THE ROLE OF PUNJAB WHEAT MARKETS AS GROWTH CENTRES

BARBARA HARRISS

This paper represents an examination (using techniques of network analysis, nearest neighbour analysis and regression analysis) of the spatial distribution and the size and structure of wholesale wheat markets (mandis) and the settlements in which they are sited, in the State of Punjab, India. Differences between the hierarchies of mandis and of central places are found. Problems associated with the shape and size of officially designated tributary areas to these mandis, and with the current super-imposition of new mandis on the trading system are discussed and potential growth centres are identified. An attempt is made to describe employment characteristics of wholesaling firms in mandis, their effects on industries and employment in the accompanying towns and on land use in rural areas.

It has become something of an academic commonplace in India that problems of employment and income distribution within and between developing urban centres might be solved by 'intermediate urbanization' based on a decentralized spatial system of wholesale and retail market centres. In spite of this, and in spite of recent improvements in agricultural production technology under the High Yielding Varieties Programme in states such as Punjab and Haryana, which have forced unprecedented large foodgrain surpluses into wholesale market centres, improvements in the marketing system have been given low planning priority (Harriss, 1972). In fact it is only since 1972 with the formulation of the Fifth Five Year Plan for 1974–79 that an attempted methodological fusion between traditional economic-sectoral and regional planning has focused attention on the selection of nested hierarchies of 'growth nodes'.

Yet this considerable change in planning orthodoxy may be of little consequence if it does not take into account in what is, to date, its somewhat crudely drawn concept of the growth-centre differences in locational characteristics between producer-orientated wholesaling, and consumer-orientated retailing activities; the former income-importing and the latter income-leaking in nature. In general there is far less literature on wholesaling activities than on retailing; what there is has been largely produced by economists, economic historians and economic anthropologists while geographers have contributed little. Only J. E. Vance, Jr. (1970) has discussed the unique features of wholesaling in an industrial and historical study of the USA written as a lengthy critique of the consumer orientation of central place theory and of much of the mass of empirical 'verification'. A brief summary of his and others' observations will pin-point the issues which the following paper discusses in relation to Punjab, where wheat wholesaling furnishes the economic base of many market towns.

1The application of this concept has been the major theme of two publications of the National Council for Applied Economic Research (NCAER, 1965 and 1972). It borrows its spatial component directly from Christaller's 'central place' theory (Christaller, 1966) and its processual component from Perroux's 'growth centres' theory (Perroux, 1955). For reviews of the history of Indian regional planning methodology and in particular use of the 'growth node', see Wannali, 1970; Misra, 1971; Chandrasekhara and Sundaram, 1972; and for a prospective account of Fifth Five Year Plan methodology, the work of Sen, 1972, is especially illuminating as it considers both the problems of existing district and state boundaries cutting across 'integrated areas' and the formidable difficulties of diverting the traditional sectoral flows of public capital into these newly created or designated regions.

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The physical location of a wholesale market can be seen as a composite function of the density and technology of production and not as directly related to distribution of population (Vance, 1970; Hill, 1965). In any predominantly agricultural region, the location of final demand for any marketable surplus will be largely outside it; and for any one market place within the region, the trading network will relate not so much to its physical location as to the type and limits of its commercial intelligence. Agricultural wholesaling links are governed not so much by competition between towns as by competition within towns between middlemen. Their role in transferring commodities between areas of surplus and those of deficit, in providing the service of price, demand and supply information, and in directly generating employment within their firms constitute economic functions of great importance (Belshaw, 1965). Social relationships between producer and middlemen stabilized by such factors as the need for economic, social or political information, or the tie of debt, are thought to make such functions geographically more rigid than in the retailing sector (Weaver, 1968). Wholesale market/hinterland relationships have been shown to be very complex. In India (as is known to be the case in the USA) each commodity brought to a wholesale market has a unique range or isovecture within which producers will travel to sell their product (Kohls and Gifford, 1957; Neale et al., 1965; Everitt, 1967; Johnson, 1970). Wholesale markets tend to be specialized,

Fig. 1 Railway network
and the process of selling may often be separated both in time and place from that of buying, whether it be agricultural inputs or consumer items. A farmer's trading activity may be focused on genuine alternative locations and it has yet to be shown what effects patterns of selling have on those of buying in the context of rising food-grain productivity.

