Von-Thunen’s Theory of Agricultural Location

Course: Economic and Resource Geography (Paper-4)

B.A. Geography (Hons.), Part-11

By

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*Johann Heinrich Von-Thunen* (1783-1850) was an economist who made an earliest attempt to correlate landuse pattern with the spatial relationship of a city to its surrounding regions. He worked for 40 years in Germany (Mecklenburg near Rostock) and analyzed the input – output, credits – expenses ratio and gave an agricultural landuse model developed around a city. He presented his classical work on agricultural landuse the “*ISOLATED STATE*” in 1826.

His model is based on certain assumptions;

1. There is an isolated state (no links with the rest of the world) totally cut off from its hinterlands
2. The area has a plain surface with – uniform soil and climatic conditions.
3. The existence of a large city (in the centre of the area) as the only market centre.
4. The horse–driven cart as the only one mode of transport found in the area.
5. All the farmers compete with each other and try to get as much profit as they can, and
6. The farmers get similar price for the similar crop in the market.

These were six dependent variables and distance from the city was the independent variable. Von – Thunen found two basic models on the basis of these assumptions,

A. The type of landuse varies with the distance from the market.
B. The intensity of a particular crop declines with the distance from the market.
On the basis of these characteristics he identified the landuse model having six concentric zones developed around the city;

**Zone 1**- This is the nearest concentric belt around the city. Perishable crops like vegetables, fruits, milk etc are grown in this belt.
**Zone 2** - This zone is covered with forest. Here trees are grown for fuel purposes due to its bulkiness. The size of this zone depends on the demand of woods in the city.

**Zone 3, 4&5** - These zones are devoted to food crops and their intensity decreases with the increase in distance from the city due to transport cost. In these belts, 3 is intensive arable, 4 in less intensive arable and zone 5 in extensive in farming nature.

**Zone 6** – This zone is used for livestock and pasture land.
Von-Thunen postulated that the profit after deducting the cost of inputs actually decides the type of land use. The location of crops according to him is determined by the market price, transport cost, and yields per hectare. He applied marginal economic rent or land rent in relation to distance from the market. The extent of each zone would be determined by the direct competition between the products based upon the formula;

\[ V - (E + T) = P \]  \hspace{1cm} (1)

Where, \( V \) = Value of the product in the market
\( E \) = Total Production Expenses (labour, seeds, manure and other inputs)
\( T \) = Transportation cost, and
\( P \) = Profit

The transport cost varies with the bulkiness and perishability of the product. If there are two places, (A) - closer to the market and another (B) - away from the centre, the market price for the crops grown at both the places will be the same, but for greater distance at B, the profit will be less. Then as distance increases, the profit to the farmer decreases.

This is presented mathematically by Dunn Losch (1954) by the formula,

\[ R = Y (P - C) - YFI \]  \hspace{1cm} (2)

Where \( R \) = Economic rent/ profit per unit area
\( Y \) = yield per unit area
\( P \) = market price of yield per unit area
\( C \) = Cost of production per unit of the commodity
If income exceeds expenditure the difference is economic rent/profit. According to him land is on the margin of cultivation if input =output

Von-Thunen later on incorporated certain changes in his basic assumptions;

1. Instead of horse–driven cart he chose a navigable river passing through the middle of the city and the transport cost was thus only 1/10th of that on the land.

2. Second modification was inclusion of one smaller city that has a competing market centre. These two modifications made the land–use pattern rather complex.
**Criticism:**

Thus we see that the theory is classical and highly relevant but its limitations particularly in the changing socio-economic circumstances need to be exposed as:

1. Existence of an isolated state is a rare phenomenon these days.
2. The second zone of Von – Thunen’s model finds no favour today because wood is no more an important domestic fuel.
3. Horse driven carts and boats are no more the means of transport in the present context, and
4. The assumption of increasing transport cost constantly as the distance increases is not valid. In reality the relative transport cost decreases as the distance increases.

The concept of Von – Thunen's theory is thus based on **distance, transport cost and profit**. But now a day's distance and transport cost have lost their importance because of fast means of transportation. Now market price fluctuation also affects the land use pattern.

**Validity:**

This theory was applied in Aligarh (U.P.) by Prof. Shafi and the study deviates, reveals no relationship with the % use of land and distance from the city. The intensity of cropping is also noticed with increasing distance and this also negates the theory. Only perishable goods like vegetables show some relationship with irrigation and are grown near the source of irrigation. Canal acts as a source from where the intensity
decreases as one goes away from this. But this situation is also disturbed if there are tube wells in the localities.

Despite these limitations and demerits, validity of the theory is justified in many cases. For example, Johnson (1925) tested it in Sweden and Volkenburg in Europe and found the zonation scheme of the Von – Thunen’s model valid. It is therefore, obvious that the theory of Von- Thunen is still relevant to a greater extent, there may be alteration of crops but the basic philosophy of concentric zonation still persists. Many criticisms have been put forth by the experts of landuse about the Von- Thunen’s Model but while criticizing the model, it should be kept in mind that the model was postulated in 1826 when the means of transportation were not so well developed and isolated states were found in many parts of the world. Von-Thunen’s model is especially useful in two ways;

- It focuses attention on economic factors particularly transport cost and distance to the market
- It attempted the concept of locational rent theory

This concept has great significance in land use studies. Moreover the assumptions of Von – Thunen led to more researches in the field of cropping intensity and land use patterns. It can therefore be said that for the geographers, Von-Thunen’s work with all its limitations, still provides a useful framework for further research in the field.