

Variation in Value of Agricultural Output in Punjab: District Wise Analysis

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Abstract

There are wide variations in the productivity levels of farmers on a per hectare basis across the state of Punjab. Value of output per hectare was taken as a proxy for farm income. The study highlights the per cent area covered by different crops along with the productivity and the value of agricultural output in all the districts so as to ascertain the poor performing districts where there is a scope for further improvement in the productivity level and hence the growth of value of output taking the triennium ending data for four decades i.e. TE 1984, TE 1992, TE 2002 and TE 2012. The study concludes that despite the decline in inequality, the degree of inter-district variation in output continues to be high which provide opportunities for raising agricultural production in the state through resource diversification towards back bancher districts.

Key Words: *Variation, Value of output, Productivity*

JEL Classification: *E01, Q13, Q19*

Introduction

Agriculture in Punjab achieved many land marks and is known for its success which is mainly the result of resource endowments, climate, topography, institutional support and socio economic factors. Planned sustainability of socio-economic development of any state primarily rests on the assumption of reduction of inequalities in terms of income, social status and growth potential (Singh *et al*; 2014). However, inequality and regional variations still remain the issues in development process. It was observed at the national level that crop

productivity in some of the most productive districts in India is more than 30 times the productivity in some of the districts with low productivity (Chand & Srivastva, 2016). These variations are the result of the interplay of many factors such as natural resource endowment, agro-ecological conditions, irrigation development, level of policy support, institutional factors, historical factors and demographic features. As a consequence, production performance of agriculture sector has followed an uneven path and large gaps have developed in productivity between different geographic locations across the state. Large variation in productivity leads to regional disparities and is generally

considered as discriminatory. Identification of various levels of productivity helps to analyze the reasons for variation in performance and in developing location specific strategies for future growth and development.

Therefore, it becomes pertinent to delineate the performing areas, analyze underlying reasons and identify effective and specific interventions. A few attempts have been made at national level, based on district wise studies, to examine regional variations in agricultural performance and productivity (Bhalla and Alagh, 1979, Bhalla and Singh, 2001 and Chand, 2011). Thus, regional disparity is a common feature of agricultural growth in many parts of the state. In this backdrop, an attempt has been made to examine the performance of major crops in Punjab, ranking of the districts and growth of value of output in Punjab over the period TE 1984 to TE 2012.

Data Sources and Methodology

The present analysis is based on information of about 21 major crops grown in Punjab. These are maize, cotton (American and Desi), groundnut, rice, jowar, bajra, sugarcane, potato, wheat, gram, barley, rapeseed and mustard, arhar, sesamum, mash, moong, lentil, sunflower and chilies. There is little under estimation in calculating value of output from agriculture because of non-availability of data not only on the production of vegetables and fruits at the district level but also their prices for different specific years. However, the area under crops considered in this study accounts for more than 90 per cent of the total cropped area in the state. The number of district varies during different decades, there were 12 districts in the early 1980s and remained same till TE 1994. However, this number increased to 17 during TE 2001-02 and to 20 during TE 2009-12.

To study the changing pattern at the district level, information on area, yield and production of the selected crops for 1980s, 1990s, 2000s and 2010s, have been compiled from official sources. It was tried to capture the peak impact of green revolution technology (mature green revolution period, 1980s) in wheat and rice, the turning point that showed stagnation in yield of crops, technology fatigue and emergence of the new problem of insects/pests (1990s). The mid triennium 1999-2003 capture the effect of world trade and the last triennium shows the scenario of agrarian crisis in the state economy.

Farm harvest prices for the selected agricultural commodities have been used for calculating the value of output at constant prices (TE 2012). The district-wise value of agricultural output has been estimated for each crop at constant 2009-12 prices. The value of output for all the crops has been obtained by aggregating at the district level. The growth rates were worked out by using the log linear method. The value of output was calculated by multiplying the prices with the production of respective crops.

Results and Discussion

The cropping pattern in India has changed significantly over time. As the cultivated area remains more or less constant, the heightened demand for food due to the increase in population and urbanization has put agricultural land under stress. This has led to crop intensification and substitution of commercial crops with food crops (Kannan, 2011). It is striking to observe that the share of area planted to all crops except for rice, wheat and potato in gross cropped area (GCA) has declined over the study period. In fact, the growth performance of agriculture at the state level was remarkable during the 1980s. Its

deceleration during the 1990s was attributed to the reduction in and/or stagnation of public expenditure on agricultural infrastructure, extension services, and biased economic reforms (Thamarajakshi 1999; Balakrishnan 2000; Hirashima 2000; Mahendradev 2000; Vyas 2001; Rao 2003). There has been a renewed policy thrust from the government since the mid-2000s to revive agricultural growth through various development programs.

