

Environmental Cost of Agriculture Development Model in Punjab

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Abstract: *In this paper an attempt is made to examine the environmental cost in Punjab resulting due to mid sixties model of agricultural development. Besides the environmental cost, the study also focus on the ecological, economic as well as health cost. Although, Punjab has made a tremendous increase in foodgrain production due to the adoption of this model but it has made a severe impact on the environment i.e., ground water depletion in all the regions except south western part, decline in soil fertility, green house emission, deteriorating quality of water and effect on species. Moreover, Punjab region is a victim of increasing cancer patients due to excessive use of chemicals in agriculture. The study suggested that proper attention should be given to this problem and breakthrough is needed from wheat-paddy cycle to high values crops of pulses, oilseeds, sugarcane, sunflower, onion, cotton, basmati rice, fruits and vegetables.*

I. Introduction

Punjab has played a vital role in transforming the country's image from a foodgrain deficit nation to a self-sufficient and stable economy (Economic Survey of Punjab, 2009-10). Agriculture sector continues to be an important driver, in the state economy, as according to quick estimates it has contributed 22.32 per cent to gross state domestic product in the year 2008-09 (at current prices) and 70 per cent population of the state is engaged in agriculture and allied activities. The composition of state income shows that the relative share of primary sector in the GDP has come down from 32.67 (Q) per cent in 2004-05 to 24.14 per cent (Q) in 2010-11. Whereas the share of secondary sector has increased from 24.74 per cent to 30.88 per cent (Q) and tertiary sector from 42.59 per cent to 44.98 per cent (Q) for the same years respectively (Economic Survey of Punjab, 2011-12).

In 1965 India imported around 14.5 million tonnes of foodgrain, mostly from USA. This situation was called ‘Ship to Mouth’ condition and at one point of time, the then prime minister of India asked the countrymen to skip meal once a day. Than scientific breakthrough occurred in wheat and rice production in Mexico (Norman Borlaug and others) and India rapidly embraced the new High Yielding Varieties (HYV) with Punjab in the forefront of what came to be known as “Green Revolution” or “New Agricultural Strategy”. This strategy brought out a revolution in the agriculture sector and transformed traditional subsistence agriculture towards scientific and technological agriculture. The main constituents of this new strategy were high yielding varieties of improved seeds, assured irrigation, chemical fertilizers, insecticides, weedicides, pesticides, farm machinery and modern agricultural practices. By the application of this strategy, Punjab witnessed a tremendous increase in production. The total foodgrain production in Punjab has significantly increased over the last few decades, especially in the post green revolution period. 90 per cent of the interstate movement of foodgrain has been of the grains from Punjab. The production of wheat and rice during 2007-08 was 157.20 and 104.89 lakh tones which further increased to 164.72 and 108.19 lakh tones in 2010-11 respectively. The state has contributed 67.80 lakh tones of wheat and 79.10 lakh tones of rice to central pool in 2007-08 (P). (Government of Punjab, 2008-09). The government policies like of the announcement of

procurement prices and minimum support price and proper marketing facilities played an important role for wheat and rice revolution in Punjab. Punjab genuinely takes pride in this achievement, but seldom realises the unduly very heavy social cost the state is paying for it, in monetary, physical and environment terms. Its past development has been commended by the World Bank which observed that most citizens of Punjab have already achieved a level of socio-economic status that the majority of Indian citizens are unlikely to experience in their lifetimes but it finally labels Punjab as a State with “A successful past but uncertain future” (Government of Punjab, 2005-06). From the environmental point of view it is impossible to sustain the current agricultural practices, without eminent disaster that would ruin not only agriculture but the whole state. Punjab has about 4.2 million hectare of land under agriculture and only 6.0 per cent area is under forest and about two million hectare degraded land is a serious issue.

