

SUGAR REFINERY AND SPATIAL ORGANIZATION OF SUGARCANE

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ABSTRACT : Von Thunen (1826) hypothesised spatial organization of perishable and bulky agricultural commodities at 'city region' scale through 'distance - cost' principle. The present paper tests the same axiom in the locational order of sugarcane at 'sugar - refinery - catchment - area' level. It confirms the operation of 'distance - decay' process, with regard to the cultivation of sugarcane and the use of bullock - carts as a media of transporting cane, from the refinery.

Sugar - refinery is an agro-processing plant. It may use sugarcane or sugarbeet as a raw material for producing sugar. In a tropical country like India, sugarcane is the only raw material used for the purpose. A sugar-refinery depends upon its surrounding countryside for the required supply of sugarcane. The farmers grow cane and transport it to the mill-gate for disposal. Sugar - refinery, therefore, furnishes an assured market for cane produced in its catchment (notified) area. It plays the same role for sugarcane as a city does for vegetables, fruits, flowers and milk. A number of scholars analysed spatial organization of agriculture around different cities of the world through Von Thunen's principle (Horvath 1969; Peet 1959; Atkins 1987; Singh, 1991; Dyal 1981; Kaur 1986; Raina 1989; Kaz'min 1989). But the author failed to find any case where a processing plant based on perishable and bulky agricultural commodity has been treated as a market for the product it processes. The present paper is a modest attempt in this direction.

Sugarcane is a semi-perishable and bulky commodity. It starts losing weight and quality once it is harvested for marketing. There-

fore, with a given mode of transport, farther is a farm from the refinery, longer this commodity remains in transit and higher is the loss in its weight and quality. Secondly, sugarcane is a bulky commodity. It fetches lower price per unit weight and incurs higher transport cost. The expenditure on its transport multiplies with increase in distance from the mill-market. Besides, the mill-management provides variety of extension services, such as technical advice; farm equipment, fertilizers, insecticides and pesticides on credit; and some quota of sugar on subsidised rates to those members who contribute the raw material. These facilities can be availed more conveniently near the mill. The farmers are sufficiently aware of the aforesaid economic realities and therefore would grow more cane near the mill than at distant locations.

Tractors and bullock-carts are the two major modes of transport used in marketing cane in the mill-region. Larger and otherwise affluent farmers own tractors. Peasants invariably depend upon bullock-carts. Animals command limited power.

They get fatigued while on work. Therefore,

carts move slowly and operate over small distances. Their use in transporting cane declines with increase in distance from the mill.

'Distance-decay' process operating in the cultivation of sugarcane and in the use of bullock-carts, however, will work more intensely only if, (i) the refinery is located on a flat plain and its entire catchment exhibits favourable environment for growing cane, (ii) each farm in its sphere of influence is adequately linked to the mill by a metalled road and (iii) every farmer in the region has an equal access to the mill-market and to the extension services provided by the management.

HYPOTHESES

1. The farmers located near the sugar-mill devote a greater share of their farmland to the cultivation of sugarcane than those located far from it.
2. The use of bullock-carts in transporting cane declines with increase in distance from the refinery.

Both the hypotheses proposed above have been tested by taking a case study of the Co-operative Sugar-mill located at Morinda (Punjab). This refinery satisfies almost all the presumptions enunciated in the '*a priori* model' and thus furnishes an appropriate case for testing the hypotheses. It is located near Chandigarh on a flat alluvial plain with its catchment area extending upon a radius of about 20 kilometres from its site. The whole of its common area is bestowed with almost equally favourable physical conditions for the cultivation of cane. Nearly all the villages positioned in its notified area are linked to the mill by metalled roads. The sugar-mill is in the co-operative sector. Therefore, every farmer residing within its catchment area has an equal access to the mill-market. The procurement policy of the mill is laid down in such a way that over 95 per cent of the total cane crushed

by the refinery is directly received at its gate. The remaining 5 per cent is procured at 7 odd collection centres located distantly to serve peripheral areas. Direct receipt of cane at mill-gate ensures fresh supply of the raw material and reduces extra burden of its transportation from the collection centres. Accessibility of the mill from Chandigarh and its large crushing capacity too prompted its selection. Production and processing of cane are integrated through contractual system. The mill-management and the farmers enter into a written agreement for the receipt and supply of the raw material. Any faulting party is penalised in the form of a fine. Supply of cane is regulated through a slip system according to which each concerned farmer is permitted to market specific amount of cane on predetermined dates. Such an arrangement guarantees regular availability of sugarcane, avoids unnecessary gluts at the mill-gate and extends the duration of crushing period.

