

## CHAPTER TWELVE

# AGRICULTURE: THEORY AND ANALYSIS

In the previous chapter attention was directed towards a consideration of the main physical and socio-economic influences on patterns of agricultural production. The aim of the present chapter is to examine an early, but still important, theory of agricultural location, and to demonstrate certain of the techniques more recently developed by geographers for studying decision-making in the agricultural context, changes in the spatial patterns of agriculture and the classification and delimitation of various types of agricultural region. A considerable degree of selectivity has been involved in the choice of techniques for inclusion—this chapter is by no means exhaustive—but the material gives some indication of the modern geographical approach to the study of agriculture.

### A Theory of Agricultural Location

#### Von Thünen's Isolated State

One of the earliest attempts to explain agricultural land use patterns in economic terms is contained in a model of agricultural location proposed by J. H. von Thünen in the early nineteenth century. Von Thünen himself was a prosperous and successful owner and manager of a large estate in Mecklenburg, and his major work, 'Der Isolierte Staat' (The Isolated State), published in 1826, was based in part on his observations of farming practices in that locality. Thus, although von Thünen's work was quoted in Chapter Four as an example of a normative model, it was based in part upon empirical evidence relating to economic conditions in the early nineteenth century.

His theory of agricultural land use is based on the concept of economic rent, which had been described earlier in 1817 by the economist, D. Ricardo, although von Thünen was unaware of Ricardo's work and arrived at the same conclusion quite independently. The economic rent of an area is the return which can be obtained above that which can be got from land which is at the margin of production.

In Fig. 12.1a, A is an area of cultivation close to a city (O). The yield for a given crop is 2.0 tonnes per hectare. As the city expands and its market for produce increases, cultivation is extended to area B, which is located further from the city and is regarded as having a lower fertility. At B the yield is 1.5 tonnes per hectare. In this situation the economic rent of A is 0.5 tonne per hectare converted to a monetary value. If area C is brought into production and yields 1.0 tonne per hectare then the economic rent of A and B will be 1.0 and 0.5 tonnes respectively. Ricardo based his ideas on economic rent on fertility differences of the soil, but von Thünen showed that exactly the same situation arises if the 'quality' of the land varies not with respect to fertility, but with respect to location. Thus in Fig. 12.1b the land is assumed to be of uniform fertility and crop yields equal in all areas, but the return on agricultural produce (XY) declines with increasing distance from the city (O) due to



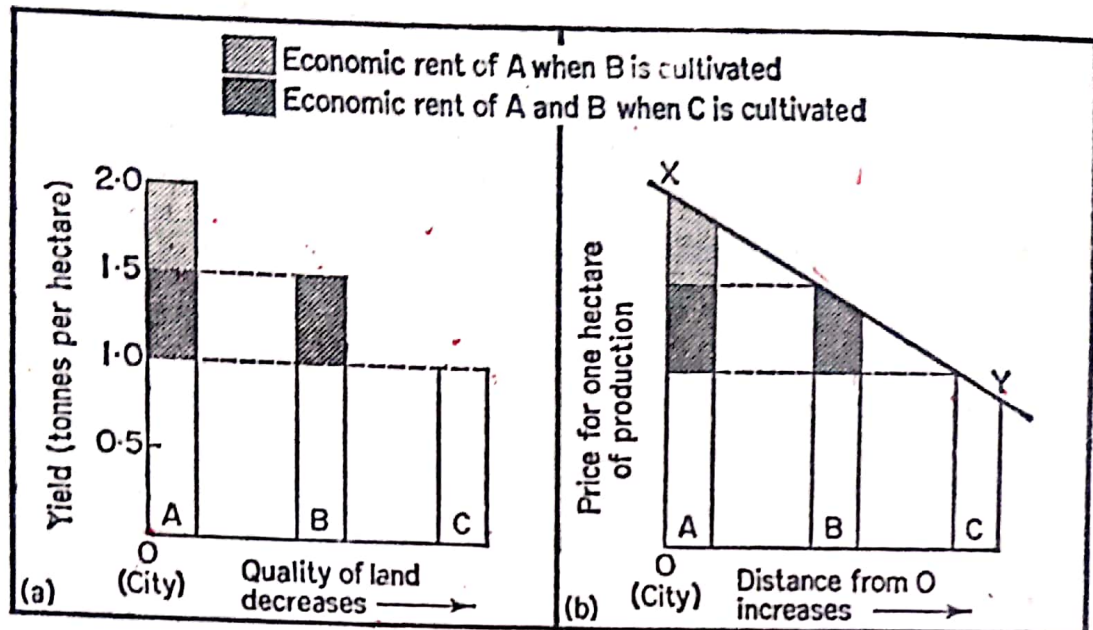


Fig. 12.1. (a) Ricardo's concept of economic rent based on the assumption of declining soil fertility with increasing distance from the city (O). (b) Von Thünen's concept of economic rent determined by the increase in transport costs with distance from the city.

the greater cost of transporting crops to the market. In the diagram the shaded portions of the columns represent the economic rent of A and B if the next distant location is farmed.

