

# Cropping Pattern and their Changes in Punjab-Haryana Plains: 1991-2011

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## Abstract

Cropping pattern means the proportions of area under various crops at a point of time. A change in the cropping pattern means a change in the proportion of area under different crops. Cropping pattern express the share of different crops in farmer's total cultivated area in an agricultural year. It is an important indicator of farmer's decision-making ability which witnesses dynamism over space and time in response to the change in physical and socio-economic factors. Cropping pattern must ensure the greatest efficiency of man, fertilizers, irrigation and other inputs. It is dynamic concept as no cropping pattern can be suitable for all times to come. A successful cropping pattern implies the most efficient use of arable land, consequent upon application of water resources, bio-chemical inputs and the like. In addition, it must offer the cultivators the possibility to maximize agricultural productivity per unit area per unit of time. A cropping pattern is determined by the interaction of physical and socio-economic factors over a period of time. No cropping pattern can be good for all times to come. But there is often a tendency for the cropping pattern to stabilize over a period of time in different agro-climatically homogeneous farming area. The main aim of the present paper is to reveal the cropping pattern and changes in Punjab-Haryana Plains during 1991 to 2011.

Key words: Cropping pattern, tractorization, chemical fertilizers, geo-climatic factors

## Introduction

Cropping pattern means distribution of the area of a farm to various crops grown in the course of one year. It includes allocation of area to various crops in different seasons. The cropping pattern of a farm actually indicates the relationship between different crops and area used under each for production purposes. (Gaffar et.al, 1996). Cropping pattern of a region/area is determined by ecological, technological and institutional factors (Shafi, 1960). Alim (1974) defined cropping pattern is yearly sequence of crops produced in an area or the way the crops grown in a piece of land in the course of a year. It stands for proportion of area under various crops at a point of time in an area (Rana and Rana, 2011). It is also called spatial arrangement of crops in a unit area. Land sown under different crops in a region/state/country/continent at a specific point of time is known as cropping pattern. It is the offspring of both physical and man-made environment. Factors determine cropping patterns of a region are geo-climatic conditions, social customs, historical factors, traditional agricultural practices, people's food habits, state of technological development, levels of infrastructural development, government policies, etc (Sohal, 2004). Nevertheless, at farmers' level, potential productivity and monetary benefits act as guiding principles while opting for a particular crop/cropping system. Farmers decisions with respect to choice of crops and cropping systems are narrowed down under influence of several other forces related to infrastructural facilities, socio-economic factors and technological developments, all operating interactively at micro-level (Das, 2013). Mandal and Bezbaruah, (2013) advocated that besides agro-ecological conditions and various socio-economic-cultural-organizational factors, the cropping pattern decision of the farmers is largely influenced by their exposure to risk arising out of various sources.

**Objective:** The objectives of the present study are:

1. To examine the nature and trends of cropping pattern.
2. To examine if there exists any significant variations in cropping pattern over the study period.

**Methodology and Sources of data:** Present study is based on secondary sources of data which is collected from census hand books of Punjab and Haryana for population statistics and crop land use data is obtained from Kanungo offices of all the districts of the study region. Data is collected for three time periods i.e. 1991, 2001 and 2011 and three years averages are taken for each time period. Statistical techniques are used for deriving the results.

## STUDY AREA

It is situated in north-west of India and contains Punjab and Haryana states with geographical area of 94,572 km<sup>2</sup> which contains 2.88 percent of the total geographical area of india. Its extent ranges between 27°37' north latitude to 32°32' north latitude and between 73°55' east longitude to 77°46' east longitude. It is flanked by the states of Jammu & Kashmir, Himachal Pradesh, Uttarakhand , Rajasthan, Uttar Pradesh and Union Territory of Delhi. It forms international boundary between India and Pakistan in the north-west. The plain is homogenous with exception of Shiwalik hills and piedmont plains in the north-east, sand studded areas in the extreme western parts and outcrops of Aravallis in the south. Average annual rainfall is about 600mm. During summers, normally temperature goes upto 46°C and during winters as low as -1°C in Amritsar. According to 2011 census, the population of the study area is 53096419 persons, out of which 28144595 are males and 24951824 are females.

