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Implications of Intensive Agriculture on Soil and Water Resources: Some Evidences from Kurukshetra District

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I

INTRODUCTION

The biochemical technology of the 1960s flourished in the resource rich regions of India, particularly north-west India. Highly subsidised farm inputs prompted farmers in the region to maximise production without regard to long term implications. Of late, the ongoing agricultural growth process is being viewed as unsustainable. Though sustainability has different dimensions, the present study deals with it from the viewpoint of natural resource degradation. The information and knowledge about rates and magnitudes of natural resource degradation are necessary for diagnosing system impairment, for assessing response of the system to ameliorative measures or resource specific technologies required to halt or reverse the unsustainable trends. Often anecdotal evidences, which are not supported by adequate empirical analysis, lead to confusion and consequent delay in evolving a suitable strategy. Hence, the present study has been undertaken in one of the leading green revolution districts of India, Kurukshetra, to assess the extent of natural resource degradation, particularly of soil and water in the wake of green revolution.

II

EXTENT OF INTENSIVE AGRICULTURE

Kurukshetra district is known as the granary and rice bowl of Haryana State. The district is endowed with all the infrastructure facilities necessary for the bio-chemical technology of the 1960s (Table 1). Irrigation was perceived as the most critical input for adopting this technology. Therefore, expansion of canal network was emphasised. The expansion in canal irrigation however could not be sustained for long, as this requires huge public investment. The canal irrigated area in the district has decreased over years. Of late, tubewell was realised as a more dependable source of irrigation (Dhawan, 1995).

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Institutional credit was also readily available to the farmers for installation of tubewells. As a result, the farmers have gone for tubewells in a big way. This is evident with the decline in figures for net area sown per tubewell (Table 1). The proportion of tubewells to canal irrigated area in the district has also increased over the years. For every one hectare of land irrigated by canal, tubewell irrigated area almost doubled.

TABLE 1. SOME OF THE INDICATORS OF INTENSIVE AGRICULTURE IN KURUKSHETRA DISTRICT, A COMPARISON OF DISTRICT WITH STATE OVER YEARS

Sr. No.	Indicators	Kurukshetra district		Haryana State	
		1972-73	1992-93	1972-73	1992-93
(1)	(2)	(3)	(4)	(5)	(6)
1.	Net irrigated to net sown area (per cent)	79.1	96.0	48.7	72.7
2.	Tubewells (hectare/tubewell)	9.4	3.9	34.3	7.0
3.	Ratio of tubewell to canal irrigated area	1.6	2.9	0.6	1.2
4.	Tractors (hectare/tractor)	104.0	16.1	168.7	26.8
5.	Area under high-yielding varieties				
	(a) Rice	48.1	66.5	42.9	72.5
	(b) Wheat	100.0	99.3	86.5	98.9
6.	Fertiliser consumption per hectare of cropped area	54.6	209.3	22.2	107.7
7.	Pattern of fertiliser consumption (N:P:K)	36 : 9 : 2	79 : 15 : 1	42 : 7: 2	205 :52 : 1
8.	Cropping intensity (per cent)	152.7	183.5	145.9	165.6

Source: Statistical Abstracts of Haryana, Government of Haryana, Chandigarh.

The biochemical technology was largely confined to fine cereals like rice and wheat. Therefore, the area under rice and wheat continued to increase throughout the period (Table 1). The area under high-yielding varieties (HYVs) of rice in the district is less than the state average, as the district under investigation is famous for cultivation of basmati rice, the traditional long plants, not the dwarf ones. Increase in area under rice and wheat has led to increase in the use of chemical fertilisers. Evidently, the use of chemical fertilisers in the district quadrupled in twenty years. Fertiliser consumption was already skewed in favour of nitrogen in the early seventies. The skewness further deteriorated in the early nineties. During a period of twenty years, there has been manifold increase in the consumption of nitrogenous and phosphatic fertilisers. The consumption of potash (K_2O) however decreased in the 1990s. This trend was prevalent for the state as a whole.

The cropping intensity in the district has increased from 153 to 184 per cent. This has been made possible with the increased mechanisation, as is evident from the figures of net sown area per tractor. The figure for net sown area cultivated by a tractor has decreased by more than six times. During the year 1992-93, around 16 hectares were cultivated by a tractor in the district. The figure was as high as 104 hectares in the year 1972-73.

