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Commercialization to Specialization: A Scenario of Punjab Agriculture

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Abstract

The present study was carried out to examine the changes in cropping pattern and the contribution of food grains to central pool over the years by Punjab. The study revealed that the area under wheat and paddy crops, which was 40.50 and 6.90 per cent of gross cropped area (GCA) during 1970-71, has increased to 44.65 and 35.66 per cent during 2011-12, respectively. However, the area under pulses, maize, bajra, oilseeds and sugarcane has declined by 7.18, 3.47, 9.75, 3.61 and 0.69 per cent, respectively. Thus, paddy-wheat crop rotation became predominant at the cost of maize, other cereals, oilseeds and pulses in the state. Food grain production in the state has grown from 20.00 million tonne in 1992-93 to 23.49 million tonne in 2002-03 and further increased to 27.22 million tonne in 2011-12. The share of Punjab state in food grain production has decreased over the years, and came down to 10.57 per cent in 2011-12 from 11.14 per cent in 1992-93. The study revealed that the production in food grains and cropping pattern in Punjab has almost stagnant, and there is a need for diversification of agriculture at this stage. Emphasis must be given on cultivation of water saving crops as well as the use of chemical fertilizers and pesticides may be minimized to enhance the sustainable agriculture in Punjab.

Keywords: Cropping pattern, food grains production, CAGR, paddy-wheat monoculture

During past decades, Indian agriculture was geared towards the production of commercial crops (tea, coffee, rubber, cotton, etc.), while the food crops suffered from neglect. After independence, India has a heavy dependence on imports of food grains as it inherited a stagnant, low-productivity, food-crop sector. Then under the impact of green revolution, HYV's of wheat and paddy were introduced which then resulted in huge increase in yield of food crops in Punjab. Acclamation for this change due to Norman Ernest Borlaug for new varieties of dwarf wheat and thereby he received the Nobel Peace Prize. Punjab is a small state which only with 1.53 per cent of total geographical area of the country contributes a major share of rice and wheat to the central pool. The cultivation of wheat and paddy have exhausted the vital nutrients of the soils in Punjab. Thus, a higher and higher dose of major nutrients, especially nitrogen, has to be applied for sustaining adequate production levels (Singh *et al.*, 2012). The depleting ground water is a major economic problem of farming in Punjab. However, Punjab agriculture has not witnessed any drastic change and remained highly favourable towards wheat-paddy monoculture which has produced various ecological problems in the state such as loss of soil fertility, water table depletion, etc. (Sharma and Mohan, 2013). A stage has reached where agricultural production and crop yield in Punjab have reached the point of stagnation (Sidhu *et al.*, 2009). Punjab rural economy is completely dependent on two most important resources i.e. land and water that have sharply deteriorated over time. Farmers who are the actual players in the field have a definite mindset and conditioned behaviour. Legal mandatory conditions are another aspect. So, planned diversification is needed to increase both individual and social gains (Haque, 1996).

Under this background, an effort has been made in this study to examine the changes in cropping pattern and the contribution of food grains to central pool over the years by Punjab.

Database and Methodology

The present study was conducted based on

secondary data. The data on area under major crops of Punjab from 1965-66 to 2011-12 were collected from Statistical Abstracts of Punjab (various issues), Chandigarh, Government of India and food grain production in Punjab contributing to central pool from 2001 to 2011 was compiled from RBI, Ministry of Agriculture. The compound annual growth rates were calculated period wise i.e. 1965-66 to 1984-85 (Green revolution period), 1985-86 to 1993-94 (Post-green revolution period) and from 1994-95 to 2011-12 (Stagnation period). The compound growth rates were calculated by fitting the exponential function as $Y= ab^t$, where Y = dependent variable, a = constant term, b = (1+r), regression coefficient, r = (b-1)*100, Compound growth rate in percentage and t = time variable.

