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Crop Diversification: An Emphatic Solution to Overcome the Crisis in Punjab Agriculture

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Abstract

This paper analyzed major problems and issues which lead to the present crisis in Punjab agriculture and Crop diversification as an emphatic solution to solve the emerging crisis of Punjab agriculture. In Punjab, the crisis of agriculture is deepening for the last more than one decade year after year. The crisis is the result of growth pattern of Punjab agriculture. With the prevailing cropping pattern in Punjab there is a serious threat to the future of agriculture. Ongoing system of agricultural production in Punjab is engulfed by the problems of marketing of crops, environmental pollution, problems relating to water like over exploitation of water, water logging, declining water-table, soil degradation etc. and unemployment in rural areas. The serious efforts were required to solve the crisis of Punjab agriculture. If the state government would not act swiftly then the coming years would be much more painful for the people of Punjab and particularly for the Peasants. The immediate remedy suggested for this crisis is crop diversification. The issue of crop diversification is significant from the point of view of policy perspective regarding agrarian and overall economic development, employment and poverty.

Keywords: [Crop Diversification, Crisis, Punjab Agriculture]

Introduction

Punjab is known as agriculturally prosperous state of India. Punjab is also being known as the "The Bread Basket" of the country as it plays very significant role for ensuring food security in India. Punjab covers only 1.53 per cent of the geographical area of India but due to high intensity of cropping it accounts for 3.90 per cent of the total cropped area. In spite of the Punjab's share in total geographical area in India is only 1.53 per cent but its contribution as its share in central pool of rice and wheat was 20.9 per cent and 37.8 per cent respectively in 2019-20 which clearly indicates its dominant role particularly in the case of wheat and rice crops. In Punjab, out of five million hectares of land 4.3 million hectares are cultivated.

Agrarian Scene of Punjab

Punjab agriculture (including live-stock) was contributing 39.85 percent to gross state domestic product in 1998-99, while at the national level the share of Primary sector was much less. Punjab has an export surplus of wheat, rice and other live-stock products. The Foodgrain production has increased from 7.3 million tones in 1970-71 to 30.7 million tons in 2019-20. The new agricultural technology introduced during mid 1960's led to significant growth in agricultural output. Taking the entire period from 1962-65 to 1992-95 , total agricultural output in India (at 1990-93 prices) increased at a compound annual growth rate of 2.71 percent. During this period, the highest output growth rate of 3.35 percent per annum was recorded by northern-western region of India, in which Punjab State had dominant share. Out of 5 million hectares of land area 4.3 million hectares are cultivated in Punjab. Table 1.1 shows that total cropped area is constantly increasing from 5678 thousand hectares in 1970-71 to 7941 thousand hectares in 2000-01 and after that there is slight decrease in total cropped area 7882 thousand hectares in 2010-11 and 7825 in 2019-20. The fallow land declined from 139 thousand hectares in 1970-71 to 91 thousand hectares in 2019-20. The net area sown is also continuously increasing during 4053 thousand hectares in 1970-71 to 4250 thousand hectares in 2000-01 and after that there is very less decreased in net area sown from 4158 thousand hectares during 2010-11 to 4119 thousand hectares in 2019-20. However the area sown more than once has been increased continuously from 1970-71 to 2019-20 which was due to the main source of increase in total cropped area. The increase in crop area during 1970-71 to 2019-20 made it clear that the cropping intensity in Punjab had increased sharply during this period and it was as high as 189.97 per cent in 2019-20. A higher cropping intensity indicates that the cropping area is being sown more than once during a year.

