing industries of fifty years ago are still dominant. Manufacturing clusters principally at Martinsville and Mooresville. The early development of these cities coupled with their location in agriculturally productive valleys are important in explaining their preeminence.

The peak in the county's industrial development came in 1929 when the value of manufactures reached almost $4,000,000. The drop during the thirties as shown by the 1940 census should be attributed mainly to the generally poor economic conditions throughout the country rather than to any relative decline in the county's industrial position. It remains to be seen if nearness to Indianapolis will become a distinct advantage. If so, Mooresville and the rest of the northeastern part of the county will benefit more than will the Martinsville location. In the past the Indianapolis area has completely overshadowed the surrounding counties in industrial enterprises; and while definite advantages have accrued to these counties because of their proximity, the tendency has been for industries to locate in Indianapolis where geographic and other factors seemed more advantageous. While the Indianapolis industrial area has been surpassed by the more favored extreme northwestern part of Indiana, the central area will remain a strong industrial sector; and with a possible tendency to decentralize some industries, Morgan County may

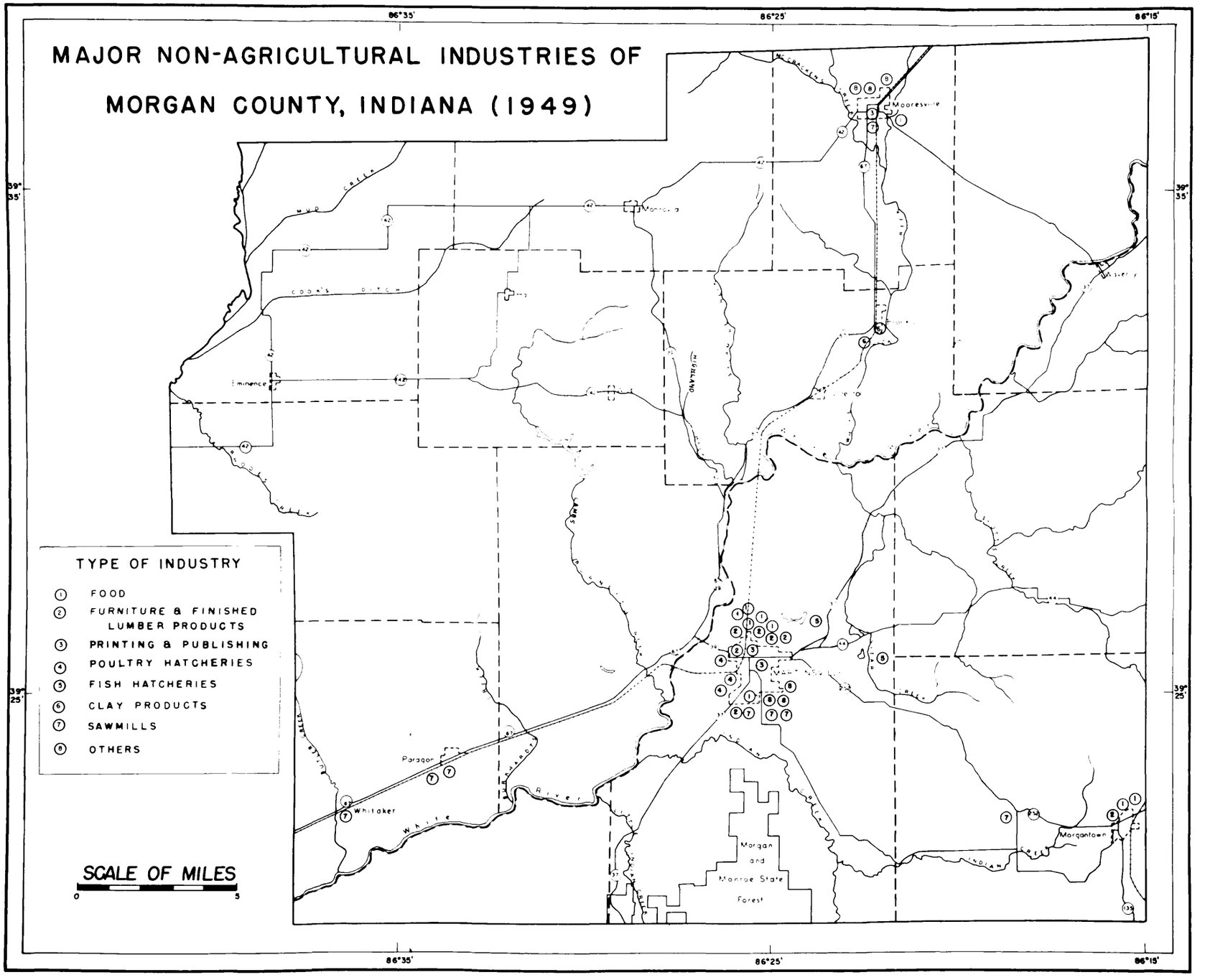

MAJOR NON-AGRICULTURAL INDUSTRIES OF
MORGAN COUNTY, INDIANA (1949)
86°35'
86°25'
86°15'
39°35'
39°25'
TYPE OF INDUSTRY
1 FOOD
2 FURNITURE & FINISHED LUMBER PRODUCTS
3 PRINTING & PUBLISHING
4 POULTRY HATCHERIES
5 FISH HATCHERIES
6 CLAY PRODUCTS
7 SAWMILLS
8 OTHERS
SCALE OF MILES
0
5
Mooresville
Monrovia
Eminence
Paragon
Whitaker
Morgantown
Morgan and Monroe State Forest
White River

FIG. 19

reasonably hope for new industrial life that will bolster more intensified agricultural production particularly of milk, poultry products, fruits, and vegetables. At the same time further migration of youth off the farms can be expected to accompany any further industrial growth. This outward migration is likely to be counterbalanced by a movement of urban families into the county.

Community Institutions and Attitudes

The Small Town or Village. Since World War I, there has been less reliance upon the small town. The little village of Whitaker which once boasted a sawmill, post office, freight depot, and two stores has now only the sawmill and one store. No longer is the post office a meeting place of the community. Likewise other towns and villages are dying. The sites of Mahalasville, The Bluffs, Exchange, and others are recognizable only to those familiar with the county's past. Centerton, Waverly, Eminence, and Hall also are shrinking villages. These small towns still have a place in the distribution of food products, hardware goods, and commercial feeds. However, they have lost much of their former importance as trading centers. The automobile, good roads, the coming of chain stores, and the ability of larger retail centers to undersell the small merchant have led to their gradual disintegration as centers of retail trade. Such recent practices as having free open air motion pictures one night a week in the small towns are illustrative of attempts being made to keep at least a partial grip upon the immediate community. But the pull of the larger distribution centers has been too great, and the fight of the small merchant has been a losing one. However, some of the small towns on main roads have remained more vigorous, because a shift in functions was feasible. Gasoline stations, restaurants, and residences for urban-employed workers have helped to maintain population, especially in Paragon, Morgantown, Monrovia, and Brooklyn.

Martinsville, the county seat, is the most important trading center with Mooresville a secondary center within the county. Since the most distant part of the county, is less than an hour's drive from Indianapolis, more of the residents of this county trade outside the county than do those of more isolated places. Although the presence of greater variety and better stocks in Indianapolis stores make them more attractive places to buy many articles, there are other factors explaining why Indianapolis gets such a large share of the county's trade. Recreational facilities are more attractive for those who can occasionally afford them. Also it must be recalled that a considerable number of people living in Morgan County have full-time jobs in Indianapolis. They commute and hence do much of their own shopping as well as an appreciable amount for others. Another sizeable group of workers are those who reside in Indianapolis during the week, but who have strong home attachments and spend the weekends at home. Naturally they do some or much of the family shopping along certain lines. Good bus service enables many to make these weekly visits home, while many others are able to travel by automobile. Certainly Indianapolis because of its proximity plays a very prominent role in the economic and cultural activities of the county.

Church. The church membership of the county is overwhelmingly Protestant, the most important denominations being Methodist, Baptist, and Christian. The Quakers are numerous in and near Mooresville. With the advent of the automobile and good roads, small country churches are having an increasingly hard time maintaining an active membership. Many of these small churches are unable to support a minister by themselves; consequently one minister often serves two or three churches which means that church services are seldom held more than twice monthly. Several of these small rural churches have been abandoned. During the past twenty years the declining position of the rural church as a strong

community institution is apparent. With this decline in small churches, small retail stores, and small post offices has come a loosening of community ties. The farmers have aligned themselves with bigger and bigger community groups and have become increasingly dependent upon the larger centers for their goods, markets, and their culture. As an influence upon the pattern of farming the church itself has not been especially strong in Morgan County.

Schools. The schools have been consolidated in the larger centers until today there are only about ten schools in the county as against more than three times that many 75 years ago. Even 15 years ago the small one-room schoolhouse was to be found in the less wealthy parts of the county. Today most of these are gone, and another small community institution has been replaced by the institution of a larger center. Probably one of the most forceful effects of this shift has been to increase the desire of farm youth to leave the farms for non-farm employment. The consolidated school has given rural youth a broader outlook and a better opportunity to train for non-farm occupations.

Organized Farm Groups — Farm Bureau, 4-H Clubs, Future Farmers of America, and Others. Such groups as these have had an important influence upon the community in recent years. 4-H clubs in particular have become increasingly active in this county, and they have exerted considerable influence in arousing interest in greater care in the breeding of livestock, the keeping of better stocks of poultry, the application of more fertilizers, the use of better seed, the adoption of better techniques of feeding and handling of livestock, and other improved practices. Young boys and girls are much more susceptible to change than older people. By example they have encouraged the spread of many better farming methods. Numerous farmers adopt new methods after their boys or girls persuaded them to let them enter the club. These groups are really significant influences in changing the agricultural scene. Their strength

varies with quality of leadership in different parts of the county, but an increasing interest in such activities in recent years is encouraging.

Governmental Agencies — the Agricultural Conservation Program, County Agent, Soil Conservation Service, Extension Service, and Others. Also of increasing importance has been the financial assistance and trained direction that various governmental agencies have been rendering. The advice and suggestions made are probably of much more long-lasting importance than the financial assistance. The ACP in helping to plan farm rotations has been helpful in improving farm practices. Encouragement in the use of lime and fertilizers has stimulated farmers to adopt them as more common practices. The County Agent is a well-qualified Purdue University graduate who has been a major asset to the agriculture of the county. In 1946 Morgan County was organized as a Soil Conservation Service district. It is just beginning to function as an important force in this county in helping farmers plan and carry out land use adjustments. As of January, 1950 there were 211 farms enrolled in the program. Much valuable aid and advice can be rendered by this agency, for erosion and fertility problems are numerous in the central and southern parts of the county. Even in the rolling till plain much improvement in the handling of the land is possible. The influence of Purdue University has probably not been as strong in southern Indiana (of which Morgan County is a northern part) as it has in north-central Indiana where it is located.

Summary

The decline of the small town as a market center for agricultural produce, dwindling membership in country churches, and consolidation of public schools indicate the weakening of community individuality and neighborliness. Cooperation among farmers no longer has its former importance. Accompanying these changes has come increased dependence on

state and federal advice and assistance. Farmers must now often turn to government agencies rather than to neighbors for help and advice. Much has been lost through excessive commercialization of agriculture that could lend stability and security to farm communities.

CHAPTER III

RIVER VALLEY AND UPLAND FRINGE

Introduction

Sharp differences in physical features and distinctive cultural contrasts divide Morgan County roughly into three separate parts. In land use the river valley and upland fringe differs from adjacent older uplands and till plain. Fig. 20 outlines the three major areas of the county along with their subdivisions. These are to be discussed in the following chapters, the purpose of which is to : (1) differentiate land use patterns of these areas, (2) relate the patterns to physical features, distribution and character of population, location in respect to main transportation routes and Indianapolis, (3) point out influences of changing institutions and technology, and (4) analyze the background and possible future solution of some fundamental problems.

Extent and Physical Characteristics

Travelling southwest out of Indianapolis on State Road 37 to Martinsville gives one a good view of the river valley gently merging with till plain upland. Crossing the river to the west of Martinsville and continuing southwest on State Road 67 enables one to see floodplain and terrace as sharply encompassed by a low but abrupt hill land horizon. Thus the river valley as shown in Fig. 1 is easily separated by soil contrasts from till plain upland and even more distinctly from the rough older uplands by a sharp topographic break. Morphologically the upland fringe is that part of the older uplands and the till plain which is peripheral to the river valley. Delimitation of the upland fringe was made primarily upon the basis of whether or not most of the farmers

LAND USE AREAS OF MORGAN COUNTY, INDIANA

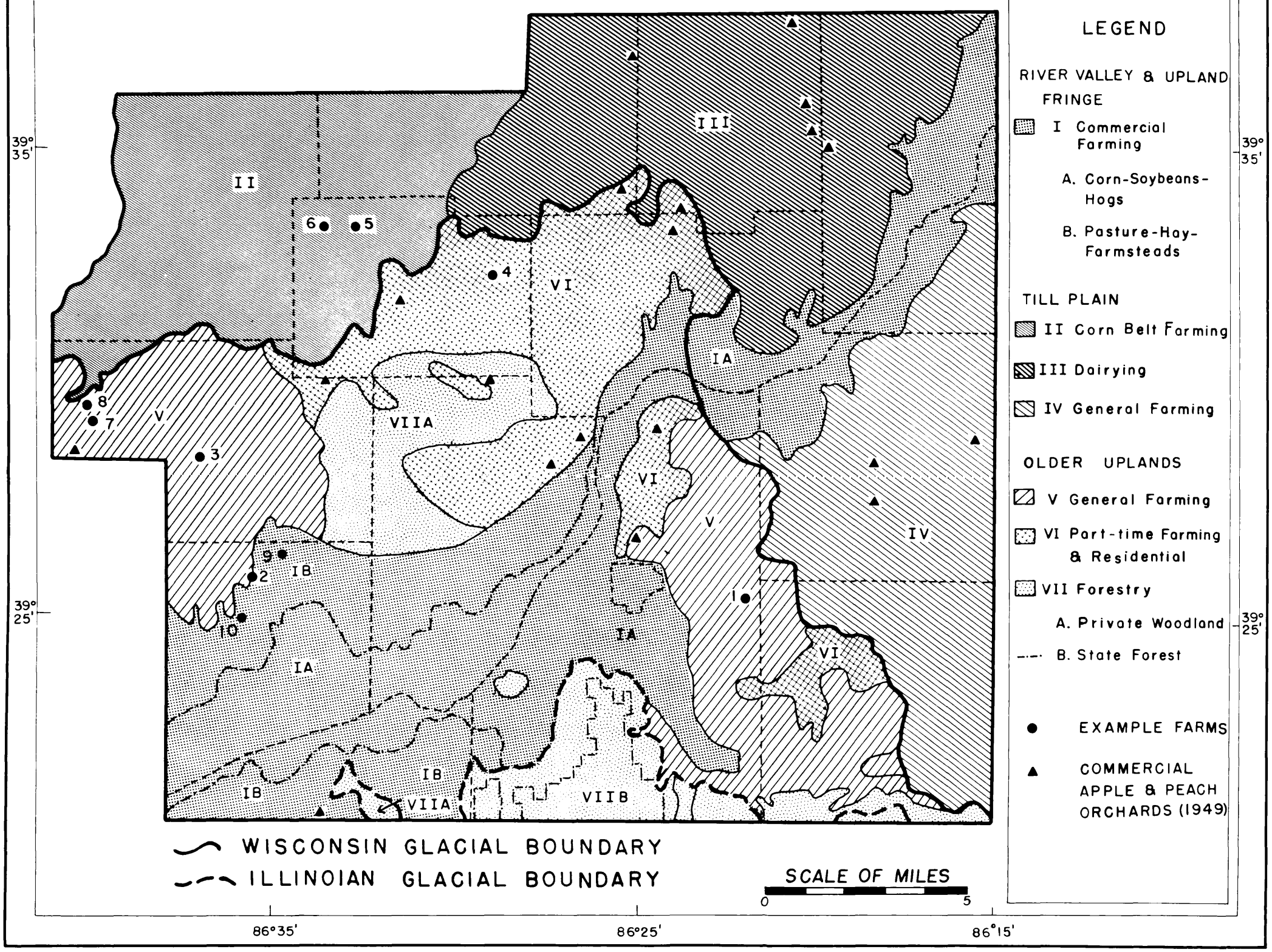


FIG. 20

living along this fringe were renters or owners of land in the valley. Using this criteria there is an absence of fringe in some places such as west and north of Martinsville, where, because of limited valley and abrupt transition to the upland, the few farmers who reside on the upland do not own or rent much land in the river valley. Likewise there is a very slight intermixture of till plain farmers who reside and farm only on the upland with those who live along the fringe and own or rent in the river valley. The broadest fringe zones are on both sides of the river in the southwest part of the county.

Reviewing briefly the description of the valley presented in Chapter I, the most distinctive features may be summarized as follows. It is extremely level with gentle transition from floodplain to terrace. A number of "old beds" or former river channels on the lower floodplain interrupt large level fields. Some of these remain in forests of sycamores, birches, willows, and soft maples; but many have been cleared and are used for crops. Since they dry out slowly after spring floods, farmers frequently must leave them idle or plant late corn or soybeans. With tractor equipment this is inconvenient because they break up many otherwise large fields so that more time and fuel is needed to tend them.

In concentrating population and transportation routes on the terrace and in placing major restrictions on land use floods have given a uniform pattern to the valley. Any flood, except those in January, February, or March, is likely to damage crops. A big flood after planting of crops means serious loss for those with cropland on the lower floodplain . It is this dependence upon the river that lends unity to the valley and adjacent fringe.

Unique Cultural Features

To study this area in detail, it was necessary to select (1) a contiguous cross section, and (2) a random sample of farms. Unpublished

minor civil division census data were not useable, because no township is completely in the valley and upland fringe. Careful observation of all of this area in the county was made before selecting a sample area for detailed mapping and analysis. A number of exceptionally large farms in Madison and Clay townships means that the cross section is not representative of some conditions in that part of the valley. Questionnaire returns and comparison with ACP data indicate the cross section to be an otherwise valid selection.

Associated with frequent floods is the absence of farmsteads, fences, and improved roads on the lower floodplain. Formerly summer farmsteads and a few year-around dwellings were situated within reach of the river. Now only roofless and tumble-down barns, a few forlorn fruit trees, broken crockery, or only a few isolated shade trees mark the places where these were once located. A careful field examination of the cross section revealed a number of these abandoned farmsteads, the location of which is indicated in Fig. 21 by small squares.

The almost complete disappearance of these farmsteads from the lower floodplain reveals two important condtions associated with land use. First the permanent houses were given up in favor of terrace sites, because increasing frequency of serious floods made year around occupancy impractical. Disastrous floods have been recorded since the earliest settlements; but their severity and frequency increased largely as a result of wholesale clearance of forest cover in the watershed northeast of Morgan County. This resulted in greatly accelerated runoff, particularly of winter snow cover and spring rains.

Disintegration of summer farmsteads has accompanied the passing of the horse. In the pre-tractor days several farmers would take their teams, older boys, and a supply of food to fields on the floodplain and "batch" while they were putting in a corn crop. Younger boys and the women took care of the livestock on the permanent farmsteads situated

FARMSTEADS and NON-FARM DWELLINGS in SOUTHWESTERN MORGAN COUNTY, INDIANA

(AS OF AUGUST, 1949)

▲ FARMSTEADS

■ ABANDONED FARMSTEADS on the RIVER FLOODPLAIN

● NON-FARM DWELLINGS

---- FLOODPLAIN MARGIN

—·—·— UPLAND FRINGE MARGIN

SCALE OF MILES

0 1

PARAGON

CREEK

67

DITCH

CREEK

WHITAKER

FALL

RIVER

WHITE

FORK

HODGES

BRYANT'S

BUTLER

WEST

CREEK

LICK

BRANCH

FIG. 21

principally on the upland fringe. To have travelled back and forth would have greatly shortened their working day in the fields. Now, with the rubber-tired tractor, it is much easier to operate these floodplain tracts which are separated from the home farmsteads.

Absence of fences on the lower floodplain signifies all cropland and no pasture. Driving along the terrace in winter looking out over the floodplain one is struck by the bareness of the land. Very few cover crops are planted and no livestock are seen. In spring this winter desolation is suddenly transformed into a scene of accelerated activity which continues into early summer when the corn is laid by.[1] Farmers with tractors, sometimes two or three in one field, are working fervishly to get corn and soybeans planted when weather and soil conditions are right. Before the tractor this was often impossible, consequently numerous tracts had to be left idle because planting was delayed until it was too late for the crop to mature before autumn frosts, which generally strike the valley a week or ten days earlier than on the adjacent uplands.

Noticeable to any passerby is the absence of improved roads on the lower floodplain. Dirt roads stand in abrupt contrast to well-maintained crushed limestone secondary and hard surfaced main roads on the terrace. Again this absence of improvement reflects the almost complete abandonment of the floodplain in winter. Since the advent of the tractor some grading of roads has been done to get better drainage, permitting them to dry out more quickly.

Influential in shaping land use is the broken farm, which is restricted mostly to the valley and upland fringe.[2] By broken farm is

---

[1] When corn is laid by, it has received its last cultivation.

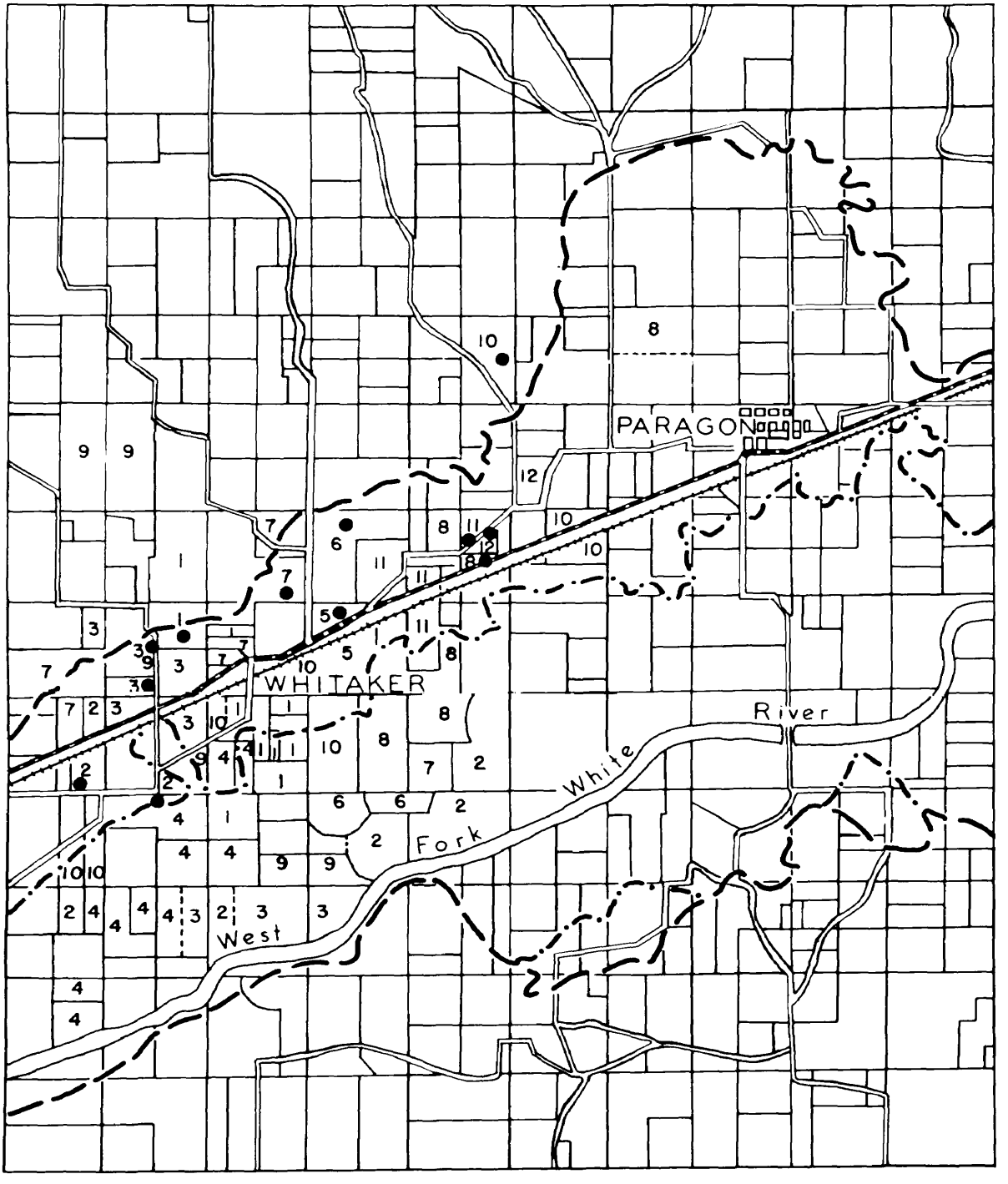
[2] A number of such farms were observed in the northwest part of the county, but otherwise they are relatively few in number.

meant the separation of the farm into a number of widely scattered tracts. In some instances a farm may include non-contiguous tracts located on upland, terrace, and floodplain. All but two of the 25 farms in the sample are of this type. In Fig. 22 a number of farms are located to illustrate this very common pattern. The type as found here is explained by two conditions. There is a concentration of farmsteads, pastures, and hay crops on the terrace and upland fringe and much of the cropland on the floodplain. Secondly the increased size of farm accompanying the introduction of the tractor has increased the number of separate tracts per farm, since few farmers are fortunate enough in getting all their cropland in one locality. Associated with the broken farms is another characteristic of river valley farming, namely the renting of land from more than one landlord.