Results and Discussion

Punjab agriculture under the impact of green revolution has undergone remarkable changes during the study period (1970-71 to 2011-12). The perusal of Table 1 revealed that during the year 1970-71, the Gross Cropped Area under different crops was 5724 thousand hectares which increased to 7902 thousand hectares during year 2011-12. Due to assured market prices and proper marketing facilities area under paddy and wheat crops showed tremendous change over the years. The area under paddy crops increased from 394.9 to 2818 thousand hectares from the year 1970-71 to 2011-12. Paddy, which occupied around 6.90 per cent of the gross cropped area in 1970-71 increased to 35.66 per cent in 2011-12. Area under wheat crop increased from 2318.2 to 3528 thousand hectares from year 1970-71 to 2011-12. After paddy and wheat crop, cotton covers maximum area in Punjab.

The area under cotton increased from 400.7 to 701 thousand hectares from the year 1970-71 to 1990-91 and then during year 2000-01, decreased to 473.0 thousand hectares. The main reason for decline in area under cotton was inclement weather and pest attack. With the introduction of Bt cotton varieties area under cotton started increasing and in the year 2011-12, it accounted for 6.52 per cent of the GCA in the state. The tremendous decline was also observed for pulses crops.

The area under pulses decreased from 417.9 to 15.3 from the year 1970-71 to 2011-12. The GCA for oilseeds was decreased from 5.20 to 0.63 per cent from year 1970-71 to 2011-12. It can be inferred that imbalance in favour of bowl of cereal i.e. paddy and wheat in the cropping pattern has further sharpened despite all efforts on diversification of state agriculture. The cropped area under other crops including fodder, aromatic and medicinal crops, spices, etc. had also shown a sharp decline in its share to GCA from 14.9 per cent in 1970-71 to 7.44 per cent in 2011-12. The cropping intensity of Punjab state increased from 140.09 to 191.00 from the year 1970-71 to 2011-12.

The cropping pattern changes, however, are the outcome of the interactive effect of many factors which can be broadly categorized into five groups (a) Resource

Table 1: Shift in cropping pattern in Punjab

(000' ha)

Year	1970-71		1980-81		1990-91		2000-01		2010-11		2011-12	
	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age	Area	%age
Paddy	394.9	6.90	1183	17.07	2015	26.80	2612	32.89	2826	35.85	2818	35.66
Cotton	400.7	7.00	649	9.36	701	9.32	473	5.95	483	6.12	515	6.52
Maize	560.9	9.80	382	5.51	188	2.50	164	2.06	133	1.68	126	1.59
Sugar cane	131.6	2.30	71	1.02	101	1.34	121	1.52	70	0.84	80	1.01
Bajra	211.8	3.70	69	0.99	12	0.16	6	0.07	3	0.04	3	0.04
Wheat	2318.2	40.50	2812	40.58	3273	43.53	3408	42.91	3510	44.53	3528	44.65
Barley	57.2	1.00	65	0.93	37	0.50	32	0.40	12	0.15	12	0.15
Total pulses	417.9	7.30	334.7	4.84	142.9	1.90	54.8	0.69	19.7	0.24	15.3	0.29
Total oilseeds	297.7	5.20	237.7	3.43	104	1.38	85.8	1.08	55.4	0.70	49.9	0.63
Total vegetable	51.6	0.90	76.2	1.10	54.6	0.73	110.3	1.38	102.9	1.30	101.5	1.20
Total Fruits	34.3	0.50	26.8	0.40	68.8	0.90	34.21	0.43	69.8	0.88	64.7	0.82
Other crops*	847.2	14.90	1022.6	14.77	820.7	10.94	839.8	10.62	597.1	7.57	588.6	7.44
Gross cropped area	5724	100.00	6929	100.00	7518	100.00	7941	100.00	7882	100.00	7902	100.00
Cropping intensity	140.09		161.37		177.86		186.07		190.00		191.00	

Source: Statistical Abstracts of Punjab (various issues).

*other crops include fodder, medicinal and aromatic, spices etc.

related factors covering irrigation, rainfall and soil fertility, (b) Technology related factors covering not only seed, fertilizer, and water technologies but also those related to marketing, storage and processing, (c) Household related factors covering food and fodder self-sufficiency requirement as well as investment capacity, (d) Price-related factors covering output and input prices as well as trade policies and other economic policies that affect these prices either directly or indirectly, (e) Institutional and infrastructure related factors covering farm size and tenancy arrangements, research, extension and marketing systems and government regulatory policies (Hazra, 2001).