In exploring these ideas, this paper tests a hypothesis suggested by Vance, that the size and spatial distribution of wholesale markets are significantly different from those of the central places in which they are located (Vance, 1970). In practical terms it looks at an area well endowed with legally regulated wholesale markets or mandis and studies their locational patterns and linkages. The area studied makes up most of Punjab State except for the extreme northern and western frontier zone. In 1968 this area had 76 regulated mandis dealing in a total of 84 food commodities (Government of Punjab, 1967). Wholesale trade in wheat comprised between 66 and 100 per cent of this trade in every district and was therefore used as a general indicator of market size.

The mandi system before 1968

Although the infra-structure of Punjab was considerably developed before the High Yielding Varieties Programme (Kahlon, et al., 1966) the pattern of regulated

![Fig. 2 Markets and their notified tributary areas 1968. Source: S. S. Kahlon, et al., 1971](image-url)
wholesale markets prior to 1968 (the first season of major surplus in wheat) can be examined as a response to an approximate equilibrium situation in the early and mid-1960s.

Spacing.—If Punjab were an isotropic surface, with uniform production potential and uniform transport availability, we would expect the market system shown in Figure 2 and labelled on Figure 1, to be evenly located over the plain. A nearest neighbour analysis of all mandis gives the statistic $R_n = 1.3$ (Haggett, 1965). So the distribution of mandis in the study area is in fact random, with a slight tendency towards regularity of spacing. However this regional randomness conceals various patterns detectable at different scales. Firstly, mandis are more evenly distributed in some parts of the area than in others; the grid square south of Amritsar, for instance, contains 20 mandis with $R_n = 1.67$; a marked improvement in distributional uniformity. Secondly 93 per cent of the mandis are located within 1.5 km of a railway line. If these markets are examined with the method used by Dacey for United States' river towns (Dacey, 1960), the proportion of first order reflexive nearest neighbours is 31 per cent; reflecting quantitatively the high degree of clustering in three main areas—along the Bhatinda-Barnala, Doraha-Sirhind and Sunam-Dhuri sections.

Contrary to the suggestions of Vance and Hill (1965) there is no relationship between yield intensity and density of market location, as can be seen in Figure 3.
Rather it would seem that access to communication facilities is the main locational determinant. Network mileage is known to be highly positively-correlated with the number of network intersections. A map of network density constructed by counting the intersections at every junction brings out an advantageous communication density along the Jullundur-Ludhiana axis with extensions along the railway spines (Fig. 4). Areas of low connectivity are juxtaposed to the high density spines on which 86.6 per cent of mandis are concentrated, a contrast resulting from the intermediate stage of transport development reached by this area where the diffusion of transportation innovation is strongly linear. A map of the railway network of the study area (Fig. 1) can be used to generate a connectivity matrix from which the accessibility index of each market with direct railway access can be totalled (Haggett and Chorley, 1972). If these are mapped as in Figure 5 a further pattern is evident. Ludhiana district lies in a focal area for communications, radiating out from which are zones of decreasing intra-regional accessibility. This factor is of relevance both in assessing the future role of bulking centres, and in assessing the growth potential of mandi towns as general service centres.

Mandis are thus to be found at points of contact between transport media, between the railway goods yard from which wheat is exported by freight trains, and the peasant-producers' own transport facilities used for bringing the surplus to market.
Ideally there should be a market centre within less than half a day's travel of every village with marketable surplus. There is a mass of empirical evidence to suggest a maximum interval of 24 to 32 km, so that the least well placed producer has to travel, on foot or by bullock cart, not more than 12 to 16 km to market. The report on 'The marketing of wheat in India' (Directorate of Marketing, 1963) states that Punjabi markets in the surplus wheat belt may draw their supplies from a radius of 16 to 32 km, though the majority of sellers come from within 16 km. The Fourth Plan for Punjab even recommends a 16 km spacing which may be compared with nineteenth century Minneapolis in which Pyle shows that 75 per cent of sellers lived within 16 km of a market (Pyle, 1971). In the study area in 1968 the spacing approximated to that recommended for 1974 by the Fourth Five Year Plan for the region. On the average, markets were 18.1 km apart but a producer might have to travel up to 36 km.