THE METHODS

1. Graphical
2. Quantitative

The graphical method deals with drawing of concentric zones around the sugar-mill, and calculating percentage area under sugarcane and number of bullock-carts used in each zone. In order to operate this method, a map of the notified area of the refinery, with village as the basic unit, was prepared. Seven concentric circles at equal width, with sugar-mill as the centre, were drawn on it. The circles, so drawn, were used to allocate various villages of the notified area to different zones. The villages which fell completely within two consecutive circles were allocated to the respective zones. However, which cut across posed a problem. The criteria of 50 per cent was pressed into service for settling such cases. A village with over half of its area falling in a

zone was wholly merged into the same. The zonal boundaries follow village outline and thus are zig-zag (fig. I). Thereafter, percentage area under cane in each zone was calculated with the help of village level data obtained from the mill-management. These percentages were computed with references to 'total area' and not with 'total cropped area'. The author is fully aware of the limitations involved in doing so. But non-availability of data pertaining to total cropped area was a

major constraint. Zone-wise proportions of sugarcane, so calculated, were used to test the first hypothesis. The second hypothesis, however, was examined differently. Instead of considering total population, only 70 villages (10 from each zone) were randomly selected from the entire notified area. Number of bullock - carts used in transporting cane in all the 10 villages of a zone were summed up. The figures, so arrived at, for each zone were used to test the second hypothesis.