This broken farm pattern significantly affects land use in a number of ways. Most important perhaps is the discouragement of winter cover crops such as rye, since it is inconvenient to pasture fields remote from the farmstead. Similarly it also discourages using distant fields for hay crops because of difficulty in hauling bulky hay long distances. Now that much hay is being baled in the field, the rotations in distant fields should not suffer so much because of their remoteness. A third influence was the discouragement to milking cows in pre-tractor days. A farmer who spent an hour or two each day during the cropping season in getting back and forth to his fields wasn't too much interested in getting up before dawn and working into darkness at nightfall to milk a herd of cows. These handicaps of the broken farm have been important in excluding dairy cattle from farms.

Two cultural alignments are expecially impressive on the terrace — the presence of main roads and the railroad and distribution of population along these main routes. Maps and text in previous chapters (Figs. 2 and 18 and pp. 72-73) describe this concentration. Also illus-

BROKEN FARMS OF THE RIVER VALLEY AND UPLAND FRINGE



DISTRIBUTION OF 12 FARMS AS OF MAY, 1950

MARGIN OF FLOODPLAIN

UPLAND FRINGE

LOCATION OF FARMSTEAD

SCALE OF MILES

0 1

FIG. 22

trating the distribution of population in greater detail is Fig. 21 in which the distribution of farm, non-farm, and abandoned dwellings are shown. This intermixture of farm and non-farm population is indicative of similar areas designated in Fig. 18, which classifies population according to predominance of farm and non-farm elements.

The disappearance of numerous small houses scattered throughout the terrace and upland fringe areas marks the passing of the hired hand. The tractor and the pull to the cities have eliminated him. Formerly the hired hand was a more or less permanent fixture on many farms. He was kept the year around and lived in a small house available on the farm. Usually the hand was given this house, stove wood, a hog, so much flour a month, and plenty of space for a truck patch and garden. Now these small houses that formerly were so common in the community have largely disappeared. The young hired hand of yesterday who acquired his start in farming through working for an established farmer no longer is able to start up the agricultural ladder in this manner. To supplement their labor today farmers are relying, during seasons of peak labor demand, upon boys of high school age and their young sons. Many of the jobs that kept a hired man employed during the winter, such as hauling out manure, caring for horses, and cutting wood are no longer time-consuming farm work.

Evolution of Land Use

As shown in Fig. 12, first purchases of land in Morgan County were concentrated on the river terrace and along adjacent creeks, especially White Lick Creek. Thus these were the first cleared parts of the valley, but it wasn't long until land on the lower floodplain was purchased, many purchases being made by those who had already taken out land on the terrace. Consequently some of the early landowners controlled very sizeable holdings. By 1900 much of the valley had been cleared with the

floodplain next to the river, old beds, and poorly drained tracts along lower creek courses remaining as the only major uncleared tracts.

As fertility levels began to sag on the terrace and adjacent upland fields, farmers in those areas turned more and more to alluvial soils to raise corn. This enabled them to lengthen rotations on terrace and upland fields. Little attention was paid to fertility on the floodplain; for owner and tenant alike regarded it as relatively inexhaustible, because of year to year renewals through floods. As late as 1940 a number of fields on the lower floodplain had been planted in continuous corn for over 20 years. One 100 acre tract had corn as its only crop for over 30 years. Since the latter part of the thirties it has been a common practice to rotate soybeans and corn, probably without much benefit to the soil on the overflow land. This is because loosening of soil by the roots encourages accelerated washing.

Before the introduction of the tractor farmers who didn't own land on the lower floodplain would rent small acreages from owners, many of whom had more land than the could crop themselves. Land was plentiful and a good renter was prized by larger landowners. Since 20 acres of corn was considered about all that one man and one team could satisfactorily handle, a large owner would rent to a number of tenants. Today this is generally reversed with a tenant renting from more than one landlord in order to get enough land. These early tenants generally owned smaller terrace and upland farms on which they were unable to grow enough corn to follow an economical livestock feeding program.

A 50-50 sharing of the crop has long been the accepted rental. However, since the tractor there is a much stronger competition for land on the floodplain, which means that owners are selecting their tenants more carefully and in some cases are getting more rental. This increase in rental is not through a change in the 50-50 share, but rather is through the renter cribbing corn for the owner, furnishing fertilizer, and doing

various favors. While these agreements on the part of the renter to do a little more are relatively insignificant, they are indicative of a growing scarcity of good land available to those who need larger acreages to maintain added mechanical equipment now needed on farms. For the past 20 years a farmer with a team of horses has found it increasingly difficult to rent overflow land, since owners are convinced of the advantages of using tractors on the lower floodplain. In the first place tractors can get crops planted at more opportune times when the ground is not too wet to work. After a late flood in May it is vital to get a crop planted quickly. Generally tractors are kept going 24 hours a day to cope with such a situation. Secondly, if a June flood drowns out corn or soybeans already planted, the ground can be rapidly reworked and replanted, usually in soybeans which will mature more quickly than corn. Lastly, the corn picker and the combine have greatly lessened the danger of losing a mature crop of corn or soybeans, since these crops do not have to stay in the fields as long as formerly. Consequently relatively common December and January floods are not the problem today that they were before the introduction of the corn picker in the late thirties.

Accompanying these observable land use changes wrought by increasing mechanization and 125 years of cropping is a change in attitude toward the land. First the owners of hill and terrace land began to use less exhaustive cropping programs. While lime and fertilizer applications are still inadequate and rotations yet have too much emphasis on row crops, there is a growing realization that fertility is a diminishing phenomenon which can be corrected by proper attention and care. On the floodplain where inherent fertility is greater, owners and renters are still following two and three-year rotations with corn and soybeans on the land three-fourths of the time. Although farmers on the lower floodplain have always looked to floods for renewal of fertility, there is a

growing realization that these soils are not producing as well as formerly. However, on both floodplain and terrace more is still being taken out by crops, leaching, and erosion than is being replaced by fertilizers, plowing under of crop residues, use of cover crops, and similar measures. With the growing realization of need there will come further evolving improvements in land use. The critical factor is time. The sooner a more balanced cropping and livestock program becomes a general practice the easier it will be to attain a more permanent agriculture in the river valley and upland fringe.

Present Land Use Patterns

In addition to these distinguishing characteristics differentiating the valley and upland fringe from other areas in the county, it remains to present further data to clarify land use patterns and furnish a background for analysis of problems of this area.

Major Uses of Land in Farms and Type of Operator and Owner. In Photograph 10 an aerial picture of the valley and upland fringe illustrates the distribution of major land uses. On the floodplain cropland is dominant with only scattered ribbons of woodland in old beds, along creek courses, and along the river. On the terrace there is a mixture of cropland and pasture much of which is permanent rather than rotation. Scattered clumps of trees constitute open woodland here. The upland fringe is easily detected on the photographs by the intermixture of cleared land and woodland. The cropland of this fringe is largely along creeks or on ridge tops, the slopes being too steep for that use. These slopes are mostly in woodland pasture, although an increasing acreage of predominantly forested areas are no longer grazed.

Table VI contains data essential to the understanding of Photograph 10. In the first place there is an increase in the size of farm as degree of ownership decreases. Thus a full tenant farms about 125 more

acres than a full owner to derive a comparable farm income.[3] Likewise the part owner farms 60 acres more than a full owner to attain the same end. Secondly, cropland acreage rented is four times as great as acreage owned per farm. Thirdly, pasture acreage owned is twice as great as acreage rented per farm. These facts imply (1) a great dependence upon rented land to obtain most of the farm income and (2) a concentration of the more productive tracts in non-operator ownership.

TABLE VI

Major Uses of Land in Farms and Status of Operator
(Based on personal interviews)

	Number of Farms in Different Categories (25 Farms)	1948 Average Acres Per Farm (25 Farms)
Full owner operated farms	3	
Part owner operated farms	14	
Full tenant operated farms	8	
Size of farm		233
Cropland		170
Rented from others		136
Owned		34
Permanent pasture (largely unwooded)		41
Rented from others		13
Owned		28
Woodland pasture, woodland, and farmsteads		22
Rented from others		12
Owned		10
Size of full owner operated farms		158
Size of part owner operated farms		218
Size of full tenant operated farms		287

[3] The census definition of tenure of operator is used throughout this study.

PHOTOGRAPH 10

An aerial photograph of White River Valley and Upland Fringe. Location of the area covered by this photograph is shown in Fig. 2. The view coincides closely with the western two-thirds of the area shown in Figs. 22, 23, and 24. Scale is approximately two inches to one mile. The bound edge of the photograph is approximately north.

If the aerial photograph (Photograph 10) and soil productivity map (Fig. 8) are compared with Figs. 23 and 24 (based on field work by the author) this dependence upon rented land and concentration of the more productive land in non-operator ownership is clearly indicated. The great preponderance of part-owner and tenant-operated land on the floodplain is illustrated by Fig. 24 which shows the distribution of tracts operated by full owners, part owners, and full tenants. On the upland fringe there is a heavy concentration of tracts operated by full owners. To a lesser extent owner-operated land predominates on the terraces. Good alluvial soils have encouraged tenancy. On the upland fringe rented land is predominantly made up of tracts rented by part owners rather than full tenants. Much of this rented land on the upland fringe is owned by retired farmers and widows. When these older people die, the estates falling to non-farmer heirs are frequently sold, since little income can be realized through renting these small units to neighboring farmers. Generally a young farmer of today in this area must buy an upland or terrace tract in order to get buildings and some pasture as a base of operations. He usually cannot afford to buy both his cropland, which is largely on the floodplain, and his farmstead in two separate tracts. Thus it is generally true that farmers of this area now own the poorer upland and terrace tracts and rent the better floodplain and terrace fields.

The distribution of three owner classes shown in Fig. 23 further emphasizes the absence of owner operators on the floodplain with a preponderance of owner operation on the upland fringe and to a lesser extent on the terrace. Out-of-county ownership is principally of two types: (1) that owned by retired farmers and widows who generally reside in neighboring towns and cities and (2) that owned by those who are investing money in land. This money has for the most part been accumulated in non-farm enterprises. Most of the purchased tracts on the floodplain

STATUS OF LAND OWNERSHIP IN SOUTHWESTERN MORGAN COUNTY, INDIANA

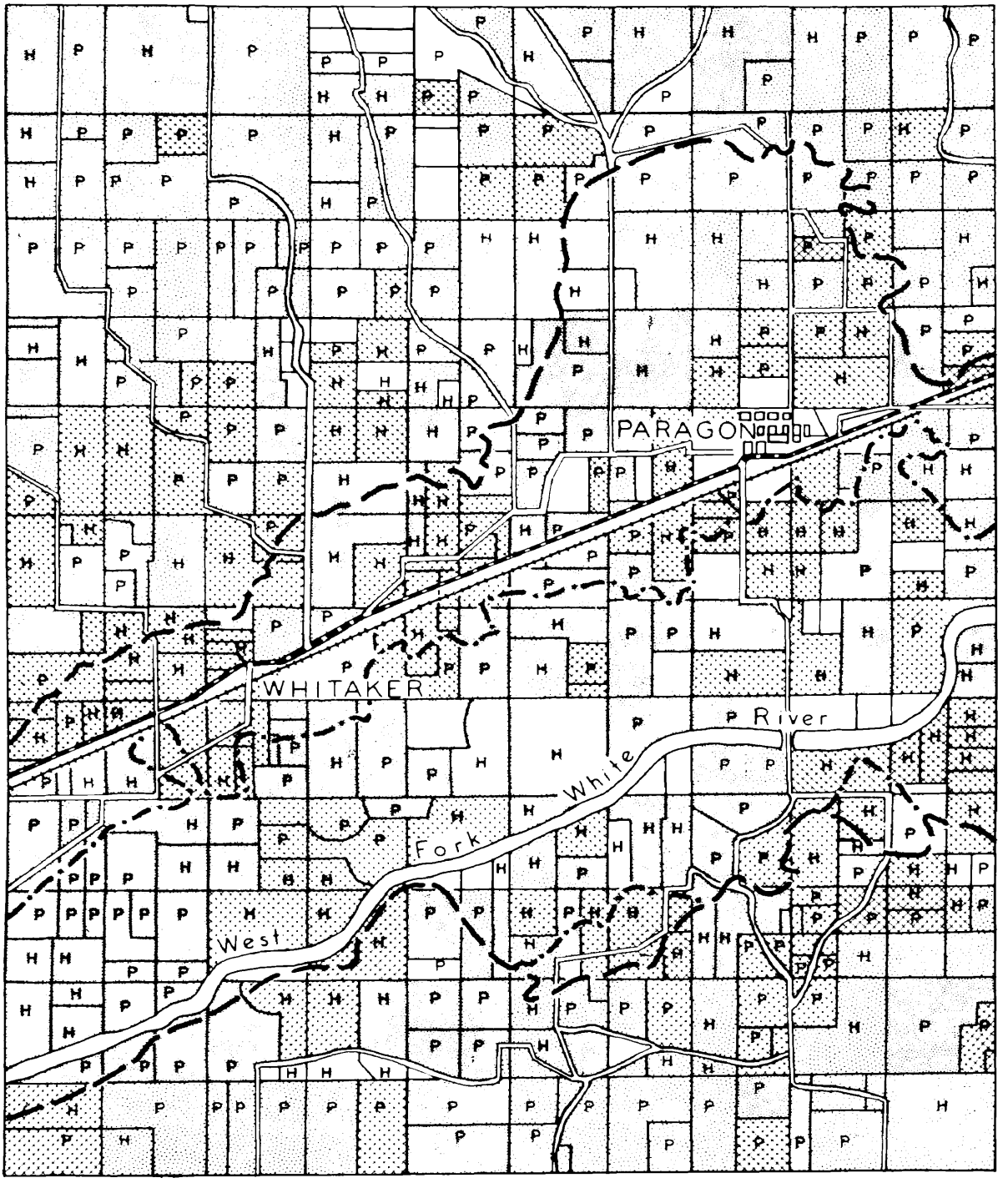


FIG. 23

STATUS OF FARM OPERATOR IN SOUTHWESTERN MORGAN COUNTY, INDIANA

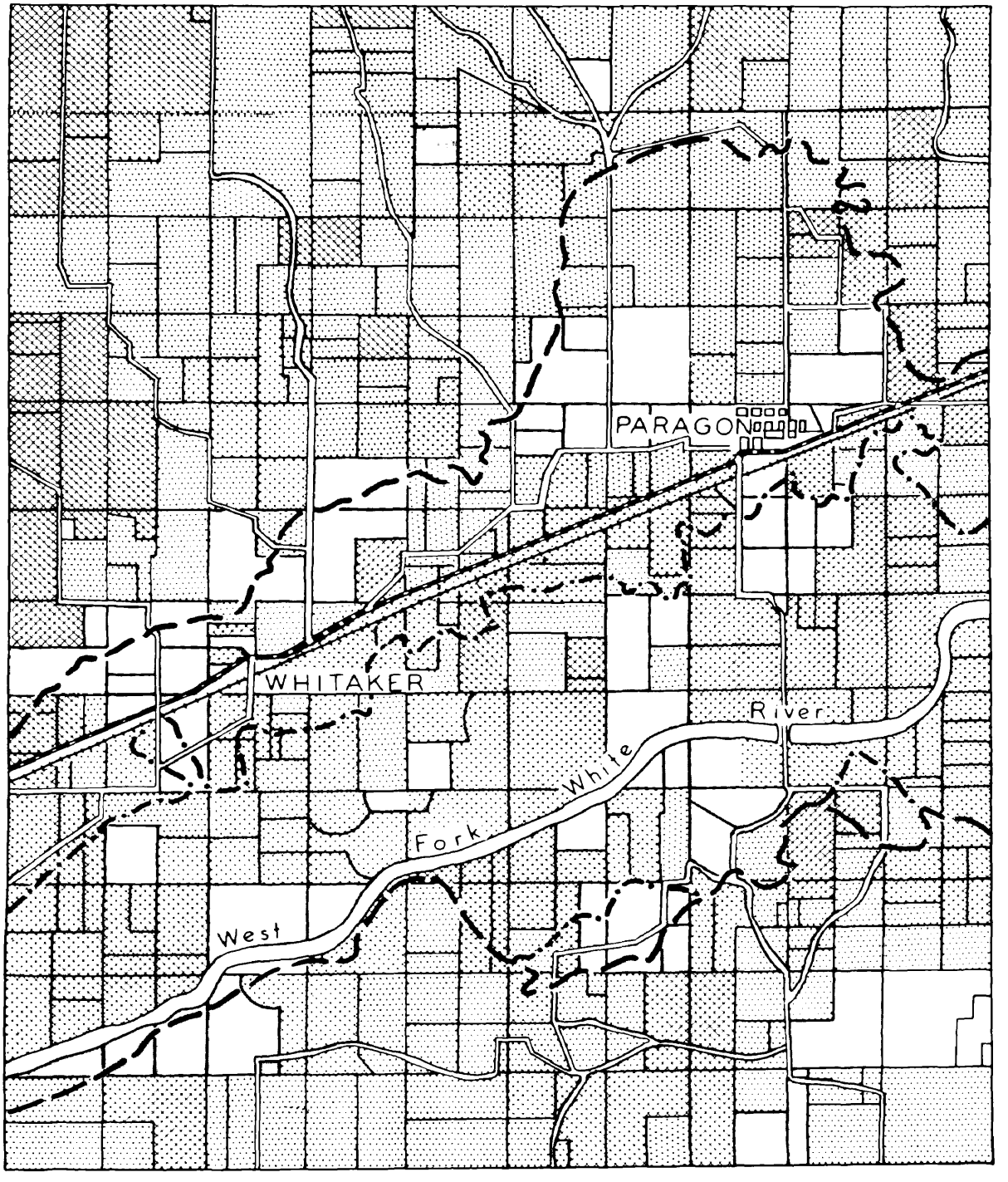


FIG. 24

are owned by the non-farm group of absentee owners.. Growing ownership by this non-farm group is encouraged by the fact that this land sells for a high price in tracts generally too large for one farmer to buy. For example, a tract of 85 acres recently sold for $17,000 at $200 an acre. The tract was completely unfenced and had no buildings. The little owner-operated land on the floodplain is owned by older farmers who will soon be passing on this land to heirs, many of whom are engaged in non-farm occupations. In many cases these heirs will offer the land for sale in order to buy urban property or for other reasons. Farmers of the valley will not be able to afford the purchase price and so other tracts will pass into the hands of absentee non-farm owners.

The contrast in size of farm and status of operator between this area and other parts of the county is marked. Nowhere else are farms so large and full ownership of the land so small. This is summarized in Table VII. Principal reasons for greater size of farms in this area are (1) higher rate of tenancy and (2) intermixture of cropland and land unsuitable for that purpose on the upland fringe. In other parts of the county cropland owned exceeds cropland rented, whereas in the valley cropland rented greatly exceeds that owned.

Major Crops. Corn, soybeans, wheat, oats, alfalfa, and other hay (principally red or Big English clover and/or timothy) are major crops of the river valley and upland fringe. Table VIII indicates that corn acreage is twice as great as that for soybeans, about four times that of wheat and oats, and over five times that of total hay. Corn has declined while soybeans have increased in acreage. Wheat has declined markedly with oats and soybeans supplanting it. Oats are still widely raised and are used in ground livestock feeds. The major shift in hay crops has been to more alfalfa and away from timothy and/or red clover. In 1948 all of the 25 farmers in the sample were raising corn, all except one were raising soybeans, only 17 were growing wheat, 21 were growing oats,

TABLE VII

Areal Contrasts in Size of Farm and Status of Operator

(Based on interviews (1949) and unpublished Minor Civil Division Census data, U. S. Bureau of the Census, 1945)

	Average Size of Farm (acres)	Full Owners %	Part Owners %	Full Tenants %	Manager Operated %
River Valley and Upland Fringe (Returns from interviews, 1949)	233	12.0	56.0	32.0	0.0
Till Plain					
(1) Corn Belt (Adams Township)	111	48.4	24.3	27.3	0.0
(2) Dairy Segment (Brown Township)	93	76.2	.5*	18.2	5.1
(3) General Farming (Greene Township)	121	65.6	17.4	17.0	0.0
Older Uplands					
(1) General Farming (Ashland Township)	113	65.2	17.9	16.9	0.0
(2) Part-time Farming & Rural Residences (Gregg Township)**	85	66.6	12.1	21.2	.1

*This appears to be a possible error in census returns.

**This township does not lie completely within the older uplands, the northwest corner lying on the till plain.

and all except two were growing some hay.

In 1946 about five-sixths of the corn and soybeans were grown on rented land which constituted four-fifths of the cropland. However, only one-half of the hay was grown on rented land, which suggests a less exhaustive cropping program on owner-operated land. Corn and

TABLE VIII

Major Crops of the River Valley and Upland Fringe
(Based on Personal Interviews in the Sample of 25 Farms)

Crop	% of Cropland Harvested
Corn	44.3
Soybeans	22.6
Wheat	11.8
Oats	10.6
All Hay	8.1
Alfalfa	4.6
All Other Crops	2.6

soybeans dominate on the floodplain as indicated by Photograph 11 which is a representative scene. Oats with sweet clover but very little wheat are grown on the floodplain. Hay crops are predominantly raised on the terrace margins of the floodplain or on the terrace. Alfalfa is concentrated on the well-drained terrace soils, since it is easily frozen out on less well-drained alluvial soils.

Limited data on yields show average 1948 corn yields of 71 bushels for the floodplain and 67 bushels for the terrace. In 1945 yields were 53 and 51 bushels respectively (49, p. 178). Soybean yields in 1948 were 27 bushels on the floodplain and 25 bushels on the terrace. That these yields are only slightly different, reflects greater use of commercial fertilizer, manure, cover crops, cropland for winter pasture, and other practices on the terrace that are very seldom employed on the floodplain.

Lime and Fertilizers. Use of lime and fertilizers in the river valley has been a relatively recent development. Whereas upland farmers reported using commercial fertilizer for 35 to 40 years on wheat and 15

PHOTOGRAPH 11

Late summer view of White River floodplain with corn and soybeans the dominating crops. Woodland areas are in old river beds to the left and along the river in the distance. It is about three-fourths of a mile to the river.

to 20 years on corn, river valley and upland fringe farmers reported using fertilizer on wheat for only 15 years or less and on corn practically all farmers who are using fertilizer started doing so within the last five years. The application of lime to terrace and upland soils has been greatly stimulated by the ACP allotment program initiated in the late thirties (then the AAA). The soils of the lower floodplain need little or no lime. While all 25 farmers in the sample except one reported use of fertilizer, most of the fertilizer is being applied to the upland fringe, terrace, and terrace margin of the floodplain. Very little is being applied to alluvial soils.

Although these farmers have suddenly become fertilizer conscious in response to stimulation of high prices for agricultural commodities, the amounts applied per acre are quite small compared to those generally applied to wheat and corn in the East. Likewise there is a lot of "shotgun" fertilizing with many farmers not bothering to get their soils analyzed in order to establish deficiencies. This is an inefficient and costly practice and explains the reaction of many farmers who feel they aren't getting enough for their fertilizer money. Failing to apply sufficient lime to make phosphorus in particular effective is another weakness. However, two to three tons applied every four to five years is becoming a common practice on terrace and upland fringe. Most farmers are using 125 to 175 pounds of fertilizer per acre with only three of the 25 farmers interviewed reporting more than 250 pounds applied. Fertilizer formulas used by farmers are generally not strong enough to be most economical. A 2-12-6 formula was being used on eight farms, a 3-12-12 formula on ten farms, with 0-15-15 or 0-20-20 formulas used on only four farms. Greater effort to grow the nitrogen is needed, since sufficient applications of this relatively costly element are not being made to raise yields to the point where greatest return will be obtained. This can be done efficiently through greater use of animal manure, green

manure crops, and legume hay.

No river valley and upland fringe farmer reported broadcasting fertilizer, all of it being applied in planter or drill along with the seed. Fertilizer is being used on all crops, but most on corn and least on soybeans. Thus this area is only in the initial and very immature stage of fertilizer application.

Rotations. Crop rotations in the river valley are still generally exploitative. Farmers are not taking into careful consideration the varying capabilities of their soils. Six of the 25 farmers reported two-year rotations on alluvial soils, but a corn-soybeans-wheat or oats with sweet clover rotation was more commonly used. On the terrace soils a three-year rotation is widely used. All but two of 14 rotations on the terrace included corn and soybeans for two of the three years. No two-year rotations are being used. The common one-year verbal rental arrangement for river valley cropland is a major factor retarding proper crop rotations.

The statement of a typical farmer with a sense of humor illustrates the prevalent careless attitude toward rotations in the river valley. Explaining his cropping program to a group of soil conservation supervisors last summer (1949), this farmer pointed to a nearby field on a creek floodplain and remarked: "Now there's a field on which I've been following a four-year rotation — four straight years of corn and not less than 100 bushels to the acre any year." To conserve soil resources, less emphasis on row crops is necessary in the river valley. On the terrace more hay and rotation pasture should be combined with a stronger livestock program in order to maintain soil fertility. This means better soil cover in winter than most farmers now employ. On the floodplain where pasture is not feasible under present flood conditions, a greater use of cover crops to protect soil in winter against leaching and flood washing is needed. Particularly increased use of soybeans

which greatly loosen the soil are subjecting overflow fields to loss of topsoil through washing. The Soil Conservation Service is recommending a cover crop of rye to follow corn and soybeans if winter wheat is not sown. This could be plowed under the following spring and oats sown with sweet clover. Increased attention to the maintenance of organic matter is the most urgent fertility problem facing practically all farmers of the river valley.