Over intensification of agriculture over the years after the adoption of agriculture development model, i.e., green revolution has led to overall degradation of the fragile agro ecosystem of the state and high cost of production and diminishing economic returns from agricultural practices are affecting the socio-economic condition of farmers. A study by International Food Policy Research Institute (IFPRI) has put out the red alert on the farm sector in Punjab. The study has warned that Punjab needs to diversify from wheat and rice, urgently; otherwise the food bowl of India could well turn into a begging bowl by 2030. Further, the policy of free electricity to farmers has resulted in excessive mining of groundwater resources due to cultivation of water-guzzler crops like paddy. Moreover, the subsidy on fertilizers has encouraged the farmers towards excessive use of nitrogenous fertilizers with relative under-utilization of other fertilizers and micronutrients leading to unbalanced fertilizer use which, in turn, has adversely affected soil quality over time, apart from causing environmental pollution. Over intensification of agriculture has led to water depletion, reduced soil fertility and micronutrient deficiency, non-judicious use of farm chemicals & problems of pesticide residue, reduced genetic diversity, soil erosion, atmospheric and water pollution and overall degradation of the rather fragile agro ecosystem of the state. In this backdrop, in this paper an effort has been made to analyse environmental cost and effects of agriculture development in Punjab.

Objectives

The most important objective of this paper is to analyse the cost of agriculture on environment front in Punjab. More specifically the study is concentrated on the following objectives:

- To analyse the environmental and ecological cost of agriculture in Punjab.
- To study the effect of agriculture environmental degradation on health in Punjab.
- To analyse the economic cost of agriculture in Punjab.

In this note we have reviewed various preliminary reports and studies on the specific issues. Various reports of Government of India and Government of Punjab are used for the fulfillment of the objectives of the study. The scope of the study is limited to examine the environmental cost of agriculture in Punjab.

In the light of above mentioned objectives, the paper is organized into three sections. The section I cover a very precious introduction of the problem. Section II

provides information of environmental cost i.e., ecological, social and economical and health issues due to agriculture practices in Punjab. In the last Section III, we describe conclusions of the study and undertake policy recommendation for environmental management in Punjab.

II. Environmental and Ecological Cost of Agriculture in Punjab

Faster Ground Water Depletion

The state surface water resources are being fully utilized through the well organized canal irrigation system in sustaining the intensive agriculture practices after adoption of agriculture development model in Punjab. However, there has been a reduction of over 35 per cent in canal irrigated area in the state since 1990 but area irrigated by centrifugal tubewells have been increasing due to increased demand of water, reduction in canal capacity due to siltation and the easy credit facilities provided by the State Land Development Bank for tubewell installation with some subsidy and liberal facilities for electrification of tubewells. As per estimates, there are 1.168 million tubewells in Punjab in 2004-05 which sharply increased to 11.581 million in 2011-12 (GOP, 2011). Hence, the ground water is being over exploited to meet the increasing demands of water for irrigation intensive agricultural practices resulting in rapid decline of water table in the entire state (except south western part where water extraction for irrigation purposes is limited due to its brackish and saline quality).

The total demand of water for agriculture (based on cropping pattern & practices) presently stands at 4.38 million hectare meter against the total availability of 3.13 million hectare meter. Hence, the deficit of 1.25 million hectare meter is met through over-exploitation of underground water reserves through tube wells, resulting in rapid decline of water table in the entire state (Kumar, 2012).

Over the last decade, 75 to 80 per cent of the water requirement of crops in the state have been met through tubewells. Consequently, water table is receding at a rate of over 70 centimeters per year. It is also estimated that if the conditions remain as they are, at the present rate of withdrawal of water from the aquifer, in the next about ten years, there will be no areas in the central Punjab with water table less than 25 meters deep. With the construction of Bhakhra dam, free flow of water and floods in the river basin that lies in the central Punjab have been controlled, canals have been lined and whatever excess water flows from the dam to the areas below has been canalised through constructing earthen banks (*Dhusi Bandhs*) of the river. Thus, water has been excessively diverted from the river basin and crop production has to depend up to about 80 per cent of its irrigation requirements on the underground water. The situation is not only unsustainable but more so it poses serious environmental challenges (Johl, 2006). Out of 137 blocks of the state, 103 blocks are overexploited, 5 blocks are critical, 4 blocks are semi critical and only 25 blocks are in safe category. All the blocks of various districts like Amritsar (16 blocks), Jalandhar (10 blocks), Moga (5 blocks), Kapurthala (5 blocks), Sangrur (12 blocks), Fatehgarh Sahib (5 blocks), Patiala (8 out of 9 blocks) and Ludhiana (9 out of 10 blocks) have been found to be over-exploited leading to sharp depletion of the water table in these districts. Other statistics related to water depletion in Punjab shows that deficit of 1.25 million hectares meters of water is being met through exploitation of ground water with 90 per cent of 137 development blocks being declared as Dark blocks (GOP, 2005).

