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AGRICULTURE SECTOR AND SUSTAINABLE DEVELOPMENT APPROACH: A CASE STUDY OF PUNJAB

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ABSTRACT

Punjab is a trendsetter state of the nation in terms of agriculture development and its pioneer of sustainable development in the country. This paper is an attempt in studying and overview of Punjab agriculture sector and the need for a sustainable agriculture development. A detailed review has been done to analyse the status of Punjab agriculture sector. The objectives of the study are to analyse the growth of agriculture sector in Punjab, to explore the need of sustainable approach in Punjab agriculture. It used the data from 1966-67 to 2014-15. Some mathematical and statistical tools like coefficient of variation, trend values, regression are used in the present study. The results show that stability over the years in agriculture production of Punjab has improved. Better agricultural practices will promote conservation of agriculture, organic farming which will lead to sustainable agriculture production.

INTRODUCTION

Punjab is the trendsetter State of the nation in terms of agriculture development and it is pioneer of sustainable development in the country. It has been instrumental in ensuring national food security, consistently contributing significant percentage of wheat and rice to the Central Pool. It has contributed 38.7 per cent of wheat and 22.1 per cent of rice to Central Pool during the year 2012-13. Although contribution of agriculture in the state's income is declining gradually, still it continues to be an important sector of State economy. As per quick estimates, it has contributed 14.59 per cent to Gross State Domestic Product at constant prices (2004-2005) during 2012-13 and around 40 per cent of working population of the state is still engaged in this sector. At present agriculture in Punjab is facing many problems.

There is hardly any scope to increase area under agriculture in the State as it has already reached at saturation level and almost 99 per cent of cultivable land is under plough. Already 97.9 per cent of the cultivated area is under irrigation. There is complete consensus among all policy makers and researchers that diversification in the farm sector is the need of the hour for maintaining sustainability in ecological balance especially soil and water. Government of Punjab is regularly pursuing for central grant from Government of India to give a push to diversification of agriculture. The productivity has stagnated in the absence of scientific breakthroughs in new high yielding varieties. Intensive farming regime has been at a huge cost in terms of depleted water table and degradation of soils in the state. There is an urgent need to revitalize research in agriculture and related activities. There is an urgent need to expand the programmes to cover processing and value addition, integration of biotechnology with crop improvement, mechanization using energy efficient machinery/focus on small farmers, crop production/protection for export, bio energy, and development of climate resilient technologies of which multiple cropping system are going to be a critical component.

OBJECTIVE OF THE STUDY

1. To analyse the growth of agriculture sector in Punjab.
2. To explore the production and yield of principal crops in Punjab.

METHODOLOGY

The present research work is primarily an analytical and critical study of the figures related to the performance of Punjab's agricultural production and foodgrains during the period of 1966-67 to 2014-15. The agriculture production is contributing significantly in the domain of Indian economy and plays a vital role for the overall economic growth and sustainable development of the Indian economy in the 21st century. To achieve the various objectives of the study, some mathematical and statistical tools like, coefficients of variation, trend values, regression, tabulation and bar diagrams are used in the present study.

SIMPLE REGRESSION MODEL

$Y = a + bt$

Y = Foodgrains of Punjab

a = Intercept

t = time

b = Linear trend

The description statistics pertaining to the agriculture production of Punjab to various years have been calculated. In the explanation of year-wise production of agriculture of Punjab, the use of Means and standard Deviation has been made to ascertain the average rise or fall in the foodgrains and their dispersion from average value respectively. Similarly, coefficient of variation, which is considered as a relative measure of inequality in the production of agriculture of Punjab, has also been found. Coefficient of variation is an important relative measure of dispersion. It was developed by Karl Pearson and is widely used in comparing the variability of two or more series. C.V. is denoted by:

$$C.V = \frac{\sigma}{\bar{X}} \times 100$$

σ = S.D. Where

$$\sigma = \sqrt{\frac{\Sigma(X-\bar{X})^2}{N}} \text{ or } \sqrt{\frac{\Sigma X^2}{N}}$$

$$\bar{X} = \frac{\Sigma X}{N}$$

Area under Crops

During the year 1970-71, area under cultivation was 40.53 lakh hectares, which increased to 41.55 lakh hectares in 2012-13, showing an increase of 2.5 per cent. Cropping intensity which reveals percentage of gross area sown to net area sown, enhanced from 140 in 1970-71 to 190 in 2012-13. The present agriculture cropping pattern in the State is dominated by the wheat- paddy rotation causing degradation in soil fertility and fall in the underground water table. Wheat and paddy cover major portion of the gross cropped area as area under these two crops has increased to 81 per cent in 2012-13 from 47 per cent in 1970-71. Area under wheat has increased from 35.10 lakh hectares in 2010-11 to 35.28 lakh hectares in 2012-13 showing a marginal increase of 0.51 per cent which is expected to decrease to 35.00 lakh hectares during 2012-13. However, the area under Paddy has slightly decreased from 28.26 lakh hectares in 2010-11 to 28.18 lakh hectares in 2012-13.

