more humid than that of the upper elevations. During the other seasons, differences are slight. In the case of both soil and air temperatures, the winter readings were lower than expected. Evidently, the warm, moderating effect of the cave and stream was more than offset by an inversion—cold air settling into the sinkhole bottom.

The summer climatic differences between upper and lower elevations are reflected in the vegetation of the area. Of a total of sixty-nine species of vascular plants occurring in the sinkhole and general area, thirty were limited to the lower elevations of the sinkhole.

The occurrence of the thirty species of plants exclusively at the lower elevations is certainly correlated with the microclimatic conditions occurring there. No doubt all three factors are involved—lower summer temperatures, higher humidity, and greater shading. Martin (1959) and Caplenor (1965) found a similar situation in regard to the occurrence of hemlock. Caplenor considered shading to be the most critical factor in limiting hemlock to the gorges of Fall Creek Falls State Park. Evidently, the hemlocks can compete more successfully in such an environment. Whether or not the reduced light is the most important factor in limiting all or most of the thirty species to the lower elevations of the sinkhole would require further investigation. Considering the diversity of plants thriving only at lower levels in the sinkhole, it is probable that different species have been selected by different microclimatic factors, or by different combinations of factors. Final resolution of the problem will require exacting autecological experimentation. Studies such as this form a starting point for such work.

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# VEGETABLE PRODUCTION IN DYER COUNTY, TENNESSEE

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### Introduction

Dyer County, in northwestern Tennessee, is representative of the inner Coastal Plain of West Tennessee both in its physical characteristics and in its agricultural land use. The county is rougly rectangular in shape and covers an area of 527 square miles. All of the county, except for some hills in the central part, is less than 400 feet in elevation (Fig. 1).

Some of the first settlements in the county were established along the Obion and Forked Deer Rivers and their tributaries as early as 1823. By 1850, the settlers were profitably shipping corn meal and tobacco to markets in New Orleans. Later, as transportation systems were developed and markets expanded, agricultural production became more diversified. The present agricultural trend in the county is toward specialization and intensification. For example, vegetable crops, though not extensive in acreage, are a very significant part of the agricultural land use. The 1945 census reported 124,580 acres under cultivation in Dyer County with 737 acres devoted to vegetables. Vegetable production increased to 3,242 acres in 1964, and total acreage under cultivation showed a gain of 19,272

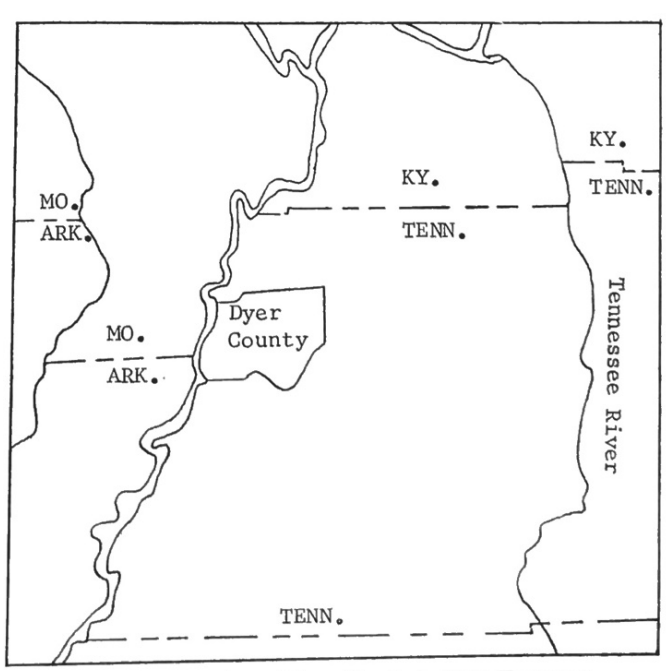


Figure 1. Location of Dyer County in West Tennessee.

acres. Before World War II, vegetables in the county were produced on small farms with the use of hired labor. After the war, a labor shortage forced most vegetable producers to mechanize various phases of production. This resulted in larger vegetable farms and greater specialization.