Furthermore, growing of paddy leads to excessive withdrawal of underground water resulting in imbalance in the sense of withdrawal of water exceeding its recharge. The central Board on underground water has reported that in central districts of Punjab the underground water being withdrawn as a per cent of recharge exceeds almost everywhere, i.e., 350 in Jalandhar East block, 317 in Nakodar, 217 in Jalandhar West, 205 in Moga I, 187 in Moga II, 180 in Ahmadgarh, 169 in Sangrur and 119 in Mahal Kalan. It is also highlighted that non judicious pumping of ground water through tubewells and continuous decline of water table in central districts has resulted in the reverse flow of water towards Moga and Sangrur districts instead of going downwards towards south western districts. It is important to take cognizance of the fact that central Punjab has 72 per cent area under paddy cultivation, out of which only 21 per cent area has canal water irrigation facility. The tubewells in the central districts of the state constitute around 70 per cent of total tubewells in Punjab, which have increased from 1.92 lacs (0.91 electric and 1.01 diesel operated) in 1970-71 to 12.76 lacs (9.96 electric and 2.80 diesel operated) in 2008-09 and during 2009-10 number of tubewells has reached 13.15 lacs (10.65 electric and 2.50 diesel operated). There are indications that sweet water has turned brackish due to reverse flow of saline groundwater from south western zone. Thus, this situation of water balance is unsustainable in entire central districts of Punjab.

Another issue of concern is that water in a large part of the area which indicates positive ground water balance, is saline and hence unfit for consumption. Studies by PAU indicated that the proportion of this unfit water in Nihal Singh Wala block has reached to 30 per cent in 2004 as compared to 11 per cent in 1997. Besides, the village ponds commonly known as '*chhapper*' or '*tobas*', which once used to be the centre of thriving rural environment have been disappearing fast throughout the state. Presently most of the village ponds in the state have either silted or are filled up, encroached upon or being used for disposing village sewerage. The sewerage dumped in ponds has been further polluting the groundwater in their surrounding areas. Further, the filling of village ponds has reduced the natural recharging of underground aquifers in the state.

Decline in soil fertility

Maintenance of soil fertility is essential to sustain agricultural production. In the past three to four decades, intensive agricultural practices have put a tremendous pressure on the soils and resulted in steady decline in its fertility (nutrient availability), both with respect to macro and micronutrients. The soils of Punjab are low in nitrogen (N) content, low to medium in Phosphorus (P) and medium to high in Potassium (K), except in Kandi belt which has low to medium K content. The exploitive agricultural practices in past two to three decades have put a tremendous pressure on the state's soils and resulted in steady decline in its fertility, both with respect to macro (NPK) and micronutrients (zinc, iron & manganese) (GOP, 2011).

Both rice and wheat have high nutritional requirements and the double cropping of this system has been heavily depleting the nutrient contents of soil. For example, rice – wheat sequence that yields 7 tons/hectare of rice and 5 tons/hectare of wheat removes more than 300 kg N, 30 kg P and 300 kg of Potassium per hectare from the soil. Even with recommended rate of fertilization in this cropping pattern, a negative balance of primary nutrients still exists (GOP, 2006). More so, organic carbon content has been reduced to very low and inadequate levels in the state, because of very low or limited application of organic manures and non- recycling of crop residues. Burning of wheat and rice straw has also contributed to loss of soil fertility apart from causing air pollution. Punjab produces around 23 million tonnes of rice straw and 17

million tonnes of wheat straw, annually. This straw is rich in Nitrogen, Phosphorus and Potassium contents. However, instead of its recycling into the soil by mulching, it is burnt in the fields. This raises the temperature of the soil in the top 3 inches to such a high degree that Carbon: Nitrogen equilibrium in soil changes rapidly. The carbon as CO₂ is lost to atmosphere, while nitrogen is converted into nitrate. This leads to a loss of about 0.824 million tones of NPK from soil. This is about 50 per cent of total fertilizer consumption in the state. Considering that 90 per cent of rice and 30 per cent of wheat straw is available for recycling, it will be equivalent to recycling of 0.56 million tones of nutrients worth Rs. 4 billion. Moreover, agriculture experts also state that fire in the fields kills friendly pests and bacteria which increase the soil fertility.

