Plant Archives Vol. 25, Supplement 1, 2025 pp. 2247-2253 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.supplement-1.309

A PREVALENT ANALYSIS ON CHANGING FARMING PATTERNS: FOR JAGRAON BLOCK, DISTRICT LUDHIANA PUNJAB, INDIA

Anupreet Kaur* and Jaidave Prasad Sharma
Department of Geography, Shri Khushal Das University, Chak 7STG, Khushal Nagar, Suratgarh - Hanumangarh Rd, Near Toll Plaza, Rajasthan 335801, India
*Corresponding author Email: abshaark001@gmail.com
(Date of Receiving : 06-10-2024; Date of Acceptance : 10-12-2024)

ABSTRACT

In recent years, Punjab, the agricultural heartland of India, has witnessed a significant shift in its cropping pattern. Traditionally known for its wheat and rice cultivation, Punjab is now embracing diversification inducing due consideration to upcoming new crop and practices for improving the environmental and economic challenges associated with mono-cropping. This shift in the cropping pattern not only aims to ensure sustainable agriculture but also holds the potential to transform the state's agricultural landscape and enhance farmers' livelihoods.

By transitioning to a more diverse cropping pattern, farmers in Punjab can reduce their reliance on water-intensive crops like rice, which is crucial in a region facing water scarcity issues. The introduction of alternative crops such as pulses, oilseeds, and vegetables not only conserves water but also improves soil health and reduces the need for harmful chemical fertilizers and pesticides. Additionally, this shift opens up new avenues for income generation as farmers can now tap into lucrative markets for organic produce and niche crops, thereby increasing their profitability and resilience to counter the fluctuating market rates and consumer needs.

Furthermore, the cultivation of alternative crops diversifies the farmers' income profile, decreasing the susceptibility with respect to cost volatility and changing consumer needs due to more health-oriented diets. This shift also promotes sustainable farming practices, as it encourages crop rotation and reduces the risk of soil erosion and degradation. Moreover, the introduction of these alternative crops can help in addressing food security concerns, as they offer a wider variety of nutritious options for consumers. Overall, this shift in farming practices not only benefits the farmers but also contributes to the sustainable development of the region.

Keywords **:** Crops, cropping pattern, crop analysis, alternative crops, cultivation, diversification.

Introduction

The cultivation of alternative crops can lead to increased biodiversity in the region. By growing different types of crops, the cultivator originates ecosystems attracting a variety of favourable nitrogen binding bugs. These, in turn, helps to maintain ecological balance and reduce the need for harmful pesticides. Furthermore, the introduction of alternative crops provides safer options to increase the variety for farmers. With the growing demand for organic and locally sourced produce, farmers can pick up the niche market source and dominate the produce. Ultimately, the shift towards alternative crops not only improves the economic well-being of farmers but also contributes to a more resilient and sustainable agricultural system.

Making a combination of crops, landlords may also decrease the dependability towards predominant produce, which is beneficial in mitigating the risks associated with pests, diseases, and climate change. Additionally, alternative crops often require less water and fertilizer compared to conventional crops, making them more environmentally friendly, Gautam R. and Sangwan B. (2021). This shift towards alternative crops can also promote biodiversity by preserving traditional and heirloom varieties, which helps to

safeguard genetic diversity and prevent the loss of valuable plant species. Overall, embracing alternative crops may route up towards resilient/sustainable farm production for future.

The changing range for produce grown, farmers can also reduce their vulnerability to market fluctuations and economic uncertainties. This can provide them with a stable income throughout the year, as different crops have different growing seasons and market demands. Furthermore, alternative produce has health-oriented ratings, offering consumers a wider variety of healthy and nutritious options. These may contribute for holistic iodation for well-being by promoting a more balanced and diverse diet. Ultimately, embracing alternative crops not only benefits the environment and farmers, but also society as a whole.

This can help ensure food security and stability in the local and regional food supply. Additionally, alternative crops often require less water and fewer chemical inputs, making them more environmentally sustainable and reducing the negative impact on ecosystems. This shift towards alternative crops can also foster innovation and entrepreneurship in agriculture, as farmers explore new markets and value-added products.

Revolving their produce, cultivators may also decrease any further consequences, infection and varied temperature fluctuations with water depletion that may affect a single crop. This can help ensure food security and stability in the local and regional food supply also suggested by Firdaus G. (2016). Additionally, alternative crops often require less water and fewer chemical inputs, making them more environmentally sustainable and reducing the negative impact on ecosystems. This shift towards alternative crops can also foster innovation and entrepreneurship in agriculture, as farmers explore new markets and value-added products.