TASK 1: Land Utilisation In Punjab

	1	2	3	4	5	6	7	8	9		
Year	Total Geog. Area	Forests	Land not Available for Culti-vation	Other Uncul-tivated land excluding fallow land	Fallows Land	Net Area Sown	Area sown more than once	Total cropped area	Cultivated area (4+5+6)	Percentage of cultivated ara to total goeg. Area	Cropping intensity
1970-71	5036	123	624	92	139	4053	1625	5678	4284	80.5	140.09
1980-81	5036	216	532	49	45	4191	2572	6763	4285	83.3	161.3
1990-91	5036	222	426	57	110	4218	3284	7502	4385	83.7	177.8
2000-01	5036	280	438	22	43	4250	3691	7941	4315	84.39	186.84
2010-11	5033	295	528	12	37	4158	3724	7882	4207	82.56	189.56
2019-20	5033	248	546	23	91	4119	3705	7825	4233	81.83	189.97

Source : Statistical Abstract of Punjab, Various Issues.

task 2: Discribuion Of Land By Farm Size Categories

Category hectare	Number of Land Holdings	Percentage of holdings								
	1970-71	1980-81	1990-91	2000-01	2010-11	1970-71	1980-81	1990-91	2000-01	2010-11
Below 1	517568	198060	295668	122760	164431	37.63	19.42	26.47	12.31	15.62
1 to 2	260083	199368	203842	173071	195439	18.91	19.54	18.25	17.35	18.57
2 – 4	281103	287423	288788	328231	324515	20.44	28.18	25.86	32.91	30.83
4-10	247755	261201	261481	300954	298451	18.01	25.61	23.41	30.18	28.36
10 and above	68883	73940	67172	72356	69718	5.01	7.25	6.01	7.25	6.62
Total	1375392	1009992	1116951	997372	1052554	100	100	100	100	100

Source: Punjab Statistical Abstracts for various issues

Structure of Land Holding in Punjab

There are considerable changes in the structure of land holding during 1970-71 to 2010-11 in Punjab. From the table 1.2 it clearly indicates that the number of operational holdings in Punjab were 10.52 lakh in 2020-11 out of which 34 per cent consisted of small and marginal farmers having less than Two hectares of land. About 65 per cent farm operators cultivated less than Four hectares of land which is below the estimated economic holding of five Hectares during 2010-11. Only 6.62 per cent of the farmers had 10 hectares and above land area. Whereas about 31 per cent medium farmers who cultivated between 4 to 10 hectares of land during 2010-11. The marginalization of operational holdings is a serious repercussion of the sub-division of land holdings which is resulting from breaking of joint families and shifting of agricultural land to non-agricultural uses.

The marginal and small farmers have two possibilities (i) These have no capacity to diversify the agricultural production and (ii) Already these are producing a diversified agricultural products to get the maximum return. So ultimately at the micro level the diversification issue is more relevant in the case of medium and large farmers.

The post-independence period is often divided into pre-green revolution period (1949-50 to 1964-65), green revolution period (1967-68 to 1985-86) and post-green revolution period after 1985. in the pre-green revolution period, the two main planks of agricultural policy were land reforms like consolidation of land holding and large investments in irrigation infrastructure. As a result the growth of Indian agriculture accelerated. Thus as compared with a growth rate of less than half per cent per annum in the pre-Independence period (1901-04 to 1940-44) the growth rate of all crops rose to 3.15 per cent per annum and in case of foodgrain crops to 2.82 per cent per annum during 1949-50 to 1964-65.

During the early phase of green revolution from 1962-65 to 1970-73, the High Yield Variety (HYV) technology was more or less confined to Punjab, Haryana and some districts in the Western Uttar Pradesh in north-western India. Its introduction brought about some major changes in the nature and pattern of agricultural development in India, first the new technology led to large increases in wheat yields and at a later period, in rice yields. Before the advent of green revolution during the mid 1960s, the increase in area was the major source of output growth and the contribution of yield was comparatively less important. One of the most significant impact of new technology was to luring about significant changes in the yield levels of major cereals namely wheat and rice and some other crops. In Punjab about 84 per cent of the geographical area is under crops. Practically the state gives a look of a vast farmstead.