Livestock. Practically all livestock are concentrated on the terrace and upland fringe, since almost none of the overflow land is fenced. Hogs and milk cows are the predominant classes of livestock found in the river valley and upland fringe today. No sheep and no horses were reported on the 25 sample farms. Only seven of the 25 farmers were keeping beef heifers or steers. The average number of feeding hogs reported per farm in August, 1949 was 37. Five sows per farm were average. Five farmers were not keeping sows, but all had some hogs. Six milk cows per farm reflects the presence of some big herds rather than a widespread interest in dairying. Three farmers kept no cows at all and eight of the 25 were keeping only one to four cows. Seven of the farms had herds of ten cows or more. Only two of these were producing Grade "A" milk. Four of these seven herds of ten or more cows had been started since 1945. Jersey, Guernsey, and milking Shorthorns are the most common breeds kept. Too few animals are being kept on the terrace and upland fringe to consume even the renter's share of grain produced on the floodplain, to say nothing of the absentee owner's share, a large part of which is sent out of the area.

Problems Associated with Rented Land

Conservation and use of land in the river valley is greatly affected by the fact that four-fifths of the cropland is rented. While not restricted to the valley, nowhere else in the county are tenants and ab-

sentee owners so numerous. Here inherently fertile alluvial soils have encouraged a high proportion of rented land. Furthermore it is land that absentee owners looking for a good investment are quick to buy, for it can stand a lot of rough treatment and at the same time needs relatively little attention from the owner. There are no buildings to maintain and rent to a tenant. There are no complicated livestock share agreements. One large absentee owner in the southwestern part of the county has repeatedly remarked that two tracts on which there are buildings and pasture are more trouble than all his other numerous holdings. This attitude is not conducive to good cropping practices and livestock programs.

Renting Land. The young farmer of fifty years ago who started to farm with a team of horses and very little equipment was generally able to buy a farm at least nearly adequate to absorb his own labor. If he had several sons, he resorted to renting land from which he increased his income with relatively little additional capital needed. The river has always been a hindrance to establishing a farmstead on the floodplain; consequently the young man of fifty years ago had to purchase his buildings (or build them) on the terrace or upland fringe. Purchase of such a farm generally left little or no money with which to buy additional high priced cropland on the floodplain, therefore he continued to rent about 20 acres if he had only one team of horses, more if he could afford a hired hand or had sons. Thus physical restrictions imposed by floods have always encouraged renting cropland on the floodplain.

In the late twenties and early thirties the tractor began to appear on river valley farms. The young man who formerly was able to use his savings to buy a farm is now faced with the necessity of buying a tractor. Today the capital needed for machinery is so great that many young men wanting to farm and who have not inherited land or will not be in line to inherit land are faced with a single alternative — rent their land.

The Division of Agricultural Economics of Purdue University estimated in 1946 that "$7,500 or more may be needed to stock and equip an economic sized farm in central Indiana under present conditions" (60, p. 2). That is a large sum for a young man with no security to raise. A common way of getting a start is for the son to rely upon father. Often a partnership arrangement is made.

A typical example of how several young men in the river valley and upland fringe are getting started in farming today is cited here to illustrate the difficulty faced. Upon the boy's graduation from high school in 1939 the father was living on an 80-acre farm inherited by the mother as her one-third of an estate left by her father. Shortly after the boy graduated, he married. The father then purchased a run-down 90-acre hill farm nearby which still had a good house on it. The son stayed on the first farm which is situated on the floodplain margin of the terrace. On the two farms there are 120 acres of cropland, 50 of which are on the hill farm and 70 on the terrace. There are 48 acres of pasture, 10 of which are wooded. A second tractor, a corn picker, and a combine have been added to the equipment owned by the father before the partnership was formed. In order to make an economical farm to support two families an additional 248 acres of cropland are rented from five different landlords. All but about 20 acres of this rented cropland is on the floodplain or on the adjacent terrace margin. The agreement is for the father and son each to get one-fourth of the crops from the rented land and the son is to get one-half from the farm on which he lives. Livestock are not kept on a partnership basis.

All except one of the seven young farmers less than thirty years of age interviewed were receiving similar financial aid or had inherited land from their parents. None had served as hired hands beyond high school graduation. However, only one of these seven young farmers was in line to inherit enough land that he would not have to rent from others

after his father died. He is now renting solely from his father. The tractor has reduced the number of renters and at the same time greatly increased the acreage per renter. The man who formerly rented a few supplementary acres of cropland from his neighbor who owned more than he could tend, now rents four-fifths of his cropland from retired farmers and to an increasing degree from absentee landlords.

Changing Patterns of Ownership. Many living in the White River valley are keenly aware of the gradual loss of ownership by active farmers. Fifty years ago fertile floodplain and terrace lands were still very largely owned by active farmers and by retired farmers and widows living on farms or in small towns in the community where they or their husbands had farmed. Few non-farm accumulated savings had been invested in this land. Also there had been little inherited land passed on to heirs who had established themselves in urban occupations outside the county. Community activities -- schools, roads, churches, and other public enterprises were strongly supported by local residents. Today, many small churches find it difficult to pay a full-time minister. Just last year (during a period of prosperity) the taxpayers of Ray Township voted down improvement of antiquated rest rooms in the local public school -- too many of the taxpayers owned property but had no children going to that school.

As illustrated in Fig. 24 the land owned today by retired farmers or non-farm owners living within the county and by owners living outside of the county accounts for a major part of the total land in the river valley. When one recalls that practically all of this land was originally purchased by farmers who resided on the land, one is impressed by the short time required to alienate the better cropland from the farmer. The study of a plat map (84) made in 1909 reveals that most of the land was still owned either by active or retired farmers living within the county; therefore it has been within the past forty years that most of

the transfers to out-of-county-ownership have been completed. The study of Paragon High School graduates reported in Chapter II (pp. 71-72) helps to explain some of the absentee ownership of land. The lure of urban jobs and increased mechanization have gone hand in hand in taking youth off the farms. With these youth went the ownership of inherited land. For those who did stay on the farm with their share of the inheritance there was the problem of buying out the other heirs in order to acquire an economical farm. Often this meant a heavy mortgage which could not be paid. During the thirties farmers had little or no savings with which to buy land, so the way was open for those with savings to buy tracts as they became available. These investors were men who had made their money in enterprises other than farming. Some are former residents of the county or have had some connection with the valley. The transfer of ownership to non-farm control is illustrated by a survey of thirteen retired or retiring farmers over 60 years of age. Each owns more than 100 acres of valley land in Ray Township. These farmers have 30 children who are potential heirs of 3,285 acres of land. These farms are the last fully owned farms in the river valley of Ray Township that are large enough to be economical units in this modern tractor age. Eight of the farmers owning 1,567 acres of land have 14 heirs all of whom are engaged in non-farm occupations. It seems certain that with the possible exception of only two of these heirs none will ever consider returning to the farm. Only two farmers each with only one heir will leave their land to a farmer son. The other three farmers having fourteen heirs will leave estates presumably to be divided equally among six children who are now farmers or married to farmers and eight who are engaged in non-farm occupations. All of these older farmers who are now stepping down have inherited most of the land they now own. Much of this land has been in the same family since the time of original purchase. With the passing of these older farmers an era is coming to an end, the

era when inheritance gave the young farmer a real start in life. The next generation of farmers will not have this advantage. After 125 years these tracts of less than 100 acres, much of which is not highly productive land, are about all that is left to the farmer. Since these are uneconomical units, he must rent from a landlord who now is generally no longer a fellow or retired farmer. This separation of the farmer from his best cropland has far reaching implications, which are well summarized in a published letter of the late O. E. Baker to an Amish gentleman in Lancaster County, Pennsylvania.

> A vast rural proletariat is developing, and the Nation may soon have as many property-less people in the country as it has in the cities . . .
>
> Now, the land is the foundation of the family, and the ownership of the land is the last bulwark of freedom. When a man is dependent on another man, or a corporation, or even the State, for the support of himself and his family, he is cautious about what he says. The farmers who own their farms are the last group of really free people in the Nation (50, p. 2).

However, tenancy and misuse of land need not necessarily be associated with each other. In England where tenants are generally much more secure on the land they rent than in most parts of the United States, tenancy and conservative farming very frequently are found together. The lack of mutual confidence and the growing separation of owner and operator in the river valley of Morgan County are detrimental to the establishment of land use patterns leading to a more permanent agriculture in this area. The physical handicap of floods combined with the general need for larger acreages and more capital on farms and the migration of ownership to the cities has given these river valleys a tenancy problem that will have no easy solution. That practically no valley land is returning to the farmers during the current period of high prices for agricultural produce means that there has been no reversal of trend here (53, p. 93).

CHAPTER IV

LAND USE CONTRASTS ON THE TILL PLAIN

Location, Extent, and Subdivisions

Pronounced physical changes are observed as one approaches Morgan County from the east, north, or northwest. The very flat plain of central Indiana becomes more rolling, and on a clear day it is possible to observe readily the distinct topographic break between till plain and rough upland some five to ten miles south of the county boundary. Also noticeable is a marked vegetational contrast between largely cleared plain and forested hill land. Streams have cut only very slight valleys below the surface of the plain, whereas pronounced steep-sided valleys are numerous in the hilly sections. Dark soils become restricted largely to depressions which are not as numerous as on the flat plain to the north.

Traversing this plain from west to east in Morgan County also emphasizes less noticeable but significant physical contrasts which partly explain marked local differences in land use. In Fig. 20 the extent and subdivisions of the plain are presented. From west to east increase in depth of soil leaching, decrease in organic matter, increase in degree of slope, change from poorly drained to well-drained soils, and general decrease in level of productivity are important physical transitions. When combined with relative nearness and accessibility to Indianapolis, the cultural significance of the Quakers, and the time and manner of settlement, these have molded and crystallized present land use.

Three patterns may be differentiated. In Fig. 20 the northwest segment is labeled Corn Belt, since it is an integral unit of that highly commercial agricultural region. Dairying is typical of the north-

east. In the eastern portion less commercialized general farming predominates. Although these are delimited by distinct boundaries, it must be emphasized that no such pronounced delimitation actually exists; however, relatively narrow rather than extended zones of transition are characteristic. Several cultural differences reflect diversity in agricultural utilization of this plain.

Cultural Contrasts Related to Land Use

The Corn Belt. The western segment consists of rolling upland surrounding a sizeable lacustrine plain of approximately 8000 acres. Two large dredged open ditches and many smaller ones situated along roads indicate the poor natural drainage of this lakebed. Relatively more organic matter and less leaching enable these soils to stand, for the present at least, the rough treatment of short rotations with major emphasis on corn and soybeans. The absence of farmsteads in the lower lakebed reflects dampness of the ground and former danger of flooding. Otherwise farmsteads are evenly distributed along both primary and secondary roads which almost invariably follow section lines. Thus the original land survey has been more influential here than topography in locating farmsteads and roads. Slight rises or knolls have been much utilized along roads as sites for barns and houses. Poorly drained parts of farms can often be detected easily by relatively open permanent woodland pasture (Photograph 12). However, these are more conspicuous because of their wooded character than because of their size, for land is too valuable as cropland to leave it permanently in pasture. Consequently small rotational pastures are common. This relatively high percentage of cropland is illustrated by a representative aerial photograph shown as Photograph 12. Uninterrupted rectangular fields averaging about 40 acres per field are conspicuous. Favorable physical conditions for agriculture are readily apparent.

PHOTOGRAPH 12

Aerial photograph of land use in the Corn Belt of northwestern Morgan County, Indiana. Note especially the great predominance of cropland, the uniformly rectangular field pattern suggestive of level land, and the small, scattered, open woodland pasture tracts indicative of poor drainage in parts of this lacustrine plain (Lake Eminence). Location of photograph is shown in Fig. 2. Scale is approximately two inches to one mile.

However, the average farmstead does not reflect a marked accumulation of wealth that should be possible in a locality where a high level of natural fertility prevails. Conspicuous barns and large houses are generally absent. Small families do not need big houses. Parts of this poorly drained lakebed were purchased from the federal government late in the settlement period (Fig. 12). Many tracts were not adequately drained for cropland until past the turn of the century when modern dredging and ditching equipment aided materially in lowering costs of converting this lakebed into productive cropland. Thus large contiguous farms were never as common here as in the northeast part of the plain or the terrace of White River. By the time consolidation of agriculturally useable land was completed, a strong migration of farm youth to non-farm occupations encouraged dissipation of rural wealth. Large brick homes found in some communities, many of which date from an era of agricultural prosperity during the first two decades of this century, were never built in the "lake country."[1] Several recently constructed and renovated farmhouses reflect the decrease in the average size of family. Consequently Cadillacs, Buicks, bathrooms, home freezers, running water, and numerous other conveniences rather than large farm mansions are modern evidences of farm prosperity in this highly commercialized segment of the till plain.

The big red barn has likewise never been an integral part of the rural landscape in this locality which has always had more need for big corn cribs than big hay mows. Similarly hogs, which constitute the major livestock enterprise, need small separate inconspicuous hoghouses rather than large stalls and tramping sheds. Factual evidence of the small investment in farm buildings is available in the 1940 census of

---

[1] A much used local reference to the lacustrine plain and its periphery.

agriculture. The average per farm investment in buildings for a representative minor civil division of this section of the till plain was $1,553 compared to $2,749 per farm in the northeast dairy segment and $1,632 in an eastern general farming township.

Completely well-fenced farms are almost as conspicuous by their absence as large barns. Practically no fenced fields are found in the lower lakebed, and even on numerous upland farms many fields are unfenced. This situation is indicative of much cash grain farming and lack of a strong livestock program on most farms. A number of reasons underlie the absence of fencing in the lakebed. First, the danger of flooding before it was well-drained deterred farmers from fencing lakebed fields. Secondly, the lower lake plain has always been considered too damp to be suitable for the grazing of livestock. Not only is this due to increased possibilities of disease, but also because of possible damage to soil structure if livestock are permitted to trample wet fields. Thirdly, much of this lower lakebed land is rented by farmers whose farmsteads are not adjacent to rented tracts, which means that these tracts are not convenient for the grazing of livestock. But perhaps the most fundamental reason of all is the high premium placed on this lakebed as cropland for the raising of corn and soybeans to be sold for cash or fed to livestock kept on peripheral upland fields.

On the whole, cultural features of this segment of the till plain reflect reckless exploitation of inherently favorable physical conditions, although noteworthy exceptions of careful conservative farming are to be found.

The Northeast Dairying Segment. Almost as strongly as the western segment of the till plain epitomizes exploitative farming practices, the northeast part has the most conservative system of farming within the county. Here where soils are somewhat less fertile and where degree of slope is sufficiently great to make soil erosion a hazard on many fields,

farmers have necessarily converted to the greater use of lime and commercial fertilizers, larger acreages in pasture, and a longer rotation with more hay crops. Nearness and accessibility to the Indianapolis fresh milk market has made it feasible to translate early realization of need into a more conservative agriculture.

This area has a smaller proportion of cropland per farm than in the western part. Also fields are noticeably smaller, a reflection of more rolling topography. Photograph 13 illustrates the more dissected utilization pattern on this part of the till plain. Particularly does this photograph emphasize the more frequent and noticeable headward erosion of streams and the more scattered woodland. This woodland is generally very open and largely pastured. It has been left in response to greater degree of slope rather than because of poor drainage, which helps to account for the fact that it isn't as compact as in the northwestern part of the county.

Most of the farms are completely fenced. Not only are boundary fences between farms common, but there are many subdividing fences in order to make better use of pasture and cropland for the grazing of cattle. This large proportion of land under fence is conducive to conservative farming, since land can be utilized more carefully according to its capabilities when livestock can be grazed on all parts of the farm. A compact farm is more generally found in the northeast dairy segment than in the "lake country" and the river valley. This favors a more even distribution of manure on the whole farm and more frequent utilization of cropland for hay crops. The relatively few detached tracts of cropland rented by farmers of this area means more of the farm is available for winter pasturing. This encourages cover crops such as rye for winter grazing.

The large hip-roofed barn and the white silo are conspicuous on many farmsteads of this northeast dairy segment. These account for

PHOTOGRAPH 13

Aerial photograph of land use in the dairying segment of northeastern Morgan County, Indiana. Note especially the narrow ribbons of open woodland along streams which have only begun to dissect this part of the till plain. Fields are more broken than in the Corn Belt segment. To the left is White Lick Creek north of Brooklyn. Location of photograph is shown in Fig. 2. Scale is approximately two inches to one mile.

much of the $1,200 cost-of-buildings discrepancy between dairy and Corn Belt portions of the till plain. Their presence indicates greater importance attached to dairy cattle with the implication of more hay crops and more ensilage. Census data does reveal that more corn is used for ensilage here than in any other part of the county, but the present situation should be noted. Last summer the author stood in the barnyard of a farmstead overlooking a wide expanse of plain and saw eight silos none of which were to be filled that fall. Furthermore, he was told that most of them had not been filled for ten or fifteen years. Was the silo a dying feature or was its non-use only a temporary indication of acute shortage of farm labor? Consideration will be given this question elsewhere in this chapter.

The General Farming Segment. Driving through the eastern part of the county one day last summer, the author came across a farm scene that he had not observed in either the Corn Belt or dairy portions of the plain. A number of farmers were putting up a field of alfalfa hay with horse-drawn wagons and man-powered pitchforks, an uncommon sight in Morgan County today with hayloader and field baler doing much of the work formerly done by hand. Further observation led him to conclude that here indeed was a part of the county where mechanization had proceeded at a slower rate than in the river valley and Corn Belt and dairy segments of the plain. Minor civil division census data confirm this conclusion. In 1945 there was an average of one horse per farm in townships representative of other parts of the plain, whereas a general farming township had two horses per farm. Table IX further illustrates this slower rate of mechanization. For the ten-year period covered by the census data the number of horses and number of farms keeping horses was halved in the Corn Belt segment, whereas in the general farming locality the rate of decrease was much less. Many farmers on rundown Greene Township farms took non-farm jobs during the war but kept up

production on their farms as a patriotic and profitable effort. Thus part-time farming and commuting to non-farm jobs became much more common from the less commercialized farming communities of the county.

TABLE IX

Number of Horses and Tractors on Till Plain Farms in Morgan County, Indiana (1935-45)

(From Unpublished Minor Civil Division Census Data, Bureau of the Census)

	Total Number of Farms		Farms Reporting Horses		Number of Horses		Farms Reporting Tractors		Number of Tractors	
	1935	1945	1935	1945	1935	1945	1940	1945	1940	1945
Corn Belt (Adams Township)	216	164	155	81	481	193	78	90	81	113
Dairying (Brown Township)	158	126	105	49	355	127	56	56	61	70
General Farming (Greene Township)	163	172	146	118	443	342	72	103	82	118*

*It should be pointed out that there is a marked difference in the size of tractor used on different parts of the till plain. Larger tractors are much more common in the Corn Belt and dairying segments, while small tractors are more frequently seen in the general farming area.

Wooded gullies are numerous, and there are very few farms not having fields chopped up by stream dissection. Recalling the productivity pattern in Fig. 8 it may be said that amount of cropland decreases as productivity decreases. Yet this does not necessarily mean that proper land use adjustments have been established. Good cropland is often being overtaxed, while poorer and more highly leached land with favorable topography might be profitably utilized more intensively for pasture

and certain crops. Photograph 14 illustrates the characteristic pattern in this area.

Land Use Patterns

Status of Operator and Size of Farm. The most fertile and least fertile parts of the till plain have the highest percentage of part-owner and tenant-operated farms. This is shown in Table X. However, there is a relatively smaller percentage of owner-operated farms in Greene Township (the least fertile) for a significantly different reason than in Adams Township (the most fertile). In the former, many older farmers, who have not had children interested in farming, have retired on their farms and are renting out their cropland to neighbors while using the pasture and their share of the crop to feed a few chickens, keep a cow or two, and fatten a couple of hogs for meat. Many of these farms are then absorbed by active farmers upon the death of the owners. Very few of these farms have been purchased by urban or other outside savings as an investment unless a fairly large farm or contiguous smaller units can be purchased together and made into a compact farm which can be placed under the care of a single tenant.

On the more fertile soils of the Corn Belt as shown in Adams Township, about one-half of the farmers are part owners or tenants. In many cases these farmers are renting land from absentee owners who have purchased blocks of lacustrine and adjacent soils as an investment. Much of the rented land has no buildings, partly because the absentee owner does not wish to be bothered with upkeep problems and also because the lower part of the lakebed is unfit for human occupance.

Three-fourths of the farmers of the dairy segment as shown in Brown Township were owner operators in 1945. That most of the other operators were full tenants reflects the scarcity of unattached tracts which could be rented as additional cropland. It also indicates that a number of

PHOTOGRAPH 14

Aerial photograph of land use in the general farming area of eastern Morgan County, Indiana. Note the greater extent of woodland along stream courses than in the dairying segment (Photograph 13). Fields in this area are smaller and more broken than elsewhere on the till plain. Location of photograph is shown in Fig. 2. Scale is approximately two inches to one mile.

farms with buildings are rented on a livestock share or cash rent basis, a very uncommon practice in the river valley of the county. Thus concentration of dairying and owner-operated farms coincides very closely, which bears out a frequent observation that tenancy and dairying are not compatible.

TABLE X

Contrasts in Size of Farm and Status of Operator on the Till Plain, 1935-45
(Unpublished Minor Civil Division Data, Bureau of the Census)

	Corn Belt (Adams Township)	Dairying (Brown Township)	General Farming (Greene Township)
Size of Farm	Acres	Acres	Acres
1935	79	88	125
1945	111	93	121
Status of Operator	Percent	Percent	Percent
Full Owners			
1935	44.9	55.7	49.1
1945	48.4	76.2	65.6
Part Owners			
1935	12.5	13.9	22.1
1945	24.3	.1	17.4
Full Tenants			
1935	42.6	26.6	27.8
1945	27.3	18.2	17.0
Manager, Operator			
1935		3.8	1.0
1945		5.5	

Table X also shows that the smaller farms of 1935 in the Corn Belt of Adams Township had increased markedly in size by 1945, those of the dairy segment as shown in Brown Township only slightly, and those of the general farming area as shown in Greene Township had decreased. The highly commercial cash grain and hog agricultural pattern of the former

was leading to larger farms, since small farms were unable to support the increased use of tractors, combines, corn pickers, hay balers, hay loaders, and other mechanical equipment. There was likewise some increase in size in Brown Township for similar reasons; however, the greater emphasis on dairying has apparently moderated mechanization and the accompanying need for more cropland per farm. In Greene Township decrease in size of farm appears due to a much slower rate of mechanization and even more to a change to part-time farming on many former subsistence-like farms where owners had insufficient capital, mortgage potentiality, and desire (especially older farmers) to consolidate and mechanize.

TABLE XI

Major Uses of Land in Farms, 1945
(Unpublished Minor Civil Division Data, Bureau of the Census)

	Corn Belt (Adams Township)	Dairying (Brown Township)	General Farming (Greene Township)
All Land in Farms (acres)	18,248	11,667	20,836
Cropland Harvested (%)	65.4	52.7	43.3
Crop Failure (%)	.3	.6	.9
Cropland Idle (%)	1.4	.3	3.6
Pasture Plowed Within Last 7 Years (%)	6.3	10.2	5.7
Other Pasture (%)	8.1	16.4	11.3
Woodland Pasture (%)	8.1	6.6	20.6
Woodland Not Pastured (%)	1.5	3.2	6.0
All Other Land (%)	8.9	10.0	8.6

Major Uses of Land in Farms. From Table XI it may be clearly seen that there is a decrease in cropland acreage per farm from west to east on the till plain in Morgan County. There is increased woodland in farms not pastured and furthermore, a marked deterioration in pasture in the eastern part of the plain with one-fifth of all farmland in woodland pasture. Whereas in Adams and Brown townships less than two percent of the total cropland was idle or had crop failure in 1944, over four percent of that in Greene was so classified. A similar comparison existed in previous census years. This higher percentage of idle land and crop failure is attributable to more marginal land in this part of the plain.

Major Crops. Probably the most relevant point emphasized in Table XII is the influence of dairying upon the cropping program in Brown Township. More corn and less soybeans, more oats than wheat, and more hay crops than in Adams reflects a stronger emphasis on cattle. There has also been a pronounced shift in the dairy section to more productive alfalfa and away from relatively low yielding timothy and (or) clover. Likewise Greene has a greater proportion of cropland in alfalfa than Adams. It should be pointed out, however, that low alfalfa acreage in Adams Township is partially due to the unsuitability of the lower lakebed for that crop. That wheat is relatively more important in Greene Township may possibly be a reflection of such factors as (1) greater realized need now for winter cover crops on more rolling land, (2) unsuitability of sloping land for soybeans, or (3) greater conservatism of older farmers. Since various maps presented in Chapter I indicate significant differences in soils and topography on the till plain, it appears that there should be greater variation in percentage of crops raised than actually exists if the resource base is to be maintained.

