ISSN PRINT 2319-1775 Online 2320-7876, www.ijfans.org
Vol.11, Iss.7, Dec- 2022

UGC CARE Listed (Group -I) Journal

Research Paper

Linking Agriculture and Ground Water Resources in Punjab

Dr. Harpreet Singh
Assistant Professor,
Department of Geography,
Banaras Hindu University, Varanasi 221005
Email: harry161980@gmail.com

Abstract
With only 1.5% of the country's total land area, the state of Punjab has achieved significant growth in the agricultural industry, particularly in the area of food crops. Green revolution boosts the agriculture in the state. Punjab is known as the "breadbasket" of the country due to high production of food crops. To sustain the existing level of agricultural growth in mono-crops (rice-wheat) the natural resources are being overused. The state of Punjab is facing problem of depletion of ground water. The modern practices of agriculture has put a big question mark on the further use of ground water any more for agriculture. Through market incentives, some land must be converted to acceptable alternative crops, especially in areas where rice production is low. The promotion of drip irrigation and sprinkler systems should be a major focus in order to use water resources wisely.
Keywords: Punjab, Wheat, Rice, Water Resource, Green revolution, agriculture

Introduction:
'Punjab' refers to water. It is a combination of two Persian words, *panj means five and āb means water*. Literally translated as "The Land of Five Waters," Punjab refers to the five rivers Jhelum, Chenab, Ravi, Sutlej, and Beas. The name 'Punjab' signifies the importance and domination of state's water resources. But now the state of Punjab is facing problem of depletion of ground water. The modern practices of agriculture has put a big question mark on the further use of ground water any more for agriculture.
With only 1.5% of the country's total land area, the state of Punjab has experienced significant growth in the agricultural industry. The State has achieved tremendous growth in the production of food crops mainly wheat and rice. The high production of wheat and rice solves the food problem of the country and helped in the eradication of poverty. Punjab's agriculture has advanced to a high degree but at the cost of over-exploitation of natural resources, particularly groundwater resources. Green revolution lead factors like technological advancement, highbred variety of seeds, price policy, market infrastructure and low cost of irrigation has shifted the traditional diversified crops to the mono-culture of rice-wheat crops. But to sustain the existing level of growth in mono-crops (rice-wheat) the natural resources are being overused. And the sustainability of existing crop systems is becoming doubtful, creating critical situation and many related problems. Because the fast increase in area under rice and wheat appears to be unsustainable due to the fast decline in water table. It is going to be a threat for further environmental issues and health issue. Such an intensive agricultural production in the state has caused environmental degradation such as fall in water table, deterioration in soil health, perpetuating pest problem and eroding bio-diversity, apart from imbalanced use of farm resources and associated social problems, etc. (Singh et al.,1997).

Study Area:
Geographically, the state of Punjab is located in the northwestern part of India. It has extends

ISSN PRINT 2319-1775 Online 2320-7876, www.ijfans.org
Vol.11, Iss.7, Dec- 2022

UGC CARE Listed (Group -I) Journal

from 29.30°North latitudes to 32.32° North latitudes and from 73.55° East longitudes to 76.50° East longitudes. It has an area of 50,362 square kilometers (19,445 square miles). It shares international border with Pakistan on its west, and with the state of Jammu & Kashmir on the north, and with the state of Himachal Pradesh in the north east and on the south it is bounded by Haryana and Rajasthan.