## Discussion

The discussion of the present study is divided into three parts:

1. Cropping pattern, 1991.
2. Cropping Pattern, 2011.
3. Changes in Cropping Pattern, 1991 to 2011

### Cropping Pattern in 1991: (Fig.1 and table .1)

In 1991, several crops were grown in the study region, but description is made of significant individual crops. Among these crops, wheat was enjoying first position in the overall cropping pattern with 39.37 per cent of the total cropped area. The share of rice crop was noted 19.14 per cent and was having second rank in the overall cropping pattern of the study region. Third most important crop was fodder with 12.41 per cent of area, next in order was cotton crop with 6.70 per cent which held fourth position in the overall cropping pattern. Fifth ranking crop was oilseeds with 5.65 per cent area under its cultivation and bajra had sixth position with an area of 5.14 per cent of the total cropped area. Pulses cultivation has 4.52 per cent area and seventh position in cropping pattern, while maize's position was eighth in the overall cropping pattern with 2.94 per cent area under its cultivation. Ninth ranking crop in respect of area was sugarcane with 2.77 per cent. Tenth ranking crop was recorded potatoes which were having only 0.44 of the total cropped area. Besides above mentioned crops, there were minor crops also which together hold 0.21 per cent of the total cropped area of the study region and these minor crops were vegetables, fruits, spices, barley, etc. Thus, it is recorded that wheat-rice-fodder

Table .1

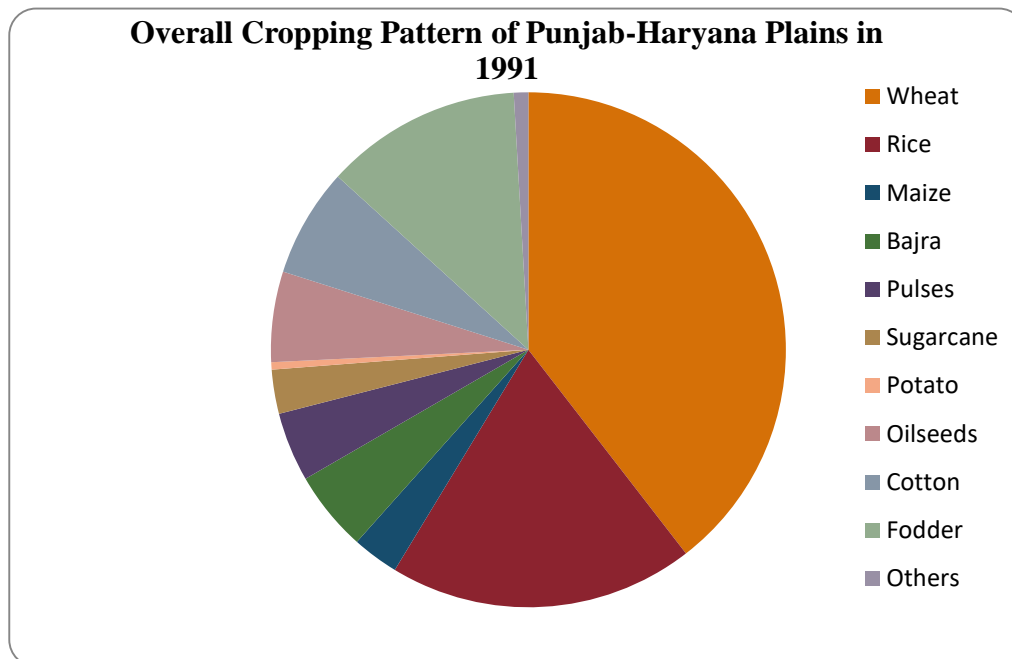
Cropping Pattern of Punjab-Haryana Plains, 1991

S. No.	Crops	Per Cent Area
1	Wheat	39.37
2	Rice	19.14
3	Maize	2.94
4	Bajra	5.14
5	Pulses	4.52
6	Sugarcane	2.77

7	Potato	0.44
8	Oilseeds	5.65
9	Cotton	6.70
10	Fodder	12.41
11	Others	0.92

Source: Economic and Statistical Organization of Punjab & Haryana

Fig. 1



Source: Economic and Statistical Organization of Punjab & Haryana

cotton-bajra-pulses-maize and sugarcane were the leading crops which held over 2 per cent area individually under their cultivation during 1991 in Punjab-Haryana Plains

### Cropping Pattern in 2011: (Fig. 2 and table 2)

The share of wheat in the total cropped area is 42.36 per cent for the study region in 2011 and is having first rank in the overall cropping pattern. Second ranking crop with 29.05 per cent of the total cropped area is rice. But the third ranking crop is noted fodder and area under its cultivation is 9.09 per cent. While bajra, cotton and oilseeds have recorded fourth, fifth and sixth ranking crop in the overall cropping pattern with share of 4.63, 4.35 and 3.97 per cent respectively. Next in order are maize (1.91 per cent), sugarcane (1.55 per cent) and pulses (1.31 per cent) crops. Whereas Potatoes with share of 0.72 per cent is the tenth ranking crop, and rest of the crops like vegetables, fruits, spices, tobacco, barley, etc are grouped under the heading other crops which have combindly 0.94 per cent of the total cropped area.