Livestock. Aside from marked differences in number of horses already discussed, the most noteworthy point of contrast in regard to livestock is the pronounced decline eastward on the till plain in number

of hogs per farm (Table XIII). Farmers in Adams Township generally feed about three times as many hogs as do farmers in Greene simply because they can produce more corn per acre and they put a higher percentage of their cropland in corn. Also hogs need less pasture than cattle, which may be a further explanation of concentration in the fertile Corn Belt segment. Difficult to expalin is the much greater number of sheep kept on Corn Belt farms than elsewhere on the plain. Whereas very few farmers kept sheep in Brown and Greene townships, nearly half of the farmers of Adams were keeping sheep, the average size of flock being about fifteen sheep. Feeder lambs brought in from western ranges are not involved. Greater freedom from the menace of dogs may possibly be a factor.

TABLE XII

Major Crops of the Till Plain, 1945
(Unpublished Minor Civil Division Data, Bureau of the Census)

		Corn Belt (Adams Township) Percent of Cropland Harvested	Dairying (Brown Township) Percent of Cropland Harvested	General Farming (Greene Township) Percent of Cropland Harvested
Cropland Harvested (acres)		11,945	6,151	9,001
Corn	(%)	45.2	49.1	43.2
Soybeans	(%)	20.5	13.7	13.0
Wheat	(%)	10.2	7.5	13.1
Oats	(%)	7.3	10.3	6.6
Clover and (or) Timothy Cut for Hay	(%)	12.2	10.5	10.3
Alfalfa Cut for Hay	(%)	.5	3.5*	4.0
All Other Crops	(%)	4.1	5.4	9.8

*Reduction of alfalfa acreage by one-half between 1940 and 1945 can be attributed to more cash grain production during the war.

TABLE XIII

Livestock on the Till Plain, 1945
(Unpublished Minor Civil Division Data, Bureau of the Census)

	Corn Belt (Adams Township) Average Number Per Farm	Dairying (Brown Township) Average Number Per Farm	General Farming (Greene Township) Average Number Per Farm
All Cattle	9.3	14.1	9.0
Cows and Heifers Milked	2.5	5.1	4.1
All Hogs	36.1	21.8	12.0
Sows and Gilts	5.0	3.7	2.3
All Sheep	7.2	1.1	2.8
All Horses	1.2	1.0	1.9

While contrast in number of cattle kept per farm is not great, there is a significant difference in number of cows milked, the northeastern part of the county having about twice as many milk cows per farm as the northwestern part . The concentration of dairying in the northeastern part of the plain is even better illustrated by Fig. 25 in which the distribution of graded (generally referred to as Grade "A") milk producers for the county is shown. Well over three-fourths of the Grade "A" milk producers are within this northeastern segment. The average size of dairy herds among graded producers is 11 milking cows compared with herds only one half as large among ungraded producers which are more widely scattered throughout the county.

A number of factors are responsible for this concentration of Grade "A" producers. Not only is the northeastern part of the till plain nearest to Indianapolis, but main transportation routes to southwest Indiana pass through this section. While rapid pickup by refrigerated trucks makes it physically possible to gather fresh milk from a wider area than

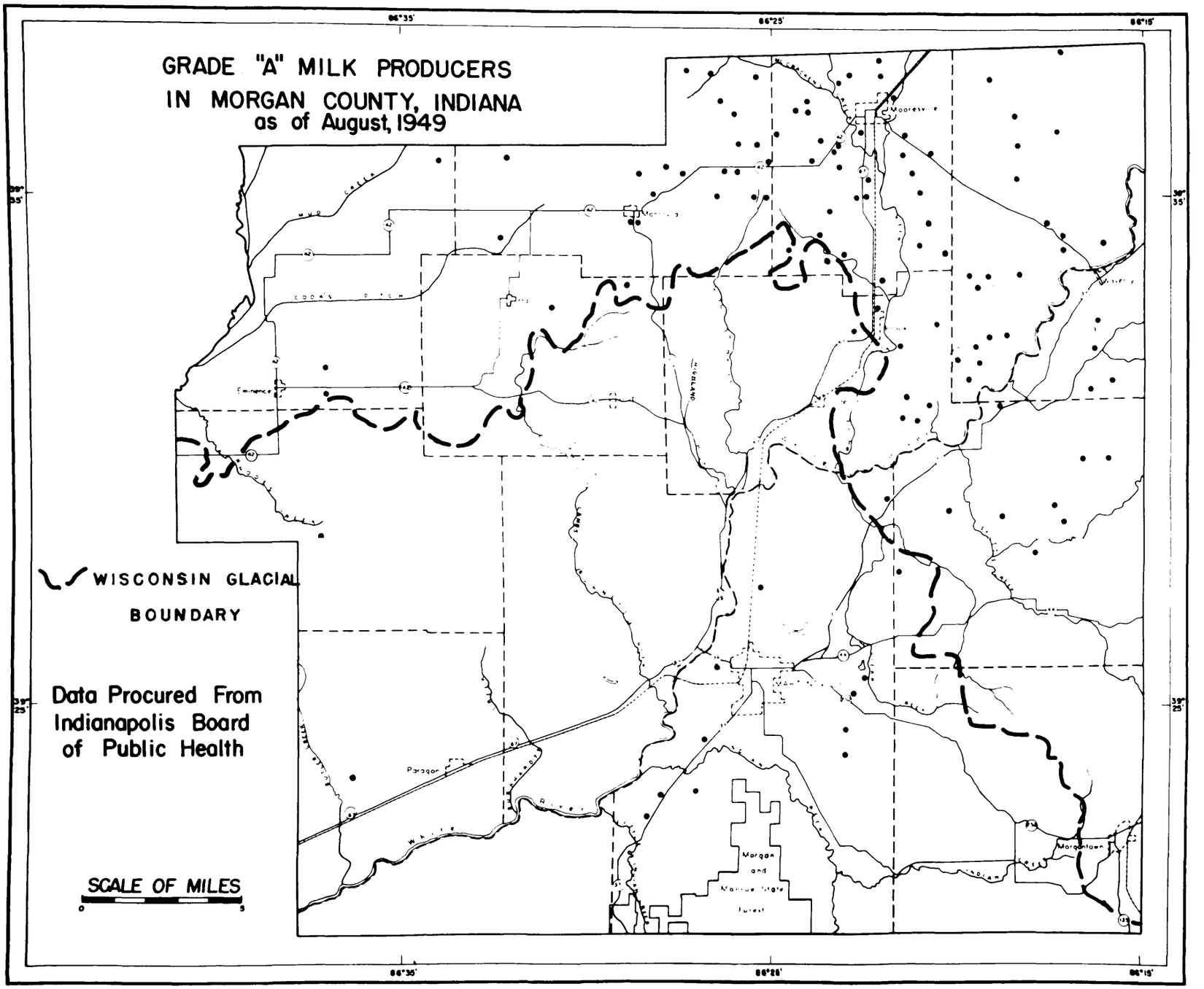

GRADE "A" MILK PRODUCERS
IN MORGAN COUNTY, INDIANA
as of August, 1949
WISCONSIN GLACIAL
BOUNDARY
Data Procured From
Indianapolis Board
of Public Health
SCALE OF MILES
0
5
Paragon
Morgantown
Morgan
and
Monroe State
Forest
86°35'
86°25'
86°15'
39°
35'
39°
25'

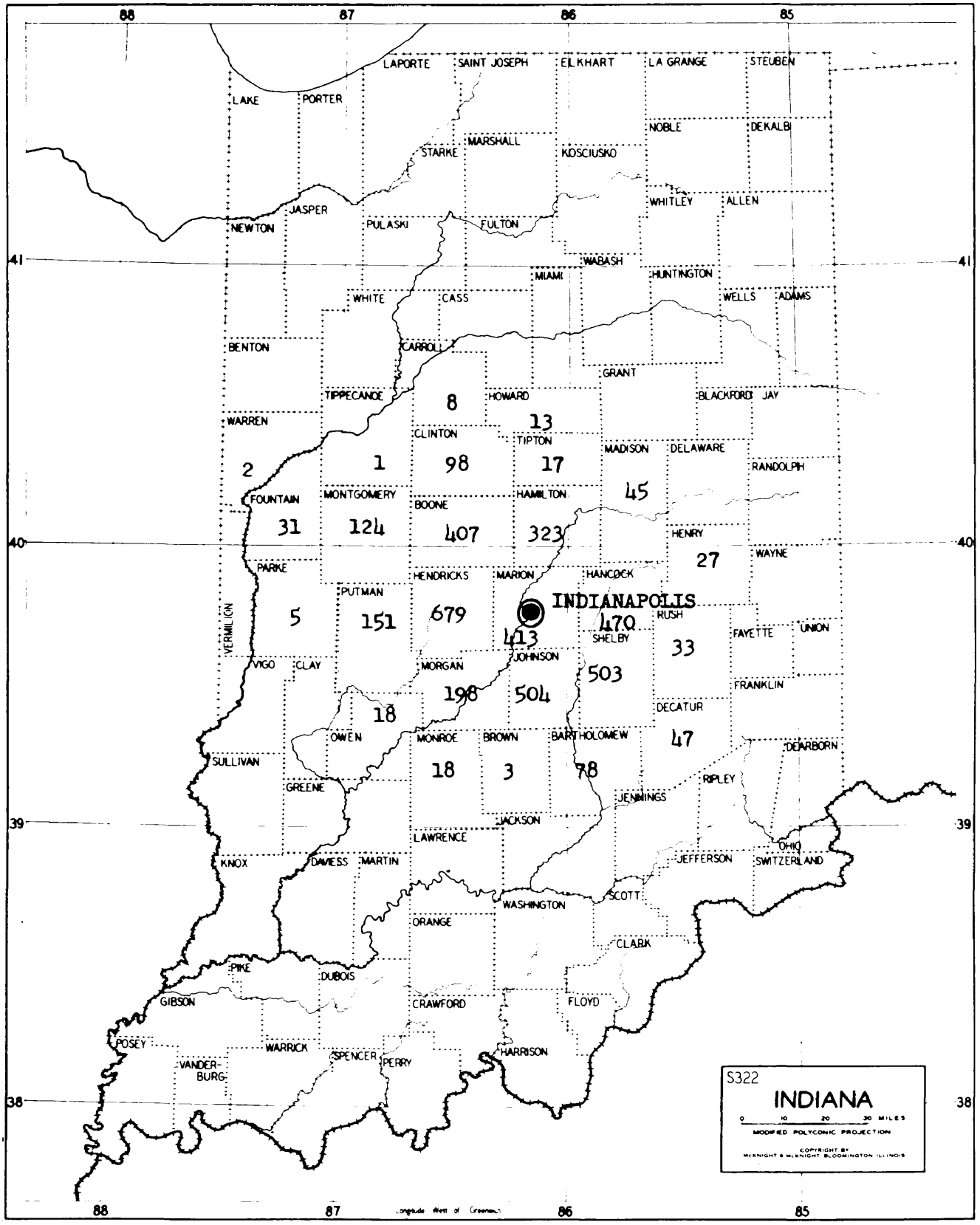
FIG._25

formerly, the milk supply of Indianapolis still comes primarily from farms situated within a twenty to thirty mile radius of the city. The number of producers shipping milk to Indianapolis from various counties in December, 1948 as shown in Fig. 26 emphasizes this relationship. That Morgan County ranks lowest in number of producers among the counties adjoining Marion suggests the importance of physical conditions favorable to dairying. With the exception of Morgan these counties are entirely on the till plain. Only about one-half of Morgan County is so situated.

While these are apparently the predominant conditions accounting for the concentration of dairying, it is interesting to note that the area having the most dairying also has the most Quakers. In 1874 the Friends Church membership of Brown, Monroe, and the northeastern part of Gregg townships constituted approximately half of the total church membership in those areas (78, p. 133 ff). These frugal industrious people were well suited to build a dairy community. Their strength in adjacent Hendricks County and the northeastern part of Morgan appears to have been a strong impetus toward making dairying important there. It should be noted in Fig. 26 that Hendricks County has the largest number of Grade "A" producers selling milk on the Indianapolis market. Proximity to a large urban center naturally stimulated the growth of dairying.

Once established, the original concentration of dairying had other advantages of: (1) being situated on well organized pickup routes having higher fluid milk per mile ratios than routes servicing more isolated producers, (2) having acquired "know-how" and (3) being able to comply more easily with city health regulations which are now a major limitation in converting from ungraded to graded milk production. The average cost of equipment and alteration for Grade "A" production is running as high as $1,000 initial outlay per farm. Many farmers are simply unwilling to risk that much capital in converting to Grade "A" production.

Fig. 26 . The Indianapolis Milkshed. (Data secured from uncompleted doctoral thesis of N. T. Pritchard, Division of Agricultural Economics, Purdue University, 1949.) Figures within each county are number of active producers shipping milk to Indianapolis from that county as of December, 1948.



Farm compactness and high proportion of owner-operated farms in the northeast corner of the plain are conducive to dairying. As emphasized in Chapter III, one very practical explanation for the absence of dairying in the White River valley was the long trip to and from rented tracts often three or four miles from the farmstead. Before the rubber-tired tractor an hour wagon trip each way hardly put the farmer in the mood to milk a herd of cows twice a day. Most of the farmers of the northeastern part of the county never faced this problem. That owner operators constitute four-fifths of the Grade "A" milk producers in Morgan County further emphasizes the generally recognized incompatibility of tenancy and dairying.

Land Use Problems of the Till Plain

Fundamental Problems. With pertinent physical and cultural characteristics in mind and with land use patterns analysed, it remains to look at current problems associated with various utilization patterns of the till plain. Three such basic problems have special significance from the standpoint of establishing a more permanent agriculture. The Corn Belt segment of the plain is faced with the necessity of maintaining and even increasing agricultural production under relatively favorable soil and topographic conditions. The dairying part of the plain in addition to sharing this problem is experiencing a noticeable deterioration of interest in dairying, which if not corrected, may have serious repercussions in upsetting a moderately conservatfve system of farming. For the general farming section a basic problem appears to be the need for maintaining and enlarging the more successful farms and at the same time establishing proper land use practices on smaller farms that probably can best be used as part-time enterprises for non-farm employed dwellers.

Problems of the Corn Belt Segment. Exploitative agricultural prac-

tices are still prevalent on many Corn Belt farms. A century of soil mining is continuing. For an era of exploitation to precede the introduction of conservative practices on soils of high natural fertility has been a more or less generally followed sequence. We are now at the stage in the Corn Belt when farmers are becoming aware of their dilemma. When yields begin to sag and increasing quantities of commercial fertilizer must be purchased, most farmers realize that something should be done. This realization of need must necessarily precede any constructive effort to hold, regain, or move on to a higher level of agricultural production. If production costs are to be kept as low as possible in the face of diminishing soil resources, then the economics of conservation must be understood by more farmers. That most farmers have much to learn is illustrated by the increased application of expensive commercial nitrogen with little thought of producing and conserving it more cheaply on the farm.

Here then is the situation in a very small segment of the Corn Belt, the northwestern corner of Morgan County. Settlers moved onto the till plain, cleared the land, planted corn, wheat, oats, and clover and timothy with very heavy emphasis on corn. Much of the land had poor natural drainage, but within fifty years reclamation of even the most poorly drained tracts had commenced by systematic ditching and tiling. Thus through clearing, drainage, and planting of row crops nearly one year out of every two an excessive drain upon natural fertility had begun. By far the most serious aspect of the problem is the depletion of organic matter, for it is the most difficult to replace (65, p. 6). Not only does its depletion mean a growing vital nitrogen deficiency; but it also means decreasing retention of moisture in the topsoil and increasing difficulty in handling soils. This organic matter is not going to be restored until a system of farming is developed that will maintain it.

A better balance of input and outgo must be struck. A few comments

from farmers living on the plain reveal the need and the trend:

> Ten years ago it was difficult to find a corn planter in the lake country with a fertilizer attachment; now practically every farmer has one.
>
> The sloppy farmer has a better chance to make a living on the more fertile soils, but does so without much thought of maintaining them.
>
> If the farmers in the lake country could feed all they produce they would have a more conservative system of farming.
>
> People in the lake country are not farming, they are just selling their wealth.
>
> The lakebed is going downhill slowly but surely by loss of organic matter.
>
> There is a field that was in corn for 17 straight years and in corn and soybeans for the past 25 years.

These comments made in the summer of 1949 indicate an awareness of what is happening. The question then arises as to how a better balance can be attained without impairing the farm income of those farmers who are still selling their soil fertility capital and calling it profit. Interviewing a number of farmers in this community led me to one farmer in particular whose bank account and farm convinced me that more farmers can improve their farming to advantage.[2]

What then are decisive differences in attitude and technique between this conservation-minded farmer and of those farmers who are taking out more fertility than they are replacing? It must be emphasized that the inherent fertility of this farm is representative of that found on most farms of the northwestern part of the county. The following differences appear significant:

(1) Rotation of Crops. In the thirties this farmer changed from a three-year rotation of corn, wheat, and hay (clover and some timothy) to a four-year rotation of corn, small grain, alfalfa-alsike-

---

[2] A partial discussion of this farm has already been presented as an example of excellent maintenance of soil fertility and a high level of productivity (pp. 33-35). The farm is located in Fig. 20 as Farm #5.

ladino hay cut for hay the first year and pastured the second. Most farmers are using a three-year rotation of corn, soybeans, wheat or oats and clover (sweet clover on the lakebed and red or Big English on the upland). On the lower lakebed some farmers use only a two-year rotation of corn and soybeans or corn and oats with sweet clover. Often, however, the sweet clover is plowed under in the fall (before much growth has taken place) rather than in the spring, because the ground plows better in the fall. There are four especially impressive advantages of the rotation employed by the conservative farmer.

(a) Greater length with less emphasis on soil depleting row crops. This means more corn per acre when a field is placed in that crop. For example, in 1948 an average weighed yield of 125 bushels per acre was grown on this farm. An average for nine other farms following three and two-year rotations and having soils of equal or better inherent fertility was 77 bushels. Thus this farmer is actually harvesting as much corn off of 60 acres as others are producing on nearly 100 and at the same time is exposing his land less frequently to erosion and leaching.

(b) Substitution of a productive alfalfa-alsike-ladino hay crop for a relatively unproductive timothy-clover mixture. This is one of the most sadly neglected opportunities for increasing farm income throughout the whole county. Livestock can be fattened very effectively by using less concentrates and more high quality hay and grass silage. By introducing more productive hay crops, farmers can initiate more conservative farming and at the same time get "efficient crop and livestock production through higher yields, lower labor, equipment, and power costs" (69, p. 14).

(c) Absence of soybeans in the rotation. Many farmers have introduced soybeans thinking that they were giving the land a rest from corn. Actually when the beans are sold, these farmers are depleting their soil more than if they were to raise a second crop of

corn in the rotation which would be fed on the farm.

(d) Provision of luxuriant rotational pastures every fourth year. This is a very efficient method of harvesting hay and spreading manure.

It is very evident that the greater length and superior quality of this rotation is paying dividends.

(2) Pasture Improvement. Since 1910 this farmer has been conscious of the need of properly caring for permanent pasture in order to realize maximum feeding value. This may be greatly enhanced through: (1) planting and maintaining good grass and clover mixtures, (2) liming and fertilizing, and (3) mowing weeds. Permanent pastures are much neglected on Morgan County farms.

(3) Lime and Fertilizer Application. Important in maintaining production is the application of sufficient quantities of proper fertilizer mixtures and lime to supply nutrients needed and to maintain a pH level conducive to the growth of crops being raised. Whereas the average fertilizer application on the nine farms mentioned above was 150 to 200 pounds of 3-12-12 per acre in 1948,[3] the conservation-minded farmer applied 300 to 400 pounds of 0-15-15 per acre in 1948. In addition he broadcasted an additional 500 pounds of 0-20-20 per acre in the spring of 1949 on about 50 acres of cropland as a convenient method of lowering his income tax. That he is applying more fertilizer per acre than is generally being applied on other farms in the northwest part of the county is significant, but it is also important to note the absence of nitrogen in purchased fertilizers. By raising nitrogen (through feeding of livestock, plowing under of green manure crops, and growing legumes) he is avoiding the purchase of the most expensive element in commercial

---

[3]This formula was used on eight of the nine farms. The other farm was using a 3-9-18 formula.

fertilizer and is thus making his fertilizer money go further.

(4) Terracing and Tiling. Six miles of terraces on a 275-acre farm is considered to be an extensive use of terracing by farmers in the community, but this much terracing has or soon will pay for the cost of construction through better soil and water conservation. Water is the most limiting factor in corn production throughout central Indiana. Greater effort to prevent rapid runoff is definitely conducive to the attainment of higher yields per acre.

(5) Livestock. A sound livestock feeding program is the very heart of a profitable conservative farm enterprise. This exemplary farmer has a fundamental policy of feeding everything that is grown on this farm. In fact the livestock feeding program has been so heavy recently that he has been buying feed.[4] This is in marked contrast to the policy of most farmers of this corner of the county who are selling a crop of soybeans and some corn every year. It is generally recognized that livestock farming is more conserving of soil resources than cash-grain farming.

Such a program as this can be profitably carried out by more farmers. Often, however, capital is not available to set into motion changes conducive to greater conservation of soil resources. Furthermore, owner-tenant relationships — and it must be recalled that one-half of the farmers of this part of the county rent part or all of their land — are frequently unfavorable to the adoption of practices leading to greater permanency of agriculture.

Dairying Segment. Dairying has been traditionally strong in northeastern Morgan County. It has already been emphasized that here agriculture has attained greater stability than in any other comparable area

---

[4] Of course it is not possible for every farmer to buy feed and sell no cash crops, but a better balance can be profitably struck on many farms.

in the county. It is widely recognized that dairying as a system of farming is conducive to: (1) good soil management, (2) year-around employment of farm labor, and (3) a more regular and stable farm income. All of these are instrumental in achieving greater permanency in agriculture. Factors leading to a strong concentration of dairying have been discussed elsewhere in this chapter. It remains to analyze some local problems confronting dairying and which are limiting expansion and even tending toward a contraction of a system of agriculture which it seems very desirable to maintain in a healthy vigorous state wherever possible.

Problems having particular application to northeastern Morgan County can be conveniently discussed under the following heads: (1) feeding, (2) labor, (3) marketing, (4) seasonality of production, (5) "in and out" production, (6) absentee ownership, (7) dairy breeds used, and (8) investment in and size of dairy unit. This discussion is based upon interviews with farmers, producers' cooperatives, milk distributors, dairy inspectors of the city health department, and dairy specialists at Purdue University.

(1) Feeding. Since feed and bedding constitute nearly one-half of the total cost of producing milk, it is extremely important for dairymen to pay strict attention to feed costs (76, p. 9). The cheapest way of producing milk is with pasture; grain feeding is the most expensive. The cost of producing 100 pounds of TDN (total digestible nutrients) from various sources is given by Gannon (66, p. 1) as follows:

Pasture	$1.14
Silage	2.07
Hay	3.35
Average grain	4.22

Apropos of these figures is the statement that: "The man who decides to become a dairy or livestock producer also commits himself to an adequate, high quality hay and pasture program, or to failure" (67).

The data in Table XII reveal that nearly half of the cropland of the dairy section as shown by Brown Township was in corn in 1944, another tenth was in oats, and less than one-sixth in hay crops. Furthermore, only one-third of the hay grown was of high quality. While nearly one-third of the total land in farms was in pasture, observation of numerous pastures led to the conclusion that on almost every farm little or no attention was being given to establishment of high yielding improved pastures. It is obvious that land use is not in line with the facts relative to low cost production of milk in northeastern Morgan County. A lowering of the general price level means that many of these farmers may find it difficult to stay in dairying and as difficult to get out. Furthermore, a shift to more hay and pasture leads to conservative agriculture as is well summarized by the following paragraph:

> The proper, balanced roughage program, including hay, silage, rotated and permanent pasture, will make a very substantial contribution to the problems of soil erosion and soil fertility. As we see the trends in the dairy industry, the stability of income in the future is going to be largely determined by the over-all quality roughage program on the farm (67).

(2) Labor. Second to feed, the principal cost in producing milk is labor[5] (76, p. 9). This is probably the most serious immediate problem facing dairymen in Morgan County. Inability to hire responsible labor was given by five prominent farmers as the major reason for going out of the dairy business during the past ten years. That the dairy farmer has not been able to compete with union wages and full employment in industry has been the immediate contributing reason for this shortage. Increased commuting to Indianapolis jobs has left a dearth of young men available to work on farms.

However, inability of the dairymen to get responsible help is more fundamentally related to the migration of youth away from the farm. As

---

[5]This does not include labor entering into the production of feed.

shown by the survey of Paragon High School graduates, more youth now think of becoming school teachers, basketball coaches, lawyers, doctors, and businessmen than returning to the farms as graduates of agricultural colleges. That Indiana University, the liberal arts part of the state university is next door to Morgan County, while Purdue, with the agricultural and engineering colleges, is 80 to 100 miles away encourages a number to live at home and commute the short distance to Bloomington. Likewise being conveniently located to Indianapolis has made it possible for many youth to find jobs there that yield greater immediate money returns than farm jobs. Youth of today are not interested in being confined, and dairying is a most confining occupation. Thus those who do stay on the farm generally prefer other types of farming.