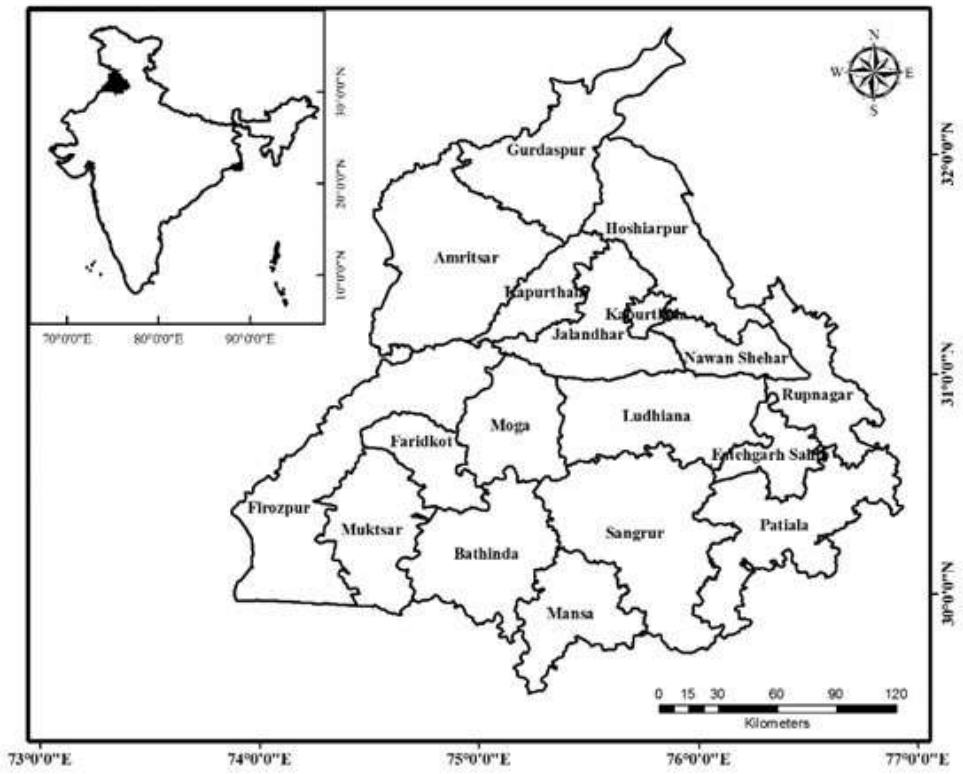

Fig.1

Objectives of The study:

The present study seeks to understand the following objectives;

1. To understand the link between green revolution and agriculture in Punjab.
2. To understand the link between agriculture and the over use of groundwater.

Database and methodology:

For the proposed study, the secondary sources of data are used. To provide the background and facts to the study of mono-croping and associated ground water problem, the available secondary data on land use, cropping pattern, average yield of different crops in the state, area irrigated by different sources etc. is used. To support the facts and data few studies on this aspect already carried out were also reviewed. The data from the department of agriculture and from Punjab agricultural university were the main contributor to the study. Various statistical diagrams are used to represent the data.

Result and discussion:

Green revolution and agriculture in Punjab: The first phase of green revolution in India was started in the late 1960s. The state of Punjab was one of the major states which were benefited from green revolution. The green revolution and its technology transformed the agriculture of the state and it becomes the "bread basket" of the country. The production of the food crops goes high mainly because of (i) availability and distribution of high yield in varieties of seeds (ii)

increased irrigation by maximum use of ground water with large scale development of tube wells (iii) maximum use of available fertilizers (iv) favorable government policies like subsidies on electricity (v) incentives from market with high Minimum Support Price for rice as well wheat crops. Green revolution boosts up the production of wheat and rice in Punjab. Recent data from statistical abstract of Punjab, 2013 shows that Punjab has highest average yield of paddy in India i.e. 4716kg./ha.

TABLE-1 PUNJAB: PRODUCTION OF MAJORCROPS

Major Crops(Production in lakh MT)				
Years	**Rice**	**Wheat**	**Cotton**	**Sugarcane**
1960-61	2.5	15.43	4.92	1.46
1970-71	4.29	25.34	3.45	1.41
1980-81	13.04	30.99	7.15	0.78
2000-01	28.79	37.56	5.22	1.33
2012-13	31.36	38.82	5.3	0.91

Source: Department of Agriculture, Punjab, 2013

It is evident from table 1 that the production of food crops especially wheat and rice goes high after 1960s the period which experiences green revolution in the state of Punjab. The trend of crop diversification now turned to the monoculture of the food crops mainly wheat and rice. The constant increase is seen in the production of wheat and rice from 1960-61 to 2012-13 whereas the production of cotton shows decline from 1960-61 to 1970-71 and further increase in subsequent years till 1990-91 but again the production slowed down to 474 thousand MT and 481 Thousand MT in the years 2000-01 and 2012-13 respectively. In the same way the production of sugarcane also shows a sharp decline from 1960-61 to2012-13 with little improvement in1990-91and 2000-01. The period of 1990-91 is seen as period of growth because of liberalization of economy of India.