Table 3: Cropping Pattern in Punjab

Year/ Crop	Wheat	Rice	Total Foodgrain	Sugarcane	Cotton	Total pulses	Total Oil seeds	Gross Area Sown
1970-71	2299 (40.48)	390 (6.86)	3928 (69.17)	128 (2.25)	397 (6.99)	414 (7.29)	295 (5.19)	5678 (100)
1980-81	2812 (41.57)	1183 (17.49)	4854 (71.77)	71 (1.04)	649 (9.59)	341 (5.04)	238 (3.51)	6763 (100)
1990-91	3273 (43.63)	2015 (26.86)	5668 (75.56)	101 (1.34)	701 (9.34)	143 (1.90)	104 (1.38)	7502 (100)
2000-01	3408 (42.91)	2612 (32.89)	6277 (79.04)	121 (1.52)	474 (5.96)	54 (0.68)	86 (1.08)	7941 (100)
2010-11	3510 (44.53)	2826 (35.85)	6504 (82.51)	70 (0.88)	483 (6.12)	20 (0.25)	56 (0.71)	7882 (100)
2019-20	3521 (44.99)	3142 (40.15)	6818 (87.13)	91 (1.16)	248 (3.16)	33 (0.42)	40 (0.51)	7825 (100)

Source :Statistical Abstract of Punjab, various issues.
Note : Figures in brackets are represent percentage.

There is dominance of wheat and rice in the cropping pattern of the Punjab state. During 2019-20, Approximately 87 per cent of the total cultivated land was used for cultivation of foodgrain. In 1970-71, 47.

34 per cent of gross cropped area was under wheat-rice rotation and this percentage increased 85.14 in 2019-20(Table 1.3). The wheat and paddy cultivation cover the major portion of the gross cropped area and area under these two crops has increased over years. Whereas the gross cropped area under Sugarcane, Cotton, Pulses and Oilseeds crops had been declining since 1970-71 to 2019-20. Sugarcane covered only 1.16 per cent of the total cropped area in 2019-20. The Cotton accounted for only 3.16 per cent of the total cropped area in 2019-20. However total pulses and oilseeds crops has been accounted only 0.42 and 0.51 per cent of the gross cropped area during 2019-20.

Table 4:Productions of Important Crops in Punjab

Year	Rice	Wheat	Pulses	Oilseeds	Sugarcane	Cotton
1970-71	688	5145	308	233	527	818
1980-81	3233	7677	204	187	392	1178
1990-91	6506	12159	105	93	5592	1909
2000-01	9157	15551	39	88	7230	1199
2010-11	10833	16472	17	73	4904	1822
2019-20	12675	17616	30	59	7302	1207

Source : Statistical Abstract of Punjab, Various Issues.

The green revolution in Punjab is called wheat-paddy revolution. Table 1.4 indicates that in Punjab the production of the wheat has increased from 5145 thousand tons in 1970-71 to 17616 thousand tons in 2019-20 and the production of rice has increased from 688 thousand tons in 1970-71 to 12675 thousand tons in 2019-20. There is constant decline in the production of pulses. The oilseeds production declined from 233 thousand tons in 1970-71 to 59 thousand tons in 2019-20. The main reason of the decline in the production of pulses and oilseeds is the decline in the area under these crops. However the fluctuations in the area under Sugarcane and Cotton have been resulted due to the fluctuation of the production of these two crops during 1970-71 to 2019-20.

Table 5 : Average Yield of Important Crops in Punjab (Kgs. Per hect.)

Year	Rice	Wheat	Cotton	Oilseeds	Sugarcane
1970-71	1765	2238	737	970	4117
1980-81	2733	2730	570	1816	5526
1990-91	3229	3715	766	3350	55369
2000-01	3506	4563	845	3251	59752
2010-11	3828	4693	1118	4752	70059
2019-20	4034	5004	1493	5321	80244

Source : Statistical Abstract of Punjab, Various Issues.

Punjab has not only achieved an irrigation coverage of 95 per cent of the net area sown, cropping intensity of 190 and 98 per cent HYV coverage which are all the highest among the Indian states, but even the yields of major crops wheat and paddy are of a very high order. With the introduction of new farm technology in mid 1960's, the average yield of crops especially of wheat and rice had been increased from 2238 and 1765 kilograms per hectares during 1970-71 to 5004 and 4034 kilograms per hectares in 2019-20 respectively. The increase in the average yield of pulses and cotton were marginal while the yield of sugarcane and oilseeds had increased significantly during this period. The policy of procurement prices fixed by the government resulted in the stability of income created imbalance in the cropping pattern in favor of wheat-paddy rotation.