Farmers themselves are in part responsible for this obviously serious labor problem in dairying. They have been so accustomed to paying low wages, that many are simply unwilling to pay a wage sufficiently high to get a man who can be trusted to help care for a herd of dairy cattle. Farmers are even more open to criticism in regard to their attitude toward accepting their children as partners in the business. Many farmers give their children very little financial encouragement to stay on the farm. Instead of sitting down with their boys and working out a plan for sharing the profits, many farmers expect their sons to work indefinitely for relatively small wages often unstipulated together with room and board. Furthermore, farmers are too prone to saturate their children with the handicaps and hardships of farm life without explaining its advantages and rewards. More active partnerships and more consideration of getting a son off to a good start would be big steps toward establishing greater continuity in dairying as well as in other types of farming.

Unfortunately the problem is not so simply solved. Fundamentally in order to retard this migration of rural youth to the cities, farms

must be larger — large enough for two families. On the average, children are born when the father is only 30. When the father is between the ages of 50 to 55, these children are wanting to get married and start on their own. But the father is unable to retire and turn the farm over to a son, and the farm is not large enough to support both father and son. There is thus a need for a larger farm unit.

Such family farms would not need to diminish the farm population and they would increase the net income to farmers by the amount of interest and rental currently paid to urban dwellers. Prior to the war, studies in Indiana revealed that the number of children on the more productive farms was no more than sufficient to maintain farm population in the more commercial areas such as Hancock County (40, p. 45). Desire of children to remain on the farm will depend on the comforts and conveniences available and prestige associated with agriculture as an occupation. Both of these conditions are undergoing rapid improvement. Electrification, good roads, and the tendency of upper class urban people to move out into the country are well exemplified in Morgan County. As for the future, O. E. Baker has said: "America has been a youthful country, with maturity land ownership will become increasingly desired and will provide increasing prestige as it does in Europe and even to a greater degree in Asia."[6] Basically then there appears to be no really feasible short cut to getting responsible labor for dairying.

(3) Marketing. Dissatisfaction with the organization of the Indianapolis milk market was evidenced last summer in a suit for over $13,000,000 filed by 74 individual milk producers against five big dairy companies and five marketing associations. Damages were asked "for losses growing out of an alleged conspiracy by which the companies con-

---

[6](Personal statement made to me while visiting Morgan County in the summerof 1949).

trol the marketing associations and beat down the price to the farmer while raising it to the consumer" (70, p. 1). Regardless of the outcome of this pending suit its mere existence is indicative of much dissatisfaction among producers relative to the marketing of their milk in Indianapolis. This distrust is not conducive to vigorous dairying in the area delimited in Fig. 26 as the Indianapolis milkshed.

Briefly this is the situation. The distributors in Indianapolis have a very closely knit organization while the individual producers are organized through four marketing organizations which are to a considerable extent competitive. In 1943 the Indianapolis Sales Association was established to coordinate the marketing activities of the four marketing cooperative. This has merely meant added marketing costs between producer and consumer. The four producer marketing organizations have never agreed to a merger largely because of fear that they will not be able to exercise the control that they want.

The inefficiency of the Indianapolis marketing set-up is apparent. Duplication of functions is unavoidable at present. Particularly is this true in three respects: (1) The overlapping of milk routes of the four marketing agencies means that four different trucks may be picking up milk along the same route. (2) The maintenance of four separate administrative staffs with a fifth added by the Indianapolis Sales Association is another grave duplication. (3) Maintenance of four separate field staffs covering the same area and vying with each other for members is a weakness admitted by the organizations themselves.

If confidence could be restored through the establishment of a single marketing agency, the outlook for maintaining moderately stable land use conditions in parts of Morgan County would be enhanced.

(4) Seasonality of Production. Whereas the monthly consumption of fluid milk in Indianapolis varies only slightly, being lowest in July and August, the production of fluid milk has flucuated greatly,

reaching peak volumes in June and declining to low levels in November and December. This has meant that in recent years it has been necessary to bring ungraded milk in from Illinois to meet this late autumn and winter shortage. Two principal causes for this wide seasonal flucuation in production are the (1) observed natural tendency for cows to freshen in the spring and (2) variation in feeding practices during the year. While these two causes affect most fresh milk markets in northeastern United States, it is interesting to compare the flucuation of local supply on the Indianapolis market with that on the well organized Washington, D. C. market. The milksheds of both cities have only slightly different frost-free seasons and late fall and winter pasture possibilities are climatically about equal. In 1945 on the Indianapolis market the peak month of production (May) was 25.8% above the average for the year and the lowest month (December) was 21.2% below the year's average (72, p. 3). For Washington, D. C. the respective percentages were 19 above and 18.5 below (74, p. 104).

This greater fluctuation in local supply for the Indianapolis market appears to be primarily due to the greater neglect of the smaller producers to breeding and feeding. Thus there is less fall freshening and poorer quality winter feeding among smaller dairy herds. The average size of herds in the Washington, D. C. milkshed is 36 milking cows (74, p. 90) compared to 14 cows in the Indianapolis milkshed (75). Is the farmer who has a herd of five to ten cows as a sideline enough of a dairyman to take steps to bring about a better adjustment in production? Gannon (67) answers this question with the statement that "the outlook for an efficient honest-to-goodness dairyman is good; however, it may not be so good for a non-specialized, not-so-good dairyman."

(5) "In and Out" Production. Dairying on the fertile till plain of central Indiana has generally been a sideline for most farmers. This is indicated by the fact that nearly 95 percent of the farms in

Indiana had herds numbering ten cows or less. Nearly three-fourths of the farms had herds of five or less (71, p. 10). Even on those farms producing Grade "A" milk for the Indianapolis market (Fig. 25) gross income from dairying constituted more than half of the total farm income on less than one-third of the farms in a sample taken by Pritchard (75).

A check of milk produced per Grade "A" producer in the Louisville, Kentucky area compared with that of Indianapolis Grade "A" producers revealed a 100 pound greater average daily shipment in July, 1949 per producer on the Louisville market.[7] A basic partial explanation for this differential appears to be the more diversified agricultural possibilities on fertile soils around Indianapolis compared with the much more restricted opportunities to shift to other lines of production in the Louisville milkshed. When general farm prices are low, many farmers turn to milk production to get a more steady income. On a loosely organized market such as Indianapolis this shift is comparatively easy to make. This is not conducive to stable dairying.

For northeastern Morgan County the sideline character of dairying has a further implication. It has already been emphasized that here is a transitional belt between central and southern Indiana in respect to soil and topography. However, in regard to the agricultural system prevailing, there appears to be a stronger tendency to follow the lead of farmers operating under better physical conditions than those farming on poorer soils and greater slopes. Thus many farmers may often be expecting too much from their farms in the transitional belt of northeastern Morgan County.

(6) Absentee Ownership. In the southern part of Madison

---

[7]Data supplied verbally by Raymond J. Pickett, Indianapolis Sales Association, Indianapolis, Indiana, August, 1949.

Township in northeastern Morgan County there are five farms which have a combined acreage of nearly 3500 acres, all owned by non-county residents. One farmer renting from a landlord living in Florida pointed out much land now unfenced was formerly fenced and that southern Madison Township was once a strong livestock community. Livestock have greatly declined, because these absentee owners are not interested in a livestock program on their farms. The implications of the absentee ownership are more fully discussed in Chapter III, and it only need be emphasized here that further purchase of land by absentee owners may seriously affect dairying in northeastern Morgan County.

(7) Breeds. It is generally agree that for fluid milk production a predominance of Holsteins in the herd is better than Jersey and Guernsey herds because of greater volume of milk per cow. The premium for butterfat content in excess of 4 percent is not sufficiently great to warrant keeping Jersey and Guernsey herds. Yet for 12 dairy herds in Morgan County having a total of 170 milking cows, four-fifths of the stock was made up of Jersey and Guernsey breeds. That many of the smaller herds produced for the churning cream and cheese milk markets before converting to Grade "A" milk seems to be a primary explanation of the high percentage of Jersey and Guernsey stock in Morgan County dairy herds.

(8) Investment. Producing Grade "A" milk means that the average expenditure for equipment and renovation alone is $1000, a sum that the farmer with small dairy herds generally cannot afford. Many farmers do not have barns satisfactory for conversion to Grade "A" milk production. The farmer going into the dairy business now had better get a sufficiently large herd to stay. Too few farmers in Morgan County have this attitude toward dairying, as is evidenced by the slipshod conver-

sions that are being made by many of them.

Here then are major problems affecting dairying in Morgan County, particularly the northeastern part where the heaviest concentration is located. Some of these are apparently unsolvable in the near future. The labor problem and absentee ownership are probably the toughest of all, because without proper attitudes the farmer can hardly hope to keep his land and labor. A little sensible cooperation can go far in solving the marketing dispute. A better feeding program, a shift to breeds more suitable for fluid milk production, and less seasonal flucuation in production will come through an educational program which is already helping.

General Farming Segment Area. In studying the eastern part of the till plain in Morgan County, one might ask: Why are these people apparently doing less well today in an area that shows evidence of once having had well cared for farmsteads? Scenes like the one shown in Photograph 15 are common. Farms in the general farming area as shown by Greene Township census data averaged 121 acres in size in 1945 compared to 125 in 1935. This is contrary to increased farm size elsewhere on the till plain. Each Greene Township farm has on the average less than 60 acres of cropland most of which has medium soil productivity and acidity and moderate susceptibility to erosion. This is in contrast to 75 acres of cropland in Adams Township (Corn Belt) most of which has high soil productivity and low acidity with little susceptibility to erosion. Average per acre corn yields in Adams Township were 57.2 bushels in 1944 and 56.3 in 1939 compared with 41.5 and 42 bushels respectively in Greene Township.

Here then are farms with less cropland of poorer quality than that found in a nearby part of the Corn Belt. It is a region of necessarily less cropland per farm because of topography; therefore it is handicapped in the use of machinery being in direct competition with farms that can reduce labor costs by use of more power per man. Thus these poorer

PHOTOGRAPH 15

Disintegrating farmsteads — a common scene in the general farming segment of the hill plain.

quality soils in this area with greater degree of slope seem adapted to three possible uses: (1) extensive grazing, (2) part-time farming, or (3) self-sufficiency agriculture.

The last named is a diminishing hope, since few young people are willing to live on self-sufficing farms today. This type of agriculture means rural slums. Fifty to 75 years ago this area had a relatively virile self-sufficing agriculture. Loss of soil fertility through misuse has occurred. Probably even more fundamental in explaining the deterioration in the cultural landscape of this part of the plain is that the outgo per farm for taxes, food, clothing, and amusements has increased to the point where the farm of 50 years ago is no longer able to support a family in good standing. Rural youth have migrated from these communities in large numbers leaving behind an aging and dying remnant of farmers who are expecting too much in this modern age from the land that once furnished them a comfortable living. Increase in part-time farming as a partial solution has already been pointed out and will be further discussed as a part of Chapter V.

Extensive grazing appears to be a hope for a stable agriculture on this land. For such a system of farming to be successfully introduced will mean consolidation of farms to make economical units and will necessitate the application of careful management willing to take advantage of proved techniques in renovating and maintaining soils topographically unsuitable for much cropping. Few Corn Belt farmers probably have the background to change to the grassland type of farming needed.

Situated slightly to the west of the till plain but having very similar topographic and soil conditions is a farm which serves as an excellent example of the kind of program needed to establish economical farms in this area (Farm #1 located in Fig. 20). Three years ago this 165 acre farm on soils of medium productivity having slopes varying from 1 to 30% was purchased by a young Purdue graduate. The purchase

price was $94 an acre (1946) and average corn and wheat yields at the time of purchase were 45 and 15 bushels respectively. Much sheet erosion and some gully erosion was evident. Recently this young man has been taking top prizes for registered purebred Aberdeen Angus bulls shown at various fairs and expositions. In August, 1949 this 165 acre farm was carrying 29 cows, 1 bull, 5 two-year old bulls, 9 two-year old heifers, and 25 spring (of 1949) calves. Practically no purchased feed was being used at any time during the year. No corn, small grain or soybeans were produced on this farm and none were grown on rented land. Thus this farmer has been instituting an all grass program with considerable success in meeting his feed requirements. The following steps are significant in explaining this noteworthy accomplishment:

1. The land use program was carefully selected to fit the soil capabilities and degree of slope on this farm.

2. Productive, good quality hay crops and pasture are being produced. Liming, fertilization and pasture renovation preceded the planting of brome grass, fescues, birdsfoot trefoil, timothy, red top, and lespedeza according to varying soil capabilities on the farm.

3. The plan of organization is providing an adequate volume of business.

4. Farm operating expenses and overhead costs are being held relatively low by using a minimum of machinery, power, and labor.

5. The livestock enterprise is being very efficiently managed.

The approach of this farmer is a sound one because after a careful inventory of the resources at his disposal, he has selected a plan of operation fitting the capabilities of both farm and farmer. Here then is another highly constructive practical contribution toward establishing a more permanent agriculture in Morgan County.

CHAPTER V

STABILIZING LAND USE ON THE OLDER UPLANDS

Introduction

As one drives through communities of the older uplands, he can feel that decline and stagnation have occurred. The marks of former enterprise are not hard to see. There are unpainted houses that formerly had attractive appearances. A number of large houses built around the turn of the century have not been well-kept. Empty and ill-kept barns are common. Bush-covered roads and lanes that once led to fields and farmsteads now lead nowhere. The sassafras and the blackberry briar are telltale signs of former cultivation of ridge top fields and bush and briar-cluttered fence rows reflect the prevalent neglect of the land. Marked sheet and gully erosion from these now abandoned fields is evident. Fewer tractors here than in the river valley or on the till plain testify to the lingering of an era. Forests that once furnished boards two feet wide found in some of the older barns now are cut over for railroad ties and hickory saplings for lawn and porch furniture. Good merchantable saw timber is becoming more and more difficult to obtain. The predominance of older people on relatively smaller and poorer farms suggests a migration of youth to Indianapolis, to Martinsville, and to other non-farm occupations. This is the old and dying culture.

Superimposed upon this disintegrating cultural scene are other features that are ushering in a new era of land use. Historically the commercial apple and peach orchards made their appearance first. The first commercial apple orchard in the county was established in 19[illegible] on one of the highest ridges where exploitative row crop, small grain, non-legume agriculture was playing havoc. Then in 1927 the state forest

preserve was started in the south-central part of the county. This now covers 4,410 acres of rough upland and small creek valleys. Also classified forests are growing in importance.[1] Along with this emphasis on reforestation came the resort and recreation-minded city dweller to buy up cheaply attractive wooded sites on high ridges for summer and weekend homes. Many liked the wooded rural surroundings and with hard surface roads and faster automobiles they began to commute regularly to urban jobs from the surrounding countryside.

Even more recently another type of urban employee has come to these areas seeking a place to live. Here he has found land which he can afford to buy, and even more important he is free to build a house or shack to fit his income, which is not possible in the suburbs where building codes are enforced. Many of these people are buying a few acres of land for security against another depression. The desire to rear children away from urban influences is another impetus to movement to the open countryside. Lower taxes and rents and the opportunity to raise a part of the family's food is further encouraging the establishment of these new rural homes. A number of abandoned farmhouses have also been filled. This movement which may develop into a major trend is beset with many problems related to land use.

Still another change is taking place in parts of the older upland, particularly on the periphery. This is the establishment of a number of new farm units. These farms are larger and are using modern techniques. Some of these examples were discussed in Chapter I in relation to soil improvement practices on the more highly leached soils of these uplands. These farms have a good chance of success because a closer adjustment to land capabilities is being made by enterprising farmers.

---

[1] These are forests that the owner agrees to protect from livestock and other misuse in return for a low rate of taxation.

The intermixture of the old and the new — the present patterns and problems of land use in these areas of the older uplands — these are the topics of this chapter.

Location, Extent, and Subdivisions

These older uplands which constitute about two-fifths of the county are delimited and subdivided into land use areas in Fig. 20. The line dividing them from the till plain is a demarkation based on glaciation. The boundary between the area of older uplands and that of river valley and upland fringe has been explained as being based on orientation toward or away from the valley. Non-uniformity of soils, slope, and degree of dissection within the area markedly influence land use. Parts are level enough to be used for farming, although soil acidity and low fertility are serious handicaps. In other areas slopes of 20 to 30 percent are common with only relatively narrow ridges and creek valleys tillable in these more dissected parts. Here residential uses and forestry are dominant, with only scattered farms occupying the more favorable situations.

Associated with marked contrasts in physical features between older uplands and other areas of the county are differences in percentage of total land in farms, use of land in farms, size of farms, crops grown, livestock kept, value of land, status of operator, and upkeep of buildings. Significantly sharp areal differences stand in such proximity that varying patterns are easily observable. A review of these emphasizes current maladjustments in an area not so richly endowed by nature as the till plain or the river valley.

Agricultural Patterns and Problems

General Use Characteristics. Study of Table XIV in conjunction with Tables VI and XI brings into focus a number of important contrasts. Farms of the more level parts of the older uplands are characterized by distinctly

TABLE XIV

Patterns of Use on the Older Uplands, Ashland Township*
(Unpublished Minor Civil Division Data, Bureau of the Census)

Size of Farm and Tenure of Operator		1935	1945
Number of farms		187	184
Size of farm	(acres)	101	113
Full owner operators	(%)	59.9	65.2
Part owner operators	(%)	9.1	17.9
Tenant operators	(%)	31.0	16.9

Major Uses of Land in Farms. (% total land in farms)		1935	1945
All land in farms	(acres)	18,873	20,862
Cropland harvested	(%)	30.1	39.0
Cropland idle	(%)	9.9	6.0
Crop failure	(%)	3.3	0.0
Pasture plowed within last 7 years (plowable pasture, 1935)	(%)	7.3	14.8
Other pasture and woodland pasture	(%)	30.1	27.9
Woodland not pastured	(%)	12.9	9.6
All other land	(%)	6.4	2.7

Major Crops, 1945 (expressed as % of total cropland harvested)	
Corn	42.5
Wheat	7.8
Oats	6.6
Soybeans	11.2
Clover and/or Timothy cut for hay	23.3
Alfalfa cut for hay	.3
All other crops	8.3

Livestock on Farms, 1945 (average number per farm)	
All cattle and calves	7.7
Cows and heifers milked	2.6
All hogs and pigs	14.2
Sows and gilts	2.1
All sheep	5.1
Horses	1.4

*Ashland Township is representative of the more level parts of the older uplands.

less cropland, lower quality pasture with more woodland pasture, and more woodland not pastured than in the till plain and river valley. Somewhat more than 11 percent of the total land in farms was reported as cropland idle (9.5%) and crop failure (1.7%) in 1939. This is in contrast to relatively much smaller acreages so reported on the till plain (Table XI). Changes in land use in response to the upward trend in general price level between 1935 and 1945 have brought a nine percent increase in cropland with declines in woodland, idle cropland, and land in other uses. Thus land submarginal for crops in the mid-thirties became marginal and supra-marginal land during the war and post-war years. In most instances these recent changes have not been toward greater permanency in agriculture on these older uplands.

While relatively more farmers own their farms on the older uplands than in the till plain or river valley, the quality of land owned is markedly lower as shown by various maps in Chapter I. Two-thirds of the farms were owner-operated in 1945 (Table XIV) compared to about one-half in the Corn Belt segment of the till plain and only one-fifth in the river valley, the most commercialized agricultural parts of the county. Only where dairying is prominent as in the northeast part of the county are there more owner-operated farms (76.2% for Brown Township in 1945).

Farms in Ashland Township on the older uplands are only ten acres smaller than those of the Corn Belt segment (Adams Township); but in 1945 the former had only about 40 acres of cropland per farm compared with about 75 acres for the latter. Even after taking into consideration the fact that farmers of Ashland Township on the older uplands own two-thirds of their farms in contrast to slightly less than one-half owned by Corn Belt farmers in Adams Township, there is still a marked disparity in both quality and quantity of cropland owned. About 28 acres is owned per farm in Ashland Township (older uplands) compared to 38 acres in

Adams. Twenty-eight acres of poor quality cropland is inadequate for tractor farming; consequently additional land must now be rented or purchased in order to establish an economical farm on the older uplands. Fewer farms and larger farms are currently needed to encourage better cropping practices and stronger livestock programs.

There is less corn, soybeans, wheat, and oats and more clover and timothy hay on Ashland Township farms (Table XIV) than in representative parts of the till plain and river valley. Average corn yields of 43.2 and 39.6 bushels in 1944 and 1939 respectively in Ashland Township are 15 to 20 bushels lower than for the Corn Belt and river valleys. Wheat yields are more nearly the same as those in surrounding areas; but small acreages per farm are insufficient to maintain a combine, and to hire a combine often means waiting until the crop has been damaged. Poorly drained and strongly acid to very strongly acid soils have greatly limited alfalfa as a more productive substitute for lower yielding timothy and clover hay now commonly grown.

Some important commercial apple and peach orchards are found on the older uplands and adjacent more rolling parts of the till plain (Fig. 20). Ridge crests and slopes originally cleared for general farm crops make favorable orchard sites. Well-drained clay loam soils with good water holding capacity situated on slopes and narrow ridges which give good frost protection is a combination of physical advantages not commonly found elsewhere in the county. For these ridges and slopes orchards are a conservative use. Although favorable physical conditions exist, the disadvantage of having to compete with Indianapolis factory labor in combination with declining general consumption in apples will limit expansion. Small orchards are now being widely planted on part-time farms and residential tracts. These small orchards will be greatly handicapped by lack of know-how and equipment. Except for limited home consumption people should be discouraged from planting them.

On farms of the older uplands fewer hogs and cattle are fed and fewer cows are milked than those of the till plain and river valley. This is a reflection of low crop and pasture production per farm rather than widespread cash sale of grains off the farm. Some of the more successful farmers of this area have a heavy livestock feeding program based in large part on grain purchased from nearby surplus grain areas, principally the river valley and Corn Belt segment of the till plain. Short distances to haul grain and the availability of feeder cattle and sheep on the nearby Indianapolis stock market is encouraging some farmers to follow heavy feeding programs which recently have been profitable and which also results in an appreciable transfer of fertility to these upland farms. It seems probable that some of these upland farmers can continue to take advantage of nearness to surplus grain and short hauls on livestock to and from the stockyards. However, stronger feeding programs within the surplus grain areas and a smaller profit margin will prevent any widespread expansion of livestock feeding based on imported animals and feed on the older uplands.

Greater frequency of dilapidated farmsteads of the older uplands are in marked contrast to well-kept farmsteads of the dairy and Corn Belt segments of the till plain. This is illustrated by Photographs 16, 17, and 18. Disintegrating farmsteads on small farms of the older uplands where farm incomes are inadequate to maintain property in good repair are common. Average 1940 per farm investment in buildings in Ashland Township was only $1,039 compared with $2,749 on the dairy segment of the till plain, $1,632 in the general farming area, and $1,553 in the Corn Belt.

Use Patterns on Individual Farms. More capital and larger units are general current needs on many farms of the older uplands. Unfortunately those who most need to expand their volume of production are least able to do so. Brief descriptions of a small, a medium, and a

PHOTOGRAPH 16
(Upper)

A well-kept farm on the till plain west of Monrovia. Such farms are typical of this northwestern part of the county.

PHOTOGRAPH 17
(Center)

Only a short distance from the farm shown above is this home with its unpainted buildings and its infertile patch of cropland in the foreground. The glaciers left little or no fertile till here.

PHOTOGRAPH 18
(Lower)

The southern part of the county also has its infertile hill farms.

large farm having similar soil and slope conditions will illustrate these needs.

One farmer owns only 66 acres of level but strongly leached land in westernAshland Township (located as Farm #7 in Fig. 20). He has 45 acres of cropland, 10 acres of open permanent pasture and 8 acres of woodland pasture. He follows a three-year rotation of either corn-hay-hay (timothy and clover) or corn-wheat-clover. In 1948 his corn made 80 bushels to the acre with 225 pounds of 3-12-12 fertilizer used. His timothy and clover hay crop yielded a very creditable 2.3 tons to the acre.[2] His livestock include two horses, three milk cows, three sows, nine fattening hogs, ten ewes, one steer, and 200 laying hens. This farmer feels that his farm is not large enough to support a tractor; so he hires his plowing and disking done, his wheat combined, and his hay baled. Like many other farmers of the older uplands he is past 60 and his two grown children are engaged in non-farm occupations. His farm is well-kept with buildings and fences in good condition. When he started farming on this farm 35 years ago, it was an economical unit for one man, his boy and two or three horses. This is not a worn-out farm but its size should be doubled to support modern conveniences desired by most farmers today.

Not far from this farm is another farm of 135 acres with 96 acres of cropland, 25 acres of open pasture, and 10 acres of woodland pasture (located as Farm #8 in Fig. 20). A three-year rotation of corn-wheat-clover is used with approximately 32 acres in each crop in 1948. This farm has about twice as much livestock as on the first farm described. This farmer has been experimenting recently with plowing under 500

---

[2]Now that many farmers are baling their hay, more accurate hay yields can be obtained. This farmer reported his yields as 1200 bales of 50 to 60 pounds from 14 acres.

pounds of 3-12-12 fertilizer in addition to applying 200 pounds with wheat and corn at time of planting. In 1948 he had a yield of 60 bushels of corn from one-half of a field on which clover had been plowed under with only 200 pounds of fertilizer applied at time of planting. On the other half of the field a yield of 90 bushels was obtained through application of an additional 500 pounds of fertilizer plowed under with clover sod. This illustrates the advantage of having available capital to initiate increased production per acre. Whereas this farmer has a tractor and accompanying equipment, a 1948 automobile, a refrigerator, running water, inside bathroom, bottle gas cook stove, and other conveniences, the 66-acre farm has a team of horses, a 1937 automobile, a dug cellar, an outdoor pump, outside toilet, and wood cook stove. These two farms having very similar slope and soil conditions have been operated by the present owners for more than 25 years. Evidence of good management is apparent on both farms. One is twice as large and therefore is able to support many modern conveniences that the other cannot afford. Both are favorably situated to compete in mechanized agriculture, yet because of limited size one has maintained the practices of a former era. Since the farmer on the 66-acre farm has prospective non-farm heirs, this tract will be sold or rented. Many of these small farms that are no longer economical units are thus being gradually consolidated into larger farms.

