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Changing agricultural system in Sonipat district: A study in temporal perspective

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Abstract

This study examines the transformation of the agricultural system in Sonipat District, Haryana, India, between 1970-71 and 2000-01. The analysis reveals significant changes, including a shift from coarse to fine food grains, increased irrigation intensity, and improved agricultural technology. The study identifies a transition from subsistence to subsistence-cum-commercial agriculture, driven by technological advancements and commercialization. Key indicators, such as cropping pattern, livestock structure, and productivity, show notable improvements. The findings provide insights into the dynamics of agricultural development in the region.

Keywords: Agricultural system, cropping pattern, irrigation, livestock structure, productivity, subsistence agriculture, commercial agriculture

Introduction

The type of agricultural system is an indicator of measurement of agricultural as well as rural development of an agriculturally dominated area. Agricultural development in true sense tells us about the quality of the agricultural system of a region, in terms of productivity, diversification and commercialization. It is consistent with the desired state of agrarian relations and ecological balance. Thus, the identification, description and explanation of agricultural systems have been a long concern of geographers. It is like any other natural system and agricultural enterprises may be described as an open system, receiving inputs from outside and losing energy and matter as outputs (Brigg and Courtney, 1985) ^[1]. The term 'agricultural system' is employed in a specific sense and referred to as a recognizable assemblage or set of agricultural practices, functionally interacted. In terms of system theory an agricultural system is an agricultural complex composed of a hierarchy of sub-complex or sub-sets of elements whose spatial organization is related with cultural evolution and technological change (Singh, 1974) ^[2]. Whereas according to Hussain, (2002) ^[3] agricultural system may be a single farm or group of inter-related farms having similarities of agricultural attributes. The first scientific attempt for the delineation of the agricultural system was made by Whittlesey, (1936) ^[4]. Its classification was based on the functioning forms of agriculture rather than on the distribution of climatic elements and landforms. Morgan (1977) ^[5] classified agricultural systems as subsistence, subsistence cum commercial and mainly commercial on the basis of purpose of production. Thus it is essential to classify agriculture into basic agricultural systems, which may assist in the description and analysis of different agricultural distributions at the micro level.

Study Area

The Sonipat district is a part of the Upper Yamuna Plane. It lies from 28° 48'30" to 29° 17'54" North latitude and from the 76° 28'30" to 77° 30'40" east of longitude. The perennial Yamuna River share a common boundary between other Indian state Uttar Pradesh and Sonipat district in the east. National capital territory Delhi and Jhajjar district lies in the south of the study area. It is surrounded by the Panipat district in the north, Jind district in the north west and Rohtak district in the South west. Its proximity to the NCR gives it an advantage in attracting urban tourists seeking rural experiences. The district's strategic location along National Highway 44 and the popularity of nearby destinations like Murthal (famous for its Dhabas) make it an ideal candidate for developing farm tourism.

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As per the 2011 Census data, Sonipat district is having a population of 1450001 out of this 68.73 inhabiting the rural regions in 323 inhabitant village.

Materials and Methodology

The term basic agricultural system as used here refers to a regional unit on the surface of earth, which possesses similar agricultural characteristics throughout Haryana, which is one of the most uniquely agricultural developed states of the nation, has occupied a place of pride in the field of agriculture. Before the green revolution it had predominantly subsistence arable farming, showing considerable fluctuations from year to year in rainfall and hence low intensity of irrigation. But in the last thirty years the economy has developed impressively in Haryana and especially in the study area. Consequently, the agricultural patterns, which are dynamic, require a constant appraisal of the functioning forms of agriculture. For this the agricultural system characteristic are described on the qualitative and

empirical basis and some of the characteristics have also been checked and confirmed with the help of statistical measurement

In the present study to characterise the agricultural system of the study area empirical, qualitative as well as quantitative approaches have been adopted, which is based uniformly on the five grade criteria or observable items listed by Whittlesey. By observable items, we mean all those characteristics of agriculture, which can be observed directly and can be enumerated as well. Besides this they can be understood directly and made comparable through some device of calculation based on statistics. The overwhelming variety of agricultural activities has been reduced to certain basic forms of agriculture and various criteria used are given in table 1. The above table 1. illustrates statistics of nine important characteristics of agriculture in the area during 1970-71 and 2000-01.