*Structure.*—This kind of generalization must be refined by considering the size and structure of wholesale markets and their accompanying towns. With reference to the latter, population is an *ad hoc* guide, in the absence of more detailed information, to the degree of functional diversity to be expected in a settlement. If settlement populations are plotted against attributes connected with the retail and service sector of the town (such as employment in trade, commerce and transport, *see* Census of India, 1961, Punjab section, vol 11 A, Table AiiB) several groups of settlements with

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**Fig. 5 Accessibility indices of mandis**

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similar proportions of attributes are revealed. These groups can be tested for significance of association within the sets of variates by a simple type of cluster analysis which enables both the central place role and the wholesaling role of a settlement to be assessed easily on a common basis for comparison. The method used here is a simplification of that used by Mayfield in his analysis of 60 centres and 129 functions in Ludhiana and Jullundur districts to define a hierarchy of three groups of urban centres below Jagraon and Phagwara (Mayfield, 1967). It is also similar to that used by Barnum to determine his central place hierarchy in Baden-Württemburg (Barnum, 1966). This present study involves a larger size range of settlements and a larger area, though for lack of primary data it contains far fewer variables than the

**Fig. 6 Spatial distribution of market town hierarchy**

Two parent studies. The correlation coefficient (r) of an empirically observed cluster is divided by that of the complete set of variates to obtain a B coefficient. Conventionally, if the B coefficient exceeds 1.3, significance is indicated.

Four groups of market towns were derived and mapped, with B coefficients as shown in the key to Figure 6. At the smallest end are mandi settlements ranging from 3000 to 17 000 inhabitants and spaced, on average, 16 km apart. These are called fourth order settlements. Third order settlements are between 17 000 and 40 000 in population and are spaced 24 km apart. Second order centres forming a group whose B coefficient is slightly lower than the conventionally accepted confidence level, are
between 40,000 and 100,000 in population and are spaced 51.2 km apart. The larger regional centres, too heterogeneous in character to form a significant cluster are spaced, on average, 70.4 km apart.

By contrast, application of the same technique to mandis themselves, based on the two parameters of wholesaling activity for which data were available (wheat tonnage handled in each mandi and storage capacity in 1970) reveal a different pattern, illustrated in Figure 7.

The lowest cluster comprises a group of 40 markets handling less than 300,000 quintals per annum with a relatively small storage component (below 200,000 quintals). Associated with this group are seven residual markets with a similar turnover but negligible storage functions. Of this major group the most obvious anomaly is Bhatinda, an important central place and part of the second order cluster in the retail and service hierarchy. Cluster 3 comprises four small markets, each with a very high storage component, while the 14 mandis comprising cluster 2 handle a wide range in volume of wheat and have relatively small storage facilities. Some of these mandis, notably Dhuri and Sirhind, have accompanying low order settlements. Associated with this group are three residual markets with no storage facilities. A group of six markets handling between 400,000 and one million quintals of wheat with a relatively large storage component makes up cluster 1. Of these only Batala...
and Ludhiana are important central places, while wholesaling in agricultural products must be a dominant element in the urban economy of the other four. Finally there are two major 'residuals'; Amritsar, a large collecting, consuming and exporting centre which handled 1,334,905 quintals in 1970 and stored 437,000 quintals; and Khanna, a relatively insignificant central place which, in 1970, collected 998,372 quintals and stored 803,000 quintals prior to export.

So Vance's and Hill's assertions that production density determines the density of wholesale markets do not hold true for this area. It is most likely that production density determines the turnover within each market and it would be very interesting and of practical value to be able to examine long run average cost curves for firms within the mandis to see if there is an upper limit to the quantity of wheat handled without excessive congestion and therefore a rise in distribution costs. Vance's contention that the retail and wholesale spatial hierarchy are significantly different would, even so, seem to be justified for Punjab.

**Bulking chain.** However, the two parameters useful in describing the wholesaling hierarchy, turnover and storage capacity, give no clue to the export role of each mandi, or to the pattern of wheat flows within and out of Punjab. The process of export is at present known as 'bulking' and differs from the collecting activity of wholesaling only in so far as it introduces into certain markets both dealers and com-

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**Fig. 8 Probable bulking chain for Punjab wheat markets**

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Sources: FCI, MARKED, S.S. Kohlon et al, 1971

Railway
modities which originate from outside their primary catchment areas. While this feature clearly ought to be included in the cluster analysis of wholesale markets, there is a dearth of reliable information on the flows of foodgrains and the inadequacy of the data makes this impossible. Separate treatment is therefore necessary.

In the model of the bulking process formulated by Smith and Hay (1969), each trader bulks a commodity until a limiting consignment is obtained, whereupon export and successive distribution take place. While this procedure is effected at the point of export there is also some lateral bulking and distributing exchange between traders. In this theory, if capital is a restraining factor, the size of the limiting consignment will be small, specialization and skill levels will not be highly developed and the numbers of intermediaries will be large—a factor which effectively limits further capital formation and discriminatory competition. This stage still characterizes Punjab, since capitalization of the distributive system has been mainly channelled into improvements in storage facilities by the three purchasing corporations (storage for 5 783 000 quintals constructed in 1969 alone).