The main reason behind the dominance of wheat and rice crops in the cropping pattern was assured market and price. In other words, the return from these two crops were not depending upon the instability in the market. It was not true in the case of other crops. Because the foodgrain surplus in the state found a comparatively ready market due to short supply of fodgrain in the country till 1985. Some how, the conditions at the national level changed after 1985 and the marketing has become a serious problem in 1990s particularly after 1995.

The pattern of growth of Punjab agriculture in the context of Indian situation was noticed in 1985 for the first time when problem of marketing of paddy had arisen. At that time to analyse the problem, Johl committee was constituted by the Punjab Government. Due to inactivity of the State government even in the light of Johl committee report, the situation deteriorated. This resulted in the sharp decline in the growth rate of agricultural and total net state domestic products (NSDP) and per capita income in Punjab during 1990s as compared to the decade of 1980s. It is the first time since the onset of green revolution when the growth rate of agricultural output in Punjab was lower than that of the national average (Table 1.6).

Table 6 : Trend Growth Rate in Net Domestic Product and Per Capita Income in Punjab and India. (Unit : Percent/annum)

	1980-81 to 1989-90	1990-91 to 1995-96
Net state domestic product-Agriculture		
Punjab	5.19	2.89
India	3.05	2.93
Net domestic Product- total		
Punjab	5.30	4.17
India	5.18	5.22
Per Capita Income		
Punjab	3.43	2.28
India	3.04	3.39

Source : Ramesh Chand (1999) : Emerging Cirsis in Punjab Agriculture, Economic and Political Weekly, Vol.34,No.13, March 27.

Crisis in Punjab Agriculture

As the output of crops increased in Punjab during 1970-71 to 1996-97, the cost of cultivation of crops also increased. The per hectare operational cost of cultivation of wheat and rice was as high as Rs. 8730.13 and Rs. 10194.66 per hectare in 1996-97. During 1990s the increase in per hectare yield of wheat and paddy was very low (Table 1.5) but the cost of production of crops is increased considerably. By the mid 1980s a wheat grower in Punjab was obtaining lower net returns per hectare, even after incurring higher costs per hectare on modern inputs, than a wheat grower in Madhya Pradesh (Nadkarni 1988). The Johl Committee Report on diversification of Punjab Agriculture (1986) recommended that at least 20 per cent of the area under wheat and paddy should be brought under new crops especially fruits and vegetables. The ongoing system of agricultural production is engulfed by the problems of marketing of crops, unemployment, pollution, water depletion, soil degradation, etc.

The production for the market in the agricultural sector is increasing. The commercialisation of agriculture has become the source of more and more trade of agricultural products. The market arrivals of crops have increased with the growth of production for the marketing. It is quite natural that the agricultural production is effected by the market forces more so by market ills. To provide safeguard to the agricultural production from market instability, the government has provided procurement prices and agencies for the purchase of crops. But, it is true only in the case of wheat and rice. The increase in the production of wheat and rice during 1990s is very less (Table 1.4) but most of the production is for the market. Due to the gap between demand and supply caused by many factors, the stocks of wheat and rice are increasing in the stores of government and semi-government purchasing agencies for the last many years. Most of these stocks are lying in the open and are not eatable. Same is the case of paddy. Wheat and paddy stocks are rotting and converting into non-eatable resulting in huge losses. Due to this situation, the government has started shedding its responsibility to provide assured market for paddy and wheat, which will result in a more serious crisis in the Punjab agriculture in the coming days.