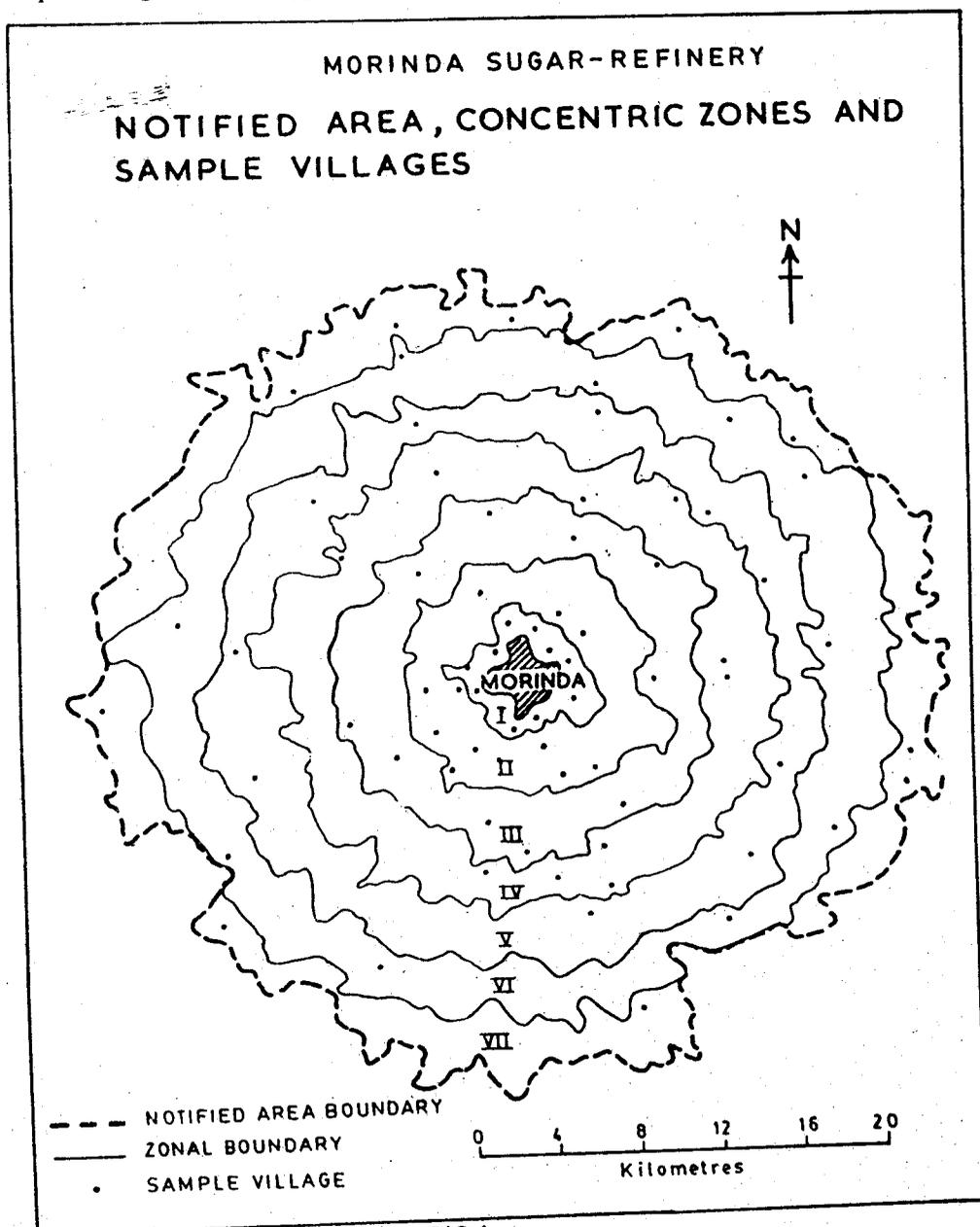


FIG.1

Zone-wise position with regard to percentage area under sugarcane and use of bullock-carts, as shown in Table 1 and figure 2, broadly comply with 'distance-decay' principle.

The proportion of sugarcane is fairly high in the first zone but is lower than the second. Thereafter, it continuously diminishes to the outermost zone. Relatively weaker position of sugarcane in the innermost ring than the next is largely due to lesser areal extent of land available for growing crops as a consequence of urban sprawl near the town. Thus, lower proportion of cane in the first than second zone is apparent and not real. Stronger competition from more remunerative and perishable products near the town, which one may envisage as another reason for lower cane cultivation in the first zone, however, is not true. The demand for such commodities in the town is negligible as a result of its small population size (13502 persons in 1981). The first hypothesis, therefore, is authentic.

Zone-wise position with regard to the use of bullock-carts is quite similar to that of sugarcane cultivation. It is lower in the first than second zone and from there declines toward the peripheral zone. Range of operation of bullock-carts is short. Their use practically ends beyond third zone i. e. at a distance of approximately 10 kilometers from the refinery. On the other hand, the use of tractors in transporting cane increases from the first to the third zone; remains fairly high in fourth and fifth zone, and declines thereafter to the outermost zone. Beyond fourth zone, tractor is almost the only transport vehicle used for the purpose. Decline in the use of bullock-carts from inner to outer zones clearly establishes the genuineness of the second hypothesis.

Greater use of bullock-carts and higher membership in the innermost zone are evident of the participation of a larger proportion of smaller farmers on the production and marketing process of sugarcane near the mill. Their

TABLE - I

THE MORINDA CO-OPERATIVE SUGAR - MILL ZONE-WISE POSITION OF SELECTED VARIABLES : 1989 - 90

Zone	Distance (Kms.)	Percentage Area under sugarcane	Number of Bullock-carts used in transporting	Number of Tractors used in Transporting cane	Average Membership per village
1	2	23	154	69	143
2	5	26	209	93	54
3	8	18	117	176	39
4	11	14	12	129	26
5	14	12	29	144	24
6	17	8	5	87	21
7	20	7	0	81	18