Partial data on ‘mandi-wise export from Punjab’ and on ‘liquid unallocated stocks’ were obtained for the rabi marketing season (April to August 1971) from the Punjab Marketing Federation (MARKFED) and the Food Corporation of India (FCI), but no information could be given by the Punjab State Government, the third collecting agency. No quantitative analysis is possible, but the sets of figures give some indication of the role of each mandi in the bulking chain (Fig. 8).

Response to the external demand for foodgrains has taken the same form as that proposed by Vance in a mercantile model. There seem to be about eight markets, large in respect of their annual turnover and storage capacity, which also retain sizeable stocks in readiness for allocation to areas of demand within Punjab and which are major exporters of foodgrains. Moga, for instance, known as the largest export centre, collected 169 000 quintals of wheat trucked from Makhu, Bagha Purana and Nihal Singhwala in 1969, while Khanna stocked 74 580 quintals of wheat assembled primarily at Muktsar, Abohar and Bariwala, west of the study area (Gill, 1971). With the exception of Rajpura, these markets are drawn from clusters 1 and 2 of the wholesaling hierarchy. There is a larger number of markets—about 13—acting as secondary bulking centres, all aligned on the railway network. The remaining mandis act as primary assembling points, rarely exporting wheat directly, but usually sending it on demand up the bulking chain to be collected for despatch. Destinations of the wheat flows are shown in Table I.

### Table I

<table>
<thead>
<tr>
<th>States</th>
<th>1970</th>
<th>1971</th>
</tr>
</thead>
<tbody>
<tr>
<td>West Bengal</td>
<td>2454</td>
<td>3026</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>2075</td>
<td>67</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>1961</td>
<td>1028</td>
</tr>
<tr>
<td>Bihar</td>
<td>1617</td>
<td>533</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>687</td>
<td>290</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>426</td>
<td>111</td>
</tr>
<tr>
<td>Jammu and Kashmir (by road)</td>
<td>413</td>
<td>357</td>
</tr>
<tr>
<td>Assam</td>
<td>258</td>
<td>344</td>
</tr>
<tr>
<td>Gujarat</td>
<td>143</td>
<td>453</td>
</tr>
<tr>
<td>Delhi</td>
<td>65</td>
<td>437</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>—</td>
<td>427</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>—</td>
<td>374</td>
</tr>
<tr>
<td>Orissa</td>
<td>—</td>
<td>184</td>
</tr>
<tr>
<td>Kerala</td>
<td>—</td>
<td>128</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>10 099</strong></td>
<td><strong>7322-48</strong></td>
</tr>
</tbody>
</table>

Considerable change in the pattern of trading from year to year is evident. Also the importance of shipments to various centres of demand differs from market to market. Barnala sends to Uttar Pradesh, Jammu and Kashmir, Himachal Pradesh and Delhi; Moga to Bombay and Delhi; Kot Kapura to Madhya Pradesh; and Khanna to Bombay, Ahmedabad and Bangalore (Lele, 1971). The balance between bullock cart transport to market, and rail transport from market is changing, but the change is inadequately recorded. Tractor-trailers are replacing the bullock carts in some areas, for example Amritsar and Ludhiana districts, and truck transport is beginning to encroach upon the monopoly of the railway. Trucks can carry in bulk and benefit from greater locational independence than trains. Road transport was planned to expand at 10 per cent per annum during the 1960s largely through private sector investment (Government of Punjab, 1967). Those mandis where more than 50 per cent of the wheat by volume is transported by tractor-trailer or truck have been marked with a T on Figure 8. It would seem that in major export centres wheat tends to be brought in by tractor, while it is in the small new collecting centres that more than 50 per cent of the procured wheat is exported by truck. In this case, innovation in transport technology is not necessarily diffusing downwards through the central place hierarchy in the way predicted by Skinner in his study of rural China (Skinner, 1964–65). Even so, the railways still handle over 75 per cent of inter-market trade; and bullock carts are still mainly responsible for the movement of wheat within the mandi town from the market place to the goods yard (Kahlon, Singh and Mehta, 1971).

Tributary areas.—If it is assumed that the central place and the wholesale systems differ in their space relations, so will their tributary areas. Unfortunately there is a dearth of data on areas of influence, and existing information relates only to mandi tributary areas, rather than to those of their associated settlements. It can be used as a guide to farmer movements to see whether it is realistic to suppose that they act in a spatially rational fashion and attempt to minimize transport costs.

