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Spatial and temporal changes in area, production and productivity of rice in Punjab

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Rice as staple food crop plays an important role in the Indian economy. In Punjab, it ranks second after wheat in terms of area, production and productivity. An inter-state comparison of productivity of rice over time reveals that Punjab has consistently improved its respective position. In Punjab, rice currently occupies an area of 2.489 million hectare with production of 8.824 million tons with an average yield of 3545 kg ha^{-1} (Anonymous, 2002).

With increasing crop area coming under irrigation in the past few decades, the state has also seen changes in the cropping pattern. In the 20th century during the sixties, only small area was under rice in the state but over a period of time during the advent of green revolution in the state as well as in the post-green revolution period, rice crop has replaced several *kharif* crops in the state. Now rice-wheat is the predominant crop rotation.

The present investigation was carried out to assess the changes in spread, production and productivity of rice in Punjab during the 30 years comprising recent three past decades (1970-71 to 1999-2000). Similar analysis of historical data to assess changes in spread, production and productivity of wheat in Punjab during the past three decades was also carried out at Ludhiana.

The data on area, production and productivity of rice in different districts in Punjab were collected for 30 crop seasons (1970-71 to 1999-2000) from the Statistical Abstract of Punjab. Based on this information, the spatio-temporal changes in area, production and productivity were worked out. Subsequently, the period of 30 years was split in 3 blocks of 10 years each which comprised the period between 1970-71 to 1979-80, 1980-81 to 1989-90 and 1990-91 to1999-2000. The spatio–temporal changes were also quantified over these three decades.

District-wise area, production and productivity (average for 30 crop seasons) of rice (Fig.1) reveals that Amritsar district occupied 1st position in terms of area (215.1 thousand ha), 3rd in terms of production (567.17 thousand tons) with an average productivity of 2525 kg ha^{-1}. Sangrur district revealed the highest production (653.90 thousand tons) but was 2nd in terms of productivity (3296 kg ha^{-1}) and 3rd in terms of area. Ludhiana district occupied first

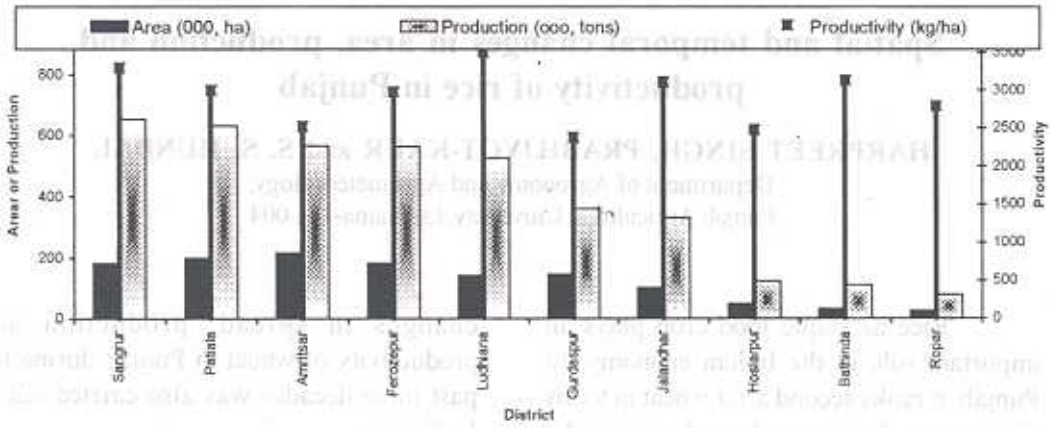

Fig. 1: District- wise area production and productivity of rice in Punjab (average over the period 1970-71 to 1999-2000)

position in terms of productivity (3498 ka ha^{-1}) with an average area of 141.83 thousand hectare and production of 523.03 thousand tons. Patiala district was 2nd highest in terms of area (200.1 thousand ha) and production (631.57, thousand tons) of rice in the state with an average productivity of 2999 kg ha^{-1}.

Ferozepur, Jalandhar and Gurdaspur were other important districts in the state where the crop has shown significant spread and production. The remaining districts of the state (Bathinda, Hoshiarpur and Ropar) were not so important as the area and production was small and productivity was also low.

Decadal shift in area, production and productivity

A significant increase in area, production and productivity (Table 1) was noticed in districts of Sangrur, Ludhiana, Patiala, Ferozepur, Jalandhar, Amritsar and Gurdaspur.

During the first decade since 1970-71 to 1979-80 the Amritsar district had the maximum area (126.30 thousand ha) and Patiala the maximum production (295.10 thousand tons) while Ludhiana had highest productivity (3031 kg ha^{-1}) of rice among the districts.

During the 2nd decade since 1980-81 to 1989-90 the position changed tremendously and the district of Patiala gained lead both in area (234.2 thousand ha) and production (772.60 thousand tons) while Ludhiana maintained lead in productivity (3851 kg ha^{-1}).