In short, Kurukshetra district had sufficient infrastructure base to adopt the bio-chemical technology of the sixties. However, in recent years, sustenance of this strategy is often questioned on account of its ill-effect on natural resources like soil and water. In order to assess these facts, the pattern of degradation of soil and groundwater has been illustrated in the following sections, and studied in the subsequent sections.

III

SOIL DEGRADATION

Kurukshetra district had no major soil problems. There were some lands with alkali soil, but with the investment in land reclamation, the area under alkali soil is now negligible (*Statistical Abstracts of Haryana*). In recent years, there has been concern over deterioration in the fertility status of soil in the district. Therefore, soil samples of the district were evaluated for principal macro-nutrients (nitrogen, phosphorus, potassium) and micro-nutrients (zinc, iron, copper, and manganese). These data were collected from the Deputy Director of Soils, Government of Haryana, Karnal, for different years. The information relating to macro-nutrients has been presented in Table 2 (A). The soil sample results were available for following years, 1980-81, 1981-82, 1994-95, 1995-96. The distribution of soil samples into low, medium and high categories is based on the parameters presented in Table 2 (B).

The estimates for nitrogen status of soil are based on the organic carbon content of the soil. Thus the nitrogen status of soil also reveals the organic matter content of soil. Since a large number of soil properties such as aeration, soil texture, structure, water retention capacity depend on the organic matter content of soil, the nitrogen status of soil, to some extent, describes the general health of soil.

It is evident from Table 2 (A) that almost all soil samples (99 per cent) are deficient in nitrogen during the later years (1995-96), while a decade back it ranged between 70 to 89 per cent. The effect of season on the nitrogen deficiency status has been conspicuous. During summer, nitrogen deficiency increases, as organic matter decomposes to release gases.

The phosphorus status of soil has also deteriorated in the nineties, with more than 70 per cent of soil samples falling in low category. The corresponding figure was around 30 per cent only during the early eighties. During later years, the season's effect on phosphorus status of soil has also become conspicuous. This to some extent reveals the application pattern of the phosphatic fertiliser. During the survey of the farmers' fields, it was observed that the phosphatic fertiliser applied to wheat (October-March) was more than the paddy crop (April-September).

TABLE 2 (A). COMPARISON OF SOIL SAMPLES OVER YEARS, ANALYSED FOR NITROGEN, PHOSPHORUS AND POTASH CONTENTS INTO LOW, MEDIUM AND HIGH CATEGORIES IN KURUKSHETRA DISTRICT

(per cent)

Year	Season	Nitrogen			Phosphate			Potash		
		Low	Medium	High	Low	Medium	High	Low	Medium	High
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1980	October-Mar ch	88.5	10.5	1.0	31.3	55.9	12.8	0	0.1	99.9
1982	April-September	70.2	29.5	0.3	32.4	58.8	8.8	0.3	47.5	52.2
1994	October-March	99.9	1.0	0	68.8	30.4	0.8	0.3	6.9	92.8
1996	April-September	99.9	0.1	0	84.6	15.2	0.2	12.6	34.5	52.1

Source : Deputy Director of Soils, Governmemt of Haryana, Karnal.

TABLE 2 (B). NORMATIVE VALUES USED FOR CLASSIFYING TESTED SOIL SAMPLES

Nutrients (1)	Low (2)	Medium (3)	High (4)
Nitrogen (organic 'C' per cent)	<0.2	0.2-0.6	>0.6
Phosphorus (kg/hectare)	<10	10-30	>30
Potash (kg/hectare)	<50	50-200	>200

Source: Deputy Director of Soils, Government of Haryana, Karnal.

The alluvial soils are generally rich in potassium. As per expectation, the potassium content of soil was in the medium to high range, though there has been significant decline in the potassium content of soil in the recent years.

The overall deterioration in the macro-nutrient status of soil indicates that the nutrient uptake by crops highly outweighs the nutrient added into or nutrient generated in the soil. In fact, with assured irrigation, farmers have gone for nutrient exhaustive crops like paddy and wheat. Again, due to unfavourable situation in rural energy front due to varied reasons, farmyard manure or organic matter residues added into the soil have decreased over the years (Kumar *et al.*, 1998). As a consequence, there is deterioration in the nitrogen status of soil, as estimate is based on the organic carbon content of the soil, finally resulting in deterioration in the physical health of soil.