Under the theoretical assumptions of a flat plain with even agricultural potential, transport facilities and no spatial difference in wholesale buying price, wheat collecting centres would be located at regular intervals and have hexagonal tributary areas. In Punjab, though the physical surface is approximately flat, the pattern of wholesale market tributary areas is distorted by three factors; firstly by differences in productivity conditioned by the rate of innovation adoption; secondly, the strong spatial bias towards railway line location distorts and elongates the hexagonal form at right angles to the railway line; thirdly, before 1967 great differences in wheat purchase price existed between mandis in larger towns and those in small isolated settlements. As long as the expected price at the large centre exceeded the time and transport costs involved in a longer journey to market, then the tributary area of a market where higher purchase prices prevailed would be larger than that expected on the basis of spatial factors alone. Since 1967, as a result of the fixing of a minimum support price of Rs 76 per quintal by the three semi-monopolistic purchasing bodies, there...
has been an average difference in the free market of only Rs 2 per quintal between the smallest and the largest mandis, and Punjab marketing officers consider that in terms of the journey to a wholesale market, farmers now act in a spatially logical way. The one detailed study of a mandi, Kurali, made in 1960, showed, as might be expected, frequency of visits declining and average weight of load increasing with distance from market (Neale et al., 1965).

In Punjab every wheat market has a legally defined 'notified area' surrounding it from which members of the administrative market committee are democratically elected. The notified area represents the anticipated tributary area at the time of legal regulation of the mandi in question. As is evident from Figure 2, these are highly irregular in size and shape. Using an index of shape (s) introduced by Haggett and then Baker:

\[ s = \frac{1.27 A}{l} \]

where \( A \) = area and \( l \) = long axis (Haggett, 1965, and Baker, 1971) there seems to be a normal distribution of shapes ranging from extremely elongated to nearly hexagonal (Fig. 9). A detectable spatial patterning of notified areas does not appear to exist in the landscape. The size of the notified areas bears little relation to the turnover of their mandis and probably owes more to their date of creation, and to the distorting effects of the railways and large rivers which act as boundaries. Farmers acting rationally often have to disregard notified area boundaries in their efforts to minimize the length of journeys to market. Newer notified areas (as for instance those of Zira, Talwandi Bhai and Dharmkot) and the notified areas of mandis located on roads rather than on railways (such as Raikot, Machhiwara and Dhariwal) tend to be more circular with the market more centrally located than is the case with the rest of the system. The only documented movement of farmers to market that is spatially (and economically) irrational is that across the state border from Haryana to Punjab where purchase price differentials for wheat, believed (erroneously) by farmers to exist, encouraged an 'irrational' flow of 15,420 quintals to two Punjab markets alone in 1968 (Gill, 1969a).

The location of new markets

From 1965–66 to 1969–70 the marketed surplus of wheat in the study area increased from 1,916,000 tonnes (38 per cent of total production) (Gill, 1969b) to 4,792,000 tonnes (65 per cent of total production) under the High Yielding Varieties Programme (Kahlon and Kehal, 1972). Wheat output gained to the detriment of all other marketed \( rabi \) crops (Kahlon, Singh and Mehta, 1970). As a result of this and of the increased demand for factor inputs and only slow improvements in the transport system, there arose a strong demand for an expanded market system. This took various forms. Some existing mandis at all levels in the hierarchy were expanded and more middlemen were absorbed into the more active system. New collecting centres were provided in areas which had hitherto practised a subsistence economy, or which had depended on peripatetic village traders who purchased small lots of surplus wheat at very low prices. Between 1968 and 1970, 29 new markets were set up in Punjab of which 20 are in the study area. At least 76 new sub-yards were created, one for each mandi and 47 village procurement centres were established (Gill, 1971). Khanna, for example, has five sub-centres dealing with 20 per cent of the primary wholesale transactions of the tributary area, although all the produce finds its way to Khanna for immediate export or for storage there (Andrade and Johnson, 1972). Also 34 new mandis were planned for 1971–73, 10 sites to replace older congested ones and 24 new sites (Kahlon and Kehal, 1972).

If the mandis set up between 1968–70 are superimposed on the pre-High Yielding Varieties Programme system as in Figure 10, two distinct patterns are seen to emerge. In the north, new mandis are located on the railway line from Amritsar to Jullundur in an area of medium communication density (see Fig. 4). In the southern half of the
region they tend to fill the interstices of the system. Here the average distance to nearest neighbours is 12.8 km, well over the density advocated by the Punjab Fourth Five Year Plan. This spacing would be excessively close were the new mandis planned as retail centres but this distance is thought reasonable for wholesaling activities by the planners.