In small local areas, soil characteristics influence agricultural land utilization more than any other single physical factor. Alternating land use, from time to time, is further influenced by the nonphysical factors of economic growth and technological development. These complex physical and economic factors very definitely influence vegetable land use in Dyer County.

The purpose of this paper is to analyze the significance of vegetable production in Dyer County and to advance some suggestions concerning future trends of this activity within the county.

## Physical Factors

*Physiography.* Dyer County is divided into two principal physical units, each of which stems directly from the physiographic characteristics. The units or divisions are separated by the Mississippi River bluffs. The Eastern Division, covering about three-fifths of the county, is the westernmost extension of the Coastal Plain of West Tennessee. It is a moderately dissected area that supports various land use activities. The farms are small as indicated by numerous fence rows. The Western Division is an alluvial lowland that is topographically monotonous, being relieved by only a few minor stream incisements. This division is one of fertile soil and large farms.

*Soils.* The Silty Adler-Morganfield-Wakeland Soil Association is the major vegetable producing area of the county. This association is a broad, level area below the Mississippi River bluffs. It slopes very gently away from the base of the bluffs for nearly two miles westward to the Mississippi River bottoms. Silt, washed from the bluffs, is about 10 feet thick at the base of the bluffs and becomes progressively thinner as the distance from the bluff increases. It is about 18 inches thick two miles from the bluffs.

This soil is some of the most fertile in the State. It is high in phosphorus and potassium and does not require lime. Therefore, with correct amounts of commercial fertilizer this silty, gently sloping association can produce row-crop agriculture every year.

*Climate.* Climatic conditions in Dyer County, as in much of West Tennessee and surrounding areas, are characterized by relatively mild winters, hot summers, and abundant rainfall. However, extreme and frequent changes in the weather, from day to day and from season to season, are common.

The average annual temperature at Newbern is 60.4 F. Prolonged periods of very cold or very hot weather are unusual. Average daily maximum temperature varies from near 50 F. in winter to the low 90's in summer; and the average daily minimum temperature varies from below freezing in winter to the upper 60's in summer. The average dates of the last freezing temperature in spring and of the first in fall are March 27 and October 31, respectively, according to Newbern records. Therefore, the growing season is approximately 217 days.

Average annual rainfall for the county is approximately 48 inches. Precipitation is lightest in late summer and early fall. However, this does not affect the production of most vegetables and the effect is minor to other aspects of the established agricultural economy.

## Major Vegetable Crops

Lima beans, spinch, and greens are the major vegetables produced in Dyer County. These crops are easily mechanized and this, in part, explains why they are significant.

*Green Lima Beans.* In 1945, Dyer County did not produce enough lima beans to record. However, in 1959, the county recorded 3,062 acres, three-fifths of the total State production. Today 5,600 acres of lima beans constitutes the major vegetable crop of the county. White (75% of total acreage) as well as speckled (25%) lima beans are produced.

The lima bean requires fertile well-drained soil and ample moisture during the growing season. Therefore, irrigation is sometimes necessary. Soil fertility is maintained by performing soil tests each year to ascertain the type and amount of fertilizer application.

Seeding is done during early May by mechanized equipment. Before planting, pre-emergence treatments are utilized to control the weeds and grasses. The cultivation following must be very shallow.

During the growth process, the lima bean is affected by several insects and diseases which must be controlled. The Mexican Bean Beattle and the Bean Leaf Beattle are dreaded insects. A fungus disease, incidence of which is related to weather conditions, is also a slight hindrance to bean production.

Harvesting is accomplished mechancially near the middle of July. The stalks are cut below the ground and the plants raked into rows. When this is completed, a machine picks up the stalk and the beans and separates the beans from the stalk. The beans are then shipped to markets for an average price of $140 per ton.

The lima bean, with a yield of 1½ tons per acre, fits very well in rotation with other vegetables produced in the county. For example, spinach is seeded in November and harvested the last of April. After harvest the land is seeded in lima beans. This enables the producer to receive a greater annual return per acre, which is essential because of the high cost of land in the area.

*Spinach.* Spinach acreage is second to lima beans in Dyer County vegetable production. Presently, in Dyer County, there are 3,000 acres devoted to this crop. From the standpoint of fertile, well-drained soil, spinach has the same requirements as the lima beans. The

soil is tested and usually requires some minor plant nutrients such as iron and magnesium, as well as a very heavy application of nitrate.