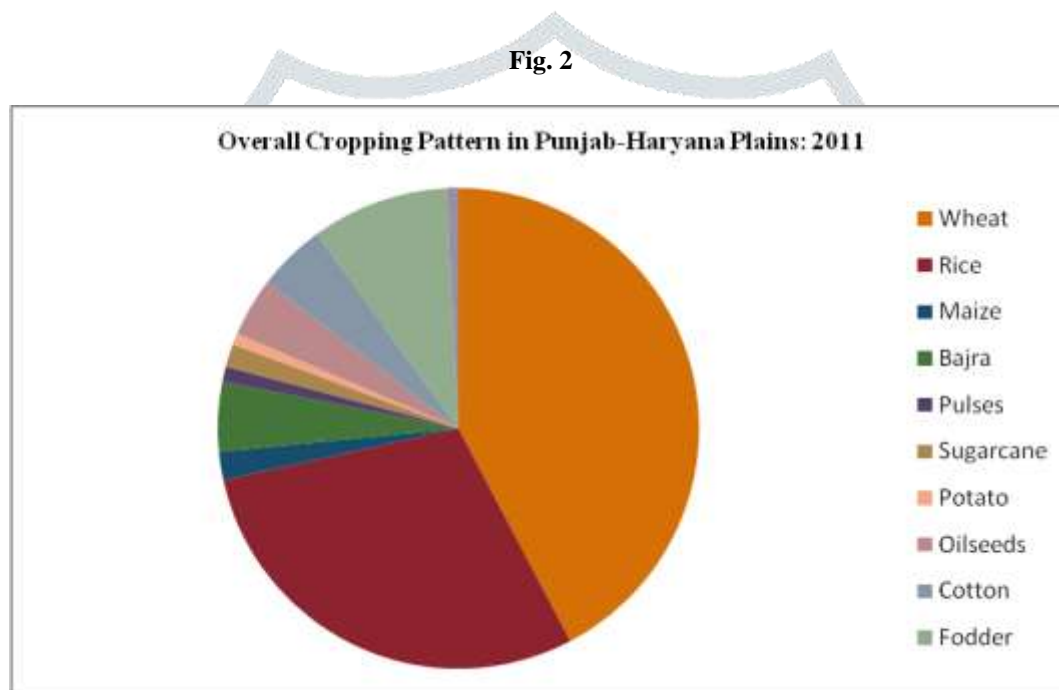
Table No.2

### Cropping Pattern in Punjab-Haryana Plains, 2011

S. No.	Crops	Per Cent Area
1	Wheat	42.36
2	Rice	29.05

3	Maize	1.91
4	Bajra	4.35
5	Pulses	1.31
6	Sugarcane	1.55
7	Potato	0.84
8	Oilseeds	3.97
9	Cotton	4.63
10	Fodder	9.09
11	Others	0.94
	Total	100

Source: Economic and Statistical Organization of Punjab & Haryana



Source: Economic and Statistical Organization of Punjab & Haryana

Thus above discussion reveals that important crops in the overall cropping pattern are wheat and rice which have combinedly 71.53 per cent of the total cropped area. The rest of the crops have less than 5 per cent area individually except fodder with 9.24 per cent. It shows that maize, bajra, pulses, oilseeds and cotton crops are of regional significance. All this shows that food grains are only predominant crops in the study region with overall per cent age share of 79.12 per cent and area under commercial crops is 10.10 per cent which includes sugarcane, oilseeds and cotton. But fodder crops have 9.24 per cent which highlights the significance of livestock, particularly of milch stock in farmer's economy.

### Changes in Cropping Pattern in Punjab-Haryana Plains, 1991 to 2011:

The study region has experienced significant changes in socio-economic variables during the period under present investigation (Table No. 3).

Table 3

## Changes in Socio-Economic Variables of Punjab-Haryana Plains: 1991 to 2011

Nomenclature	1991	2011	Change
Canal Irrigation (Per Cent)	43.63	33.76	-9.87
Tube-Wells Irrigation (Per Cent)	56.08	66.18	10.10
Other Sources (Per Cent)	0.29	0.06	-0.23
Extent of Irrigation (Per Cent)	83.90	90.63	6.73
Consumption of Chemical Fertilizers (Kg/ hecta)	232 kg	427kg	195kg
Density of Tractors/ 00hecta	5.18	7.56	2.38
Density of Tube-wells/00hecta	12.09	20.67	8.58
Area under HYV Seeds (Per Cent of TCA)	97.13	93.37	-3.76
Density of Roads/00 km <sup>2</sup> area	69.87	133.91	64.04
Area served/ Agricultural Market in km <sup>2</sup>	402	374	-28

