



## **CDEIS POLICY BRIEF SERIES ON PUNJAB ECONOMY**

**#2020-01**

### **Agricultural Sustainability in Punjab: A Way Forward**

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**October, 2020**

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## **CDEIS Policy Brief Series on Punjab Economy**

The COVID-19 pandemic has shaken the economies globally and added to the existing problems and their intensity like climate change, poverty, unemployment, migration, education, and of course, health. Developing economies have suffered even more due to their vulnerabilities to such sudden and large shocks. India is no exception to this trend and has regional variations in the impact of COVID-19 as there is much disparity and specificity in the levels of development of state economies. Punjab being an agriculturally grown state though still highly dependent on its agriculture and rural non-farm economy for significant proportion of its population and their livelihoods in the presence of public resource crunch has also faced this COVID-19 onslaught while being in economic, social and environmental crisis.

In this context, it was thought fit to get an independent set of policy directions from scholars in their respective domains based in Punjab, outside Punjab and even overseas to encourage public policy debate in and outside the state about the nature and magnitude of Punjab's economic and developmental crisis and the COVID-19 implications for it and explore possible ways forward to make the economic and social systems of the state move out of the situation of economic and policy inertia.

The policy briefs in this series numbering more than 20 examine issues ranging from agricultural sustainability, environmental and market aspects of the agricultural systems to allied sector and informal and small-scale sector livelihoods including dairy and MSMEs. The marginalised group livelihoods like women, schedule castes, and farm labour and other rural and migrant workers also get adequate attention. The sectors of health and education are also examined. On the fiscal front, institutional credit for recovery and revenue of the state post-GST are analysed. The larger aspects of governance, federalism and diaspora also get a coverage as contextual and overarching themes.

We hope that these briefs would serve to encourage more informed debate and discussion in the interest of the betterment of the state economy and society to aid post-COVID recovery and medium and long-term sustainable development policy making.

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# **Agricultural Sustainability in Punjab: A Way Forward**

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## **Abstract**

Punjab is an agriculturally strategic state of India. However, its agricultural sector is currently passing through a critical phase where the natural resources are depleting, yields are stagnating, and farm incomes are falling. A continued reliance on wheat and rice (paddy) production and overdependence on underground water resources have raised questions about the sustainability of agriculture in Punjab. The current cropping patterns, which are heavily dependent on wheat and rice, are highly intensive with low diversity potentially undermining overall agricultural sustainability of the state. A reduced crop diversity mainly in the *kharif* season with a focus on rice intensification and a regime of free-of-cost electricity supply to farm sector have had an adverse effect on groundwater resources while an overdose of fertilizers and pesticides and over-capitalized farm machinery have undermined the economic sustainability of Punjab's farm enterprises. From a policy perspective, crop diversification policies in Punjab need to be more practical and pragmatic providing alternative sets of crops to farmers which can economically complete with wheat and rice. Like Haryana, Punjab government can rationalize rice cultivation and/or disseminate alternative methods of rice cultivation avoiding flood irrigation in the central zone where groundwater depletion rates are very high. In the post COVID-19 phase, Punjab government might consider promoting rural agribusiness, i.e. food processing, fine-tuning the current agricultural marketing systems, and rationalizing the current regime of electricity subsidy to farm sector to improve the overall agricultural sustainability in Punjab.

# Agricultural Sustainability in Punjab: A Way Forward

Sukhwinder Singh

## Introduction

Punjab's economy is predominantly agrarian (Singh and Singh, 2002). However, the share of agriculture to the Gross State Domestic Product (GSDP) has declined from 49% in 1980-81 to 28% in 2019-20 with about 26% workforce engaged into farming and its allied activities. The state GSDP grew at about 6% between 2015-16 and 2019-20 whereas the average growth rate for agriculture and allied sectors remained only 1.7% between 2012-13 and 2016-17 (GoP, 2020). Due to conducive agro-climatic conditions and a widespread application of green revolution technologies, Punjab could increase its cropping intensity up to 189% and produce 18% and 12% of India's wheat and rice, respectively. However, Punjab's current cropping patterns, which largely concentrate on wheat and rice production, are not sustainable, especially economically and environmentally. In the following sections, the current cropping patterns in Punjab are analyzed in the light of three pillars of agricultural sustainability, i.e. economic, environmental and social:

## Economic sustainability

Economic sustainability of a farm enterprise depends mainly on crop yield, cost of cultivation, and produce prices. The average per hectare yield of wheat, rice, basmati and cotton was 4.0, 6.8, 4.8 and 2.4 t/ha, respectively. However, the cost of cultivation (A1) for cotton was the highest (Rs 68,604/ha) followed by basmati (Rs 62,071/ha), rice (Rs 53,362/ha) and wheat (Rs 39,060/ha). Basmati was the highest profit generating *kharif* crop followed by rice, wheat and cotton (Singh, 2020). A couple of other studies (Singh et al., 2017; Raju et al., 2015) also reported that basmati fetched the highest gross returns and net returns using market prices, economic prices, and natural resource valuation. However, basmati does not come under the Government of India's Minimum Support Price (MSP) umbrella. On the other hand, cotton generated the lowest per hectare net profit that could be attributed to its higher cost of cultivation. Additionally, cotton cultivation is known to be prone to the highest level of yield and marketing related risks when compared to other *kharif* crops (Chand, 1999) which could dent its net profitability.

From an economic sustainability angle, a typical farmer spent Rs 84,374 and earned Rs 12,055 from each hectare annually. A typical farm enterprise of 4.8 hectares could generate an annual income of Rs 50,201 which does not include income from allied activities e.g. dairy, fishery (Singh, 2020). As per a national sample survey (NSSO, 2014), income from other activities than crop production such as allied farming activities e.g., dairy, poultry etc., including wages in Punjab during 2012-13 contributed up to 40% to total income of a farm household. Thus, adding this assumptive figure of estimated income from other allied farming activities to Rs 50,201, an average farmer household could have earned Rs 83,668 from all sources. Analyzing this figure in the context of farmer livelihoods in Punjab, an average monthly income of a farmer household comes to be Rs 6,972. That means an average farmer household of five members in Punjab is living on Rs 1,395 in a month. Considering the per-capita income, a member of a farming family of Punjab has Rs 46 (\$0.93) to spend in a day. If those who live on \$1.25 a day are poor as per IFAD (2011) estimation, an average farm household of 'so-called' agriculturally advanced state like Punjab is in deep poverty. Even the Indian government's estimates on poverty line for 2011-12 (Planning Commission, 2013) revealed that a person living in rural Punjab is to be considered below poverty line (BPL) if he or she earns less than Rs 1,054 (\$21) per month. Therefore, Punjab's current cropping patterns are economically unsustainable and need a multidimensional investigation.

## Environmental sustainability

The environmental sustainability of Punjab's cropping systems can be investigated by examining the current status of its national resources, mainly soil and groundwater. Due to indiscriminate application of chemical fertilizers and pesticides in the recent past, soil health in Punjab has been a debatable issue mainly because of lack of pragmatic scientific inquiry. Singh and Benbi (2016) through a systematic and multifaceted study provided a deep understanding of the soil health issues in Punjab. Contrasting the main body of literature, they argued that Punjab soils had become healthier between 1980-1981 and 2010-2011, particularly with respect to Soil Organic Matter (SOM), Phosphorus (P) and Potassium (K). The pH exhibited a declining trend,

whereas Electrical Conductivity (EC) stayed almost constant. While endorsing these results, Benbi and Brar (2009) reported that intensive agricultural practices by allowing a greater root biomass addition and decomposition in the surface soil because of increased crop productivity have improved the SOM by 38% and reduced the soil pH by 0.8 units between 1980–1981 and 2005–2006. While associating this with crop productivity, Shergill (2013) argued that the rice and wheat yields had increased from 2.7 t/ha in 1980 to 4 (rice) and 4.5 t/ha (wheat) in 2005. However, these crop yield increases could be associated with improved seeds varieties which resulted in greater nutrient removal, i.e. nutrient mining, from soils (Benbi et al., 2006).

Groundwater depletion in Punjab, in general, and in the central zone (rice belt covering 50% land area of Punjab), in particular, is a serious concern in relation to the environmental sustainability of farm enterprises in Punjab (Singh and Park, 2018). Between 2000 and 2010, the groundwater level on 92% of the farms in the central zone, had depleted by more than 0.60 metres annually. Despite Punjab government's consistent but largely failed crop diversification policy and programs, the area under rice cultivation in Punjab has constantly been increasing since 1990 (GoP, 2019). Punjab government's latest crop diversification plan suggested that the area under rice should be reduced from 3 to 1.6 million hectares (PSFC, 2013). Additionally, Benbi (2018) argued that the environmental sustainability of rice has declined overtime as the greatest decline in energy use efficiency was observed in the cultivation of rice followed by wheat and maize. It is likely that if the existing policy framework for groundwater resources in the state, i.e. free electricity to farm sector particularly for rice cultivation, and MSP regime continues, Punjab might end up losing much of its groundwater resources. Since it is a complex problem with a range of policy, economic, attitudinal, social and political dimensions, a multidimensional approach might help overcome further over-extraction of groundwater resources in Punjab.