Result and Discussion

Table 1: Statistical characteristics of agriculture systems in Sonipat

Sr. No.	Agriculture characteristics	Measurement Year 1970-71	Measurement Year 2000-2001
1	Cropping pattern	Fine food grain (40.61), coarse food grain (26.67), Forage crops (19.53), industrial crops (10.98) fruits& vegetables (1.29), oilseeds (0.92)	Fine food grain (76.60), coarse food grain (3.93), Forage crops (11.80), industrial crops (3.28), fruits& vegetables (2.98), oil seeds (1.41)
2	Livestock units per 100 hect of cropped area	250.63 cattle dominated	295.41 cattle dominated but piggery at place in transformation agriculture
3	Intensity of cropping	136	161.55
4	Intensity of irrigation	66.97	97.30
5	Cultivator/100 hect of cultivated area	41.58	108.63
6	Hired agriculture workers/100 hect of cultivated area	17.13	49.90
7	Index of agriculture technology	153.93	887.16
8	Index of Agriculture productivity	93.70	95.47
9	Index of Crop Diversification	0.79	0.67
10	Agricultural system	Fine and coarse food grain, intensive subsistence	Fine food grain, intensive Subsistence cum commercial

Results and Discussion

- **Temporal changes in cropping pattern:** The analysis reveals a temporal change in the cropping pattern of study area between 1700-71 and 2000-01 (Table 7.9). In 1970-71 fine food grain (wheat and rice) occupied 40.61% of the total cropped area (TCA) followed by coarse food grain (barley, bajra, maize and pulses) 26.67%, forage crops 19.53%, industrial crop (Sugarcane and cotton) 10.98%, fruits and vegetables 1.29% and oilseeds 0.92%. But a dynamic change in cropping patterns in the preceding years has been found. In 2000-01 fine food grain occupied 76.60% of TCA followed by forage crops 11.80%, coarse food grain 3.93%, industrial crops 3.28%, fruits and vegetables 2.98% and oil seeds 1.41%.
- **Changes in livestock structure:** (Conversion of all classes of stock based on a scale is given by Singh, J.1974)⁶. In 1970-71 livestock units Per 100 Hect. of TCA were 250.63, which increased to 295.41 in 2000-01 showing a positive change of 18%. Cattle are the most important livestock accounting for more than 70% of total livestock units in area followed by poultry, piggery, goat and sheep.
- **Intensification of cropping:** The extension of cultivation is not important these days but the intensity of cropping is of much significance for the development of the agricultural economy. The intensity of cropping

refers to the number of crops raised on a field during an agricultural year. The total cropped area as a percentage of net cropped area gives a measure of intensity of cropping. During 1970-71, the intensity of cropping was 136 in the study area, which increased to 161.55 in 2000-01 with 19% increase

- **Intensification of irrigation:** Rainfall is deficient in the study area so the irrigation facilities are important and decisive factors in determining the agricultural system. Irrigation being an artery and pulsing heart, is an absolute constraint as well as a sufficient volitional commands over the location of commercial crops, improvement in agricultural production per hectare, swing in cropping pattern, and change in the mechanics of land use and dynamism in the livestock structure in the area. The intensity of irrigation refers to net area irrigated as percentage of net area sown. During 1970-71, the intensity of cropping was 66.97 in the area that increased to 97.30 in 2000-01 and noted 45.29% positive change.
- **Changes in cultivators density:** The cultivator density (Cultivators Per 100 Hectare of Cultivated area) affects land use pattern considerably. It is unrealistic to regard agricultural cultivation systems as adaptation to different natural conditions, but cultivation systems can be more plausible interpreted in collaboration with differences in cultivator's density. The cultivators per

100 hect. of cultivated area must clearly be related to farm size and to the type of farming. When the cultivator's densities of 2000-01 (108.63) were compared to 1970-71 (41.58) it was observed that there is a high pressure on the cultivated area.