Source: Economic and Statistical Organization of Punjab-Haryana

Extent of irrigation was 83.90 per cent in 1991 which increased to 90.63 per cent in 2011, thus recorded 6.73 per cent positive volume of change. Tube-wells irrigation has also registered positive volume of change of 10.10 per cent which has increased from 56.08 per cent to 66.18 per cent, a positive sign for changes in cropping pattern which are considered as best source of irrigation because farmers can use water according to requirement and time for irrigating a crop. A positive volume of change of 195 kg/ hectare is recorded in consumption of chemical fertilizers. Density of tractors has grown from 5.18 per cent to 7.56 per cent/ 100 hectares of net sown area. While density of tube-wells has increased from 12.09 per cent to 20.67 per cent during study period and noted 8.58 per cent positive volume of change. Another important factor which affects the cropping pattern is density of roads which has witnessed an increase of 64.04 km length /100 km<sup>2</sup> of reporting area. The efficiency of agricultural market has increased because area served per market has declined from 451 km to 352 km<sup>2</sup> of reporting area/ per market. Thus all these positive changes in socio-economic indicators have affected the cropping pattern of the study region during 1991 to 2011 and consequently area under some crops have decreased, while in some others have increased as is shown in table No.3.

## Spatial Changes in Cropping Pattern of Punjab-Haryana Plains: 1991 to 2011

Table No. 4

S. No.	Crops	1991	2011	Change (Per Cent)
1	Wheat	39.37	42.36	2.99
2	Rice	19.14	29.05	9.91
3	Maize	2.94	1.91	-1.03
4	Bajra	5.14	4.35	-0.79
5	Pulses	4.52	1.31	-3.21
6	Sugarcane	2.77	1.55	-1.22
7	Potatoes	0.44	0.84	0.40

8	Oilseeds	5.65	3.97	-1.68
9	Cotton	6.70	4.63	-2.07
10	Fodder	12.41	9.09	-3.32
11	Others	0.92	0.94	0.02
	<b>Total</b>	<b>100</b>	<b>100</b>	<b>0</b>

Source: Economic and Statistical Organization of Punjab-Haryana

Hence wheat crop has experienced positive volume of change of 2.99 per cent; area under rice crop has increased from 19.14 per cent to 29.05 per cent during 1991 to 2011 and recorded 9.91 per cent positive volume of change. Another crop has experienced positive change is potatoes, which has increased from 0.44 per cent in 1991 to 0.84 per cent area during 2011 and noted 0.40 per cent positive volume of change. The remaining crops witnessed negative volume of change are maize, bajra, pulses, sugarcane, oilseeds, cotton and fodder. The most important crop which has recorded high negative volume of change of 3.29 per cent is fodder followed by pulses (3.21 per cent), cotton (2.07 per cent), oilseeds (1.68 per cent), sugarcane (1.22 per cent) and maize (1.03 per cent). All these above mentioned crops have lost more than 1.00 per cent area under their cultivation respectively during study period. Besides above mentioned crops, bajra has lost 0.79 per cent area under its cultivation during the study period because it has decreased from 5.14 per cent to 4.35 per cent during 1991 to 2011. While areas under other crops have experienced 0.02 per cent positive volume of change because of increase from 0.92 per cent to 0.94 per cent during study period.

**Conclusion and Suggestion:** Thus, it is observed that significant gainer crops in area are rice and wheat with 9.91 per cent and 2.99 per cent area respectively due to sandy soil, poor irrigation facilities, less developed agricultural infrastructure and low per cent share of wheat in the cropping pattern in 1991 as compared to 2011 have experienced moderate or high positive volume of change in wheat cultivation, while areas of flat land or leveled sand dunes, fertile soil, moderate to high extent of irrigation, well developed agricultural infrastructure and high per cent share under wheat cultivation in 1991 as well as in 2011 have noted low positive volume of change, but districts with increased area under fodder, melon, water melon and vegetables especially potatoes, etc in 2011 as compare to 1991 have recorded negative volume of change in wheat cultivation. While the most top loser crops are fodder, pulses and cotton with 3.29 per cent, 3.21 per cent and 2.07 per cent respectively. These crops have low share due to sandy loam soil, high number of cold storages, positive aptitude of farmers for potato cultivation, marketing facility, etc. but areas have unfavorable physical environment, sandy soil, lack of farmer's attitude for potato cultivation, lack of cold storages, emergence of wheat-rice crop rotation, high extent of irrigation, developed agricultural infrastructure, high density of tractors, high density of tube-wells etc. The per cent share of cotton cultivation is low due emergence of rice as major crop of kharif season.

There is a dire need for agricultural research by the scientists particularly Plant Breeders to increase the yield of bajra, maize and pulses, which are soil building crops, can be encouraged and will increase area under food crops, because farmers will stop to shift area from these crops to wheat-rice owing to higher economic returns from bajra, maize and pulses also. This effort will certainly help to reduce considerable area from wheat-rice vicious circle and help to make study region's agriculture sustainable.

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