***Agriculture and Exploitation of Ground Water*:**

The net area sown constitutes around 4.2 million hectares of the state's total 5 million hectares geographical area. Fallow land has been converted to cultivated land, and the unproductive land was reclaimed. In terms of net irrigated land (percentage), Punjab State leads all of India, and the agricultural industry uses about 85% of the state's water. Additionally, the cropping intensity increased from 126 to 190 percent. There is now an even greater need for water resources due to the increased area of land covered by crops. Thus, the exploitation of the natural resource water, particularly ground water, has been trumped by the selection of crops with higher water requirements. The amount of water needed over the past five decades has increased by nearly 170 percent due to a rise in the area under cultivation, cropping intensity, and change in crop pattern. According to estimations, the state's total annual demand for irrigation water is 4.76 million hectare meters (mhm), compared to the state's entire annual supply of 3.48 mhm from canals and ground-water resources. On an annual basis, a net shortage of 1.28 mhm (Jain, A K) is left over as a result of this excessive demand, and this deficit is filled by overusing groundwater supplies through tubewells. A total of 84 percent of the area that is irrigated now receives water from tubewells, which have almost doubled in number during the past two decades.

ISSN PRINT 2319-1775 Online 2320-7876, www.ijfans.org
Vol.11, Iss.7, Dec- 2022

Research Paper
UGC CARE Listed (Group -I) Journal

Punjab: Net irrigated area by various sources

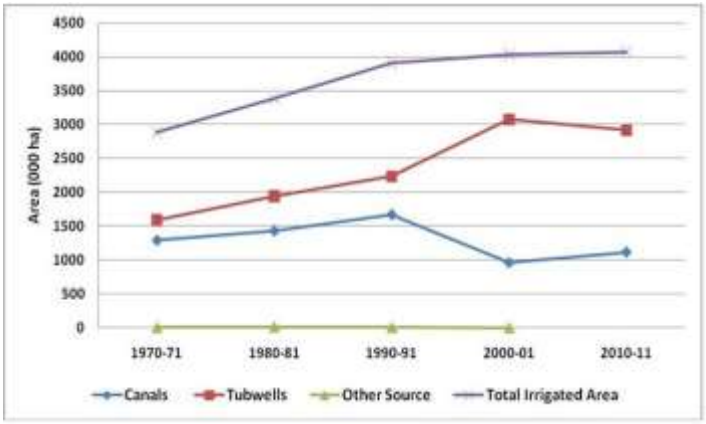

Fig.1

Fig.1 shows that among various sources of irrigation tubewells are the first preference of the farmers of Punjab. The sudden rise in the number of tubewells is seen from 1990-91 onwards. The preference of more numbers of tubewells is directly linked with the overexploitation of the ground water. It is evidenced that as the number of tubewells increased in the state the exploitation of ground water increased. The increase in tube-wells from 192 thousand in 1970–1971 to 1276 thousand in 2008–2009, while the coverage of canals decreased in all regions of the state, further confirms the fact that water is being over-exploited. In certain locations, the ground water level dropped by as much as 0.75 to 1 m/year. Excessive exploitation has lowered the groundwater table below the threshold depth of 10 meters in several regions. The rate of fall in water table was 18 cm during 1982-87; which increased to42 cm during 1997-2002 (Hira et al, 2004) and further to 75 cm during 2002-06 (Singh, 2006). Annual ground water extraction in Punjab is 31.16 billion m3 as opposed to 21.44 billionm3 availability.