Cropping pattern

The cropping pattern in Punjab state has shown a changing trend in favour of food crops (Table 1). During the period 1980 to 2012, the area under pulses, oil seeds, sugarcane and maize declined by varying degrees and has increased under selected crops. During TE 1984, around four per cent of the gross cropped area (GCA) was under maize, about six per cent under pulses and oilseeds which has

Table 1. Relative share of major crops in gross cropped area in Punjab, TE 1984- TE 2012 (Per cent)

Crops Years	TE 1984	TE 1992	TE 2002	TE 2012	Per cent change	
					TE 1992 to TE 2002	TE 2002 to TE 2012
Rice	26.69	26.28	34.52	35.63	2.76	0.32
Jowar	0.02	0.03	-	-	-	-100.000
Bajra	0.70	0.13	0.08	-	-5.11	-100.00
Maize	4.37	2.57	2.20	1.68	-1.51	-2.68
Wheat	46.04	43.38	45.77	44.55	0.54	-0.27
Barley	1.10	0.56	0.39	-	-3.59	-100.00
Gram	2.22	0.68	0.09	0.03	-17.96	-10.32
Mash	0.09	0.11	0.06	0.04	-6.12	-4.73
Arhar	-	0.19	0.12	0.05	-4.63	-8.19
Moong	0.42	0.61	0.41	0.09	-25.29	-13.78
Massar	0.19	0.12	0.06	0.01	-6.86	-13.33
Ground Nut	1.05	0.17	0.06	0.03	-9.88	-7.95
R+M	1.38	1.22	0.72	0.38	-5.14	-6.13
Sun Flower	-	-	0.16	0.21	-	2.68
Sesamum	0.23	0.22	0.24	0.08	1.03	-10.65
S. Cane	1.38	1.39	1.66	0.89	1.78	-6.11
Dry Chilly	0.13	0.05	0.04	0.01	-1.37	-10.84
Potato	0.46	0.35	0.85	0.98	9.32	1.43
Cotton (A)	8.10	8.72	8.71	6.21	-0.01	-3.32
Cotton (D)	1.35	1.01	1.39	0.15	3.27	-19.88

Source: Statistical Abstract of Punjab, various issues

drastically dropped to less than two per cent under maize and less than one per cent under pulses and oilseeds respectively during TE 2012.

During the study period the major gainer was rice as its share increased to about 35 per cent of GCA. During TE 2012 area under wheat remained almost constant with little fluctuations, area under american cotton declined during the last decade and constituted only about 6 per cent of the GCA. The percentage area under jowar, bajra, barley, sugarcane, and dry chillies witnessed a decline during this period. The major decline was observed in the area under pulses and oilseeds which was more than three per cent during nineties but reduced to less than one per cent during the period of 2012s. The above table vividly explains that diversification of crops is vanished and it is out weighted by specialized and concentrated crops. Although the number of specialized crops is small (rice, wheat) but the total share of their area is high. Among these crops, rice has the highest share in area and this has increased over time (study period). An important implication of this observation is that contrary to the association of crop diversification with agricultural development, specialization is associated with higher commercialization and agricultural production.

It is well documented in the literature that growth in area was the major source of production growth until early 1960s. The high yielding varieties introduced in wheat and rice crops during the late sixties heralded Punjab's green revolution. Along with technology, new institutional structures enabled the farmers to adopt improved methods of cultivation. The major changes included provision of better irrigation facilities, government procurement

system, guaranteed support price and input subsidies. Therefore, it is interesting to observe a relatively higher growth in the value of output of all major crops during 1980s to 1990s, i.e., the mature green revolution period.

Yield performance of major crops

Compared to other crops maize stands out as the best performing crop in terms of increase in yield; the average yield increased from 1844 kg per hectare during TE 1984 to 3688 kg during TE 2012. The worst sufferer was the cotton crop among all crops, yield of cotton (A) did not show a definite trend (Table 2).

Prior to TE 2012, yield of the major crops, grown in the state has registered substantial increase. Among cereal crops rice and wheat are relatively major gainer in terms of yield during the study period as compared to rapeseed and mustard and sugarcane.