One key challenge that alternative crops can help address is the issue of climate change. As temperatures rise and weather patterns become more unpredictable, traditional crops may struggle to adapt and thrive. However, alternative crops that are more resilient to changing conditions, such as drought-tolerant varieties or heat-resistant species, can offer a solution. By diversifying crop options, farmers can mitigate the risks associated with climate change and ensure a stable food supply even in the face of environmental uncertainties.

Apart from considerable advantages for agricultural ecosystem, alternative crops can also have positive social and economic impacts. For example, certain alternative crops may require less labour-intensive cultivation practices, allowing farmers to reduce their workload or allocate resources to other income-generating activities. Moreover, the cultivation of unique or niche alternative crops can create new market opportunities, both domestically and internationally. This diversification of agricultural products can enhance rural livelihoods, generate economic growth, and improve rural communities.

However, its more crucial to acknowledge that the adoption of changing cropping patterns is not without challenges. Farmers could have barriers for example, scarce information, lack of technical expertise, or inadequate infrastructure for processing and marketing these crops. Therefore, supportive policies, investments in research and development, and capacity-building programs are crucial to facilitate the successful integration of alternative crops into agricultural systems.

Factors influencing changing cropping patterns

The changing cropping patterns are influenced by various factors. One of the key factors is the integration of alternative crops into agricultural systems. This practice offers numerous advantages for the agricultural sector, the environment, and society as a whole. By diversifying crop options, addressing climate change, promoting biodiversity, and creating economic opportunities, alternative crops may lead to a power packed produce/food system. It is important to provide the necessary support and investment to facilitate this shift towards alternative crops, as it has the potential to transform the cultivation to regulate an agricultural ecosystem capable to lead the upcoming conditions.

Review on changing cropping patterns

Sekhon *et al*. (2010) has evaluated technological productivity of agricultural produce in Punjab state to see how various zones had incorporated contemporary technologies. In 2005-06, primary data was acquired using a three-stage stratified random sampling procedure. To determine the technical efficiency of each farm, the particular stochastic frontier production function was computed. According to the study's findings, even though Punjab is an agriculturally wealthy state, there is still a need to increase farm technological efficiency. The technical efficiency indicated a substantial variance across zones; the centre zone was determined to be 90% more efficient than the south western and sub-mountainous zones. Disguised unemployment in the sub-mountainous area was also

explained by the Agri-production functions and comparative findings.

Rehima *et al.* (2013) A primary survey of 300 plus farmers was started in order to gauge Ethiopia's degree of diversification. The diversification scenario has been seen using the Heckman two-stage model and the Margalef index of richness. To evaluate the elements driving Ethiopia's agricultural diversification, Probit and OLS were created. Diversification is positively influenced by the variable gender, indicating that households headed by women are more likely to diversify. Diversity is positively impacted by additional education, landholdings, plots, and market distance. Factors like plot fertility, trade expertise, and membership in social groups have a detrimental effect on crop diversification.

Vashisht *et al.* (2013) investigated how wheat production and water productivity will be affected in a scenario of climate change. The results indicate that throughout the mid-century period from 2021 onwards, and increases the risk of elevation in climatic conditions decrease wheat production percentage considerably.

Jalota *et al.* (2014) has studied the climate shocks in terms of agricultural productivity, water balance, and nitrogen balance. They also investigated crop planting date postponement as an adaptive method. Climate shocks would rise in the mid- and end-of-century time slices of the 21st century, resulting in lower agriculture productivity due to crop duration shortening.

Sichoongwe *et al.* (2014) the determinants and intensity of crop diversification among small land holding size in Zambia's southern province were investigated. The Tobit model was used to test the diversification drivers. They utilised secondary data for this analysis. Crop diversification was shown to be positively and substantially influenced by characteristics such as landholding size, fertiliser quantity utilised, plough tillage, and market distance.

Firdaus (2016) cropping patterns in developing nations are shifting from cereals to noncereal cash crops, however there is a lack of research examining the source and effect link of this phenomenon. The current study sought to examine the consumption patterns of important food products and their influence on cropping patterns in India as a whole, as well as in the National Capital Territory (NCT) of Delhi in particular. This has demonstrated the influence of shifting consumption habits on cropping patterns.

Singh *et al.* (2017) analysed preferred resource usage productivity and identified Using data from the 2008 and later large crop cost of cultivation surveys at the plot level to determine its causes. Technical efficiency was initially evaluated using the DEA approach, and then the many factors that contribute to technical efficiency variance were identified using Tobit regression. The findings indicated bigger land coverage were technically efficient than small holding sizes across all crops. Furthermore, this was shown that larger cultivated land sizes utilised more equipment and fertiliser per acre and needed less work. Conversely, compared to medium and large farm size producers, low land holding cultivators utilised more irrigation hours per hectare. As a result, the overall findings imply that focus should be placed on increasing operational land holding size through consolidation.