Farmers who are aware of depleting nitrogen status are applying higher doses of inorganic fertilisers. Bulk of these nutrients are however lost in soil, and soil sub-surface. In this regard the study indicates that only one-third of the total nitrogenous fertiliser applied in the soil is absorbed by the plant (Sawant and Dutta, 1982).

Considering these observations, it may be concluded that the soils in Kurukshetra district are extremely poor in nitrogen. Phosphorus content is also low, while potash content ranges between medium to high category. The study establishes that, over the years, there has been deterioration in the macro-nutrient status of soil. The depletion in organic matter content is most alarming.

Micro-nutrients

The soil sample results for different micro-nutrients are available for the years 1987 and 1995. While analysing soil sample results, the critical limits for micro-nutrients, as reported by Deputy Director of Soils, are zinc(0.6 ppm), copper (0.2 ppm), iron (2.4 - 4.5 ppm), manganese (1.0 ppm). These levels of micro-nutrients are the lower limits, below which soil is regarded as deficient in the said nutrient. Table 3 presents distribution of soil samples deficient in various micro-nutrients.

TABLE 3. COMPARISON OF SOIL SAMPLES DEFICIENT FOR DIFFERENT MICRO NUTRIENTS

Nutrients	Percentage of soil samples found deficient in			
	Kurukshetra district		Haryana state	
	1987	1995	1987	1995
(1)	(2)	(3)	(4)	(5)
Zinc	37.5	36.0	32.1	52.2
Iron	44.1	31.7	31.8	36.9
Copper	1.7	2.7	1.5	5.3
Manganese	1.7	38.1	1.7	25.6

Source: Deputy Director of Soils, Government of Haryana, Karnal.

As is evident from Table 3, there has been a significant decline in the micro-nutrient status of soil in the state during a span of 6 years only. Though the trend for the district is not as clear as it is for the state, in the year 1995, there has been a marginal decline in the deficiency status of zinc over the earlier year of reference, i.e., 1987. As a matter of fact, the farmers have realised the importance of application of zinc in the rice fields towards the end of the 1980s. The regular application of zinc has prevented the growth of zinc deficiency in the soils.

There has been a significant improvement in the iron status of soil during the reference years. Paddy cultivation has increased in the district and waterlogged condition in a paddy field improves the iron status of soil (Poonam *et al.*, 1982). On the other hand, there has been marginal increase in copper deficiency over the reference years. There has been an abrupt increase in manganese deficiency during the period under study.

In brief, there emerges a mixed picture of change in the micro-nutrient status of soils. The decline in zinc has been arrested by regular application of zinc in the paddy fields. Again, with the increased area under paddy, the status of iron has also improved in the soils of the district. But copper and manganese deficiencies have gone up.

IV

GROUNDWATER RESOURCES

It is now an established fact that the green revolution has flourished in regions endowed with good and dependable supply of water resource. Kurukshetra district is served by a number of canal distributaries, like Thaska, Salbanikala, Markanda, Thanesar, Papnawa, Saraswati. The Satlej-Yamuna canal and Markanda river also pass through the district. In spite of it, canal irrigation has not been sufficient. As is apparent from Table 1, groundwater has provided immense support to the agricultural development of the district. In recent years, over-exploitation of groundwater has however drawn attention of all the concerned persons. This section discusses groundwater conditions, pattern of groundwater fluctuation and factors responsible for it. It also discusses groundwater balances, and irrigation quality of groundwater.

Groundwater Conditions

The occurrence and movement of groundwater depend on the hydrogeological characteristics of the sub-surface formation. Since Kurukshetra district lies in the large alluvial tract of the trans-gangetic plains, groundwater occurs in deposits of loose, unconsolidated sediments in unconfined form. The aquifer zone extends to depths greater than 100 metres below the ground surface.

Water table levels in the different districts of Haryana are monitored periodically (1974 onwards) by the State Directorate of Ground Water through observation of a number of wells located in different villages. Information on depth of groundwater is available for 31 villages of Kurukshetra district. This is for the months of June and October that represent pre- and post- monsoon groundwater levels respectively. Based on this information, few salient facts about groundwater conditions in Kurukshetra district are listed below.