The state of Punjab has achieved significant strides in the development of agriculture. The present level of prosperity in the state is one of the highest with highest per capita income and consumption in the country. It is all due to the spectacular progress made in agriculture by the farmers of Punjab. Punjab stands at second position at all India level in terms of food grain production. Table 2 revealed that the food grain production of Punjab was increasing over the years. The food grain production in India was 179.48 MT and in Punjab was 20.00 MT during the year 1992-93. Later on, during 1998-99 it increased to 204.01 MT for India and 22.91 MT for Punjab. During the year 2002-03, the food grain production in Punjab was 23.49 MT which increased to 27.22 MT during year 2011-12. For the year 2004-05 the food grain production of India was 541.55 MT and then during 2011-12 the food grain production of India reached at 257.44 MT. Table 2 revealed that the share of Punjab in the India's total rice production has remained more or less same during the last decade. During the year 1992-93, the food grain contribution of Punjab to the central pool was 11.14 per cent which increased to 12.84 per cent during the year 2001-02. During the year 2002-03, the food grain share of Punjab in central pool has decreased to 4.33%.

Punjab agriculture has shown sign of stagnation in the nineties. The growth in area of major crops in the Punjab state over the period of 1965-66 to 2011-12 has been presented in Table 3. The growth in area under paddy crop in period I was 10.46 per cent per annum which has declined to 3.14 per cent in period II and further 1.41 per cent in period III. Overall area under paddy crop has increased by 5.25 per cent per annum during the period 1965-66 to 2011-12. This tremendous increase in area under paddy crop was witnessed in spite of the fact that Punjab was not a traditional rice growing state.

Wheat also showed the same trend but the increase was at lesser pace than that of paddy crop as this increase in area during the period 1965-66 to 2011-12 was 1.35 per cent. Period-wise area increase under wheat crop was largest (3.20%) during the green revolution period, whereas increase was at lesser pace i.e. 0.52 per cent per annum during stagnation period. Area under cotton crop also increased in overall scenario but this increase

Table 2: Food grain production in Punjab vis-à-vis India

Year	Punjab (MT)	India (MT)	Contribution of Punjab to India (%)
1992-93	20.00	179.48	11.14
1993-94	21.58	184.26	11.71
1994-95	21.82	191.49	11.39
1995-96	19.81	180.41	10.98
1996-97	21.56	199.83	10.79
1997-98	21.14	192.64	10.97
1998-99	22.91	204.01	11.23
1999-00	25.20	210.22	11.99
2000-01	25.32	197.20	12.84
2001-02	24.89	213.27	11.67
2002-03	23.49	541.45	4.33
2003-04	24.73	213.61	11.58
2004-05	24.72	198.36	12.46
2005-06	25.67	208.60	11.78
2006-07	25.18	217.82	11.56
2007-08	25.31	230.77	10.97
2008-09	26.81	234.47	11.43
2009-10	27.33	218.10	12.53
2010-11	27.32	244.77	11.16
2011-12	27.22	257.44	10.57

Source: RBI, Government of India.

Table 3: Trends in growth in area under various crops in Punjab

(Per cent/annum)

Crops	Period I (1965-66 to 1984-85)	Period II (1985-86 to 1993-94)	Period III (1994- 95 to 2011-12)	Overall (1965-66 to 2011-12)
Paddy	10.46**	3.14**	1.41**	5.25**
Cotton	2.35**	2.86 ns	3.48*	0.28 ns
Maize	-2.16**	-4.63**	1.39**	-3.47**
Sugarcane	-4.27**	0.66ns	-3.20**	-0.69**
Bajra	-7.64**	-10.57**	-4.71**	-9.75**
Wheat	3.20**	0.77**	0.52**	1.35**
Total Pulses	-4.06**	-10.03**	-9.88**	-7.18**
Total Oilseeds	-2.32**	-1.72 ns	-7.81**	-3.61**