Interestingly, the locational effect of new mandis is to increase the element of randomness, with $R_n$ reduced from 1.3 to 1.22. Although it is known that new mandis are more centrally located within their tributary areas, it is not known what effect the sub-centres and village level procurement centres will have on older mandi tributary areas. The geographical effect may well be slight. For a start these small

![Fig. 10 Mandis established between 1968-70](image)

mandis are highly seasonal in operation, at present being active from late April until August and dealing exclusively in wheat. Although the farmers' journeys to wholesale markets will be shorter, wheat collected there will be transported to the original mandi by traders for primary bulking, and at present the farmer will also have to travel to the nearest central place in order to purchase factor inputs and consumer goods—very often to the site of the traditional mandi. New procurement centres themselves lack basic agricultural service functions such as storage facilities, skilled labour, banks, telephones and accommodation for the fewer and more monopsonistic traders (Gill, 1971). Competition amongst commission agents or *kachcha arhatiyas*
is weak and on average, free market wholesale prices are up to Rs 2 per quintal lower to the farmer than in the pre-High Yielding Varieties Programme system. So the impetus will be for conservatism and the impact of such centres is not likely to be great in the future.

The spatial rationale for the location of the mandis in the southern area accords with Skinner's theoretical model for market intensification in rural China (Skinner, op. cit.) where, on a flat plain, market spawning was interstitial and not related to dominant transport arteries as was the case in hilly areas. As implied earlier, interstitial locations presuppose a wider use of truck transport. These might turn out to be an example of Skinner's 'false modernization'. When lorry or tractor-trailer transport becomes more universally available, a reduction in the friction of distance limiting areas of influence around settlements may contribute to the greater thriving of regional centres which already supply a range of wholesaling, retailing and service facilities, thereby rendering obsolete some of the present rash of mandis, except as storage centres. Lele (1971) has remarked that the 1960s saw a trend towards larger established markets as foci for wholesaling, and a reasoned estimate of future grain marketing conditions supplied by Cummings states: 'The eventual system will be based on bulk handling... Perhaps this will be common practice in 20 years' (1971, p. 19). This is certainly the case in the United Kingdom, as is minutely described by D. R. Britton, although too close a comparison must be avoided because of very basic differences in resource endowment, farm size and density of the agricultural population (Britton, 1969). A trend in the direction of a more simplified marketing process may be seen in the progressive Ludhiana district where attempts to bypass the politically powerful commission agents are being made by MARKFED and the FCI by negotiating directly with the producer. A geographical cycle of marketing can be envisaged, with the site for transactions oscillating between village and town, the village site ultimately ceasing to be at an economic disadvantage when controlled 'fair' prices are offered to the farmer.

The effects of mandis on towns

To what extent can the interaction between a mandi and its accompanying town be used as a basis for 'intermediate urbanization'? Market towns grow to be functionally structured so as to support the marketing process. Such minimum support functions as lodging houses, banks, post and telegraph offices, go-downs and parking places, and such urban amenities as metalled roads, electricity, water and underground sewage systems are often quoted as equally essential to the proper functioning of a mandi as merchants and their shops (Talwar, 1972). These of course do not inevitably imply the necessity of a large supporting town with varied social as well as economic facilities—the evidence of Khanna, a very large market in a town of only 25,000 inhabitants, belies this. But all the same the minimum infra-structure necessary to support a mandi may well be attractive to other industries, and increased farmer prosperity will stimulate demand for service and consumer-goods suppliers.

Three types of agricultural industry are likely to be attracted by proximity to a mandi. Firstly, distributive industries linked backwards from agriculture—the sales and service of market and farm equipment, fertilizers etc. Fieldwork in Kharar, a mandi town of 9000 inhabitants, showed that 15 per cent of functions in the urban area were of this type (Harriss, 1970). Coordinated planning or fostering of these interrelated functions is vital to the survival of small mandi centres. Forward-linking agricultural processing units such as flour milling, cotton ginning and paddy hulling will be the second type of agricultural industry drawn to this kind of settlement. These industries are essential prerequisites to distribution and often have an economic storage function (Kahlon and George, 1966). The number of agricultural processing units in each market town in 1970 is shown on Figure 8. Though all major bulking centres with the exception of Rajpura have over 11 processing units, there are some mandi towns not significant as central places or as bulking centres which have a large number of processing units; these are all either on the rail network or
located at the very periphery of the study area. Conversely there are some medium sized mandis and central places highly deficient in such industries, e.g. Barnala, Mansa and Maler Kotla. Thirdly, the storage and warehousing industry will be attracted to mandi locations. In 1969 and 1970, MARKFED and the FCI built storage go-downs to the capacity of 5,783,000 quintals to bring the State total to 920,000 tonnes. Total procurement for 1971 was 2.5 million tonnes and it was planned to store half the marketed surplus for delivery later in 1972. These last two types of industry are more often found in older, larger mandi centres and (as very recent experiments with blow-up polythene stores have shown) are highly capital intensive.