- Area with depth to water table of 12 metres or more has increased from none in 1974 to more than 60 per cent in 1995. Variation in groundwater table across villages has also increased over the years.
- Area having groundwater table of 16 metres or more was as high as 26 and 39 per cent in pre- and post-monsoon seasons respectively in the year 1995.
- The average depth to water table during pre-monsoon period was 15.1 metres in 1995. The corresponding figure was only 7.5 metres in 1974. Thus the annual average decline in groundwater table was 0.36 metres in a district well endowed with surface irrigation.

Thus there is a definite trend of decline in groundwater table in Kurukshetra district. The spatial variation in the groundwater table has also increased over the years. It was found during the present survey that spatial variation in cropping pattern in the district was not significant till the eighties. Therefore, demand for water in the historical years has not changed across villages. Thus spatial variation of groundwater table in fact shows proximity of different water harvesting structures, like irrigation canals to the villages. The proximity to irrigation canals, a major water recharging structure in the district, has relieved few villages from deterioration in groundwater table.

Water Table Fluctuation

The fluctuation in the water table represents the net effect of both recharge and draft of groundwater during a year. Since, information on fluctuation is available for 31 villages, the pattern of groundwater fluctuation has been presented with probability of decline in water table in the successive years, secular or annual fluctuation. Again since information on depth to water table is available for pre- and post-monsoon seasons, the probability of seasonal decline in groundwater table has also been studied.

Probit analysis was performed to assess the factors responsible for annual and seasonal fluctuations in water table. It was postulated that the probability of decline in groundwater table in the successive years depends on the annual rainfall in the previous year, percentage of area under paddy and oilseeds to net sown area, and percentage of tubewell irrigated area to total irrigated area in the district.

The estimation results have not been encouraging, the coefficients for most of the variables are statistically insignificant though coefficients for some variables have yielded expected signs. Most surprisingly, rainfall was not found to have any significant effect on the probability of decline in groundwater table. Therefore, the results are not presented in the table. The important points are however discussed.

The study suggests that with the increase in the area under paddy, chances of decline in groundwater table have increased. The groundwater situation in the study area further worsened during the late eighties, with the cultivation of short duration paddy varieties. The variety popularly known as *sathi* was generally sown in the month of May. This requires huge amount of water (around 140 per cent of *kharif* paddy) as it is cultivated in the peak summer season (before the onset of monsoon).

The analysis also indicates that the area under oilseeds has reduced the chances of annual decline in groundwater. In fact, sunflower, to a large extent, has replaced late sown wheat in the study area. In sunflower, irrigation water requirement is less, around 20 per cent of late sown wheat. In fact, increase in the area under sunflower has happened only after 1990.

Groundwater Balance

The groundwater balance in the aquifer has been studied by the relationship of utilisable resource minus net draft. The utilisable groundwater resource is essentially the dynamic component. This is the result of periodic recharge through rainfall, seepage from canal, irrigation return flows, etc. Groundwater potential is based on the water table fluctuation approach, as recommended by Ground Water Estimation Committee of the Ministry of Irrigation, Government of India.

A comparison of groundwater balance estimates for various blocks in Kurukshetra district has been presented in Table 4. The reference years for comparison are 1990 and 1995. The estimates show that the groundwater balance has been negative in all the blocks for both the years under study. Stated differently, net annual recharge falls short of draft in all the blocks and has been termed as 'dark'. The net annual draft has been more than double the utilisable groundwater resource in three out of the four blocks during the year 1990. The stage of groundwater development, i.e., annual draft as percentage of utilisable resources across blocks has been in the range of 178 and 373 per cent during the year 1990.

Though a comparison of 1990 and 1995 situation as such is not valid, this has been done to highlight the changes in the component of groundwater balance in different blocks. The comparison shows reduction in groundwater imbalances over the years from 241 to 154 per cent. The stage of development is still 154 per cent. Stated differently, net draft is around 1.5 times that of the utilisable resources, indicating over-exploitation of groundwater resources.