The crop wise value of output (Table 3) has shown that the maximum value of output had been obtained from wheat crop which was Rs 31963.40 per hectare during TE 1984 and it rose up to Rs 53100.37 per hectare during TE 2012. The maize crop stood second in terms of value of output which was Rs 21910.24 per hectare during TE 1984 and increased to Rs 43829.76 per hectare of GCA during TE 2012 followed by paddy with Rs 32294.12 per hectare of and Rs 40786.59 per hectare respectively during the above said period and cotton crop contributed to Rs 21512.34 per hectare of gross cropped area during TE 2012 which was Rs 9755.51 per hectare during TE 1984. Although maize crop has been competing with the paddy crop in TE 2012 in terms of value of output but still the preference of farmers for paddy can be attributed to the low production and marketing risks and higher level of yield. With decline in area, impressive

Table 2. Average yield of major crops in Punjab**(Kg/ha)**

Crops	Triennium Ending			
	1984	1992	2002	2012
Rice	2240	3384	3465	3860
Maize	1844	1878	2709	3688
Wheat	2984	3703	4597	4699
Rapeseed & mustard	749	970	1159	1297
Sugarcane	612	620	640	694
Poato	18973	19600	24704	28332
Cotton (A)	280	566	384	617

Table 3. Crop wise value of output in Punjab over time (At constant prices)**(Rs/ha)**

Crops	Period I (Mature Green Revolution period)	Period II (Stagnation period)	Period III (Impact of WTO)	Period IV (Agrarian crisis)
Paddy	32294.12	35758.56 (10.72)	36612.53 (2.38)	40786.59 (11.40)
Wheat	31963.40	41845.14 (30.91)	51943.73 (24.13)	53100.37 (2.22)
Maize	21910.24	22321.58 (1.87)	32196.01 (44.23)	43829.76 (36.13)
Cotton	9755.51	19747.32 (102.42)	13384.72 (-32.22)	21512.34 (60.72)

Figures in parentheses indicate per cent change over the previous period.

growth in production of most crops was mainly contributed by growth in yield. The value of output of paddy registered a percentage increase of 11.4 in the last period over 2.38 in the previous period III. The value of maize output also showed splendid increase of 36.13 over 1.87 in period II. However, a negative growth was reflected in case of cotton crop during the period III. This was, in fact, a disturbing scenario, which resulted in low

growth in crop output because of the crop being prone to insects and pests. However, there was increase in area for rice and wheat during this period. This occurred particularly because of market incentives which were in force in terms of price support, assured government procurement for wheat and rice and favourable policy environment for providing inputs to farmers at subsidised rates.

It is observed that rice and wheat have

witnessed the highest increase in value of production. The value of cotton is found to be the most volatile among all the crops. Interesting bit of these crops (rice and wheat) is that they have witnessed simultaneous increase in area and yield. A similar pattern is also found in case of maize that accounts for substantial increase in value of production but did not get a fair share in area under cultivation. This may imply that the significant growth achieved in agriculture GSDP during past decades is contributed by only a few crops especially rice, wheat etc. It is quite clear from the analysis that the value of output had been rising since TE 1984 with wheat crop being at the top followed by paddy, maize and cotton. In case of maize crop, the value of output almost remained stagnant during TE 1984 to TE 1992 and after that it started increasing. Further, in case of cotton crop somewhat dwindling trend could be seen which might be due to the crop being prone to various pests and diseases and the problem of water logging in cotton belt which led to the fall in the production and hence the value of output.

Growth of value of output along with ranking of the districts

It is also important to recognize inter-district differences at different time periods. The perusal of Table 4 indicated that the average value of output of Punjab during TE 1984 was Rs 26093.80 per hectare of gross cropped area with the maximum value of Rs 32346.96 and minimum of Rs 18943.48 per hectare. Out of 12 districts, six districts maintained the value of output above the average value of the state whereas the remaining districts had the value of output below the average value of the state with 15.33 per cent coefficient of variation. The analysis also reveals that during TE 1992, there were 12 districts, out of which 6 districts

were having value of output above the average value of output of Punjab which was Rs 31945.99 per hectare of gross cropped area and 6 districts were having value of output below the average value of Punjab with the maximum of Rs 38528.83 per hectare of gross cropped area and minimum of Rs 26773.31 per hectare of gross cropped area.

The analysis further reveals that during TE 2002 the average value of output of Punjab was Rs 42169.34 per hectare of gross cropped area with the maximum of Rs 50229.40 and minimum of Rs 33060.00 per hectare of gross cropped area. Out of the total (17) districts during the above said period, 9 districts were having value of output above the average of Punjab and 8 districts were having value of output below the average value of Punjab.