Agricultural Production

The total foodgrains production in Punjab has increased significantly over the last few decades. In 1990-91, production of foodgrains was 192.18 lakh metric tonnes, which increased to 290.92 lakh metric tonnes in 2012-13 showing an increase of 51.38 percent. In 2010-11, production of foodgrains was 278.46 lakh metric tones. Wheat and rice played a major role in pushing up agricultural production in the State. The production of rice has increased from 65.06 lakh metric tonnes in 1990-91 to 105.42 lakh metric tonnes in 2012- 13 showing an increase of 62 per cent. Similarly, the production of wheat has increased from 121.59 lakh metric tonnes in 1990-91 to 179.82 lakh metric tonnes during 2012-13 registering an increase of 48 per cent.

The Index of Agricultural Production (all commodities) rose from 269.55 in 1990-91 to 379.17 during 2012-13 showing an overall increase of 40.67 per cent.

Yield of Principal Crops

Yield rates in kgs per hectare during 2012-13 are: wheat 5097, rice 3741, maize 3981, gram 1237, sugarcane (Gur) 5834, cotton (American) 537, cotton (Desi) 449, rape seed and mustard 1292, groundnut 1716 and sunflower 1790.

TABLE 1 Gross Area Under Crops

(000 HECTARE)

ITEM	1990-1991	2008-2009	2009-2010	2010-2011	2011-2012(P)	2012-2013(T)	2012-2013 Likely Achievements (p)
RICE	2015	2734	2802	2826	2818	2780	2826
BAJRA	12	5	3	3	3	4	4
MAIZE	188	152	139	133	126	140	124
WHEAT	3272	3526	3522	3510	3528	3500	3500
BARLEY	37	16	14	12	12	15	15
JOWAR	(a)	(a)	(a)	-	-	-	-
OTHER CEREALS	(a)	-	-	-	-	-	-
TOTAL CEREALS	5525	6433	6480	6484	6487	6439	6469
GRAM	60	3	3	3	2	4	4
OTHER PULSES	83	22	15	17	17	24	21
TOTAL PULSES	143	25	18	20	19	28	25
TOTAL FOODGRAINS	5668	6458	6498	6504	6506	6467	6494

Source; (i) Director, Land Records, Punjab (ii) Director, Agriculture, Punjab

TABLE. 2 Production Of Principal Crops

(000 TONNE)

ITEM	1990-1991	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013 (T)	2012-2013 Likely Achievements (p)
RICE	6506	10996	11236	10819	10542	10850	11374
BAJRA	13	5	4	3	3	4	4
MAIZE	333	517	475	491	502	490	458
WHEAT	12159	15733	15169	16472	17982	16100	16591
BARLEY	101	55	47	44	47	32	52
JOWAR	1	(b)	-	-	-	-	-
OTHER CEREALS	(b)	-	-	-	-	-	-
TOTAL CEREALS	19113	27306	26931	27829	29076	27476	27924
GRAM	45	3	3	3	2	5	5
OTHER PULSES	60	19	13	14	14	21	17
TOTAL PULSES	105	22	16	17	16	26	22
TOTAL FOODGRAINS	19218	27328	26947	27846	29092	27502	27946

Source; (i)Director, Land Records, Punjab. (ii)Director, Agriculture, punjab.

TABLE. 3 Agriculture Production Of Punjab

(000 TONNE)

YEAR	WHEAT	RICE	TOTAL
1966-67	10233	560	6501
1970-71	12301	668	7305
1980-81	13240	3233	11921
1990-91	14230	6506	19223
2000-01	15551	9157	25324
2001-02	15230	9012	24103
2002-03	14175	8880	25541
2003-04	14489	9656	24510
2004-05	14695	10437	25011
2005-06	14493	10193	25215
2006-07	14596	10138	25313
2007-08	15716	10486	26818
2008-09	15733	11000	27328
2009-10	15169	11236	26949
2010-11	16472	10837	27846
2011-12	18012	10863	28891
2012-13	16591	11374	30142
2013-14	15195	11267	32510
2014-15	17100	11107	33540

Source:(I) Statistical Abstract in Punjab, various issue (ii) Agriculture Minister of Punjab

ESTIMATED RESULTS:

TABLE. 4: Estimated Results Of The Simple Linear Regression Model Foodgrains Of Punjab During The Period (1966-67 To 2014-15)

(000 TONNE)

Regression	Statistics
Multiply R	0.867803
R Square	0.753081
Adjusted R	0.738557
Standard E	3867.207
Observation	19