TABLE 4. COMPARISON OF GROUNDWATER BALANCE IN KURUKSHETRA

(ha/cm)

Block (1)	Year (2)	Utilisable resource (3)	Net draft (4)	Groundwater balance (ha/cm) (5)	Stage of development (per cent) (6)
Ladwa	1995	5,498	9,435	-3,936	172
	1990	4,398	13,986	-9,588	318
Pehowa	1995	18,223	18,482	-259	102
	1990	4,604	17,173	-12,569	373
Shahbad	1995	5,654	14,173	-8,518	250
	1990	7,308	14,616	-7,308	200
Thanesar	1995	7,805	15,036	-7,230	193
	1990	10,178	18,117	-7,939	178
Kurukshetra (total)	1995	37,180	57,126	-19,945	154
	1990	26,488	63,892	-37,404	241

Source : Directorate of Groundwater, Government of Haryana, Karnal.

The improvement in the groundwater imbalances were observed in three out of four blocks. It is heartening to note that the improvement has been the direct consequence of decline in annual draft. The block Pehowa is an exception - there has been a marginal increase in net draft, and reduction in groundwater imbalance has been brought about by manifold increase in utilisable resources or annual recharge. The increase in groundwater recharge, to some extent, is due to increase in irrigated area in the block during the reference period.

In contrast to the previous block, Ladwa, another block of the district, is not supplied with any canal irrigation. The block has recorded maximum decline in draft over the reference years. It seems that in Ladwa, unlike in other blocks, rainfall has been the prime source of groundwater recharge. Thus imbalances continue despite decline in draft. This is primarily due to change in crop enterprise-mix; the acreage under summer paddy or *sathi* (water intensive crop) has decreased, while the acreage under sunflower (less water intensive crop) has increased. The cultivation of sunflower is largely popularised after 1990, and has replaced late sown wheat on a large scale. This is evident with decline in area under wheat in the year 1994-5 over 1990-91 (see Annexure).

The foregoing analysis indicates that groundwater is over-exploited in the district. The extent of over-exploitation has however reduced over the years largely due to decline in net annual draft. This has been brought about largely by reduction in area under summer paddy or *sathi,* late sown wheat, and increase in the area under paddy and sunflower crop.

Irrigation Quality of Groundwater

The suitability of water for irrigation is determined by the amount and type of salts present in it. The accepted criteria for judging the quality are: total salt concentration, as measured by electrical conductivity; relative proportion of cations as expressed by sodium absorption ratio (SAR). The anions like bicarbonate and boron also influences the irrigation quality of groundwater (Michael, 1985).

The available information with respect to these parameters were analysed to study changes in groundwater quality. The selected period for comparison was 1975-76 and 1995-96. The result is not exciting and therefore is not presented in the table. Some of the important findings of present analysis are however presented.

Total salt concentration in groundwater has decreased over the reference years. The chances of soil salinity tend to increase as total salt concentration in irrigation water increases (Michael 1985). There has been a significant decline in cations, represented as sodium absorption ratio (SAR). Any decline in the sodium absorption ratio (SAR) of irrigation water decreases, reducing the exchangeable sodium in the soil, ultimately reducing the chances of sodicity (Michael, 1985).

Thus the present analysis indicates that over the years, the quality of groundwater has improved in the study area. If we correlate this finding with that in the previous section, it is apparent that there has been improvement in groundwater quality with decline in water table. This sets aside the apprehension of intrusion of poor quality groundwater from the surrounding area, following the increase in groundwater depth. The fear is based on the principle that states that the peizometric pressure gets reduced in an over-pumped aquifer, causing water to move in from an adjacent aquifer. This assumes greater importance considering the fact that Kaithal, the southern surrounding district of Kurukshetra, has significant area with poor quality of saline groundwater. The present study, therefore, does not support the aforesaid hypotheses, it is, however, based on a small sample.

In brief, the present study indicates that irrigation quality of groundwater has improved over the years, with increase in groundwater depth. The quality of groundwater was, of course, not poor in the earlier years. The study does not support the prevalent theory that increase in groundwater depth leads to invasion of poor quality groundwater from the surrounding area.

V

IMPLICATIONS AND IMPERATIVES

Implications of Soil Degradation

Some implications of this study are quite clear. The decline in macro- and micro-nutrient status of soil has led to an increase in the cost of production, as the farmers are now applying larger quantities of chemical fertilisers. A continuous decline in organic matter content of soil, as reflected through low nitrogen status, has larger ramifications. The organic matter content of soil influences a large number of physical and chemical characteristics of soil, affecting soil productivity.