Excessive use of chemical fertilizers and pesticides

Fertilizers are an important component of agricultural technology. Whereas initially organic fertilizers were mainly used in the fields, however, chemical fertilizers have played a very important role in enhancing the agricultural production in the state. Since the introduction of high yielding varieties, the consumption of chemical fertilizers has been increasing steadily. It has increased more than 8 times in the past 35 years from 213 nutrient thousand tones in 1970-71 to 1911 nutrient thousand tones in 2010-11. Moreover, the consumption of pesticides in Punjab was 5760 million tones of technical grade in 2010-11 which is second highest in India after Uttar Pradesh. It is worth mentioning here that in reaction to the prevalent use of toxic substances, from 1989 to 2003, GOI banned 28 pesticides for use in agriculture, many of which had already been removed from the international market by the Stockholm and Rotterdam Conventions. Unfortunately the banning of pesticides remains theoretical in nature (Kaur, 2012). The extensive use of fertilizers and pesticides have resulted in high concentration of nitrates, the accumulation of pesticide residues in soil, water flood and other agricultural products at levels that are much higher than tolerance limits which have serious health and ecological consequences.

Moreover, the policy of subsidy on fertilizers encourages the farmers for excessive use of nitrogenous fertilizers with relative under-utilization of other fertilizers and micronutrients. Unbalanced fertilizer use does not lead to immediately visible harmful effects but it adversely affects soil quality over time. Moreover, the injudicious use of fertilizers can practically cause all forms of pollution i.e. of soil, air and water. The soil pollution load further increases due to their reaction products and residues. Air pollution is also caused by the gases arising from fertilizer use in soil. The gases *viz.* ammonia, nitrogen dioxide, nitrous oxide, sulphur dioxide, hydrogen sulphide, etc. may not only vitiate air but could also lead to ozone layer depletion and global warming. No specific studies are however available in this respect in Punjab.

Emission of green house gases

The another issue of environmental degradation is not only in terms of high temperature, humidity, soil and water pollution, but more importantly in terms of the emission of green house gases i.e., carbon dioxide, methane and nitrous oxide that are emitted in to the environment from the paddy fields. It is estimated that rice crop growing in standing water over a period of 90 days produces more than 0.45 tones of methane, one hectare of rice crop over its growing period emits an equivalent of about 20 tones of carbon dioxide.

Effect on species

On the ecological front, out of 87 species of mammals that existed in the beginning of 20th century, only about 40 remain now, the others have become extinct. The same is true for all other species of fauna and also flora. It has serious ecological ramifications (GOP, 2006).

Economic Cost of agriculture

The performance of all important sectors in the economy ranging from agriculture to commerce and industry depends on the availability, cost and quality of power. Energy in the form of electricity plays a key role in performance of agriculture sector in Punjab as it is used most importantly in pumping ground water for irrigation purposes apart from other farm operations. After Gujarat and Haryana, Punjab has the highest annual per capita consumption of electricity in agriculture sector (Statistical Abstract of Punjab, 2005). The annual per capita sale of electricity use of agriculture was 34.73 per cent in 1970-71 which rapidly increase to 228 per cent in 2000-01 and 346 per cent in 2010-11 which is highest among other uses in the state. The demand for energy in agriculture in Punjab has increased from a meager 463 million Kwh units to 7314 million Kwh units from 1971 to 31st March, 2006 mainly due to ever increasing area under water guzzling paddy crop. About 45 per cent of total demand in the agriculture sector is concentrated in paddy season. This is peak demand of electricity in the state as it is unlikely that area under paddy would increase further. Punjab's self-generated thermal and hydel power accounts for 75 per cent of total power availability and the remaining 25 per cent being purchased from outside. For the last decade, due to poor monsoon, the state is buying power from outside sources to provide at least eight hours supply to farm sector especially during paddy season. It creates the scarcity of most important source of power for both present and future generations.

Further, the power supply to agriculture sector in the state is highly subsidised. It was totally free during the years 1997-2002. The state Government is again providing free electricity to all farmers from September, 2005. As per PSEB, Punjab has purchased power worth ₹ 51600 million during 2002 to 2005 from outside sources. This is being purchased at nearly ₹ 6 per unit but is provided free to farmers causing economic loss to the state.