ANOVA

	Df	SS	MS	F	Significance F
Regression	1	7.75E+08	7.75E+08	51.8486	1.48E-06
Residual	17	2.54E+08	1495529	1	
TOTAL	18	1.03E+09	2		

	Intercept	X Variable
Coefficient	12230.77	1166.349
Standard Error	1846.85	161.9795
t stat	6.622503	7.200598*
p-value	4.32e-06	1.48E-06
Lower95 per cent	8334.258	824.6023
Upper95 per cent	16127.29	1508.096
Lower95.0 per cent	8334.258	824.6023
Upper95.0 per cent	16127.29	1508.096

Source: Agriculture ministry of Punjab, (ii) Statistical Abstract in Punjab, various issue

NOTE; The Coefficients are significant at α=0.05.

(I) Dependent variable (Y) = production of foodgrains of Punjab

(ii) Independent variable (X) =time

Table. 4 vividly portrays a comprehensive picture of the production of food grains during the period of 1966-67 to 2014-15. It displays the estimate Results of the Regression parameters from the simple Regression model with food grains of Punjab as dependent variable (Y). In the model, variable time is the affecting significantly the variable (Y). The trend values (Ordinary Least Square Method) of the foodgrains of Punjab during the period 1966-67 to 2014-15 are 1166.349 significant. In the end, all the coefficients are statistically significant at =0.05 level of Significance with t- value (7.20).

TABLE.5: Descriptive Statistic Of Foodgrains Of Punjab The Period From (1966-67 To 2014-15)

(0000 TONNE)

SR NO I	YEAR II	MEAN III	S.D IV	C.V V
1	1966-67	3530.5	2970.5	84.13822
2	1970-71	3986.5	3318.5	83.24345
3	1980-81	7577.0	4344.0	57.3314
4	1990-91	12864.5	6358.5	49.42672
5	2000-01	17240.5	8083.5	46.88669
6	2001-02	16557.5	7545.5	45.57149
7	2002-03	17210.5	8330.5	48.40359
8	2003-04	17083.0	7427.0	43.47597
9	2004-05	17724.0	7287.0	41.11374
10	2005-06	17704.0	7511.0	42.42544
11	2006-07	17725.5	7587.5	42.80556
12	2007-08	18652.0	8166.0	43.78083
13	2008-09	19164.0	8164.0	42.60071
14	2009-10	19092.5	7856.5	41.14967
15	2010-11	19341.5	8504.5	43.97022
16	2011-12	19877.0	9014.0	45.3489
17	2012-13	20785.0	9384.0	45.20667
18	2013-14	21888.5	10621.5	48.52548
19	2014-15	22323.5	11216.5	50.24526

Source: Agriculture ministry of Punjab, (ii) Statistical Abstract in Punjab, various issue

Table.5 consists of descriptive statistics pertaining to the foodgrains of Punjab 1966-67 to 2014-15 .The column III of The table represents the mean value of the foodgrains of Punjab for the respective years similarly, column IV represents standard deviation of foodgrains of Punjab ,which highlights the absolute dispersion the last column of the table provides C.V, which is considered as a relative measure of inequality of foodgrains of Punjab the mean value of foodgrains rice and wheat of Punjab have increased from 3530.5 to 22323.5 which is almost 6 times increase from the year 1966-67 to 2014-15. Likewise the absolute dispersion measured by S.D has increased from 2970.5 to 11216.5, which is about 3 times increased over the study period. However, the CV reveals that 84.13 to 50.24 reduction in the inequality of food grains, rice and wheat of Punjab from 1966-67 to 2014-15. Further, we conclude that the stability over the year in agriculture production of Punjab has improved. Obviously, it also means an improvement in the stability of the foodgrains. Such kind, of analysis in ascertaining the concert action of Punjab's foodgrains may prove beneficial for the future course of action in the economy.

CONCLUSION

Agriculture transformation is a potent instrument for bringing about significant acceleration in the overall growth and transformation of a labour surplus economy dominated by the agriculture sector. In the case of Punjab, the conditions for development of sustainable agriculture are becoming more and more favorable. New opportunities are opening the eyes of farmers, development workers, researchers and policy makers. Conditions for farming will continue to change, the key to sustainable agriculture is the capacity of farmers and all other actors in agricultural development, as well as the wider society, to learn, experiment, adapt and cooperate in an effective way. To conclude, a small farm management to improve productivity, profitability and sustainability of the farming system will go a long way to ensure the all round sustainability.

Better agricultural practices will promote conservation of agriculture, organic farming which will lead to sustainable agriculture production. As the input required in such farming practices will have to be produced locally, such agricultural practices will create more rural employment in agriculture. Such practices will also help in reducing the cost of production in agriculture. In the long run, it will give a sustainable growth to our agricultural production.

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