The employment in agriculture as cultivators and labourers increased during 1961 and 1971. The percentage of cultivators and agricultural labourers in total workers was 55.89 in 1961. It increased to 62.67 per cent in 1971 and then declined to 54 per cent in 1981 (Table 1.7) This was the result of mechanisation of Punjab Agriculture. The percentage of agricultural workers to total workers declined sharply from 55.26 per cent in 1991 to only 39.36 per cent in 2001. The little increase in number of agricul-

tural workers during 1991-2001 is actually not indicating the increase in employment, rather shows the retaining of workers under compulsion. The annual rate of growth of total employment in urban India was 3.39 per cent during 1987-88 to 1993-94 and 2.55 per cent during 1993-94 to 1999-2000. But in rural India it was 2.03 per cent during 1987-88 to 1993-94 and only 0.58 per cent for the period 1993-94 to 1999-2000. It clearly indicates that there are very less opportunities for employment in agricultural sector. It is more relevant in the case of Punjab due to mechanisation of agriculture. The growth in agricultural workers in Punjab was 0.67 per cent per annum against the 4.99 per cent per annum during 1991 to 2001. The unemployment has taken a very ugly shape in the rural Punjab.

Table 7: Total Workers in Agriculture (Cultivators and Agricultural Labourers) in Punjab

Year	Total Workers in Punjab 1	Cultivators 2	Agricultural Labourers 3	Total workers in Agriculture (2+3=4) 4	Total workers in Agriculture as a percentage of total workers 5
1961	3466269	1602648	334610	1937258	55.89%
1971	3912592	1665158	786705	2451863	62.67%
1981	5288000	1767000	1092000	2859000	54.07%
1991	6098374	1917210	1452828	3370038	55.26%
2001	9141760	2099330	1498976	3598306	39.36%
2011	9127474	2065067	1489861	3554928	38.94%

Source :

1. Census of India Series 17 Part-IA, Punjab Gen. Report of 1961.
2. Census of India Series 17 Part-IA, Punjab Gen. Report of 1971.
3. Census of India Series 17 Part-IA, Punjab Gen. Report of 1981.
4. Census of India Series 17 Part-IA, Punjab Gen. Report of 1991.
5. Census of India 2001.
6. Census of India 2011.

With the expansion of irrigation net-work covering 95 per cent area in 1995-96 as compared to only 54 per cent in 1960-61, the agriculture production has increased manifold. But it also created problems relating to water and its management. The three different agro-climate zones of Punjab are suffering from the problem relating with water management. In submountaneous (kandi zone) due to denudation of upper hills resulting from overgrazing and deforestation, there is high run-off of water resulting from floods and heavy soil erosion. The south western zone (cotton belt) is suffering from the water logging problem and menance of pests has resulted in shifting the area from cotton to rice cultivation.

The central zone comprising the major part of state is highly productive and has well knitted system of irrigation, but the water table in this zone is falling with an average rate of 0.23 meter per year during last 15 years. The over-exploitation of water is due to the increase in the number of tubewells from 1.92 lakh in 1970-71 to 10.90 lakh in 1997-98. With the prevailing cropping pattern in Punjab there is serious threat of agriculture. If alternatives are not found or searched and not put into practice then what talk of crop diversification, the mere survival of the agriculture will be in danger. Burning of crop residual and application of insecticides and pesticides are the major sources of environmental pollution by agriculture activities. But the problem like declining water-table in some part, waterlogging in other parts, soil degradation and environmental pollution have reached such portion as to force the state government to make serious efforts to address these problems.

The crisis is the result of growth pattern of Punjab agriculture. With the prevailing cropping pattern in Punjab there is a serious threat to the future of agriculture. Ongoing system of agricultural production in Punjab is engulfed by the problems of marketing of crops, environmental pollution, problems relating to water like over exploitation of water, water logging, declining water-table, soil degradation and unemployment in rural areas.The Punjab government is much far behind to take necessary initiative to change this pattern. If the state government would not act swiftly then the coming years would be much more painful for the

people of Punjab and particularly for the peasants.

In Punjab, the crisis of agriculture is deepening for the last more than one decade year after year. To make efforts to solve the crisis of the Punjab economy particularly of the agriculture sector, one of the emphatic solution suggested is the diversification. Diversification is a wider concept even in the context of rural/agricultural economy.