More so, declining farm yield and income due to economic (high cost of inputs like, seeds, fertilizers, pesticides and farm labour, as well as, low MSP) and ecological (low productivity of soil, receding water table, etc.) factors is pushing marginal and small farmers into the vicious cycle of debt. Many of the productive activities like motor burn outs, tubewell deepening, and electric connection and use of tractors and heavy machinery cost a lot of money. But there is hardly any institutional credit available for these purposes. The high cost farming makes need of credit for day-to-day expenses in the farm sector, a necessity and the *aartiya*, a necessary evil. On the top of it, the poor quality of inputs and high cost debt for buying them makes matters worse. There is no doubt that the seasonal crop loan limits for different crops are inadequate to meet the higher and increasing cost of production (meet only 60-86 per cent of credit needs in major crops of the state) (Satish, 2006). This gap and the need of credit for other purposes, for which formal institutions do not offer any credit, pressurize farmers turn to *aartiyas* (commission agents) or money lenders. Seasonal repayment, being must in institutional sources before fresh loans for next season, makes things difficult for small farmers and they comes under the debt trap. The total indebtedness is around ₹ 240 million, i.e., 50 per cent each from Institutional and Non Institutional sources for the loans taken for tractors, tubewells, farm

chemicals, seeds, as well as, for other social needs (GOP, 2007-08). The indebtedness of Punjab farmers on an average is ₹ 41,576 against the national average of ₹ 12,585.

Moreover, as already discussed that there is a situation of over capitalisation of farm sector when more than 70 per cent of the farms are below 10 acres each and 26.50 per cent of the farmers have a holding of less than one hectares each in Punjab. Another 18.26 per cent have between 1 and 2 hectares, i.e., nearly 45 per cent of farmers are small and marginal farmers with a holding size of below 2 hectares. These farmers are not able in position to mobilize resources for a submersible pump, tractor and other heavy machinery. The loss of most reliable source of production affect their livelihood, land values and causing deep concern to small and marginal farmers and create social unrest in rural Punjab (Sidhu, 2005). At the structural level, these problems have led to reverse tenancy, lack of effective farm industry linkages and suicides of farmers.

Social Cost of Agriculture

The rampant use of pesticides and agro-chemicals to achieve the green revolution is responsible for high incidence of cancer and other diseases in Punjab. Punjab has become the cancer capital of India due to rising use of pesticides and fertilizers (Kumar, 2012). Union Rural Development Minister Jairam Ramesh in his visit to Punjab confirmed the presence of substantial quantities of uranium, arsenic, mercury and other heavy metals in the tested samples of groundwater in the state and serious efforts are afoot to control the damage. Of the 2462 samples of water collected from tube wells across Punjab, 1140 samples had tested positive for the presence of uranium and arsenic. The level of uranium in the ground water is 50 per cent over the WHO norms. The worst affected regions are found in south west Punjab's fertile *Malwa* belt, i.e., the area south of the river *Sutlej* -- comprising the districts of Mansa, Bathinda, Moga, Faridkot, Barnala, Sangrur and some parts of Ludhiana. Muktsar and Bathinda reported the maximum of 75.1 and 75 incidences of cancer patients per one lakh population, respectively, which is more than double the state average. Besides this, there is continues rise on other diseases and children being born with abnormalities. In fact, a train that connects Bathinda with Bikaner in neighbouring Rajasthan is known as the 'Cancer Express' as it ferries a large number of cancer patients from Punjab to Bikaner for treatment at a cancer hospital (The Hindu, 2012). Moreover, a house-to-house survey conducted by the State Health Department in June 2005 in 4 districts of Muktsar, Bathinda, Faridkot and Mansa found the prevalence of cancer is 30.54 per lakh population whereas the prevalence in India is 125 per lakh which is a very serious problem for the state. While the health department of Punjab claimed detecting 5276 cancer patients in Punjab, the information procured under the RTI by a voluntary organisation, *Bhai Kanhaiya Cancer Roko Sewa Society* in Faridkot, revealed that as many as 6,434 cancer patients were presently receiving treatment at just two government medical colleges in Punjab. While there are other government, private, charitable hospitals in and outside Punjab from where the patients from the state are receiving treatment (The Tribune, 2012). Govt of India has included three districts namely Bathinda, Mansa & Hoshiarpur under the National Cancer Control Programme.

Further, a study conducted in 2005 by Center for Science and Environment in Delhi found 11 of 14 pesticides including DDT, chlordane, malathion, endosulfan in high quantity and frequency in the blood of Punjabi farmers. Notably, more than half of these substances have been banned by the Stockholm and Rotterdam International Conventions. In comparing the data from this study to one conducted by the U.S. Center for Disease Control and Prevention, the concentration of these pesticides in the blood of Punjabis was 15 to 605 times greater than the concentration of the same compounds found in U.S. farmers. The main reasons for the

detrimental health effects include the increase in pesticides and fertilizers required to support High Yield Variety seeds, the continued use of internationally banned chemicals, the pesticide contamination and disposal of hazardous wastes in drinking water, and the lack of education on safety precautions for handling toxins.