The idea may next be extended to two crops, potatoes and wheat. Fig. 12.2 shows the decline in returns over distance for the two crops. Potatoes yield a larger bulk per hectare than wheat, and are more costly to transport. The return from potatoes therefore shows a steeper decline away from the city.

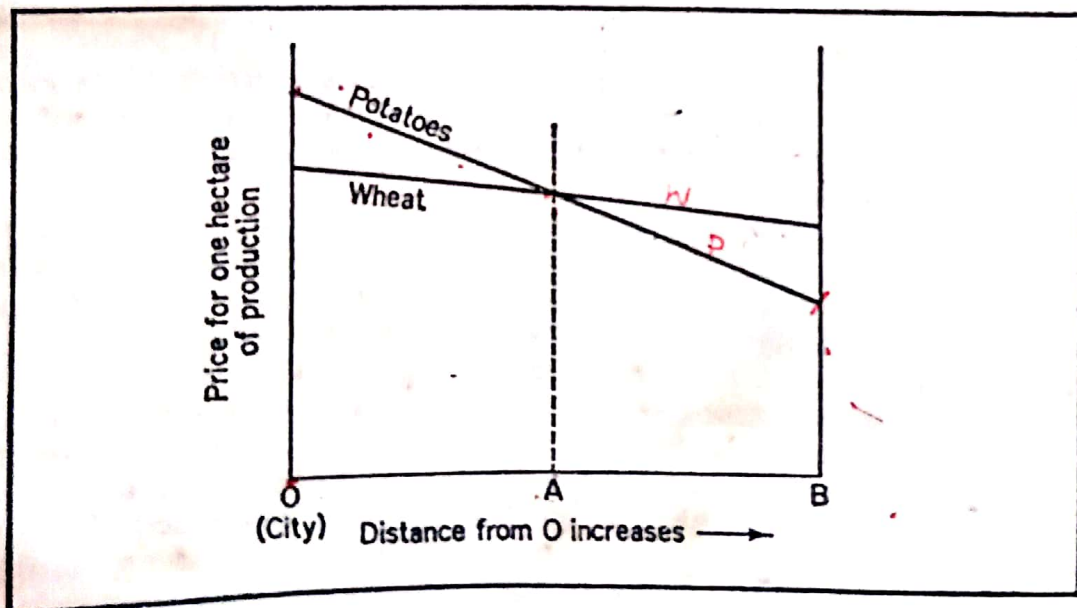


Fig. 12.2. Economic rent for two crops: wheat and potatoes. Taking into account transport costs, potatoes are most profitably grown between O and A, and wheat between A and B.



market than that of wheat. Under these circumstances potatoes will tend to be grown between OA and wheat between AB. By rotating the axis OAB through 360 degrees a concentric zonation of land use will result.

This principle was applied by von Thünen to a hypothetical area which he described as an 'isolated state', surrounded by an uncultivated wilderness and having no trade connections with outside areas. Within this hypothetical state he also assumed the terrain to be completely uniform in respect of relief, soil, climate and all other physical conditions (an isotropic surface). His theory was developed on the further assumptions that all surplus produce was sold in a single central city upon which all communications converged, that a single form of transport was used (horse-drawn carts), and that transport costs were directly proportional to distance. Under these conditions von Thünen envisaged that the pattern of agricultural land use would consist of a series of concentric zones of differing production around the city as shown in Fig. 12.3a.