During the 3rd decade since 1990-91 to 1999-2000 the position changed again and the district of Sangrur became the leader in area (323.90 thousand ha), production (1183.20 thousand tons) as well

Table 1: Decade-wise area, production and productivity of rice in Punjab

Districts	Area, (000, ha)			Production, (000, tons)			Productivity, (kg/ha)		
	A	B	C	A	B	C	A	B	C
Gurdaspur	103.0	150.3	184.7	208.1	373.7	496.7	1966.0	2483.3	2694.0
Amritsar	126.3	224.5	294.5	289.8	547.3	864.4	2236.1	2409.3	2929.6
Jalandhar	40.5	119.3	142.2	113.1	393.8	483.3	2614.9	3287.9	3425.4
Hoshiarpur	38.1	48.5	57.3	74.7	122.8	170.2	1951.5	2524.6	2966.5
Ropar	9.4	25.8	40.4	19.0	85.3	128.9	1902.4	3291.4	3197.6
Ludhiana	29.8	162.3	233.4	102.0	624.4	842.7	3030.5	3850.7	3611.8
Ferozepur	100.4	200.4	242.8	259.4	593.0	840.3	2521.6	2952.0	3462.5
Bathinda	3.4	31.3	59.9	8.6	107.1	211.5	2313.7	3445.9	3647.5
Sangrur	37.3	185.9	323.9	110.7	667.8	1183.2	2616.1	3583.8	3689.2
Patiala	115.9	234.2	250.2	295.1	772.6	827.0	2416.6	3290.1	3290.4
Total	604.1	1382.5	1829.3	1480.5	4287.8	6048.2	2450.7	3101.5	3306.3

A- represents 1st decade ((1970-71 to 1979-80); B- represents 2nd decade (1980-81 to 89-90);
B- C-represents 3rd decade (1990-91-1999-2000) * Total productivity (kg/ha)

Table 2: Decadal-wise shift (%) in area, production and productivity of rice in Punjab

Districts	Area			Production			Productivity		
	A	B	C	A	B	C	A	B	C
Gurdaspur	45.9	79.3	22.9	79.6	138.7	32.9	26.3	37.0	8.6
Amritsar	77.8	133.2	31.2	88.9	198.3	57.9	7.7	31.0	21.6
Jalandhar	194.6	251.1	19.2	248.2	327.3	22.7	25.7	31.0	4.2
Hoshiarpur	27.3	50.4	18.1	64.4	127.8	38.6	29.4	52.0	17.5
Ropar	174.5	329.8	56.6	349.0	578.4	51.1	73.0	68.1	-2.9
Ludhiana	444.6	683.2	43.8	512.2	726.2	35.0	27.1	19.2	-6.2
Ferozepur	99.6	141.8	21.2	128.6	223.9	41.7	17.1	37.3	17.3
Bathinda	820.6	1661.8	91.4	1145.4	2359.3	97.5	48.9	57.7	5.8
Sangrur	398.4	768.4	74.2	503.3	968.8	77.2	37.0	41.0	2.9
Patiala	102.1	115.9	6.8	161.8	180.2	7.0	36.2	36.2	0.0

A- represents Shift during 2nd decade over 1st decade, B represents shift during 3rd decade over 1st decade, C-represents shift during 3rd decade over 2nd decade

as in productivity (3689 kg ha^{-1}).

The percent increase / decrease in area, production and productivity of rice for three decades are presented in Table 2. The area under rice crop in 2nd decade (1980-81 to 1989-90) increased by 400 % or more over 1st decade (1970-71 to 1979-80) in districts of Sangrur and Ludhiana. Likewise, the production also showed a spectacular increase of more than 500 % in district of Sangrur and Ludhiana. In other districts where rice crop occupied significant area, the increase was around 80% or more in Patiala, Ferozepur and Jalandhar. The improvement in productivity was significant in districts of Sangrur and Patiala (37 and

36 percent, respectively), whereas, a uniform improvement of around 25 to 29 % in productivity was noticed in the districts of Gurdaspur, Jalandhar and Ludhiana.

Accompanying the gain in area and production was a significant improvement in the average productivity in all important districts. Subsequently in 3rd decade compared to 1st decade, the quantum of increase in area ranged between 683 to 768 percent in Ludhiana and Sangrur districts (Table 2). Nearly uniform improvement of around 30 to 40 percent in productivity was noticed in the districts of Gurdaspur, Amritsar, Jalandhar, Ferozepur, Sangrur and Patiala.

A comparison of 3rd decade with the 2nd decade revealed that the quantum of increase in area ranged between 56 to 74 percent in Ropar and Sangrur district (Table 2). The improvement in productivity was of significant magnitude in districts of Amritsar and Ferozepur (21.6 and 17.3 percent, respectively), whereas, nearly uniform improvement of around 4 to 8 % in productivity was noticed in the districts of Gurdaspur, Jalandhar and Bathinda. On the contrary, productivity declined in Ropar and Ludhiana by 2.85 and 6.20 percent, respectively.

For the three decades on an average, district of Amritsar revealed highest area (215.10 thousand ha) while it was 3rd in production (567.17 thousand tons) of rice. The district of Sangrur revealed highest production (653.90 thousand tons) but was 3rd in area of rice (182.37 thousand ha). The average productivity of the crop during the 30-year period was highest in the district of Ludhiana (3498 kg ha^{-1}) followed by Sangrur (3296 kg ha^{-1}). The districts of Amritsar, Jalandhar, Ludhiana, Ferozepur, Sangrur, Patiala and Gurdaspur had significant share in area and production of rice crop in the state. The increase in both area and production was more conspicuous in the middle decade of 1980-81 to 1989-90 as compared to the other two decades. Further, the study revealed that the increase in production was not solely due to increase in area, but also due to enhanced productivity.

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