The effects of a mandi upon retail and service industries is depicted in Kahlon and Kehal's study of Dhuri and Nawashahr, similar settlements with populations of 17-18,000 whose medium sized mandis expanded greatly under the High Yielding Varieties Programme. From 1966 until 1971, cloth and provisions units increased in the towns 1.6 times, as did units of vegetable stalls; the number of shops selling milk, eggs and meat trebled; shops selling house construction materials and electrical goods increased 3.6 times and equipment repair and service units multiplied by 4 (Kahlon and Kehal, 1972). A similar trend in consumer goods provision obtained at Khanna (Andrade and Johnson, 1972).

It would be useful to be able to calculate the direct seasonal employment multiplier for any mandi. Here the lack of data exacerbates what seems a complicated issue. In any mandi the chief assembler or distributor is the wholesale merchant or *pukka arhatiya*. He deals with government buying corporations, he finances producers, smaller merchants and even retailers and it is outside his shop that grain is auctioned (Directorate of Marketing, 1963). His main subsidiary is the commission agent or *kachcha arhatiya* (who may also work independently) who does not purchase the grain but arranges purchase, and supervises the delivery, weighing and cleaning of the grain. Together, during the six months that 93 per cent of the mandis are in operation each year, these two dealers generate employment for about 20-25 people as shown in the diagram.

<table>
<thead>
<tr>
<th>Pukka Arhatiya</th>
<th>Kachcha Arhatiya</th>
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</thead>
<tbody>
<tr>
<td>Dalal (clerk)</td>
<td></td>
</tr>
<tr>
<td>Money lender</td>
<td>Palledars (coolies)</td>
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<tr>
<td>Sweeper</td>
<td></td>
</tr>
<tr>
<td>Cook</td>
<td></td>
</tr>
<tr>
<td>Servant</td>
<td></td>
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<tr>
<td>Watchman</td>
<td></td>
</tr>
<tr>
<td>Waterman</td>
<td></td>
</tr>
<tr>
<td>Cartman</td>
<td></td>
</tr>
</tbody>
</table>

( Source: Government of India, 1950 )

The multiplier factor of the firm will vary with its management structure as well as with turnover since there are usually between 1 and 4 *pukka arhatiyas* in a firm. It is reasonable to suppose that the number of firms varies with the age of the mandi and with its size of turnover, but this is not upheld by the figures available. A study of three markets suggests that it is not possible to say that a turnover of x tonnes will generate employment for y people in various skill categories (Table II).

The absence of correlation between turnover per *pukka arhatiya* and turnover per *kachcha arhatiya* expressed in the wide scatter of values in Figure 11 exposes a surprising lack of uniformity in employment potential in the markets of Punjab. In a free market situation the higher the ratio between *pukka arhatiya* and tonnage
handled, the less the competitive activity and the greater the likelihood of low prices
being offered to the farmer, and of inequitable allocation of the distributive margin.
Out of the 76 markets in operation in 1968, 24 had no pukka arhatiya, including
Khanna, the second largest market in the study area (see Fig. 12). Medium sized
mandis such as Mansa (wholesale cluster 2) and small ones like Adampur and
Bhatinda (wholesale cluster 4) had large numbers of functionaries, Mansa and
Adampur having a glut of kachcha arhatiyas and Bhatinda even more inexplicably
of pukka arhatiyas.

It is clearly premature to judge the contemporary employment system in mandis
since the organization of wheat wholesaling is in a state of flux and is lagging in
development behind the organization of wheat production. It would be useful for
planning purposes, however, to know desirable levels of business within which
pukka and kachcha arhatiyas can operate efficiently.

The effects of mandis on surrounding rural areas

Do mandis help to reduce spatial income differences between town and country-
side by raising those of the rural areas? Wholesale markets play a primary role in
distributing money within the agricultural sector. The farmer's cash or credit may
be spent in various ways. He may reinvest in fixed assets, such as machinery, or in
inputs such as fertilizers; or he and his family may demand exogenous foodstuffs, liquor, consumer goods and services. In the former case they will be using urban functions associated with the wholesaling sector, in the latter with the retailing sector, and the aggregate spatial influence of a mandi town will depend on the nature of the combination of these sectors.