TABLE-2: DISTRIBUTION OF BLOCKS IN DIFFERENT CATEGORIES ON BASIS OF UNDER GROUND WATER RESOURCES IN PUNJAB

S.No.	Category	2000	2005	2010
1	Safe	27.54	18.25	16.67
2	Semi-critical	11.59	2.92	1.45
3	Critical	7.97	3.65	2.17
4	Over-exploited	52.9	75.18	79.71
	Total	100.00	100.00	100.00

Source: Jain AK, Department of Soil &Water Engineering, PAU, Ludhiana

Out of 138 blocks in the state, 110 blocks were overexploited in 2010, with exploitation exceeding 100% of the annual net recharge of water. Two blocks fell into the critical category (exploitation above 85%), while three blocks fell into the semi-critical category (exploitation between 65 and 85%). Therefore, there were only 23 blocks that were deemed secure. In other words, groundwater has been overexploited across 80% of the state's overall geographic area, with another 4% falling into the critical or semi-critical category.

Conclusion:

The natural resources are being rapidly exhausted in Punjab to maintain the current plateau of agricultural expansion. The primary cause of ground water depletion and concerns with

sustainability is currently the enormous area of land produced for rice, along with the prevailing production method, which is quite intensive. Therefore, switching from wheat and rice monocultures to other crop rotations is crucial for soil and water conservation. The wise use of water resources and their conservation should be prioritized. The state's central regions' falling water tables deserve special attention.

References:

1. Batta Nidhi,2007"Judicious Use of water Resources", Compiled in http://www.dswcpunjab.gov.in/contents/data_folder/Nidhi_Batta_Paper.htm
2. Draft Policy for Management and Utilization of Paddy Straw in Punjab, 2013. Department of Science, Tech. &Environment, Govt. of Punjab.
3. Economic & Statistical Organization, Punjab, "Statistical Abstract of Punjab", Chandigarh, India. Various issues.
4. Gupta, R. Detal 1995."Availability and quality of Ground water in Punjab State". In: Water Management, Punjab Agricultural University, Ludhiana, pp 18-42.
5. Hira, G.S. and Khaira, K.L.2000."Water Resource Management in Punjab under Rice-Wheat Production System",Research Bulletin, Punjab Agricultural University, Ludhiana,p84.
6. Jerath, Neelima; Ladhar, Satnam Singh; Singh, Gurharminder; 2014.State of Environment, Punjab-2014, Punjab State Council for Science and Technology, pp 126
7. Kumar et al 2005. "Water resources of India", Current Science,89(5)
8. Prihar, S.S et al. 1993. "Water Resources of Punjab", Punjab Agricultural University, Research Bulletin, p 60.
9. Singla,T.L.,1992."Groundwater Recharge Programme–Present status and scope".Water Resources Day, Vol. I, Punjab Agricultural University, p 1169-73.
10. Singh, Joginder et al.1997."ChangingScenarioofPunjabAgriculture-AnEcologicalPerspective", Bulletin by Centre for Research in Rural & Industrial Development, Chandigarh, India.
11. Singh Joginder and Hossain M. 2002. "Total factor productivity analysis and its components in a high potential rice-wheat system: a case study of the Indian Punjab". P. 409-417 in Sombilla M, Hossain M and Hardy B, editors. Developments in the Asian rice economy, 3-5December 2001,Los Baños, Philippines: International Rice Research Institute. 436 p.
12. Singh, Joginder, 2004. "An Analysis of Depleting Water Resources of Indian Punjab and Policy Options" in Workshop proceedings on Groundwater Use in North-West India, Centre for Sustainable Agriculture, New Delhi, P.166-177.
13. StateofIndianAgriculture, 2012-13. Published by Department of Agriculture & Cooperation, Govt. of India, New Delhi.Pp-247.
14. Statistical Abstract of Punjab, 2012. Published by Directorate of Economics and Statistics, Government of Punjab.
15. Tiwana, N.S; Jerath, N; Ladhar, S.S; Singh, G; Paul, R; Dua, D.K and Parwana, H.K, 2007. State of Environment; Punjab-2007, Punjab State Council for Science and Technology, pp243.