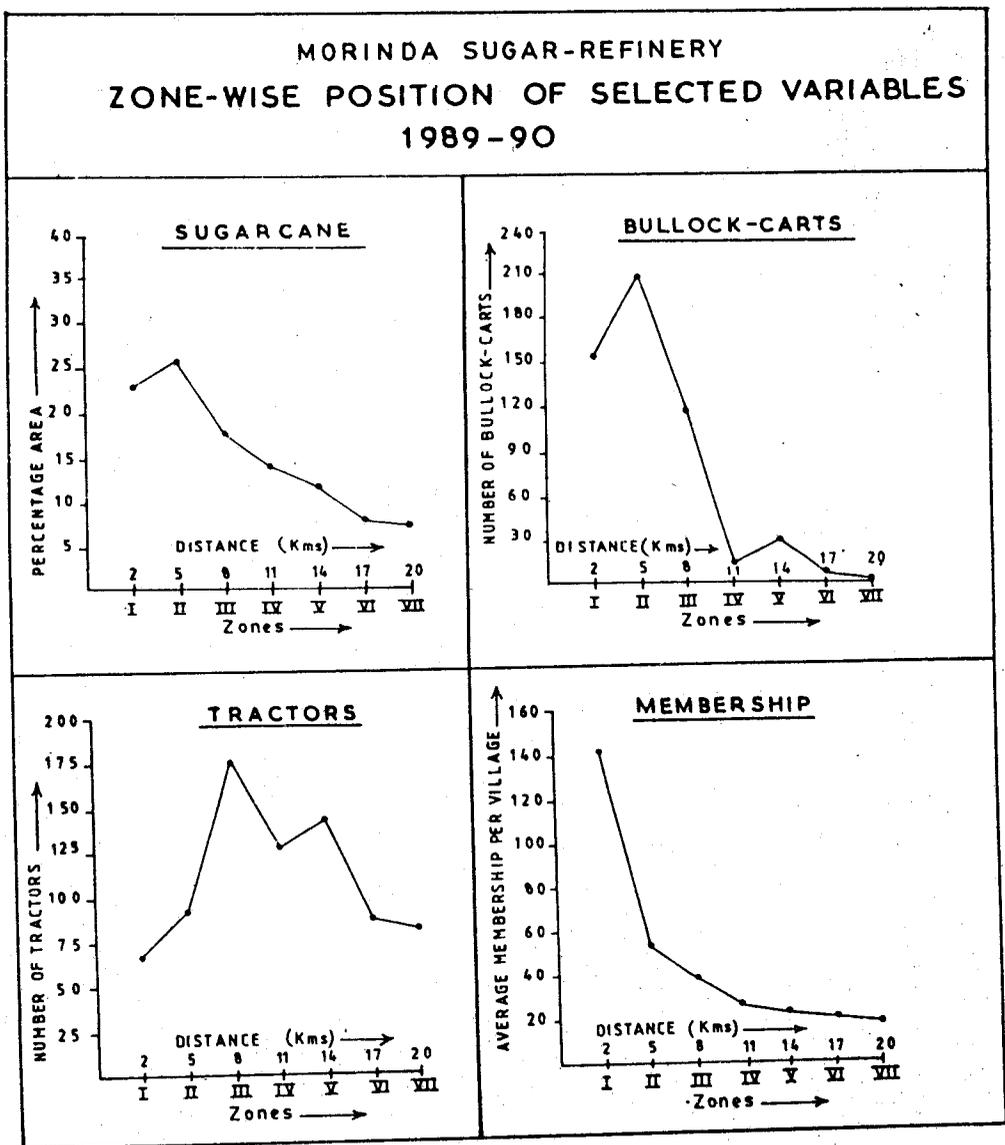


FIG. 2

involvement, however, varies towards the outer zones due to constraints of traditional mode of transport available with them. In farther areas, tractor owning farmers are the major beneficiaries.

Second method is quantitative in nature. It relates to the determination of coefficient of correlation between distance and percentage

area under sugarcane; and between distance and number of bullock-carts used in transporting cane. Village level data have been used for this purpose. The same 70 villages (10 from each zone) were taken once again. Straight distances between the mill-site and the centre of each selected village were measured on the map. Percentage area under cane for each of

Table - 2

COEFFICIENTS OF CORRELATION (r)

	Percentage area under sugarcane	Number of bullock-carts	Number of Tractors
Distance	0.55	-0.36	-0.02

the 70 villages were calculated from the available secondary data. Thereafter, coefficients of correlation between distance and the other two variables were computed (Table 2). The values of 'r', so obtained, were used to substantiate both the hypotheses.

The figures for the coefficient of correlation are negative, fairly strong and are significant at one per cent level. Therefore, both the proposed hypotheses are valid.

CONCLUSIONS

'Distance-decay' rule laid down by Von Thunen in spatial organization of perishable and bulky

agricultural commodities at 'city-region' level is equally true in the case of a semi-perishable and bulky farm product, such as sugarcane at 'sugar-refinery-catchment-area' level. The use of bullock-carts in transporting cane and the membership of the co-operative sugar-mill too follow the same principle. Larger membership and greater use of carts in the inner zones, is a clear evidence of the wider participation of all sections of the farming community in the production and marketing process of sugarcane, and hence of social justice, in the neighbourhood of the mill.

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