The average value of output during TE 2012 was Rs 43762.95 with the maximum of Rs 52542.61 per hectare and the minimum of Rs 37137.31 per hectare in the state. The districts with the value more than the average were Kapurthala, Jalandhar, Hoshiarpur, Ludhiana, Moga, Sangrur, Barnala, Patiala and Fatehgarh Sahib. Out of the total 20 districts, the remaining 11 districts were having value of output less than the average value of Punjab. There are significant growth changes in the cropping pattern with a visible shift in crop specialization away from coarse cereals towards rice and wheat in central and sub mountainous regions. So, the perusal of Table 4 clearly indicates that the value of output was increasing with 2.27 per cent per annum during the period 1984 to 1992. The rate of increase was maximum i.e. 2.82 per cent during 1992 to 2002. Further, it slowed down and was (0.37 per cent) during TE 2002 to TE 2012. The overall growth rate remained 0.86 per cent during TE 1984 to TE 2012. There are many

Table 4. Distribution of districts across productivity classes during different triennium
(At constant prices)

Period	Value of output (Rs/ha of GCA)	Maximum value of output (Rs/ha of GCA)	Minimum value of output (Rs/ha of GCA)	Districts having productivity above average	Districts having productivity below average	Coefficient of variation (Per cent)
Mature Green Revolution period (TE 1984)	26093.80	32346.96	18943.48	Kapurthala, Jalandhar, Ludhiana, Firozpur Sangrur and Patiala	Gurdaspur, Amritsar, Hoshiarpur, Roop Nagar, Faridkot and Bathinda	15.33
Stagnation period (TE 1992)	31945.99 (2.27)	38528.83	26773.31	Kapurthala, Jalandhar, Ludhiana, Firozpur Sangrur and Patiala	Gurdaspur, Amritsar, Hoshiarpur, Roop Nagar, Faridkot and Bathinda	13.13
Impact of WTO (TE 2002)	42169.34 (2.82)	50229.40	33060.00	Gurdaspur, Kapurthala, Jalandhar, Nawan Shehar, Ludhiana, Moga, Sangrur, Patiala and Fatehgarh Sahib	Amritsar, Hoshiarpur, Roop Nagar, Firozpur, Faridkot, Muktsar, Bathinda and Mansa	12.66
Period of agrarian crisis (TE 2012)	43762.95 (0.37)	52542.61	37137.31	Kapurthala, Jalandhar, Hoshiarpur, Ludhiana, Moga, Sangrur, Barnala Patiala and Fatehgarh Sahib	Gurdaspur, Amritsar, Tam Taran, Nawan Shehar, Roop Nagar, SAS Nagar, Firozpur, Faridkot, Muktsar, Bathinda and Mansa	11.70

Figures in parentheses indicate percentage rate of change in value of output

reasons for slower growth which needs detailed investigation.

One important factor to be kept in mind while examining the results at the district level is that the profiles of the economic status of different social groups could differ from the one obtained at the national level. This is because of heterogeneity in size and economic environment. From the above discussion, it is highlighted that during the trienniums of 1984 and 1992 fifty per cent of the districts were below and fifty per cent were above the average of the state in terms of value of output. During TE 2002 only 9 districts out of 17 were above the state average and during TE 2012, it can be seen that 9 districts out of 17 having value of output above that of the state. It can be concluded that though the value of output is increasing but the rate of growth was falling during the study period. There is a need to diversify the agrarian economy as both the horizontal and vertical expansion have reached the saturation point i.e. the agricultural production in the state has reached a plateau which is clear from the cropping intensity of nearly 190 per cent in the state. The deteriorating soil health and the depletion of water table due to wheat-rice rotation have further worsened the situation.

Conclusion and Policy Implications

The production of wheat and rice had increased manifold in Punjab over the years. There is an ample scope of raising the production in the areas giving a below average productivity level and should be made the target area in order to bring their productivity level to that of the average productivity level of other high productivity districts. The Twelfth Plan document bemoans that the recent growth revival has been weak in areas with high land productivity. Clearly, the important lesson is

that growth is more difficult to accelerate in areas with higher productivity levels without new technology “particularly if past patterns of growth have taken a toll on natural resources” (Planning Commission 2013). So the paths to be followed should be directed towards specification especially in the districts with low and medium level of productivity and towards having second green revolution. Districts having low production also offer opportunities for raising agricultural productivity in the state through resource diversification.

To sum up, the indicators of variation bring out that the introduction of new technology led to an increase in inter district variation during 1980-84 to 2009-12, presumably because of the concentration of high yield in few districts (areas). This inequality came down in successive periods because of both deepening of the technology and more importantly, its spreading to many more new areas. But it needs to be underlined that despite a decline in inequality, the degree of inter-district variation in output continues to be high. This is the major issue which should be a matter of major concern for policy makers in Punjab.

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