Simple meaning of diversification is to making things varied. It means the process with which the different changes are being made in wider sense. Diversification is an integral part of the process of structural transformation of an economy at the macro level. The economy is diversifying with the secondary and tertiary sector for their contribution to national income as well as in disposition of the work force. Rural diversification is a process of broadening and strengthening the income sources of rural households. The process extends from the introduction of new crops and technologies into traditional farming system to the development of off-farm jobs in small-scale rural industries. In this way, rural diversification is gradual process and must happen with the passage of time and related to structural transformation of the economy.

In the light of above mentioned domain diversification issues can be approached at four levels : farm, regional, sectoral and intersectoral. The change in the past crop production at farm level shows that the diversification is not new for the farmers. The changes in the society, market conditions, profitability and risk are reflected in the adjustment by the farmers at the farm level.

The diversification at regional level is related to specialize in specific enterprises. The scope for the diversification is affected by the ability of each region to specialize in specific enterprises based on comparative advantage. Regional diversification is influenced by several technical factors. Its scope is determined by agro-climatic conditions including suitability of the natural environment (soil, weather and water) for expanding crop production or advancing specialized technology.

At the intersectoral level diversification implies that rural population seek better income-earning prospects off the farm or outside agriculture. Those have inadequate land or farm employment, they need diversification out of agriculture. But the changes at this level are complex and are desirable as a long-run response. For this purpose whatever may the type/level of diversification, it is influenced by government policies, input supplies, institutional support, technological development etc.

The significance of crop diversification gracious situation arises with the process of deterioration of farm income caused by sudden and sharp decline in earnings from specific crops or because incomes in farming rapidly decline relative to income in other sector.

For the last many years, scholars are suggesting the change in cropping pattern and crop rotation. The crop diversification depends on output prices, input prices and yields. These three variables are influenced by many factors. Relatively, the input prices and yields are inflexible as compared to output prices. So the instability in farm incomes is driven primarily by instability in output prices. While, the shift of area from one crop to another crop is suggested on the basis of deficiency in supply against demand then it is very difficult to asses what will happen to the price of crop in favour of which shifting is suggested. It is more important due to the nature of supply of crops particularly of perishable crops (fruits, vegetables, flowers etc.). The crop diversification is taking place very slowly due to crop specific Policy of the state.Only two crops(Wheat and Rice) have assured market and price. The market of these crops is almost synonymous with the markets administrated by state.

The return vis-a-vis risk of these crops (wheat and rice) is higher in comparison to other crops due to assured market and price. The cultivation of these crops by farmers is done with less risk/tension in the context of market instability. The recent crisis in Punjab agriculture is becoming more serious in the light of problem of marketing of rice and wheat resulting from the shedding of responsibility by the state. Besides the foodgrains output growth rate has declined sharply during 1990s but there is an unprecedented build-up of food stocks. The decline in growth rate had resulted in the decline of per capita food availability at the national level, which is at the same level now as in the hungry nineteen thirties. Moreover, the prices of wheat, rice, cotton, sugarcane, maize, groundnut and soyabean had declined during 1995-2001 in the international market.

Actually the crisis of agriculture is not only the crisis of this sector rather it is a crisis of the whole economy. As mentioned in Johl Committee Report it has to be understood and realized that there are no real surpluses of foodgrains in the country in terms of the needs of the society. It is only a situation of excess supplies over effective demand. A large majority of the poorer section of the society does not have enough purchasing power. The situation, since the Johl Committee Report, has not improved rather worsened and has become more complex particularly in the light of new economic policy/WTO.

To analyse the agrarian crisis in Punjab, it is very essential that the prospects of diversification in agriculture sector particularly crop diversification must be studied. Crop

diversification can play vital role for encouraging and promoting agricultural development. There is a need to analyze the whole problem in a comprehensive way and the state government should design and implement a comprehensive policy comprising innovative technology, policy support, infrastructural development and appropriate institutional arrangements to promote and accelerate the process of crop diversification in Punjab agriculture. Crop diversification will be helpful for increasing farmers income as well as to control the environmental problems, thus maintain environmental sustainability. The problems relating to supply, demand and price in the agriculture sector should be looked into especially in the context of institutional factors and WTO. The issue of diversification of agriculture is also significant from the point of view of policy perspective regarding agrarian development, economic development, employment and poverty.

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