- **Growth of hired agricultural workers:** The kind of crop is primarily related to the hired agricultural workers per 100 hectare of cultivated area. A high requirement of hired agriculture workers was observed during the paddy cultivation whereas a low requirement was observed during wheat cultivation in the study area. When the hired agricultural workers density of 2000-01 (49.90) was compared to that of 1970-71 (17.13) (Table 7.9), it strengthens the conclusion that there is dynamic increase in the employment of agricultural labourers by cultivators in the area. Further, it supports that farming is becoming more and more capitalized, intensive and commercial.
- **Advancement in agricultural technology:** Improved agricultural technology plays a major role in agriculture development of an area. For measuring the agricultural technification of the area, the data on mechanization and biological indicators of farm technology were processed. In the present study seven indicators were selected for measurement of agricultural technology in 1970-71 and 2000-01 and composite score of these indicators shows the agricultural technification. The equation may be written as

$$C \text{ sat} = T + T_{oi} + H_i + I_{ps} + P_{pe} + H_y + C_f$$

Where C sat implies the composite score of agricultural technology; T is Tractors per 1000 hectares of cultivated area; Toi indicators tractors operated implements per 1000 hectares of cultivated area; Hi appreciates harvesting implements per 1000 hectares of cultivated area; Ips covers irrigation pump set per 1000 hectares of cultivated area; Pps is plant protection equipments per 1000 hectares of cultivated area; Hy stands for area under HYV as percentage of T.C.A and Cf denotes use of chemical fertilizers in kg per hectare of T. C. A.

Table 1 reveals that in 1970-71 the composite score of agricultural technology was 157.93 which increased up to 887.16 in 2000-01 and noted 476% positive change.

- **Changes in agriculture productivity:** Agricultural productivity is an important indicator of agricultural development. Agriculture productivity has been calculated by various methods. But in the present study to assess the temporal difference in the level of crop productivity, the statistical technique formulated by Bhatia (1976)⁷ has been used. The composite crop productivity index provides a good measure of temporal variation in overall agricultural productivity of the study area. The composite productivity index was found to be 93.70 in 1970-71, which increased to 95.47 in 2000-01.
- **Changes in crop diversification:** Crop diversification can be defined as growing the number of crops in a given area in an agricultural year. It is an indicator of agricultural development. In general, higher the level of agricultural technology, lesser the degree of diversification (Husain, 1996)⁸ In the present study Gibbs-Martin (1962)⁹ index of crop diversification has

been used for measuring the extent of diversification in cropping pattern of study area. In this technique index is directly related to the magnitude of diversification. On the basis of above technique the index of crop diversification was 0.79 in 1970-71 and it decreased to 0.67 in 2000-01 in the area, which tells us about the increase in the technological level and also specialisation by some particular crops like fine food grain in the study area.

Conclusion

While identifying the agricultural system in the study area only the predominant crops raised (fine/coarse food grain) and animal husbandry (cattle, piggery and poultry dominated), intensity of cropping, intensity of irrigation, density of cultivators and hired agricultural workers, indices of agricultural technification, agricultural productivity and crop diversification were considered. In the study area most of the farmers raise crops, which are sold but are not termed as cash cropping. Consumption of the farm products by the farmer's family, which forms the basis of subsistence agriculture, and the consumption of the farm products by the outsiders, which involves exchange and termed, as commercial agriculture were not considered. In this discussion the purpose of farming has been identified in terms of the agricultural productivity and the inputs (labour, techno-chemicals), which are applied with the methods of cultivation. These basic forms of agriculture are identified on the basis of district level statistics of 1970-71 and 2000-01 and are given in table 7.9, and shows a particular form of agriculture system in the area. In 1970-71 fine and coarse food grain intensive subsistence agricultural system was identified. It shows a dominance of fine and coarse food grains farming, cattle dominance in terms of animal husbandry, low intensity of cropping and irrigation and high index of crop diversification. The area was found to have high density of cultivators and low density of hired agricultural workers, with low indices of agricultural technification and agricultural productivity.

In 2000-01 whereas, the area was having a fine food grain intensive subsistence cum commercial agricultural system. In this type of system there is dominance of fine food grain in crops and cattle dominance with piggery and poultry having a significant place in livestock. The study area has high intensity of cropping and irrigation, very high density of cultivators and hired agricultural workers, high indices of agricultural technification and agricultural productivity but low index of crop diversification in 2000-01.

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