Kahlon and Kehal have examined the responses to mandi establishment of farms of varied sizes, in villages at varying distances within the tributary areas of Dhuri and Nawashahr. There is evidence of a reaction to the existence of urban demand, part of which will arise from people employed in a mandi and from rural mandi users. They found land use to be as in Table III.

**Table III**

*Average production patterns around Dhuri and Nawashahr*

<table>
<thead>
<tr>
<th>Distance from town in km</th>
<th>Foodgrains</th>
<th>Percentage of area under:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Cash crops</td>
</tr>
<tr>
<td>1–8</td>
<td>58.8</td>
<td>12.2</td>
</tr>
<tr>
<td>9–16</td>
<td>76.9</td>
<td>11.0</td>
</tr>
<tr>
<td>17–24</td>
<td>75.1</td>
<td>12.8</td>
</tr>
</tbody>
</table>

(Source: Kahlon and Kehal, 1972)

Within eight km of a town there was a higher intensity/cropping ratio and more land under vegetables and potatoes, affecting the proportion of land under foodgrains rather than under any other cash crop. There was also significantly greater acceptance of pesticides, tractors and tube wells within this range of distance.

The diffusion of consumer goods (such as 'electric fans, sewing machines, watches and radios, fine cloth, shoes, toilet soap, face cream and the consumption of bread and biscuits') was used as a guide to rural development. This was well advanced throughout the whole area, though it declined with distance from the mandi. Non-agricultural employment remained constant at three per cent of the population. However, this study is patently marred by the absence of a control survey of the spatial influence of a similar sized town without, or with only a very small, mandi.

![Fig. 12 Employment structure of mandis 1970](image-url)
Conclusion

Wholesale markets have been seen to form a distinct structured system related not so much to the productivity of the land as to access to transport facilities. Preliminary investigations suggest that mandis influence employment and industry in their associated towns in complicated ways both directly and indirectly. They also affect land use and affluence around them.

The success of planned growth centres based on the mandi and functions known to be related to it will depend on investment priorities involving the private as well as the public sector. Here the policy maker is faced with selecting either a low capital strategy for the public sector or a publicly financed decentralization of marketing and related facilities. The first would allow free play of existing forces which will probably result in the reinforcement of the regional grip of present major centres, i.e. the 60 per cent of central place cluster 3 which coincides with wholesale cluster 2 having greatest growth potential (and in particular those 11 centres at present under-provided with agricultural processing industries). At present few farmers plan trips to mandis on their return-loading expectations, since a paucity of storage capacity on farms necessitates special visits for fertilizer and other materials needed by the HYV Programme. The most mechanized farmers spend relatively, as well as absolutely, most money on such requirements and they are the most sensitive to transport costs (Deb, 1969). With increased tractor ownership (privately financed though often publicly subsidized) and with increasing 'peasant' affluence, demand for a larger variety of return-loading and recreational facilities, especially the cinema, is likely to grow. Improvements in the road network may have one of two opposite effects: they may bring villages within the wider orbit of larger urban centres, with negative results both for the outlying farm and for the small farmer; or they may disperse development to villages and to small towns. The second type of investment strategy would aim consciously at this latter effect. Within five years at present investment rates, small mandis might have an impact on areas within 8 km. But in the longer term, with future trends in transportation as well as the Western marketing model in mind, such large scale investments might well prove to be white elephants, especially where mandis have been located as political status symbols. Punjab seems to be pursuing this latter policy at present.

There are strong economic reasons for letting the centrifugal force of the existing system expand untrammelled, as in the first strategy, and good social reasons for the second strategy. A careful compromise may not be a weak solution if development is based on mandi settlements in the 17-40 000 population range, located in the interstices of the main wholesale market network but well endowed with communications. There are nine or ten such suitable settlements in the study area. Throughout India, however, it is precisely this category that is badly represented in the urban system. It is estimated (Johnson, 1970) that 47 000 market towns in approximately that size range are needed, while less than 2000 exist. It is abundantly clear that much research needs to be done in India on the selling and purchasing patterns of farmers, on commodity flows and employment generation and on the structure of trading firms, in order to refine the idea of an agriculturally-based growth centre to a point where planners can incorporate it usefully into a location model for wholesale markets and their towns.

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