On these small and medium farms a continuity of family ownership is difficult because the units are too small to support owner and son for that span of years when both will need separate incomes. Several farms of the older uplands are large enough to encourage the inheritance of the farm by a farmer heir. The man who inherits a farm as a going concern is able to add improvements and follow conservative agricultural practices not economically feasible on smaller units. An illustration of such a farm is one of 485 acres purchased three years ago by the present owners - a father and son (located as Farm #3 in Fig. 20). Somewhat

greater degree of slope than on the two farms previously described encourages greater emphasis on livestock. A dairy herd of 20 Holstein cows, 15 sows, 95 fattening hogs, and 12 young dairy heifers were on the farm in August, 1949. The 361 acres of cropland was being used as follows in 1949:

Corn	150 acres
Soybeans	70 acres
Wheat	56 acres
Mixed Clover	85 acres

A four-year rotation of corn-soybeans-wheat-clover is currently being followed, but eventually most of the cropland is to be taken out of row crops. Heavy (4 tons to the acre) applications of lime twice in three years on some of the farm plus heavy initial applications of fertilizer (500 pounds of 4-12-8) plowed under and 200 pounds of 3-18-9 planted with corn, wheat, and soybeans is rapidly building up the productive capacity of this farm. Fields that had been yielding 20 to 25 bushels of corn when the farm was taken over three years ago yielded approximately 100 bushels of corn in 1948. On this farm, which was also discussed in Chapter I (Table II), capital is available to apply adequate lime and fertilizer to attain high production quickly. These soils are classified as being of medium to low productivity, moderate susceptibility to erosion, and very strongly acid. However, if the present emphasis on livestock with accompanying strong hay and pasture programs is continued, there is a good indication that a successful commercial farm can be established, because the size of the unit is sufficiently large to make closer adjustment to the capabilities of the land.

All three of these farms have generally favorable slope conditions and a high proportion of cropland per farm. Within the older uplands are areas generally too rough for agriculture, but on the periphery of

these more dissected uplands are farms handicapped by adverse slopes. These farms must be large to be economical units. Furthermore, major emphasis on livestock appears essential to their success. Those inadequate in size are relegated to an inferior agricultural role with many destined to revert to forest, residential or resort use. In some cases they will remain as part-time farms or be consolidated with neighboring farms. Much the same situation as prevails in the general farming segment of the till plain is applicable to the small uneconomical farms of the older uplands that are in many instances owned by older and retired farmers who will generally leave them to non-farm heirs. These heirs often sell the estate at the first opportunity, especially if there is more than one heir.

If the farm is large, then it may be possible to operate it profitably if careful adaptation to land capabilities is made. The layout of fields used for crops, pasture and woodland must give close attention to slops and soil conditions. A strong livestock grazing program based on high quality pasture and hay is probably the mostfeasible land use on such farms (77, p. 2).

A survey of four large farms situated within the rough uplands reveals the patterns as shown in Table XV. They all have large acreages in woodland and woodland pasture, generally less than half of the total acreage in crops, and large livestock populations that must be fattened partly with purchased feed. The apparent success of these farms strongly suggests size and patterns of use desirable under similar slope and soil conditions. With careful and capable management a number of favorably located large farms in the more dissected uplands are feasible.

Part-Time Farming, Residential, and Resort Patterns and Problems

Since the depression years of the thirties, some significant changes in the rural landscape have been taking place in parts of Morgan County.

TABLE XV

Land Use and Livestock Kept in 1949 on Four Large Farms of the Rough Uplands.

(Numbers heading columns indicate farm locations in Fig. 20 .

	#4 (acres)	#2 (acres)	#10 (acres)	#9 (acres)
Size of farm	540	282	314	388
Owned	480	282	216	388
Rented	60	0	98	0
Cropland	166	144	168	125
Corn	76	38	81	60
Wheat, oats, and rye	59	49	27	30
Soybeans	0	33	45	12
Hay crops	31	24	15	23
Cleared pasture	45	36	8	10
Wooded pasture	80	0	128	253
Woodland not pastured	239	100	0	0
Livestock (August, 1949)				
Sows	40	0	11	12
Fattening hogs	280	0	95	100
Beef cattle				
Cows	0	14	0	11
Heifers and steers	50	13	7	9
Milk cows	1	1	5	4
Sheep (ewes)	0	0	10	20

Nowhere else in the county have changes been so rapid as in the more dissected parts of the older uplands. The part-time farm, the rural residence, and the summer cottage have greatly increased in number.[3] The "back to the land" movement of the thirties, stimulated by the great economic depression, was followed closely by a period of war prosperity, during which years urban housing became critically short in many centers where war industries were developed, as in Indianapolis. As stressed in Chapter II, fast hard-surfaced highways, improved automobiles, and the eight-hour day have made it increasingly easy for more urban-employed workers to seek the amenities of rural living. The rough uplands of Morgan County are well located as sites for rural residences. Here is land available for subdivision nearer to Indianapolis than any other area of cheap land. Furthermore, because this land is situated on the industrial side of Indianapolis, slow crosstown traffic is avoided and rapid commuting is favored. Lack of zoning laws in Morgan County makes it possible to erect any type of house. Certain restrictions on subdivision of land and building in Marion County have encouraged many to take advantage of the absence of rural zoning in Morgan County.

Growth. The great increase in number of rural residences and part-time farms is shown by Fig. 27. This contiguous area of about 25 square miles in the rough central part of the county has had a large concentrated influx of people during the past ten years. In 1936 there were 157 dwellings in the area. In August, 1949 there were 295 houses, only 41 of these were on full-time farms. The others were rural non-farm residences and part-time farmsteads. Many of the ridges have been occupied only very recently by these non-farm rural residents. Of the 51

---

[3]The part-time farm as used in this discussion is one having over three acres of land or a value of products of at least $250. A rural residence is a holding that doesn't meet these qualifications. There are many one and two acre tracts on which less than $250 worth of produce is being raised.

DISTRIBUTION OF DWELLINGS ON THE ROUGH UPLANDS IN CENTRAL MORGAN COUNTY, INDIANA

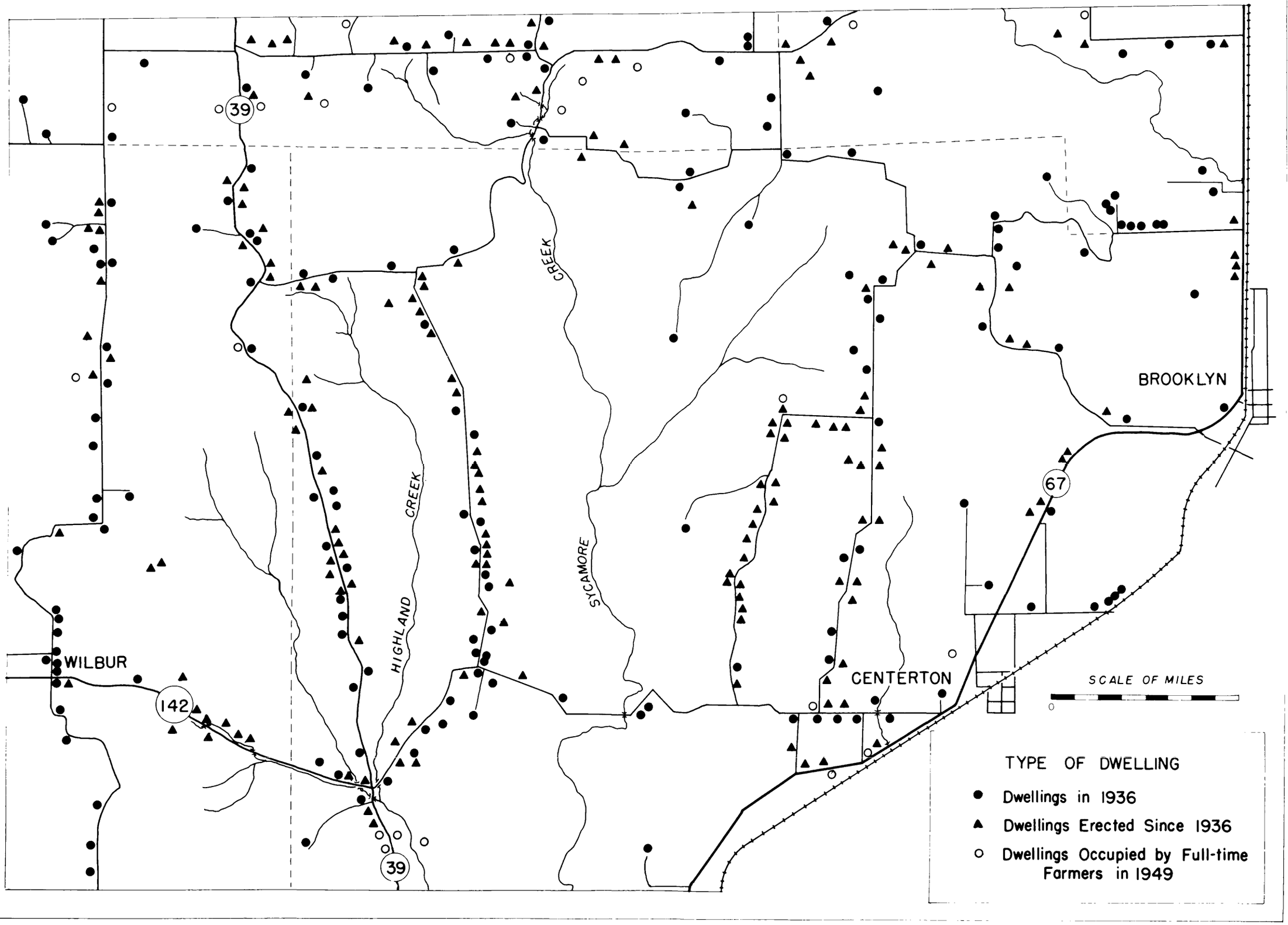


FIG. 27

families interviewed,[4] 33 had lived at their present residence five years or less; 22 families had lived in their present homes for only two years or less. Only nine had established their present home before 1940. Of these nine part-time farms and rural residences, five have incomes exceeding $5,000 a year. Thus the largest increase in rural population in Morgan County during the past decade has been in the more dissected areas of highly leached and easily eroded soils.

Subdivision of Tracts. This sudden increase in dwellings has been accompanied by considerable subdivision of tracts and greatly inflated prices for land mostof which could have been purchased for $10 to $20 an acre 20 years ago. The desire to get small tracts fronting on roads has greatly boosted land prices. Post-war per acre prices for tracts of one to five acres are ranging from $75 to $125 an acre. Frequently only an acre or so is cleared and often a deep hollow is a prominent feature on part of the tract. For larger tracts the prices are about $50 to $75 an acre. Generally there is uncleared land on the tract but little or no valuable timber is left. Most of this land has little possibility of being developed into cropland in fields suitable for large scale tractor farming. Small fields for crops are feasible; however, much of it is suitable only for woodland or pasture. This is the cheapest land available, since good cropland in the northeastern part of the county along main highways is generally selling for not less than $400 to $600 an acre in one to two acre tracts. Many who have purchased rough upland expressed a preference for small tracts more conveniently located along state highways, but in many instances such sites are simply not for sale, since farmers are unwilling to sell part of a good field to someone who may become an undesirable neighbor.

---

[4] The sample of 51 rural non-farm residents was taken at random from the whole county.

Trends in the subdividing of some areas of rough land in Morgan County are revealed by comparing plats of 1909, 1931, and 1949 (84, 85, and 86). In 1909 there were 44 landowners in six sections situated in the rough central uplands.[5] The average size of tract owned in these sections was 87 acres. In 1931 there were 37 owners in the same area with 103 acres the average size of holding. By 1949 there were 89 owners of holdings averaging 43 acres. This clearly indicates that subdivision of tracts has occurred since 1931. Subdivided tracts are aligned along secondary roads. In selling land owners have generally insisted upon selling elongated strips with narrow road frontages. This means that more tracts can be sold at better prices. Since the roads in the rough parts of the county tend to follow ridges or creek valleys, subdividing into long narrow strips means that most tracts have a considerable acreage in hollows and steep slopes.

Motivation Behind the Influx. The motivation behind this shift of non-farm residents to the open countryside is a complex of several desires and necessities. Interviews of 51 families revealed both immediate and deep-seated motives behind the establishing of rural non-farm residences in various parts of Morgan County. Table XVI classifies the replies to the question "Why did you move to this location?" Many of the replies were in terms of strong convictions about the country being a better place to live and to rear children. The recency of the last depression combined with the opportunity and necessity of finding a residence on the countryside surrounding urban centers resulted in an accelerated movement into Morgan County. Practically all of those interviewed considered their present residence as permanent rather than temporary until they can again find urban or suburban housing.

---

[5] Sections 21,22, 27,28, 33, and 34 of Township 12N, Range 1E were used to compare these changes in land ownership.

TABLE XVI

Replies to the Question: "Why did you move to this location?"

Classification of Replies	Number of Replies
Lower living costs	13
Desire for the amenities of rural life	12
To rear family away from urban influence	9
To get out of Indianapolis and Martinsville	7
To get a place to retire	7
Wanted a week-end and summer vacation place	6
To farm	5
Living on the old "homeplace"	5
Unable to find housing in Indianapolis	4
Security	2
Conveniently located near to work possibilities	2
For health	2

Type of Residence. Rural non-farm residents have come from a wide range of income groups and have tended to concentrate in parts of the rough uplands for widely different reasons. Those with higher incomes often came seeking week-end and summer vacation homes. The scenery and isolation of the area have attracted many; particularly impressive are the autumn scenery and unobstructed views across the White River valley from certain ridges of the rough uplands. Many discovered they liked living in the country and became permanent residents commuting to urban jobs. There is an apparent tendency for the high income groups to segregate on certain ridges or parts of ridges that have become restricted through the efforts of a few far-sighted residents who have purchased additional tracts along the roads in order to keep out undesirables. Photograph 19 shows a typical rural non-farm residence of a moderately well-to-do businessman who selected the site 16 years ago.

Lower income groups have concentrated on the ridges of the dissected uplands because here was land that they could afford. Furthermore, there are no building codes specifying the type of house which can be built.

PHOTOGRAPH 19
(Lower Right)

Rural residence — first class.

PHOTOGRAPH 20
(Upper Right)

Rural slums.

PHOTOGRAPH 21
(Upper Left)

The old "homestead" now occupied by urban-employed dweller.

PHOTOGRAPH 22
(Lower Left)

Small well-kept cottage on the rough uplands.

Some of the ridge roads are lined at intervals of less than a quarter of a mile with small houses and shacks similar to those shown in Photographs 20 and 21. Very few of the newly constructed houses are substantial and comfortable for the size of family generally occupying them. Some parts of these ridges may be appropriately designated as rural slums. Many of the houses are unpainted; others are dilapidated farm houses either sold or abandoned by former owners. On the other hand there are numerous attractive small cottages often surrounded by shaded well-kept lawns (Photograph 22). There are very few large dwellings.

Background of Residents over 18 Years of Age. Nearly one-half of the residents over 18 years of age were reared in cities. Another one-third were reared in the rural communities where they are now residing. The remaining one-fifth were reared in other rural areas. Four-fifths of the residents over 18 years of age had lived in a city at some time or other. Two important observations may be made from these data. In the first place there is a strong movement from the cities, since nearly one-half had been reared in urban centers and over four-fifths had lived there. Also there is an apparent tendency to take up residence near the old homeplace, since one-third were reared in the community where they are now residing. Many of this latter group had lived in a city at least for awhile. This high proportion of urban reared residents has encouraged neglect of the land on which the residences are situated, because so many lack the know-how to use it properly. To date little constructive use is being made of most of the tracts occupied by rural non-farm residents.

Place and Kind of Employment. As shown in Table XVII over half of those interviewed are employed in Indianapolis, with Martinsville the next most important place of employment. Thirty-seven of the 43 gainfully employed persons are working all year, while the others work from

TABLE XVII

Type and Place of Employment of 43 Gainfully Employed Rural Non-Farm Residents

Place of Employment	Number Employed	Type of Employment	Number Employed
Indianapolis	30	Factory	21
		Allison	5
Martinsville	6	Chevrolet	2
		Link Belt	2
Mooresville	2	Others (less than two in any factory)	12
Brooklyn	1		
		Service	12
Monrovia	1	Carpenters	4
		Auto Mechanics	3
Valley Mills	1	Other	5
Neighborhood & Travelling	3	Widows	2
Widows	2	Retired with pension	3
Retired	5	Retired without pension	2
		Welfare relief	1

100 to 225 days. The greatest proportion of the rural non-farm residents are factory workers, although Table XVII indicates a fairly wide dispersal among other kinds of employment. The representation of older people such as widows and those with and without pensions indicates this to be a cheap and pleasant place to spend the latter years of life. The absence of heavy concentration of employment in a few firms or in a few kinds of jobs is a reflection of the diversified industrial pattern of Indianapolis. This wide dispersal of employment is of special importance when the question of poor relief is raised. In townships dominated by the older uplands the problem of raising sufficient taxes to support schools, roads, poor relief, a township trustee, and other expenses of local government has always been a serious one. The recent influx of urban employed workers has suddenly raised the amount and value of tax-

able property. The sudden lay-off of these workers would just as suddenly reduce the taxes that could be collected. Since practically all of the rural non-farm residents are producing no saleable produce on their land, the collection of property taxes in these townships depends primarily upon the level of urban employment. This is evidence that townships as taxation units are obsolete, since great mobility today cuts across townships.

Commuting. Driving southwest out of Indianapolis on state roads 67 or 37 between five and six p.m. on a workday impresses one with the heavy volume of commuter traffic. Approximately 500 are commuting from Martinsville[6] and many from Mooresville are working in Indianapolis. When the considerable numbers from the open countryside are added to the commuter traffic converging cityward from Mooresville and Waverly, the traffic intensity becomes heavy. In order to reduce cost of commuting, it is a common practice to haul paying riders or take turns in the use of automobiles owned by various riders. During the week parked automobiles at the intersections of secondary roads and main highways are seen frequently. For example, seven parked automobiles were observed at one intersection on numerous days last summer. All parts of Morgan County are within a forty-mile radius of Indianapolis, which means that the driving time for the most distant parts is only slightly more than an hour to and from the city limits. Crosstown rush traffic within Indianapolis makes it necessary for many urban residents to spend an hour each way getting to and from work. The added cost of commuting from the open countryside or from small towns and cities is easily compensated for by the lower prevailing rents and taxes in these places, which means that any food produced by commuters can be considered

---

[6]Estimate of Chamber of Commerce for 1947-48.

as an additional income advantage over urban residents. Rural non-farm residents having gardens and some livestock pointed out that their urban-dwelling friends were greatly surprised at their lower food bills. Such impressions as these, related to friends residing in the city are giving added impetus to the surge to the urban fringe from which commuting is now a pleasure most of the year rather than a long tiresome street car ride.

Tenure, Size, and Use of Holdings. Practically all of the rural non-farm residents and part-time farmers own their land. Only three out of 51 families interviewed are cash renters. The average size of holding is 21.9 acres. Table XVIII shows that most of the holdings are less than 50 acres with about two-fifths of them less than ten acres. On the average only 5.8 acres of each holding is cleared land, the remainder being in woodland suitable for fuel but having very little merchantable timber. Only one-fourth of the owners are making any use of their woodland other than for recreational purposes. One-third of the residents are using some of their land for crops. Four of these rent cropland to farmers. However, only one-sixth of the total acreage in the 51 holdings is being used for crops. Most of the cropland is being used for corn and soybeans. Low yields are characteristic.

TABLE XVIII

Size of Holding Among 51 Rural Non-Farm Residents and Part-Time Farmers

Size of Holding	Number of Holdings
Less than 3 acres	11
3 to 10 acres	10
11 to 20 acres	13
21 to 50 acres	13
Over 50 acres	4

Three-fourths of the residents have gardens, but the benefits derived vary greatly. Practically all of the gardens are maintained only for home use with very little grown for sale. Production for sale is uneconomical because of competition with commercial farms, but food produced for home use assumes a retail value which if grown can mean a considerable saving. Most of the produce is consumed fresh, but some are canned. Four of the 51 residents had frozen food units. These units are profitable to this group of rural non-farm residents only if they will produce more of their own food. A big well-cared-for garden is the greatest single most practical use that a resident can make of his land. Such a garden can be maintained by having a farmer break and work the ground in the spring after which working it can be properly cared for by hand. Such a garden should add $150 to $200 to the family income if it is well managed.

Nearly half of the residents have some fruit trees planted either for home use or small commercial production. From the standpoint of physical conditions these small orchards are generally well located, but they will be a financial loss to their owners as a commercial enterprise. Existing commercial apple orchards in areas where rural non-farm residents are numerous have probably encouraged many of the uninitiated to plant small orchards. Several are growing small fruits which are much better adapted to the average size of residential holding. Strawberries, raspberries, and blackberries yield well on some of the soil types found in the older uplands. These come into bearing much more quickly than peaches and apples; furthermore, they require less skill in caring for them. In addition to these advantages, market opportunities in Indiana for these small fruits have been exceptionally strong since the war. The increased demand for them is partially explained by their adaptability to freezing. Indianapolis offers a nearby market for commuters to sell a considerable share of their fruit

as fresh produce through door to door sales. If only fruit for home use is all that is wanted, these small fruits likewise have special merit for small holdings.

Livestock kept without growing the feed is probably a waste of time on small holdings. A few chickens to dispose of garbage is a possible exception. If grain and pasture can be provided on the holding then a cow and a hog are likely to lower food costs. Two-fifths of the 51 residents interviewed are keeping chickens. Most of those keeping hens have less than 30. Only seven residents reported large numbers of fryers for the summer of 1949. High cost of feed is discouraging many from raising chickens. Practically all of the flocks kept were for home use, with sale of eggs and fryers only incidental.

Only nine of the 51 residents are keeping one or more cows per family. One-sixth of the families are keeping some other livestock, principally some rabbits and a hog or two per household. For many of the residents livestock other than chickens are too confining; particularly is this true for milk cows. With one-half of these over 18 years of age reared in urban centers, it is understandable why the livestock population is not greater among the rural non-farm residents. Furthermore, most of these residents do not have the capital or know-how to start raising livestock.

Toward More Effective Utilization of Residential and Part-time Farming Tracts. Since most of the residents are engaged in jobs having a 40-hour week and since commuting time from most of Morgan County to the outskirts of Indianapolis is an hour or less each way, there is considerable opportunity to make the land count for much more in boosting the family income than it generally does at the present time. Many rural residents could provide themselves with a better living if more attention were given to the growing of better gardens and in some cases keeping some livestock. Lack of know-how, inadequate capital, and an

unwillingness to be tied down by growing gardens and keeping livestock prevent many from benefiting economically from rural residence. Producing more of the family's food means an increased family income.

The opportunities available to these rural residents may be illustrated by the land use program of a young factory worker and his wife, who have three children. Both have a rural background and both have lived long enough in Indianapolis to discover that they didn't like it. They own a small four-acre tract. Only about two acres are suitable for garden and crops, the remainder being on a moderate slope which is well utilized for pasture. The tillable two acres are about equally divided between a large garden plot and a field for growing hay and corn. Strawberries, raspberries, blackberries, cherries, and peaches are also being grown. A hand sprayer is used for spraying the fruit trees regularly. A small garden tractor is used for cultivating. Only the breaking and disking of the ground is hired. Cropland and garden are well fertilized and limed. The livestock being kept in August, 1949 were a cow, three calves, 50 fryers, and 15 laying hens. Generally a hog is kept for winter killing. One of the calves is to be killed during the winter; one is a young heifer calf, and the other is yet unweaned. If the field is in corn, then hay is purchased; when it is in hay, corn is obtained from a neighbor. A frozen food unit and a wife willing to can fruit and vegetables grown also figure prominently in making profitable use of this small tract.

Table XIX presents an itemized account of expenditures and sources of income from this small tract operated under careful management by this industrious couple. The value of produce raised is figured on a retail basis, since the quantity produced is for home consumption only. The return to labor and land of $476.65 represents a considerable opportunity to increase the family income that is available on many of these residential and part-time tracts through greater effort to make the land

TABLE XIX

Retail Price and Cost of Producing Commodities on a Four-Acre Part-Time Farm in 1949.

