Changing Cropping Patterns and Irrigation Practices: Implications for Promoting Sustainable Growth of Agriculture in West Bengal, India

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Abstract
The relationships between availability of irrigation facilities and changes in cropping patterns, especially in an agrarian economy like India, require deeper investigation for rational use of water and promoting sustainable growth of agriculture sector. The existing studies generally focus on how access to irrigation can change cropping patterns. Accordingly, policy changes and institutional arrangements are suggested to provide the farmers greater access to irrigation facilities. While this is imperative to promote inclusive agricultural growth, ensuring its sustainability requires exploring how changes in cropping patterns subsequently affect extent and patterns of irrigation. In this perspective, the present paper attempts to understand how changes cropping patterns have affected irrigation requirements and its structures in the Indian state of West Bengal. While deeper investigation at micro level is necessary to draw more robust conclusions, initiatives should be taken towards guiding the farmers towards choice of appropriate cropping patterns for more judicious use of water. The local level institutions like water users' association should play a crucial role in this regard.
Keywords: Irrigation, cropping patterns, crop diversification, sustainable growth, West Bengal.

1. Introduction

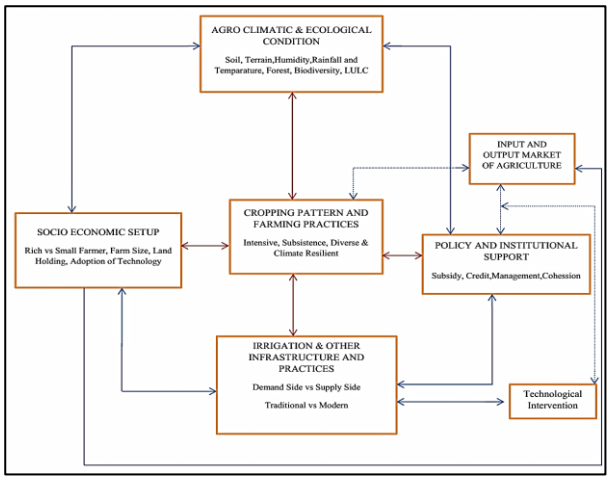
Agriculture is the primary source of livelihood for about 58 per cent of India's population. As the Indian economy has diversified and grown, agriculture's contribution to GDP has steadily declined from 1951 to 2011 (FAO, 2012). The slow-down in agricultural growth has become a major cause for concern. Inadequate infrastructural support, especially limited irrigation facilities coupled with policy bias, institutional constraints, and mismatched agro-ecological planning over the years have led to low productivity and slowed growth of the sector. As the water resources are also limited and water for irrigation must contend with increasing industrial and urban needs, so raising productivity per unit of land will need to be the main engine of agricultural growth. In this perspective, gap between potential created and potential utilized is to be bridged to provide the benefits to farmers. Thus, appropriate cropping systems and practices have been critical aspects of Indian agriculture, particularly in the rainfed agriculture, where house the largest proportion of the country's total poor. Furthermore, ways to radically enhance the productivity of irrigation (more crops per drop) need to be found. We have not taken worthwhile steps until now for improving water efficiency through redevelopment of existing systems of major and medium schemes, which have worsening over the years. While irrigation through watershed development can lead to a win-win situation by complementing agricultural productivity, property rights are expected to provide incentives for sustainable farming practices and promoting inclusive growth of agriculture. The local level institutions like water users' association should play a crucial role in this regard. So, sustainable agriculture intensification is the only future of agriculture as this system is more economically viable, environmentally safe and socially fair (Wezel et al., 2015).

2. Literature Review

More than sixty percent of the country's poor inhabited in rural areas and primarily engage in farming activities, hence, India's proper developmental strategy lies on agriculture still now (Behera and Mishra, 2018) **.** But, Socio-economic pressures and climate change inflict confinements to water allocated to agriculture (Jensen, 1993). Irrigated farming is expected to expand rapidly in the future with subsequent increase of water use for irrigation (Chartzoulakis and Bertaki, 2015). Technological initiative and breakthrough along with institutional arrangement for both management and

mobilization of resources purposes driving the will of water resource sustainability in agriculture sector. (Palanisami. et. al. 2010). To arrest over extraction of groundwater, these surface water sources should be renovated and a conjunctive use of the both surface water and groundwater irrigation through integrated development of both of the sources can be exercised (Laha and Arambagh, 2017). So traditional water harvesting system along with tanks and ponds, which were neglected by the government and communities also need to be renovated to coping up the climatic vagaries and proper water management in agricultural purposes (Behera and Mishra, 2007). There is no pragmatic consideration for sugar cane in Marathwada, or even in the Gangetic plains in western Uttar Pradesh, eventually, wheat–rice cycle in northwestern India (Thakkar, 2019). So, Agro ecological management approach desperately needed to achieve a sustainable agricultural ecosystem utilizing local resources, local wisdom, in production (Koohafkan and Altieri, 2011). Emphasizing and stimulating crop diversification are the key strategies to be pursued in future (Haque, 2003) reducing dependence on monoculture cropping for income and employment (Rosegrant. et. al, 1995). In developing agro- ecological practices, the question of diversification is destiny in terms of run-off, infiltration and crop period management planning purposes (Wezel et al., 2015).

5. Conceptual Framework



Sustainable Growth of Agriculture (By Authors)

6. Findings and Conclusion

The paper finds that there has been significant shift of cultivated area towards boro paddy, although aman paddy still remains the most important crop in the state. Further, while area under high yielding paddy, jute and vegetables as proportion of gross cropped area has increased, that under pulses has declined sharply. Such changes in cropping patterns coupled with drying natural water bodies with high siltation, degraded environment and ecosystem, erratic rainfall and deterioration in quality of surface water seem to have created further pressure on groundwater level and generally, use of limited drip irrigation regime with 50% of water requirement had significant benefits in terms of saved irrigation water. Beside study indicates that the relation between irrigation intensity and cropping intensity remained positive and it became stronger. The indices of diversification in different districts of West Bengal, besides being remunerative, also require less irrigation which makes them ideal for cultivation in the areas with less rain or irrigation This is very important for promoting sustainable growth of agriculture in the state that has five major cropping clusters backed by possibly the most successful three-tier Panchayats institutions in the country to facilitate optimum utilization of local resources and expertise. The governance on water should be transparent, adequate and participatory in nature beyond political clotting. Initiatives should be taken towards guiding the farmers towards choice of appropriate cropping patterns for more judicious use of water a crucial role in general and achieving food and nutritional security in particular. Similarly, the results of some Government initiated programs on water and crop resource management specified with justified irrigation adoption made famers self-sufficient by using different land use patterns; production diversified crops of some areas West Bengal, which showed a good sign for achievement of the target.

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