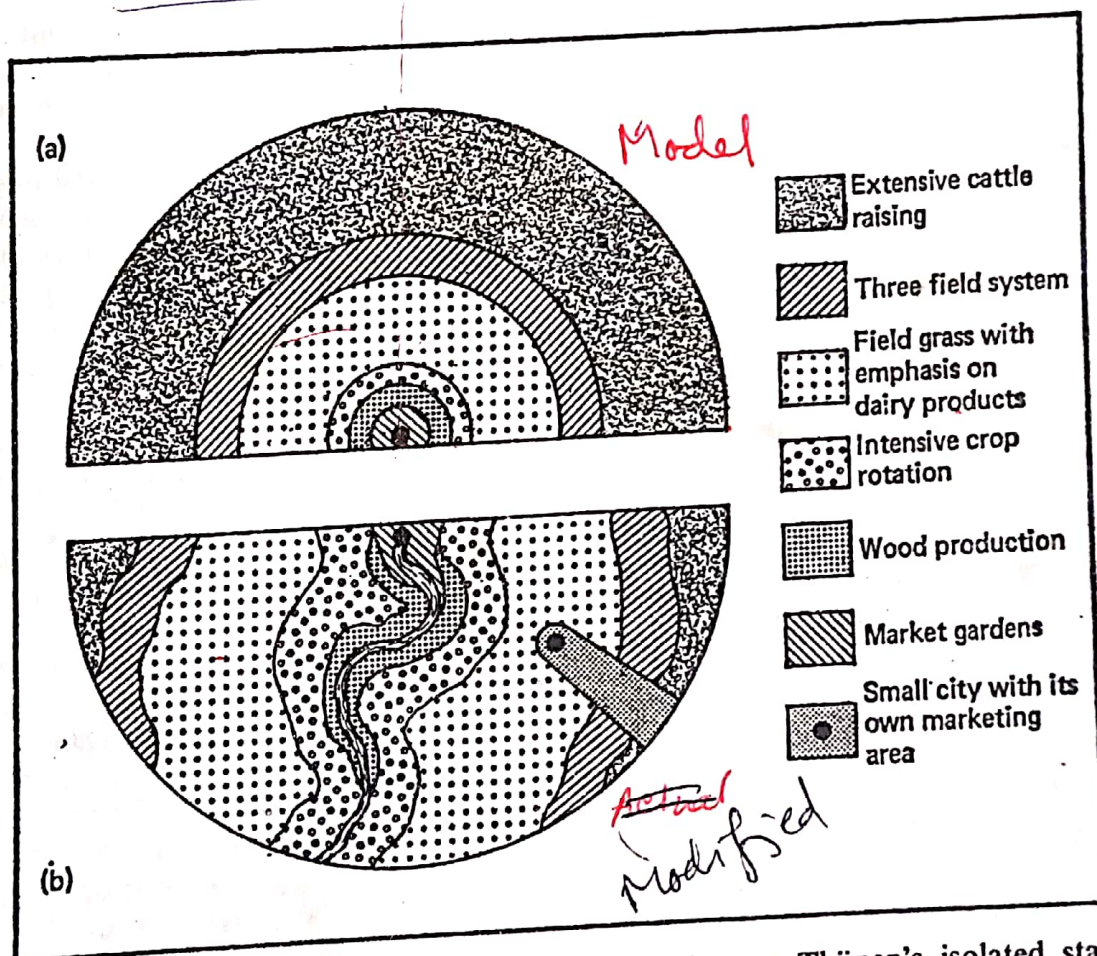


Fig. 12.3. (a) Concentric zonation of land use in von Thünen's isolated state. (b) Land use modified by two variables: a navigable river and a second market centre.

The presence of a forest belt close to the city deserves comment. It should be remembered that in the early nineteenth century timber was in strong demand for building and fuel, produced high returns, was both difficult and costly to transport and therefore represented a logical land use close to the city under the economic conditions of that time. Having examined the anticipated pattern of land use in his highly idealised and isolated state, von Thünen then



proceeded to use his model as a yardstick, or norm, for studying the causes of deviations from the theoretical pattern and the effect of particular variables. For example, the modified diagram (Fig. 12.3b) illustrates the distortions produced by the presence of a navigable river and a second urban centre.

### ✓ The Application of von Thünen's Model

Von Thünen's model has been dismissed by various writers as being anachronistic and of no relevance to the contemporary economic situation. However, von Thünen himself went to some length to point out that his work was essentially a method of approach to the complex subject of agricultural location, and that while his findings had no claim to universality, the methods by which they were obtained could be applied generally. Changes in transportation since the early nineteenth century have done most to destroy the symmetry of the land use systems around central markets. Modern transport and refrigeration now enable city markets to receive perishable goods from a variety of distant suppliers. Nevertheless, 'while transport costs continue to form a major part of the total costs of producing and marketing crops, at least some semblance of a concentric zonal system remains'. (J. R. Peet)

A neglected aspect of von Thünen's model is that of its scale. M. Chisholm has suggested that the principles may be applied to the land use on a single farm or estate, to the land surrounding a village, or to the patterns of agriculture at national or even continental scale. In other words, the model is applicable at all scales. Chisholm himself quotes several examples of agricultural villages in southern Europe around which the intensity of land use varies inversely with distance from the settlement. At national level a recent study interpreted the pattern of agricultural land use in Uruguay in terms of the von Thünen model, while O. Jonasson attempted to apply the basic principles to an understanding of the pattern of farming in Europe.

As mentioned in Chapter Four, normative models such as that of von Thünen are particularly limited by two of their basic assumptions. **First**, they assume, in the context of agricultural location, that all operators have complete information about crop yields and prices, and **secondly**, that each operator makes completely rational decisions to maximise returns in the light of that knowledge. In reality crop yields vary from year to year according to weather conditions, market prices fluctuate according to demand, and neither can be forecast with complete accuracy. Furthermore, farmers differ in their evaluation of the land and what they regard as a just remuneration for their work, and may neither make rational decisions about choice of crops and livestock, nor seek to maximise the return from their land. All of these factors combine to distort the symmetry of von Thünen's circles. In view of these problems much attention has been directed in recent years to the question of decision-making at the level of the individual farmer.