Item	Quantity	Unit Retail Price August, 1949	Total
INCOME			
Potatoes Stored for Winter Use	10 bu.	$2.50	$ 25.00
Fruits & Vegetables Canned			
Corn	20 pts.	.18	3.60
Green Beans	30 qts.	.20	6.00
Tomatoes	20 qts.	.25	5.00
Tomato Juice	25 qts.	.17	4.00
Blackberry Preserves	10 pts.	.33	3.30
Raspberry "	10 pts.	.51	5.10
Peach "	10 pts.	.23	2.30
Fruits & Vegetables Frozen			
Corn	15 containers	.27	4.05
Peaches	25 "	.35	8.75
Raspberries	10 "	.45	4.50
Cherries	10 "	.45	4.50
Strawberries	25 "	.39	9.75
Fruits & Vegetables Consumed Fresh (estimate)			200.00
Dairy Products			
Milk	1000 qts.	.17	170.00
Butter	55 lbs.	.67	36.85
Meat			
Pork (two hogs)	400 lbs.		119.00
Beef (steer)	700 lbs.		142.95
	TOTAL PRODUCE		754.65
EXPENSES			
Home Freezing Unit			
Depreciation & Interest			48.00
Electricity			60.00
Garden Tractor			
Depreciation & Interest			45.00
Gasoline			10.00
Other			5.00
Breaking & Disking of Ground			15.00
Alfalfa hay	3 tons	20.00	60.00
Fertilizer	300 lbs.	66.00 (ton)	10.00
Seed, Spray Materials, & Other Miscellaneous Expenses			25.00
	TOTAL EXPENSES		278.00
	ADDED INCOME FROM USE OF HOLDING		$476.65

count for something other than a place to live and for recreation. Many are probably too lazy to avail themselves of this possibility of improving the utilization of their land. However, talks with rural non-farm residents reveal a widespread desire to make better use of the land they own. Furthermore, it is apparent that many of these people know little or nothing of how to tackle the problem from a paying standpoint. Here is a group of people and a considerable amount of land that is being almost completely neglected by the Extension Service and the Soil Conservation Service. They do not have the time to give technical advice and work out programs with this large group of potential gardeners and hobby farmers. The example of this one family points to the possibility of much improvement.

Forestry

Forests are sufficient to support a sizeable lumbering industry in Morgan County on the margin of rough unglaciated south-central Indiana. In the once-glaciated and in the non-glaciated parts of the county, forests are a major land use, except in the White River and larger creek valleys (Fig. 20). One of Morgan County's most abundant resources has been its forests. When the white settlers came, these luxuriant forests were so dense and widespread as to be a nuisance to the pioneer who was anxious to get enough cropland to support his family; consequently there was much destruction and waste. Following the Civil War, a greater utilization was made of the forests, since the demand for good hardwood lumber was considerable, particularly in the East. In 1870 Morgan County had some 97,000 acres classified as woodland according to the census; in 1939 only 40,000 acres were so classified. Thus in seventy years, the forest area was approximately halved.

In comparing Morgan County's rank in the state as to forested area, the best available figures are the census enumeration of acres of wood-

land in farms. This excludes some commercial tracts of timber and also the state forest. In comparison with other counties, Morgan has a relatively high proportion of its area in woodland. Only 14 of Indiana's 92 counties had more woodland in farms in 1940 than did Morgan; ten of which are in the unglaciated part of the state. In value of forest products Morgan County ranked ninth in 1939.

The importance of sawmills to the early settlers was considerable, for fine timber was a major source of income to farmers; and logging jobs furnished them with employment during the winter months. These sawmills, often small and widely scattered, were set up and operated in many cases only during the winter season. They became so important that from about 1850 to 1900 this industry employed more men than any other manufacturing industry in Indiana. Today seven mills, concentrated in the southern part of the county, are operating. Only one is located on the till plain (Fig. 19).

Two principal factors have determined the location of the mill sites: (1) nearness to timber supply and (2) availability of transportation facilities. These mills have had permanent locations for many years; formerly mills shifted from time to time to keep near the timber supply. Nearly three-fourths of the lumber production comes from the five mills situated at Martinsville, Whitaker, and Paragon. Approximately one-third of the timber is sawed by the three mills in Martinsville. Another mill, located at Whitaker, saws nearly another one-third of the county's output.

However, unless more systematic methods for the preservation and growth of forests are put into operation, most of Morgan County's sawmills will soon lack the necessary raw materials. Timber is being cut more rapidly than it is being grown and lumber production has been steadily declining for the past thirty-five years in Indiana (Table XX).

TABLE XX

Lumber Production Indiana (1909-1939)
(Source: U. S. Census)

Year	Number of Active Mills	Quantity Produced (M feet b. m.)
1909	1,599	556,418
1919	707	282,487
1929	349	169,970
1939	297	111,280

The location of Morgan County on the margin of the more heavily forested part of Indiana and near good transportation facilities and markets is relatively favorable to the continuance of a profitable lumbering industry, so long as timber remains available. And the presence in parts of the county of sizeable areas ill-adapted to farming but suitable to forest growth makes it desirable to preserve this industry and promote better land use in the more isolated parts of the more dissected uplands. More classified forests and state forests are needed. In the south-central part of the county where a contiguous area of unglaciated rough upland affords little agricultural possibilities a state forest preserve has been established (Fig. 20). There are 4,410 acres of this preserve in Morgan County with more of it extending southward into Monroe. Since July, 1949 additional purchase of 2,891 acres of land has been made in the area immediately adjoining the Morgan-Monroe Preserve at an average purchase price of only $10.24 per acre (88). Much of this land was in extremely bad shape. Replanting some of the badly eroded ridges with pine during the thirties combined with years of protected growth is gradually improving the timber stands and holding the soil.

Classified forests on farms are an attempt to persuade farmers to protect and rejuvenate their timber stands by keeping out livestock. As of March, 1950 there are only 20 classified forest owners in Morgan County with 1,438 acres classified. When classified the land is valued at a $1.00 per acre. Indiana Department of Conservation records show that pre-classification values for these classified tracts varied from $5.00 to $35.00 per acre (87). However, the cost of fencing small tracts on the farm often keeps a farmer from classifying his woodland. Farmers are generally not aware that protected forests can become an important source of income on farms with a lot of woodland. Growth studies indicate that the annual saw timber growth in Morgan County is about 6,000,000 board feet which growth has an annual value of about $120,000 to the landowners. This does not include growth cut for fuel wood, fence posts, saplings for furniture, and other uses (87). A more widespread educational program along with further financial inducements are necessary to make classified forests effective.

Summary

Thus on the older uplands more land is in forests than in any other use. Agriculture is primarily limited to the level lacustrine plain, the karst plain, and adjacent areas of rolling to moderately rough terrain. One of the most intensive uses is for rural dwellings of the non-farm population. Areas of rough terrain lying within 20 to 25 miles of Indianapolis have site value that is associated with pronounced population increase within the past 20 years. Greater changes in land use and ownership have occurred on the older uplands than elsewhere in the county.

CHAPTER VI

SUMMARY

This chapter serves two purposes: (1) It is a summary of pertinent geographic facts regarding physical features, historical development, and present areal differences in land use in Morgan County. (2) It summarizes problems and recommendations related to better land use adjustments.

Summary of Geographic Facts

Landforms. Glacial deposition and a relatively short period of post-glacial erosion are largely responsible for the present landforms. Length of time since the Wisconsin glaciation, depth of till, and deposition of outwash have much topographic significance. About two-fifths of the county is a recent till plain of Wisconsin age little deformed by dissection. Decreasing depth of till from west to east on this plain has made for variations in size of farm, cropland per farm, and utilization of machinery.

Another two-fifths of the county has either been glaciated much earlier (Illinoian) or not at all. The south-central margin and the higher ridges in the central part of the county show little or no evidence of glaciation. These uplands are designated as older uplands to differentiate them from the upland affected by more recent Wisconsin glaciation. Marked dissection has occurred in these uplands with the exception of an old poorly drained lakebed (Lake Quincy - Fig. 3) and adjacent fringe in the west-central part of the county. Here the Illinoian till has a depth of about 100 feet. Otherwise, thinner till and greater interval of time since glaciation means much more area in steep

slopes, narrow ridge crests, and hemmed-in creek valleys. This is an area ill-suited to benefit by the introduction of the tractor and accompanying equipment.

Diagonally crossing the county from northeast to southwest is the White River valley varying in width from nearly five miles at Paragon to hardly more than one mile near the Wisconsin glacial margin (Figs. 2 and 3). Floodplain and terrace are not distinctly separated; the line marking extent of highest flooding is the common basis for separating terrace from floodplain. The valley floor is extremely level with sandy knolls on the terrace and abandoned river channels on the floodplain offering the only diversity. Thus the valley is topographically ideal for highly mechanized agriculture.

Soils. Soil forming processes at work on glacial deposits of different age and depth under diverse drainage and slope conditions have led to marked soil variations which have been highly significant in fashioning land use patterns. Soils are conveniently classified as (1) upland, (2) terrace and lacustrine, and (3) alluvial. All are deciduous forest soils, light in color and low in organic matter except where drainage has been unusually poor. Fine texture predominates with five-sixths of the soils being silt loams. Three-fourths of the soils are naturally well-drained; the others grade from poorly to very poorly drained. On the latter much ditching and tiling has been needed in order to use them agriculturally. One-fourth of the soils are classified as mildly alkaline, neutral and slightly acid. These soils are situated primarily: (1) on the floodplain of White River, (2) along creeks with watersheds in areas of Wisconsin till, and (3) in the poorly drained lakebeds and depressions of the northwestern part of the county. Little or no lime amendment is needed on these soils. Soils of medium acidity are found on the terrace built from Wisconsin glacio-fluvial and wind blown materials and on the better drained upland of Wisconsin till.

Lime application to these soils is desirable. Strongly acid and very strongly acid soils, composing two-fifths of the total area, are found on upland, terrace, and floodplain made up of Illinoian glacial drift, limestone, shale, and sandstone materials. On these soils heavy application of lime must necessarily precede other agricultural improvement measures.

Limitations especially significant to the use of Morgan County soils are: low organic content, erosion menace and erosion damage already inflicted, acidity, poor drainage, excessive drainage and droughtiness, and overflow.

Climate. Local climatic differences are of little significance to land use in Morgan County. The most noticeable climatic contrast existing within the county is a marked difference of one to two weeks in length of frost-free season between river valley and adjacent high ridges on which most of the county's commercial apple and peach orchards are located. Some significant characteristics of climate include: (1) tropic-like summers with an average temperature of 74°F., (2) frost-free season of around 180 days, (3) winters with mean temperature slightly below freezing, (4) little snow cover, (5) evapotranspiration greater than precipitation from about mid-June until the first part of September under average conditions, (6) sufficient variability in rainfall to curtail crops and pasture in dry years, and (7) wet springs which cause floods in the fertile valleys.

Natural Vegetation. Originally covered with luxuriant beech-maple, oak-hickory, and sycamore-willow-soft maple forests, Morgan County now has practically no original stands left. Second and third growth timber still occupies about one-fourth of the area of which only a relatively small part is good commercial saw timber. Valley lands and till plain have been mostly cleared for cropland and pasture while the rough terrain of the older uplands is still largely forested.

Evolution of Land Use. The settlement of Morgan County extended from 1819 to 1853, and after 1853 very little land was still owned by the federal government. The greatest influx of settlers was from about 1819 to 1830. Upon entering Morgan County the pioneers first located on the terrace of White River and along the larger creeks, since water transportation was then vital. Before the Civil War agriculture was largely self-sufficing with only a small part of the produce sold to buy necessities that could not be produced on the farm. The outlet for these early agricultural commodities was down-river by flatboat to New Orleans.

By 1880 about 95 percent of the land was in farms. Since this peak a decline to 86 percent in 1945 has taken place with the state forest preserve, rural residences, commercial timber tracts, roads and growth of towns and cities accounting for the reduction. Woodland in farms has steadily declined. Acreage in cropland was highest in 1920, but increased use of lime and fertilizers, improved seed, hybrid corn, more balanced rotations, use of more mechanized equipment, and other improved practices have kept production at a high level. Sharp reductions in wheat and corn acreages without appreciable replacement by other crops occurred between 1920 and 1930. This reduction in cropland was accompanied by marked decline in the number of farms (2492 to 1972) with many farmers going off the farms to work in Indianapolis, Martinsville, and elsewhere. Much marginal land retired from use since 1920 was not returned to crops, but remained in forest or pasture. Farmers were beginning to concentrate their efforts on the better lands.

In no census year has corn occupied less than 42 percent of the cropland harvested for the county as a whole; in 1880 slightly more than half the cropland harvested was in that crop. The decline in wheat started prior to World War I but that crop was temporarily revived by the high prices prevailing during and after the first World War.

World War II accounted for little appreciable increase in wheat acreage. Soybeans have greatly increased in importance since 1940 in response to the increase in demand for domestic vegetable oils. Alfalfa has taken an important place as a hay crop in the county, although the total acreage remains relatively small.

The most marked trend in livestock has been a sharp decline in the number of horses since 1925. Hogs have been declining slightly with cattle becoming more numerous. Milk breeds have generally been more common than beef cattle; however only recently has interest in dairying become widespread. Chickens and poultry products produced largely on general farms find a market in Indianapolis. Sheep, while never of major importance, have declined partly because of the menace of dogs.

Thus the most significant recent developments in land use in Morgan County are the reduced acreage in crops and the rising production per acre. The retirement of some of the marginal land from crops has been an important step forward in stabilizing agricultural land use in this county.

Cultural Features Significant to Land Use. Growth and distribution of population, changes in transportation, growth of manufacturing, and community institutions and attitudes are significantly related to land use changes, patterns, and problems.

(1) Growth and Distribution of Population. Until about 1850 agricultural development was the keynote and the availability of good farm land largely determined the population. By 1850 most of the good land was taken; consequently fewer and fewer new settlers stopped in Morgan County. From 1850 to 1910 the growth of manufacturing within the county absorbed surplus young men and women reared on Morgan County farms, consequently the total population continued to increase. Since 1910 the migration of the youth from farms to cities outside the county has been sufficiently great to cause a decline in total population

(Fig. 16). The 1940 population of 19,801 was 2,617 less than in the peak census year of 1910. A study of approximately 300 Paragon High School graduates revealed that less than one-fourth of the youth reared in a rural community of southwestern Morgan County remained in their home community after graduation from high school. Starting with the depression and gaining momentum during and following World War II a reversal of net migration has occurred which is modifying land use patterns appreciably in some parts of the county.

Rural population falls into three groups: (1) the small town and village group, (2) the non-farm group living in the open countryside, and (3) the farm group. The small towns and villages are all long established centers that were an integral part of the early settlement pattern. Today their functions are more restricted, although the more accessible villages have to an important extent become residential centers for people commuting to jobs in Indianapolis and elsewhere. Within the last fifteen years the non-farm group living in the open countryside has grown greatly. These are concentrated in three types of locations: (1) rough areas where abandoned farms on ridges and cutover woodland have been offered for sale at prices that prospective owners can afford, (2) narrow strips along main highways not suitable for cropland, (3) strips along roads radiating out of the county's principal towns, Martinsville, Mooresville, and Morgantown. In addition to these concentrations, the non-farm population is scattered in all parts of the county.

Some of the most productive and least productive land is sparsely populated. The lower White River valley, some smaller stream floodplains, and the lower part of the Lake Eminence plain have very few people because of flood hazard and dampness. There is a concentration of farmsteads on their margins. Two rough non-agricultural areas along the southern margin and in the central part of the county have very few people. On the other hand some parts of the rough upland have heavy

concentrations of rural population. People have moved into these areas for two major divergent reasons: (1) cheap land was available for those with little money, and (2) the scenery and isolation desired by many was available.

(2) Changes in Transportation. The flatboat, railroad, and truck have successively played the major role in transporting farm produce and forest products to market. Orientation of main transportation routes has been controlled principally by the White River valley and the location of Indianapolis. In the flatboat era (1830-1853) produce went to market largely down-river. Since then Indianapolis has been the principal outlet.

(3) Growth of Manufacturing. By encouraging the migration of youth off the farms and by furnishing local markets for agricultural and forest products, local manufacturing has been important to land use developments. The greatest expansion in manufacturing occurred between 1880 and 1910. Sawmills and furniture manufacture have long drawn upon the forests of Morgan and adjacent counties. Canneries process tomatoes, sweet corn, peas, and pumpkins grown by Morgan County farmers. Some specialized small manufacturing industries established in Mooresville and Martinsville during the past fifteen years have added to the movement of non-farm population to the open countryside.

(4) Community Institutions and Attitudes. In town and village, school and church a loosening of community ties has been characteristic. Rural dwelling people in aligning themselves with larger centers of economic and social activity have become increasingly dependent upon these for their goods, markets, and their culture. Consolidated schools offering more varied secondary training have channelled many youth into non-farm employment, and at the same time 4-H clubs, Future Farmers of America, and other youth groups are preparing those who remain to become farmers and farmwives and to make a better living through better care

of their farms. The Extension Service, the Soil Conservation Service, the Agricultural Conservation Program, Farm Security Administration, the Forestry Service, and other agencies are carrying on a program of education that is helping in many instances to adjust rural land use more closely to physical, economic, and social conditions.

Areal Differences in Land Use Patterns. Distinct patterns of rural land use were delimited in Morgan County through field survey, personal interviews with farmers and extension specialists, use of minor civil division census data, and long-standing acquaintance with the area and its people.

Contributing the major part of the agricultural produce are the more commercialized farms of the Corn Belt (Fig. 20), the northeast dairy segment of the till plain, and the White River and larger creek valleys. Less productive general farms characterize the eastern part of the till plain and the more level and rolling parts of the older uplands. The rougher areas of these uplands have scattered full-time farms with markedly less cropland and more woodland per farm and increasing acreages devoted to state forests, part-time farms, and rural residences (Fig. 20).

(1) River Valley and Upland Fringe. This area has some unique features which set it apart in land use. A ribbon of uninhabited fertile floodplain is flanked by concentrated farmsteads on the terrace and more diffused farmsteads on the upland fringe. These are orientated toward the river, because the cropland on the floodplain is needed to supply adequate crop acreage for these farmers. Frequent floods have long renewed fertility on the one hand and menaced crops on the other. They exclude all but unimproved roads from overflow land; likewise there is a unique absence of farmsteads and fences on the floodplain. Formerly the summer farmstead was a common adaptation for those farms with a separation of cropland, and permanent residence. Today the rubber-tired

tractor has not only enlarged river valley and upland fringe farms but has broken them into even more scattered and numerous tracts than formerly. Concentrated settlement and clearing of land for crops occurred first on the terrace (Fig. 12) but soon spilled over onto adjacent floodplain and upland fringe. Permanent farmsteads advanced toward the river only to retreat with increased frequency of floods (Fig. 21). Those who came later had to be content with left-over upland fringe tracts. By 1853 practically all land had been purchased and a century later most of the forests had been cleared except for steep slopes of the fringe area. Today cropland constitutes nearly three-fourths of all land in farms (Table XXI). No other area of comparable size has so much cropland and so little pasture.

Farms are large in the valley and adjacent fringe, because so much land is rented. There is an increase in the size of farm as the degree of ownership decreases. Nearly nine-tenths of the farmers rent some or all of their land. Four-fifths of the cropland is rented, most of it on a 50-50 share rental basis. Only in the river valley does rented cropland exceed owned cropland. Generally active farmers still own the less fertile tracts, while much of the fertile floodplain is owned by retired farmers, widows, and other non-farm owners (Fig. 24). It is significant that while four out of every five acres of cropland is rented, two out of every three acres of pasture are owned. High tenancy on the fertile floodplain results in part from the inability of farmers to purchase expensive land from non-farmer heirs and others who are willing to sell their land. Non-farm savings seeking investment opportunities have been used to purchase much of this good land as it is offered for sale.

Two-thirds of the cropland is in corn and soybeans -- more than for any other land use area in the county. Slightly over one-fifth of the cropland is in wheat and oats -- also more than other areas. Hay occupies markedly less cropland than elsewhere, but there is somewhat greater

TABLE XXI

Areal Contrasts in Size of Farm, Status of Operator, Major Use of Land, Major Crops, and Livestock for Morgan County.
(Unpublished Minor Civil Division Data, Bureau of Census (1945), except River Bottoms and Upland Fringe Area for which 1949 personal interview data is used.)

	River Bottoms-Upland Fringe (Personal Interviews)	Corn Belt (Adams Township)	Dairying (Brown Township)	General Farming Till Plain (Greene Township)	General Farming Older Uplands (Ashland Township)
Size of Farms (acres)	233	111	93	121	113
Status of Operator (as % of all operators)					
Full Owners	12.0	48.4	76.2	65.6	65.2
Part Owners	56.0	24.3	.5	17.4	17.9
Full Tenants	32.0	27.3	18.2	17.0	16.9
Manager Operator	0.0	0.0	5.1	0.0	0.0
Major Uses of Land in Farms (as % of all land in farms)					
Cropland Harvested	72.9[2]	65.4	52.7	43.3	39.0
Crop Failure	—	.3	.6	.9	0.0
Cropland Idle	—	1.4	.3	3.6	6.0
Pasture Plowed Within Last 7 Years	17.6[3]	6.3	10.2	5.7	14.8
Other Pasture	—	8.1	16.4	11.3	25.1
Woodland Pasture	--	8.1	6.6	20.6	2.8
Woodland Not Pastured	9.5[4]	1.5	3.2	6.0	9.6
All Other Land	--	8.9	10.0	8.6	2.7
Major Crops (% of cropland harvested)					
Corn	44.6	45.2	49.1	43.2	42.5
Soybeans	22.6	20.5	13.7	13.0	7.8
Wheat	11.8	10.2	7.5	13.1	6.6
Oats	10.6	7.3	10.3	6.6	11.2
Clover and (or) Timothy Cut for Hay	2.4	12.2	10.5	10.3	23.3
Alfalfa Cut for Hay	4.6	.5	3.5	4.0	.3
All Other Crops	--	4.1	5.4	9.8	8.3
Livestock (Average number per farm)					
All Cattle	12.0	9.3	11.7	9.0	7.7
Cows and Heifers Milked	5.0	2.5	5.1	4.1	2.6
All Hogs	37.0	36.1	21.8	12.0	14.2
Sows and Gilts	5.0	5.0	3.7	2.3	2.1
All Sheep	0.0	7.2	1.1	2.8	5.1
All Horses	0.0	1.2	1.0	1.9	1.4

[1]This appears to be a possible error in census returns.

[2]This is all cropland only a small part of which was idle or had crop failure in 1949.

[3]This includes all pasture.

[4]This is woodland not pastured and other land.

emphasis on high quality alfalfa as a hay crop. The floodplain has the heaviest concentration of corn and soybeans. Some oats are grown on the floodplain but most of the wheat and hay are grown on the terrace and on the upland fringe. One-half of the hay is grown on owner-operated cropland which suggests somewhat less emphasis on row crops on owner-operated land.

Hogs are kept in larger numbers in this area than elsewhere. Increased numbers of dairy animals are being kept on some of the farms, but others still keep few or none. The horse is gone and very few sheep remain. Relatively few farmers are emphasizing beef cattle. More livestock will probably be kept when current high prices for cash grains decline.

(2) Land Use Contrasts on the Till Plain. Some significant differences in land use on the till plain correlate closely with differences in depth of glacial till. Soils and topography are progressively less favorable for agriculture from west to east (Figs. 5 and 7). Table XXI emphasizes graduations in land use which include a west to east decline in quality of pasture, and an increase in woodland not pastured. Nearness to Indianapolis, the cultural influence of the Quakers, and presence of main travel routes offset agriculturally less favorable soils and topography in the northeast.

Patterns of land use divide the till plain roughly into three parts. The northwestern segment can properly be designated as the Corn Belt because of heavy emphasis on corn and soybeans raised as cash crops and the high hog population. Only the White River valley has more acres of corn and soybeans than on the northwest segment of the plain. Hogs are also much more common here than elsewhere except in the river valley and upland fringe area. Excepting the rough uplands no other part of the county has so few milk cows.

In the northeast, dairying is stronger than elsewhere. Nowhere

else are there more owner-operated farms than here. Thrifty Quakers have held onto their land. Fewer hogs are fattened here than in the Corn Belt or in the river valley and upland fringe areas. The greater acreage devoted to corn in Brown Township than elsewhere in the county is explained by the fertile White Lick valley bordered by good upland soils. For the northeast as a whole less corn is more characteristic. Soybeans are much less important than in the river valley or on the northwest part of the plain.

In the eastern general farming segment less corn and soybeans and more wheat are typical. There are very few hogs but interest in dairying has been growing. Whereas farms have been getting larger elsewhere on the plain in response to increased use of mechanized equipment, farms of this area have declined slightly in size which is indicative of a deterioration of interest in farming and inability to compete with more favored areas unless consolidation and better management of farms take place.

These differences in agricultural land use are reflected in various pertinent cultural features of the plain. Small relatively inconspicuous barns in the northwest, the big red barn and white silo in the northeast, and the dilapidated barn of the east can hardly escape attention. Compact farms are more prevalent in the northeast and east than in the river valley and upland fringe and northwest segment of the plain. Greater compactness is associated with greater degree of owner-operated farms and is partially explained by the need for less land to absorb labor and the capital invested in machinery. Greater irregularity, smaller size, and more dissection of fields from west to east means decreasing adaptability to use of tractor-powered equipment.

(3) Land Use on the Older Uplands. In close juxtaposition to the till plain and river valley, the older uplands sharply contrast with these areas in agricultural productiveness. Soils are strongly and very

strongly acid (Fig. 6), mostly susceptible to severe or very severe erosion if cultivated (Fig. 7), and of low to medium productivity (Fig. 8). Topography varies from a very level poorly drained old lakebed (Lake Quincy), through a more rolling karst area with little surface drainage, to a highly dissected area with narrow ridges and small stream valleys (Fig. 3). Decreasing depth of the Illinoian till and finally its absence accounts for increasing ruggedness. Much of the more rugged parts of this upland remain forested with second and third growth oak-hickory stands.