III. Conclusion and Policy Implication for Environment Management in Punjab Agriculture

Our study examines the various issues related to the environmental cost along with ecological, economic and social effects of adoption of Agriculture Development Model in Punjab. The study concluded that Punjab has witnessed a tremendous increase in production of wheat and rice with introduction of new agricultural practices since mid 60es. However, it results in over intensification of agriculture over the years and led to overall environment degradation in the state. On the economic front high cost and diminishing economic returns from agricultural practices affecting the socio-economic condition of framers. Furthermore, increase in demand of water for paddy cultivation results in faster depletion of ground water in the entire state (except south western part). Out of 137 blocks of the state, 103 blocks are overexploited, 5 blocks are critical, 4 blocks are semi critical and only 25 blocks are in safe category. Burning of wheat and paddy straws by farmers in the fields create environment pollution to great extent, decrease soil fertility and kills friendly pests and bacteria. Moreover, excessive use of chemicals and internationally banned agro-chemicals and pesticide is responsible for high incidence of cancer and other diseases in Punjab. The worst affected regions are found in south west Punjab's fertile Malwa belt, i.e., the districts of Mansa, Bathinda, Moga, Faridkot, Barnala, Sangrur and some parts of Ludhiana.

To overcome these problems there is now a need to pay special attention by our policy makers, farming system and community if they really want to see Punjab's healthy present and sustainable future. In this regard some policy measures are given as below:

More significantly, there is dire need for sustained pressure on governments to implement the judicial and legislative reforms. To tackle with the problem of depletion of water table, the number and spacing of tubewells should be regulated through a suitable farmer friendly law. The quantum and timing of pumping out water also be regulated through a price regime and a strict control over the supply of power to tubewells by Punjab State Electricity Board. Punjab has paid a huge environment cost for adoption of mono-culture cropping system in the state. Therefore, for sustainable development of agriculture, farmers should encourage to go for diversification from rice-wheat cropping system to high value crops, i.e., pulses, oilseeds, potato, sunflower, onion, cotton, basmati rice, sugarcane and fruits and vegetables carefully earmarked for different agro-climatic sub-zones based on comparative advantage.

More importantly, presently, a massive reduction in area under wheat and paddy is neither desirable by farmers, nor approved by centre and state governments. Therefore, assignment of quota for various crops to each Punjab farmer under assured procurement and minimum support price programme will ensure a gradual and painless reduction in area under wheat and paddy. Awareness in this concern can be amplified by different NGOs, social organisations and state's urban and local bodies through organising different workshops and seminars on such sensitive issue and encourage public participation to protect and manage state forests and other natural resources and encourage farmers to grow trees on farm sides and boundaries and optimal use of fertilizers and pesticides. Despite lot of interest and discussion on diversification no serious efforts have been made to identify and encourage area specific

activities. General type recommendations are being made for whole of the state. There is a need to identify and adopt area specific enterprises taking into account the ground water status, soil health and other micro characteristics of different regions.

Hybrids and other high yielding varieties need more inputs in terms of fertilizers and water. The farmers should encourage for organic farming and use of bio-fertilizers and traditional organic seeds, as many studies found that traditional varieties are nutrient rich and develop immunity to many chronic diseases. The organic markets in the country have already started selling such produce. There is urgent need to develop these markets in the state. In order to encourage farmers to shift cropping pattern, the corporate farming can play a positive role by initiating export of fresh fruits and vegetable and development of agro-industrial products. As part of diversification plan, the state has introduced four councils, i.e., Council for Citrus and Agri Juicing, Organic Farming Council of Punjab, Council for Value Added Horticulture and Viticulture Council of Punjab in 2006 as a joint venture by pepsico and the state governments' Punjab Agro Foodgrains Corporations. Still, achievements in this concern are quite less than required. Lastly, dairying is the best choice for agricultural diversification in the state, ecological as well as economic grounds. It has vast potential for growth in employment and income and for restoring soil health. Efficient and modern system of marketing and processing is required to give boost to dairy industry in the state.

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