Most surprisingly, decline in the organic matter content of soil has also led to deterioration in potable quality of groundwater. The farmers, who are aware of low nitrogen status in soil, often consider inorganic fertilisers as substitute to organic one, and apply higher doses of it. The effect of higher doses of nitrogen on plant is more visible, as nitrogen is largely responsible for vegetative growth of plant. The utilisation of inorganic nitrogenous fertiliser is low, around one-third of nitrate leaches downward reducing the potable quality of groundwater (Sawant and Dutta, 1982). Though recent information on nitrate content in groundwater is not available, one of the earlier studies (Kakkar, 1983) reports an alarming increase in the nitrate content of groundwater in the district.

Implications of Groundwater Depletion

The existing wheat-paddy cropping system has widened the gap between average annual draft and recharge, leading to a secular decline in the level of groundwater. A continuous decline in groundwater has rendered the existing water lifting technology (centrifugal pumps) inefficient or in some places infeasible too. Therefore, some well-to-do farmers, generally with large operational holdings, are going for alternate technology like submersible pumps. But this has endangered the aquifer. A competitive deepening activities with high-powered pumpset may lead to permanent loss of aquifer.

The submersible pump has also emerged as a new source of inequity in rural India. It is capital intensive. Moreover, the indivisibility of this investment on the small farm further constrains its adoption. Therefore, the small farmers largely depend on shallow tubewells for irrigation. Considering the competitive deepening with submersible pump, and lack of water market in the area, these farmers will soon be deprived of water. During the survey, it was observed that the small farmers were opting for less water intensive crops like fodder. These crops are also less remunerative, further accentuating the existing gap between the small and large farmers.

Policy Imperatives

By now it is well understood that bulk of degradation of natural resources like soil and water can be checked by rationalising farm input prices. For instance, nutrient prices originated from organic vis-a-vis inorganic source, if rationalised, may encourage the farmers to apply higher doses of organic manure in their fields. Similarly, rationalisation of power tariff would increase private cost of irrigation, and may encourage the farmers to adopt less water intensive crops. This will help in improving the groundwater imbalances.

An inadequate property right for groundwater restricts government to prevent the farmers from installing submersible pumps. The Government attempts to check installation of submersible pump by denying institutional finance for tubewells in 'dark' areas or to those who do not maintain the minimum spacing between wells imposed by a state agency, or denying electricity connections to those who violate government regulations. These restrictions however do not pose any threat to self-financing, generally to the large farmers. There are suggestions to nationalise the groundwater resources (Reddy, 1999). However, the issue of property right in groundwater is not easy to resolve. This shifts the responsibility of managing groundwater resources towards local institutions which should come forward in implementing prudent but harsh decisions for the community.

Technological Imperatives

This study also highlights the role of less water intensive crops like sunflower in improving the negative groundwater balances in the district. The study proposes that the varietal breakthrough could be induced through undistorted resource prices. The area is water scarce, therefore improvement in less water intensive crop is desired. In any case water intensive crop varieties like summer paddy or *sathi* should not be released.

Participation of farmers in evolving suitable crop variety is desired. During the present survey the farmers emphasised the need for stabilising yield of short duration summer pulse. The summer pulse can be incorporated between wheat-paddy crop rotation, and to a large extent, would discourage the farmers from growing summer paddy or *sathi*. The summer pulse is less water intensive, soil enriching being leguminous but involves enormous yield risk. Therefore, stabilising yield in summer pulse and similar resource specific, need-oriented research would go a long way in improving inter-generational equity in the region.

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ANNEXURE

RECENT CHANGES IN AREA UNDER PRINCIPAL CROPS IN THE DISTRICT

(000 'hectare)

Crops	Kurukshetra district		Haryana State
	1990-91	1994-95	1990-91
(1)	(2)	(3)	(4)
Rice	101.6	101.0	661.2
Wheat	105.2	104.5	1,850.1
Other cereals	2.0	2.0	826.0
Pulses	2.7	2.8	742.0
Oilseeds	1.7	1.9	488.5
Sugarcane	2.0	12.2	147.8
Potatoes	3.7	4.0	10.5
Others	–	–	–
Total cropped area	255.0	256.0	5,919.0
Net sown area	139.0	139.0	3,575.0
Total geographical area	160.0	160.0	4,378.0

Source: *Statistical Abstract of Haryana*, Government of Haryana, Chandigarh.