Four patterns of land use prevail on these older uplands: (1) full-time general farming, (2) commercial apple and peach orcharding, (3) part-time farming and residential, and (4) state and private forestry. Formerly full-time farming has been more widespread than now. Today many small uneconomical farms have become part-time farms and residential tracts for urban-employed occupants. Since 1927, state forests have expanded to include 4,410 acres within the county. Further expansion is now taking place.

(a) Full-Time General Farming. Many of the farms are too small in terms of quantity and quality of cropland to be operated as individual units with tractor equipment (Table XXI). Much of the pasture is low quality woodland pasture. As in the general farming segment of the till plain full owners constitute about two-thirds of the farm operators. Although much of the cropland is not well-suited to row crops, corn occupies nearly as much of the cropland harvested as in the White River valley; however soybeans are of much less importance. Corn yields of about 40 bushels per acre are characteristic.

Clover and/or timothy hay occupies nearly one-fourth of the cropland which is almost twice as great as in any other area of the county. Relatively few cows are milked per farm and the corn crop is adequate to feed only about one-third as many hogs as on river valley and upland

fringe farms. Sheep are relatively important. Here as on the general farming segment of the till plain the horse has lingered as a source of power on the smaller farms where older farmers are living out their days on farms that will in many instances be inherited by non-farmer heirs.

(b) Commercial Apple and Peach Orcharding. Orcharding has been sufficiently important in Morgan County to place it fourth among Indiana's 92 counties in total number of trees in 1940. High ridges with clay loam soils have been favorable to apples and peaches. Nearness to Indianapolis has made it easier to market the fruit; but recently competition with urban industries for labor has made it difficult to operate orchards. Since the general apple market outlook is unfavorable and since land suitable for orchards is limited, the expansion of commerical orcharding will be small.

(c) Part-Time Farms and Residential Tracts. Rapid recent increase in number of part-time farms and residential tracts in Morgan County has been stimulated by such factors as nearness to Indianapolis, improved roads and automobiles, reduction in length of work day, scarcity of urban housing, and greater strictness of suburban building codes. People have pushed to the urban fringe seeking, among other things, lower living costs, the amenities of rural life, a chance to rear a family away from urban influences, a place to retire, a week-end and summer place, and security.

Greatest recent growth of rural population has occurred on some of the poorest land. Part-time farming and residential tracts are concentrated there for two widely divergent reasons. On the one hand urban people of the higher income groups have been seeking the scenery and isolation of hilly areas. Those of the lower income groups have come to the rough uplands because here is the cheapest land they can buy. The background of the incoming residents is largely urban — one-half

were reared in cities. About one-third are from the rural communities where they are now residing. Many of this latter group had been living in cities. Employment in Indianapolis and Martinsville is most common. Factory workers constitute the largest group with those engaged in service industries second most important. A number of the residents are retired; some are widows, and a few are welfare cases. Commuting range to Indianapolis includes all of Morgan County.

Nearly all of the part-time farms and rural residences are owned or are being purchased by the occupants. Nearly one-half of the holdings are less than ten acres and practically all are less than 50 acres. Uncleared land greatly exceeds that cleared. Only about one-sixth of the land is being used for crops with most of the cropland in corn and soybeans. Some fuel was being obtained from wooded tracts. Three-fourths of the residents have gardens for home use which vary greatly in quality and size. A strong interest in small orchards for commercial production needs to be discouraged, since they will not be profitable. A few fruit trees kept for home use and small fruits such as strawberries, raspberries, and blackberries appear to be much more practical. A few chickens, an occasional cow, some hogs for meat, and rabbits constitute the sparse livestock population.

(d) Forestry. Forests have always been important on the rough uplands. Sawmills now drawing upon an area much larger than Morgan County are still numerous. The establishment of the state forest preserve and classified forests have been initial steps toward a more scientific forestry which would be the desirable land use for the isolated rough areas of the county.

Summary of Problems and Recommendations

Morgan County is a county in transition from a predominantly exploitative economy to one making more enduring use of farm and forest

land. It lacks the stability and attention to conservation which characterizes such areas as parts of sourtheastern Pennsylvania. Major land use problems confronting all or part of the county are considered in the light of what can be done to correct some of the maladjustments. The various land use areas have basic problems which are of special significance from the standpoint of establishing greater permanency in land use. These may be summarized as follows:

(1) The Corn Belt of the till plain and the river valley-upland fringe area are faced with the necessity of maintaining and even increasing agricultural production under relatively favorable soil and topographic conditions. Also in these areas absentee ownership of the better land is a growing problem.

(2) The dairying part of the till plain is experiencing a noticeable deterioration of interest in dairying, which if not corrected, may have serious repercussions in upsetting a moderately conservative system of farming. Several specific problems to be mentioned later are also of importance in the dairying area.

(3) For the general farming sections of the till plain and older uplands a basic problem appears to be the need for maintaining and enlarging the more successful farms and at the same time establishing proper land use practices on smaller farms that can be used advantageously as part-time enterprises for non-farm employed dwellers.

(4) In the part-time farming and residential areas there is general neglect of the land.

(5) For the forestry areas a major problem is better care of privately owned woodland.

Possible courses of action in terms of some apparently successful patterns of use now established within the county are summarized below for these problems.

Corn Belt and River Valley-Upland Fringe Areas. In the Corn Belt

the maintenance and restoration of organic matter to highly productive soils is a major fertility problem (Chapter I, pp. 31-35) and (Chapter IV, pp. 134-139). In the river valley increased effort is needed to supplement floods on the lower floodplain in order to keep productivity at a high level. Soil fertility is currently being drawn upon heavily by corn and soybean cropping (Chapter I, pp. 40-41). In neither of these areas is soil erosion or the correction of excessive soil acidity an important problem (Figs. 6 and 7).

Very consistently farmers having balanced livestock programs are among the most successful farmers with higher incomes and well-maintained farms. The Corn Belt, with its lacustrine plain ill-suited for pasture and with a high proportion of land suited to crops, is capable of feeding out large numbers of hogs and beef cattle and is relatively less favorable for dairying. Many farmers are utilizing a little labor on good land by making direct sales of corn and soybeans rather than utilizing surplus labor in winter by feeding out more hogs and beef cattle.

In the river valley and upland fringe area livestock are restricted to the terrace and upland fringe. If floods cannot be avoided on the lower floodplain, the problem is to find a crop that can compete with corn and soybeans yet maintain productivity and provide an adequate income on this land. For the immediate future greater use of a winter cover crop such as rye and of an annual legume like sweet clover is highly desirable on the floodplain. More attention to livestock is further hampered by the high proportion of rented cropland that is often remote from the farmstead of the operator (Fig. 22). Furthermore, since many of the owners of this land are not interested in livestock rental arrangements, about one-third of the crop is sold out of the area as cash grain.

Increasing absentee ownership is a specially significant problem

of the river valley and upland fringe. A farmer who doesn't inherit land generally cannot afford to buy both a tract on the terrace or upland fringe for a farmstead and another tract on the floodplain for cropland. Since a declining number of farmer heirs are in line to inherit land, a separation of the farmer from his best land has been taking place. Strong migration of potential heirs off the farm and competition of non-farm savings seeking good investment opportunities have accelerated the alienation of the best land from the farmer. Nowhere else in the county does this separation of land and farmer stand in such bold relief as in the river valley where floods have always more or less necessitated a broken farm and the renting of some cropland (Fig. 22 and Chapter III, PP. 109-114).

The migration of youth off the farms and the substitution of the tractor for the horse have greatly increased the acreage of rented land. In the river valley owner and tenant alike have long exploited the land on the assumption that what was taken from the soil in crops the river would put back through frequent floods. There is currently a growing realization among river valley farmers that deposition of alluvium and a few slipshod conservation farming practices are no longer maintaining soil fertility. Only within the last five years has fertilizer been widely used on farms in this area. Widespread application of crushed limestone on terrace and upland fringe has also been a recent innovation. Rotations are not yet carefully aligned with soil capabilities.

Dairying Area. In the northeastern part of the county dairying can take advantage of a favorable market position and soils and topography that can be well utilized if more attention is given to pasture and hay crops. Important problems for dairying in Morgan County include: (1) inadequate attention to good feeding, (2) shortage of responsible labor, (3) marketing disputes, (4) marked seasonality of production, (5) "in and out" production, (6) absentee ownership, (7) need for shift in dairy

breeds (fewer Jerseys and Guernseys and more Holsteins), and (6) large investment needed to sell Grade "A" milk. Some of these are unlikely to be solved soon. The labor problem and absentee ownership are probably the toughest problems of all, because without proper attitudes the farmer can hardly hope to keep his land and his labor. A little sensible cooperation can go a long way in solving the marketing dispute. A better feeding program, a shift to breeds more suitable for fluid milk production, and less seasonal flucuation in production will come through an educational program which is already helping (See Chapter IV, pp. 139-148).

General Farming Areas of the Till Plain and Older Uplands. In the general farming areas more larger farms are needed. More emphasis on grazing here is complementary to a stronger feeding program in the northwestern Corn Belt. Definitely less emphasis on row crops is needed to conserve soil resources and maintain strong farms.

While it is generally true that the farms of the eastern till plain and the older uplands are too small to be economical, there are several sufficiently large ones to compete successfully with those in the Corn Belt and river valley having more and better cropland. Careful and shrewd management characterize these larger farms. Heavy applications of ground limestone and fertilizer, better planning of rotations, greater regard for slope conditions in utilization of fields, strong livestock feeding programs, and attention to pasture improvement are some of the practices that set these farms apart in an area where a successful farmer must be a skillful one. Consolidation of the smaller units is necessary for more widespread stability in farming the older uplands (Chapter I, pp. 35-40, Chapter IV, pp. 148-151, and Chapter V, pp. 154- 163).

Part-Time Farming and Residential Areas. On the whole, relatively little use is being made of the land in part-time farms and residential

tracts. That these tracts could materially increase the incomes of most of the families living on them is illustrated by Table XIX which presents income data for a well utilized small part-time farm. Many are handicapped by inadequate "know-how" and lack of advice as to how their holdings can be made more useful (Chapter V, pp. 176-179).

The recent impact of this greatly increased non-farm population brings to the foreground many problems related to taxation and the provision of governmental services. The following suggestions are pertinent. Services such as roads and school buses can be much more economically provided to areas with concentrations of part-time farms and rural residences than to isolated dwellings; consequently limited rural zoning could well be used to advantage. Furthermore, greater savings to commuters by hauling more passengers per automobile are possible in areas of heavier concentration.

Forestry Areas. Much land with rough terrain in the more isolated parts of the county is best adapted to forests. The present state forest preserve and classified forests on private holdings account for a small part of such land. More understanding and cooperation among forest owners and more encouragement and purchase by state and federal government are needed to accomplish better land use adjustments on much of this land (Chapter V, pp. 178-182).

Concluding Note. Patterns of land use are built up over a long period of time, and adjustments are often slow and dependent upon the inherent productivity of the land and the progressive outlook of the owners. Once soils and natural resources have become partially depleted an effort beyond the means of the average owner may be necessary to regain a higher level of productivity.

In writing this thesis it has been kept in mind that problems of rural land use are often intimately associated with those of the entire economy; therefore local difficulties cannot be divorced from those of

national scene. The general price level, changing consumer demand, opportunities for export of agricultural commodities, regional contrasts and shifts in the cost of production, federal and state agricultural policy, and other factors are all vital to the well-being of any area. A healthy economy is essential for the establishment of greater permanency in land use in this commercialized age. This great dependence of the American farmer on others means that many problems affecting the land use of a specific area must be threshed out on a national level. However, local attitudes and decisions still have a significant role in the realization of better land use adjustments. It is to this local aspect that primary attention has been directed.

BIBLIOGRAPHY

Chapter I. Physical Patterns

1. Brown, R. T., "Geology of Morgan County," Ann. Rept. Indiana Dept. Geol. and Nat. Hist., 13:71-85, 1883.

2. Bushnell, T. M., The Story of Indiana Soils. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, 1944. 52 pp.

3. DeTurk, E. E., "Learn Hunger Signs of Crops," Better Crops with Plant Food Magazine, 30:6-12 and 46-49, May, 1946.

4. Hoffer, C. M., "Potash Fertilizers Are Needed On Many Midwestern Farms," Better Crops with Plant Food Magazine, 29:12-16 and 41-44, August-September, 1945.

5. Indiana Department of Conservation, Streams and Lakes of Indiana, 1933. (Map).

6. Krantz, B. A., "Correlation of Soil Types with Present Land Use," Soil Society of America Proceedings, 5:309-312, 1940.

7. Logan, W. N., E. R. Cumings, C. A. Malott, S. S. Visher, et al, Handbook of Indiana Geology. Indianapolis: Department of Conservation, 2nd Publication, No. 21, 1922. 1120 pp.

8. Malott, C. A., "The Glacial Boundary in Indiana," Proc. Indiana Acad. Sci., 35:93-107, 1925.

9. Purdue University, Dept. of Agricultural Statistics, Indiana Crops and Livestock -- Assessors' Enumeration of Crops, 1930-1945.

10. _____, Indiana Crops and Livestock -- Annual Crop Summary, 1925-1945.

11. _____, Indiana Crops and Livestock -- Annual Livestock Summary, 1926-1945.

12. _____, Division of Agricultural Economics, Morgan County Land Use Planning Committee Report, 1940.

13. Robertson, L., E. C. Young, and H. J. Houk., Types of Farming in Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 342, 1939. 52 pp.

14. Romaine, J. D., "When Fertilizing Consider Plant-food Content of Crops," Better Crops with Plant Food Magazine, 24:6-9 and 37-42, March, 1940.

15. Scarseth, G. D., "Organic Matter and Our Food Supply," Better Crops with Plant Food Magazine, 32:21-22 and 42-44, April, 1948.

16. Snider, H. J., "Needs of the Corn Crop," Better Crops with Plant Food Magazine, 32:19-20 and 47, April, 1948.

17. Thornbury, W. D., Glacial Geology of Southern and South-Central Indiana. Indianapolis: Indiana Conservation Dept., Div. of Geol., 1937. 138 pp.

18. _____, "Glacial Lakes Quincy and Eminence," Proc. Indiana Acad. Sci., 49:131-144, 1938.

19. Truog, E., O. J. Attoe, and M. L. Jackson., "Fertilizer Application Rationalized," Proc. Soil Sci., Soc. of America, 10:219-223, 1945.

20. Ulrich, H. P. and assistants, Soil Survey of Morgan County, 1937. (Pending publication by the U. S. Dept. of Agriculture.)

21. United States Department of Agriculture, Weather Bureau. Climatic Summary of the United States, 1930.

22. United States Department of Commerce, Weather Bureau. Climatological Data, 1924-1948.

23. University of Illinois, Agricultural Experiment Station, Effects of Soil Treatment on Soil Productivity. Bulletin No. 516, December, 1945.

24. Visher, S. S., Climate of Indiana. Bloomington, Indiana: Indiana University, 1944. 511 pp.

25. _____, Economic Geography of Indiana. New York: D. Appleton and Co., 1923. 225 pp.

26. _____, "Regionalization of Indiana," Ann. of the Assoc. of Amer. Geog., 38:282-300, December, 1948.

Chapter II. Evolving Cultural Patterns

27. Baker, O. E., "The Agricultural Prospect," A. E. Parkins and J. R. Whitaker, editors, Our Natural Resources and Their Conservation. New York: John Wiley & Sons, Inc., 1936. 650 pp.

28. _____, "Agricultural and Forest Land," Reprinted from Recent Social Trends in the United States. McGraw-Hill Book Company, Inc., 1933. Pp. 90-121.

29. Blanchard, Charles, editor, Counties of Morgan, Monroe, and Brown -- Historical Bibliographical. Chicago: F. A. Battey & Co., Publishers, 1884. 660 pp.

30. Esarey, L., A History of Indiana, 3rd Edition. Fort Wayne: The Hoosier Press, 1924. Vol. I, 572 pp.

31. Gray, L. C., and O. E. Baker, Land Utilization and the Farm Problem. United States Department of Agriculture, Publication No. 97. U. S. Government Printing Office, 1930. 54 pp.

32. Indiana State Highway Commission, General Highway and Transportation Map of Morgan County, 1937.

33. _____, Traffic Map for the State of Indiana, 1940.

34. Indiana State Planning Board, Preliminary Report on a State Plan for Indiana. Indianapolis: 1934. 163 pp.

35. Indiana; The Land and the People. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 496, July, 1944. 66 pp.

36. Latta, W. C., Outline History of Indiana Agriculture. Lafayette, Indiana: Lafayette Printing Co., 1937. 372 pp.

37. Major, N., "The Pioneers of Morgan County," Logan Esarey, editor, Indiana Historical Society Publications. 5:396-403, 1915.

38. McCrory, S. H., H. F. Hendrickson, and Committee, Technological Trends in Relation to Agriculture. U. S. Department of Agriculture. Washington: U. S. Government Printing Office, 1937. 144 pp.

39. Robertson, L. S., and E. L. Butz, Indiana's Agriculture: It's Output, Costs, and Trends. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, August, 1947. 47 pp.

40. _____, H. F. Ainsworth, O. E. Baker, and N. T. Frame, Rural Youth in Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 467, April, 1942. 47 pp.

41. Starr, G. W., Industrial Development of Indiana. Bloomington, Indiana: Indiana University, School of Business Administration, 1937. 124 pp.

42. Thornbury, W. D., "The Mineral Waters and Health Resorts of Indiana," Proc. Indiana Acad. Sci., 50:154-157, 1941.

43. United States Department of Agriculture, Bureau of Agricultural Economics, Consumption of Food in the United States from 1909 to 1948. Washington: August, 1949. 196 pp.

44. _____, Possible Effects of Conservational Land Use on Production in the Corn Belt and Lake States. Washington: December, 1947. 57 pp.

45. _____, Rural Youth in Southern Indiana.

46. _____, Rural Youth, Hancock County, Indiana. May, 1942. 39 pp.

47. United States Department of Commerce, Bureau of the Census, Census Reports from 1850 to 1945.

48. Visher, S. S., "Population Changes in Indiana 1840-1940," Proc. Indiana Acad. Sci., 51:179-193, 1942.

Chapter III. River Valley and Upland Fringe

49. Anderson, James R., "Some Effects of Glaciation Upon Agricultural Productivity in Morgan County," Proc. Indiana Acad. Sci., 56:174-181, 1947.

50. Baker, O. E., "Rural Needs Analyzed." A published personal letter to Eli M. Shirk, Ephrata, R 2, Pennsylvania, written January 28, 1941.

51. Goodsell, Wylie D., Ronald W. Jones, and Russell W. Bierman, Typical Family-Operated Farms, 1930-45, Adjustments, Costs, and Returns. U. S. Department of Agriculture, Bureau of Agricultural Economics, April, 1946. 91 pp.

52. Graphic Summary of Farm Tenure in the United States. Bureau of the Census, U. S. Department of Commerce, and Bureau of Agricultural Economics, U. S. Department of Agriculture, 1948. 40 pp.

53. Inman, Buis T., "Current Farm Tenure Trends," Agricultural Economics Research, Vol. I, No. 3, 93-97, July, 1949.

54. _____, and William H. Fippin, Farm Land Ownership in the United States. Washington: U. S. Department of Agriculture, Bureau of Agricultural Economics, Misc. Publication 699, December, 1949. 77 pp.

55. Johnson, V. Webster, "Economics of Soil Conservation," Unpublished paper presented before the United Nations Economic and Social Council, June 17, 1949.

56. Jones, Ronald W., and Wylie D. Goodsell, Typical Family-Operated Farms, 1930-45, An Historical Look to the Future, U. S. Department of Agriculture, Bureau of Agricultural Economics, April, 1946. 24 pp.

57. Quackenbush, G. G., and O. G. Lloyd, Farm Tenure in Indiana by Type-of-Farming Areas. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 480, July, 1943. 30 pp.

58. Robertson, Lynn, H. F. Ainsworth, O. E. Baker, Nathaniel T. Frame, and W. V. Rush, Rural Youth of Blackford County, Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station and U. S. Department of Agriculture, Bureau of Agricultural Economics, December, 1940. 95 pp.

59. Timmons, John F., and Raleigh Barlowe, Farm Ownership in the Midwest. Ames, Iowa: Iowa State College, Agricultural Experiment Station, Bulletin 361, June, 1949. Pp. 847-959.

60. Working Capital Needed to Farm in Central Indiana. Lafayette, Indiana: Purdue University, Department of Agricultural Extension, Leaflet 275, 1946. 12 pp.

Chapter IV. Land Use Contrasts on the Till Plain

61. Capital Needed to Farm in the Midwest. St. Paul, Minnesota: University of Minnesota, Agricultural Experiment Station, Bulletin 389, January, 1946. 34 pp.

62. Chapman, C. J., "Efficient Management for Abundant Pastures," Better Crops with Plant Food Magazine, 31:18-22 and 43-46, March, 1947.

63. _____, "Organic Matter Puts New Life in Old Soils," Better Crops with Plant Food Magazine, 33:6-11 and 45, January, 1949.

64. Combs, L. R., "Soil Conservation Raises Midwest Crop Potentials," Reprinted from Better Crops with Plant Food Magazine, 32:25-28 and 43-46, August-September, 1948.

65. Crane, F. H., "Legumes Supply Organic Matter," Reprinted from Better Crops with Plant Food Magazine, 32:6-11 and 45-46, December, 1948.

66. Gannon, E. A., "Dairymen — Can Go To Grass," Lafayette, Indiana: Purdue University Dairy Extension, Mimeo. No. 6. Pp. 1-4.

67. _____, and Charles E. French, "What's Ahead for the Dairyman?" Reprinted from The Hoosier Farmer, June, 1949.

68. Hardin, Clifford M., The Supply and Utilization of Milk in Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 462, August, 1941. 47 pp.

69. Heath, Maurice E., "The Need for Grassland Husbandry," Better Crops with Plant Food Magazine, 32:14-16 and 46-48, October, 1948.

70. Hunt, Lester M., "Suit Attacks Milk 'Trust' — Producers Group Asks $13,000,000," Indianapolis, Indiana: Indianapolis Star, August 24, 1949.

71. Manhart, V. C., Indiana Milk Supply for Different Market Outlets. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 479, March, 1943. 22 pp.

72. Milk Market Review — Indianapolis Marketing Area. Indianapolis, Indiana: Indianapolis Sales Association, Inc., 28 pp.

73. Milk Ordinance of the City of Indianapolis. Indianapolis, Indiana: Department of Public Health, 1949. 16 pp.

74. Nath, Vishwambar, Production and Marketing of Milk for Washington, D. C., 1949. Unpublished doctoral dissertation, Department of Geography, University of Maryland, 1949.

75. Pritchard, Norris T., Uncompleted thesis dealing with The Indianapolis Milk Market, Division of Agricultural Economics, Purdue University, 1949.

76. Robertson, Lynn, Dairy Cattle Costs and Returns in Northwestern Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 481, 1942. 40 pp.

77. Smith, F. V., The Management of Farms in the Limestone Area of South-Central Indiana with Special Reference to the Provision and Utilisation of Pasture. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 473, June, 1942. 51 pp.

78. The People's Guide, Directory of Morgan County, Indiana. Cline and McHaffie, Indianapolis: 1874. 406 pp.

Chapter V. Stabilizing Land Use on the Older Uplands

79. County Forests For Indiana. Indiana Economic Council, Indianapolis, Indiana: September, 1944. 40 pp.

80. Hawley, H. L., Small Agricultural Holdings In Two Industrial Areas In Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 460, May, 1941. 35 pp.

81. Kohlmeyer, J. B., John W. VanHoy, and Sherman O. Kessler, The School Fund Mortgage Loan Situation In Indiana With Special Reference To Land Use In Martin County. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 422, July, 1937. 16 pp.

82. Kohlmeyer, J. B., Major Land Use Problems In Martin County, Indiana, with Suggestions for Programs and Policies. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 453, October, 1940. 34 pp.

83. Moore, H. E., and O. G. Lloyd, The Back-to-the-Land Movement in Southern Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 409, April, 1936. 28 pp.

84. Morgan County, Indiana, Map of Land Ownership, 1909.

85. _____, Map of Land Ownership, 1931.

86. _____, Individual Plats of Land Ownership, 1949.

87. Personal Letter from Carl M. Carpenter, District Forester, Indiana Department of Conservation, Nashville, Indiana: March, 1950.

88. Personal Letter from Margaret M. K. Lanahan, Division of Public Relations, Indiana Department of Conservation, Indianapolis, Indiana: April, 1950.

89. Robertson, Lynn S., and Staff Members, A Guide To Agricultural Programs in Type-of-Farming Area 8, Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 480, October, 1942. 48 pp.

90. Smith, F. V., The Economy of Pastures in the Limestone Area of Southern Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 454, September, 1940. 36 pp.

91. _____, and O. G. Lloyd, Part-Time Farming in Indiana. Lafayette, Indiana: Purdue University, Agricultural Station, Bulletin 410, April, 1936. 28 pp.

92. _____, Farm and Family Incomes and Expenses of Low-Income Farm Families in Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 485, July, 1943. 38 pp.

93. _____, Adjustments in Farm Organization Needed to Conserve Soil Resources in South-Central Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 515, 1946. 39 pp.

94. Young, G. E., Economic Utilization of Land for Pasture in Southern Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 359, February, 1932. 24 pp.

95. _____, Marginal Farm Land in Southern Indiana. Lafayette, Indiana: Purdue University, Agricultural Experiment Station, Bulletin 376, March, 1933. 26 pp.