* Indicates statistical significance at 1 per cent level

** indicates statistical significance at 5 per cent level; and ns indicates non- significant values

was not significant while during the period I, growth in area was 2.35 per cent and was 3.48 per cent during period III. Due to increase in area under paddy and wheat crops, the area under pulses, maize, bajra, oilseeds and sugarcane went down by 7.18, 3.47, 9.75, 3.61and 0.69 per cent, respectively over the period 1965-66 to 2011-12. It clearly reveals that the paddy- wheat crop rotation became predominant at the cost of maize, other cereals, oilseed and pulses in the state.

Conclusion

Punjab agriculture witnessed spectacular transformation as a result of Green Revolution during the period 1965-66 to 2011-12. Total cropped area saw a sharp increase from 5724 thousand hectare in 1970-71 to 7882 thousand hectare in 2010-11. In 1970-71, about 40.5 per cent of the gross cropped area (GCA) was under wheat which increased to 44.50 per cent in 2010-11. Rice, which occupied around 6.90 per cent of the gross cropped area in 1970-71 increased to 35.85 per cent in 2010-11. The increase in wheat cultivation has been at the cost of gram, rapeseed and mustard, while that of rice has been obtained by shifting the area from maize, groundnut, millets and cotton. This happened because of better relative profitability of these crops with minimum production and marketing risk as compared to other crops. The CAGR of area under paddy over the study period (1965-66 to 2011-12) went up tremendously by 5.25 per cent. Wheat also showed the same trend but the increase was at lesser pace than for the paddy as its increase in area during the study period (1965-66 to 2011-12) was 1.35 per cent. Despite these increases, the area under pulses, maize, bajra, oilseeds and sugarcane went down by 7.18, 3.47, 9.75, 3.61and 0.69 per cent, respectively over the study period. In view these, following suggestions can be made for the overall improvement of Punjab agriculture.

- Punjab agriculture has reached at a point of stagnation. So, in order to make region's agriculture sustainable, stress should be given on those crops which require less water. Paddy-wheat crop rotation should be diverted to other crops like maize, fodder, vegetables, pulses and oilseeds so that the water resources and soil health can be saved.
- Extension efforts should be further strengthened for adoption of tensiometers, laser levelling of fields, bed planting and emphasis on growing water saving crops are some of the steps which should be taken on priority basis (Dhawan and Singh, 2015).
- The blue print outline made by state government conclude that the area under paddy will be brought down from 28 to 16 lakh hectares in a phased manner over a period of six years. The biggest shift would be towards maize, from 1.5 to 5.5 lakh hectares, while two lakh hectares would be diverted to cotton which is currently grown at 5.5 lakh hectares. Of the remaining, 1.5 lakh hectares each can go to sugarcane and fodder, two lakh hectares to agro forestry and one lakh hectare towards pulses, fruits and vegetables (Kaur, 2012).
- Johl in his report Diversification and Reorientation of Agriculture in Punjab has suggested that one million hectares each of kharif cultivation of rice and rabi sowing for wheat be replaced with high value crops such as oilseeds and pulses (Johl, 2002).
- Contract farming should be encouraged.
- In Punjab, only less than two per cent of the fruits and vegetables produced are

processed, compared with 80% in Malaysia. Therefore, there is need for setting up a processing industry in the state, on a priority basis, using indigenous technologies as well as the latest technologies from abroad (Dhawan and Kashish, 2015).

- Before setting up a medium to large sized food processing units, the entrepreneurs must expose themselves to the international and national market. They must focus on the market share rather than on strategies to pay less to the farmers; only then the farmers at the grassroots level may be ready to diversify (www.ggssc.net).
- Government initiatives should be there to ensure farmers by giving assured prices and marketing of competing crops of paddy and wheat, besides, farmer awareness camps, demonstration and subsidies etc for other crops can make a way out for the farmers from paddy-wheat monoculture and this can be helpful in diversification of Punjab agriculture.

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