### **Social sustainability**

Although the expansion and intensification of farm machinery in Punjab played a crucial role in boosting the production as well as productivity of main crops thus achieving the national food security, it displaced much of rural farm labor, side-lined many rural artisans and pushed smallholders out of business by making small farms economically unviable (Sidhu, 2011; Singh, 2012). Smallholders, despite

constituting 30% of the total landholdings and operating 8% of Punjab's total land area, had inequitable access to various farm resources, e.g. landholding, irrigation sources, farm machinery and extension services, which are the key determinants of farm profitability (Singh, 2014). Although owning a tractor is uneconomical for a smallholder, only 50% of smallholders owned tractors compared to 72% and 83% of medium and large holders, respectively. Further, about 14% of the smallholders had no access to any source of irrigation and were dependent on rented irrigation from medium and large holders (Singh, 2014). Further, only 11% and 47% of the smallholders had Kisan Credit Cards and had access to credit facilities available with the Primary Agriculture Credit Society (PACS), respectively whereas 75% of the medium and large holders each had Kisan Credit Cards and were PACS account holders. Being not accommodated properly by the PACS, smallholders go to non-institutional sources, i.e. local commission agents, who charge exorbitantly higher interest rates and generally exploit them to the extent that they have to either sell off their land to them to pay off their debts or commit suicide (Singh, 2014).

With respect to agricultural extension provided by the Department of Agriculture (Punjab) and PAU Ludhiana, only 28% and 64% of the smallholders were connected to these networks, respectively, whereas the corresponding figures were 22% and 75% for medium holders and 42% and 92% for large holders (Singh, 2014). Smallholders, who are otherwise efficient in terms of per unit productivity and have been contributing significantly to food security (Chand et al., 2011; Dev, 2012) were largely marginalized in terms of limited access to farm machinery, irrigation sources, agricultural subsidies, institutional credit, and extension services. The culture of mono-cropping and subsequent mechanization of farm operations pushed farm labor, local artisans and women out of farming in Punjab whereas in other Indian states, they are contributing to farm sector considerably (Singh, 2014).

### **Conclusions and policy recommendations**

Punjab agriculture is currently passing through a very critical phase as a continued reliance on wheat and rice production and an overdependence on underground water resources have raised questions on the overall sustainability of agriculture in Punjab. However, the soils of Punjab are still healthy and can keep producing a variety of crops if the cycle of mono-cropping (wheat-rice-wheat) can be broken. Punjab's current cropping patterns are highly

intensive with low diversity. A reduced crop diversity mainly in the *kharif* season with a focus on rice intensification and a regime of free-of-cost electricity supply to farm sector have had an adverse effect on groundwater resources while an overdose of fertilizers and pesticides and over-capitalized farm machinery have undermined the economic sustainability of farm enterprises. Since agricultural sustainability of Punjab's farming enterprises is a complex problem with a range of policy, economic, attitudinal, social and political dimensions, a multidimensional approach is required. The following policy measures could form the basis of such an approach:

1. Crop diversity and groundwater resources are significantly associated with each other (Singh and Park, 2018). As the past crop diversification endeavors by the Punjab government have largely failed (PSFC 2013); therefore, future policies and programs related to crop diversification need to be more practical and pragmatic bearing in mind the agro-climatic conditions and market potential of different crop combinations in all three agro-climatic regions of Punjab. Probably, Punjab government may learn from Haryana who has recently planned to make farmers diversify from paddy to less water consuming crops like maize, cotton, bajra, pulses and fruits and vegetables on a land area of about one lakh hectares. Under 'Mera Pani, Meri Virasat' program, Haryana government has come up with a crop diversification plan to discourage farmers from paddy cultivation in eight blocks where the groundwater levels have already gone beyond 35-40 meters. Farmers are advised to sow paddy on 50% of total land area of their farm in these eight blocks and those not implementing the government orders would lose certain government incentives and privileges. Farmers, those who will replace paddy with suggested crops, will get an incentive of Rs 7,000-8000 per acre. Moreover, farmers will get 85% subsidy on installation of micro-irrigation system in the diversified crops area (Singh, 2020a). This endeavor will not only help save the groundwater resource but also reduce the number of incidents of rice crop stubble burning. Considering the current state of groundwater resources in the central zone of Punjab, which covers more than half the land area and contains 70% of total tube wells, has a majority of blocks under over-exploited (water withdrawal exceeds recharge) category with the highest rates of groundwater depletion across Punjab (Singh and Park, 2018). Punjab government can restrict paddy cultivation in these nine-districts of the

central zone to save groundwater resources and reduce rice stubble burning. However, Punjab governments have to provide some financial incentives to diversifying farmers to sustain their economic losses. Additionally, the proposed crop-diversification plan should address the productivity and marketing-related risks so that farmers feel convinced and can have enough confidence to experiment with alternative crops. This will need a close synchronization of policy, research and extension agencies so that whatever is planned by the policy makers and endorsed by the researchers, the same should be disseminated to farmers with no communication gap.