Spinach is seeded in intervals, spring and fall, so it will not mature all at once. This staggered planting schedule is necessary, because the entire crop is grown under contract with various frozen food processors. This eliminates the flooding of factories with vegetables.

The farmer harvests the spinach when the processing plants are ready. Spinach is a perishable crop—sun and heat ruin the tender leaves—and it is harvested around the clock. When the spinach is cut at night, the dew preserves its top quality a little longer. The cut spinach is loaded into trucks and delivered to markets for an average price of $50 per ton.

The operation is mechanized. Normally, it takes 10 men two weeks to harvest 150 acres of spinach. After the first crop is harvested, the farmer may apply nitrate and produce a second crop. If so, from four to eight tons can be produced per acre. This is another example of intensified agriculture.

*Turnip Greens.* Turnip greens are planted in rows 10 inches apart. Four rows are placed in a bed five feet wide. In fact, the turnip greens and spinach are seeded similarly. The greens require fertile and well-drained soils, and must be irrigated.

The cabbage looper is a worm that presents a problem to the farmer. The worm migrates rapidly from plant to plant, and the controlling chemical agent is a health danger to the consumer. Also, the plant growth period is so short that the producer hardly has time to spray.

Turnip greens are planted and harvested by machines. The harvest takes place every 30 days, and the yield per acre varies from 6 to 10 tons. Inasmuch as the plants are hybrids and produce greens of very high quality, the market price is from $28 to $30 per ton. The greens are shipped to the same markets as the lima beans and spinach.

## Minor Vegetable Crops

*Snap Beans.* In 1959 there were 163 acres of snap beans in Dyer County. The acreage in 1964 was not enough to record. The commercial acreage has fallen because snap beans production is not mechanized. Small quantities are grown for the local market.

*Sweet Potatoes.* In 1945 Dyer County had 282 acres of sweet potatoes which yielded 26,220 bushels. In 1959, the county had only 57 acres and produced 8,956 bushels. The 1964 census revealed only 38 acres. The crop is declining very rapidly in the county because hand labor is not available. The small amount is marketed throughout the county or shipped to fresh markets in Memphis.

*Tomatoes.* In 1945, Dyer County produced 408 acres of tomatoes. Today the production on a commercial basis is almost non-existent. Decline in production resulted from the inability of farmers to obtain the necessary hand labor. In 1966, the county recorded 10 acres of commercial tomatoes produced by one farmer and he, because of labor shortage, has terminated production.

*Peas and Other Minor Vegetables.* Peas are not very important to the county at this time. If a pea harvesting machine were available the hilly eastern section of the county might become a great producer.

Other vegetable crops such as okra, sweet corn, cabbage, sweet peppers, and cucumbers are also diminishing because of a lack of hand labor.

## Marketing

*Major Vegetables.* The markets for the major vegetables are Bush Brothers Company in Blytheville, Arkansas, Winter Garden Company in Bells and Memphis, Tennessee, Humboldt Freezing Plant in Humboldt, Tennessee, and Frosty Foods Company in Dyersburg, Tennessee. Vegetables are grown under contract between the processing plants and the farmers. This enables the producers to receive a guaranteed price for vegetables.

*Minor Vegetables.* Because these vegetable crops are diminishing in importance, most are marketed locally rather than contracted to processing plants.

## Future Trends in Vegetable Production

Presently, Dyer County is one of the greatest producers of vegetables in West Tennessee. The future will perhaps see the county intensifying its vegetable production.

A highway bridge, crossing the Mississippi River near Dyersburg, is in the planning stage. When completed, both Saint Louis and Memphis markets will be more accessible to Dyer County. In addition, the proposed highway will connect the vegetable producing area of Arkansas and Missouri to Dyer County. More freezing and processing plants will probably locate near the river.

A recent field survey shows that 20,000 prime acres of bottomland suitable for vegetable production are now used for cotton and soybeans. However, by 1980, with the addition of more processing plants, it is likely that very little cotton will be grown and commercial vegetables will be the county's second highest income crop.