2. Punjab policy makers should be aware that wheat-rice makes the best crop combination in terms of lower productivity risks and higher economic returns compared with other suggested crop-combinations; therefore, the future policies can also target technical diversification in terms of reducing water use in wheat-rice cultivation. As the adoption of water conservation technologies is low in Punjab, government could initiate more pragmatic programs to disseminate water-saving technologies, such as micro-irrigation, direct seeding of rice providing additional incentives to farmers. However, researchers should evaluate the success rate and economic rate of return of all the technologies before prescribing them. Further, although PAU has made considerable efforts to provide the latest varieties of seeds to maintain yield rates of crops, these efforts so far have been restricted to wheat and rice. To reduce capital investment on farm machinery, more custom hiring centers should be opened at village level providing entire range of farm equipment to widen up the access of farm machinery to small and marginal farmers.
3. The current regime of free electricity to farm sector is not really benefitting a large portion of farmers who are either not using groundwater or not able to install big tube wells to pull water from deeper levels. Therefore, this regime should be rationalized by ending power subsidy to medium and large farmers cultivating more than 10 acres so that small and marginal farmers could be sustained.
4. Interestingly, cropping intensity had no negative impact on soil health (Singh and Benbi, 2016) and groundwater resources (Singh and Park, 2018); Punjab government can encourage farmers to sow a third (preferably non-irrigated) crop, i.e. a legume, during May-June. It will not only bring

higher returns to farmers but also improve soil health by supplying additional nitrogen. However, it does not mean that farmers can sow a third crop along with cultivation of rice in the *kharif* season. They have to either stop rice cultivation or reduce the area under rice to spare water for the third crop. Additionally, scientists have to provide short-duration crop varieties to facilitate cultivation of three crops in a year and extensionists might need to update their knowledge on new crops and their cultivation methods as they have specialized around wheat-rice production systems for decades.

5. “The Punjab Preservation of Sub Soil Water Act, 2009” which currently forbids farmers to transplant rice before 15th June, needs reviewing as one-fifth of the farmers surveyed agreed to delay sowing of rice by another two weeks. Additionally, as monsoons reach Punjab by the first or second week of July, June 15th could be extended to June 30th as that would help save water used for rice cultivation without compromising the productivity levels. Actually, Punjab government should discourage paddy cultivation and find out alternative *kharif* crops which can be sown any time between May and July. As higher cropping intensity have no negative impact on soil health and groundwater resources, farmers should be encourage to sow three crops in a year because the agro-climatic and marketing conditions allow farmers to increase cropping intensity up to 300%. This will not only bring higher economic returns but also improve environmental and social sustainability of farm enterprises in Punjab.
6. Surpassing the state governments’ domains, the Indian government passed an ordinance to amend three laws related to production, storage and marketing of farm produce. Two of them are relatively more relevant in the context of economic sustainability of farm enterprises in Punjab. First, Farmers’ Produce Trade and Commerce (Promotion and Facilitation) Ordinance, 2020 (FPTC) which allows trading of farmer produce out of designated APMC markets and provides a facilitative framework for electronic trading within and across states. It allows farmer producer organizations (FPOs), which are generally into pre- and post-production aggregation, trading and value addition, to establish e-markets. However, the real concern here is how many FPOs can make use of this opportunity as they are not defined as “buyers” unlike cooperatives and co-operative societies

(Singh, 2020b). Second, Farmers (Empowerment and Protection) Agreement on Price Assurance and Farm Services Ordinance, 2020 (FAPAFS) is nothing but “a badly designed contract farming law” which leaves out many aspects of modern contract farming practices, like contract cancellation clauses; delayed deliveries or purchases, and damage therein; and ‘tournaments’ in contract farming (Singh, 2020b). Essentially, neither of them is in the interest of either farmers or consumers. Probably they aim to provide conducive environment to big companies and farm produce traders to restrict government procurement agencies from buying directly from farmers, and disallowing state governments to charge marketing fee which they use to develop and maintain rural infrastructure.

7. In the post COVID-19 phase, Punjab government might consider promoting rural agribusiness, i.e. food processing (which is currently non-existent in Punjab), and fine-tuning the current agricultural marketing systems to improve the overall agricultural sustainability in Punjab.

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