Bidyadhar Majhi *et al.* (2018) has reported that, the agriculture sector in India has seen significant changes in terms of area under cultivation, cropping pattern, productivity, use of technology, land holding pattern and reforms, use of fertilisers and pesticides, irrigation pattern, and area under cultivation. Irrigation, the utilisation of high-yielding seed varieties, and so forth. Various researchers have conducted study on issues related to the aforementioned agricultural factors and their changing dimensions over the years, with differing research conclusions. It should be noted that, among the aforementioned difficulties, there has been a lot of interest in studying the shifting cropping crop pattern of agriculture in India, which has a big impact on agricultural productivity and the volume of agricultural output of different crops.

Waha, (2020) have deployed national and sub-national data on monthly crop-specific growing areas for 26 crop groups around the year 2000 (1998-2002), Crop harvested areas and the quantity of farmland worldwide are used to determine sequential cropping systems that include two or three crops with non-overlapping growing seasons. On more than 100 million hectares, they detected several agricultural systems, with fewer than 80 million hectares under irrigated agriculture. Multiple cropping methods are crucial for grain production, as seen by the fact that they account for rice, wheat, and maize land, respectively.

Singh (2020) considered the Micro-level data on farmers' perceptions of climate change and adaptation choices comes from India's Bundelkhand Region. To identify research locations and respondents, a multi-stage sampling procedure was used. Using a well-structured and pre-tested programme, 200 sample households of various land size groups were called to gather data. The study's findings indicated that temperature and rainfall fluctuation had harmed farmers' livelihoods. The primary impediments to climate change adaptation were a low degree of

livelihood status, fewer non-farm work alternatives, and a limited cultivated area under irrigation. Insurance and financing were the primary motivators for farmers to change their farming techniques. The most successful adaptation tactics were early ripening seed variants and crop kinds that required less water.

Cui (2020) has used temporal variance in decades-long weather averages to determine agricultural acreage elasticities in relation to climate change in the United States. He discovered significant climate change adaptation in US agriculture through acreage modifications. Climate change accounts for approximately more than 10 percent and less than 40 percent of observed US maize and soybean increase over the last 30 years, with habitable produce alteration playing a significant role.

Brar *et al.* (2020) the study was done in Punjab's five agroclimatic zones. Random selection was used to choose 10 farmers per village having at least fifteen years of experience in paddy cultivation, one district from each zone, three blocks from each district, and one village from each block. Over 80 percent used weather predicting services, and most chose short-duration crop kinds. Over three-quarters of those surveyed think that employing laser land management techniques, like leaser levellers, helps lessen the effects of climate change during paddy production. Additionally, more than 25 percent think that employing resource conservation technologies, 30 percent think that using soil moisture conservation techniques, and more than 10 percent think that putting out the fire helps.

Gautam and Sangwan (2021) cropping pattern statistics show that cereals, notably wheat and rice, have come to dominate the cropping pattern in the state as a result of modern agricultural technology, while the area devoted to pluses, sugarcane, bajra, maize, barley, and jowar has fallen. Two similar facts result from modifying irrigation system and farming pattern. The first is an increase in water consumption due to increased rice farming. Second, since water availability in canals has reduced due to inadequate maintenance, this rise in demand for water is increasingly met by groundwater irrigation, and tubewells have their own set of advantages in terms of flexibility and dependability of irrigation. The results also show that the extent of tubewell irrigation is substantially correlated

Singh (2021) has stated that cereals, pulses, and oilseeds have been drastically reduced in the last 30 years, owing to the advent of vegetable crops. On average, the total area planted with vegetable crops during the summer and winter seasons was 0.2974 and 0.3158 hectares, respectively, on the overall farm scenario. The prevalence of insect pests and illnesses constituted a serious productivity limitation. Obtaining a bank loan was time-consuming, and the most severe financial and institutional restrictions, respectively, were a lack of extension facilities. Farmers should be trained in the newest KVK and SAU technologies in order to overcome productivity limits.

Cropping Analysis

Geographical coordinates: Latitude: 30.804; Longitude: 75.475 (source: Bhoonidhi)

Table 1 : (Cropping pattern of Jagraon)

CROP	Acres
Wheat	1209
Rice (Paddy)	1168
Cotton	0
Sugarcane	0
Maize	5
Other cereals	15
HYV of Wheat	1210
HYV of Rice	1160
High yielding variety maize	5
Oil seeds	0
Other crops – Vegetables	30
Other crops – Non vegetables	7
Fodder	112
Other crops – Area under orchards	0
Toria - Seasonal crops	0
Sunflower - Seasonal crops	0
Medicinal crops	0
Other crops specify with details	0

Source: Economic and statistical organization (ESO), Ludhiana

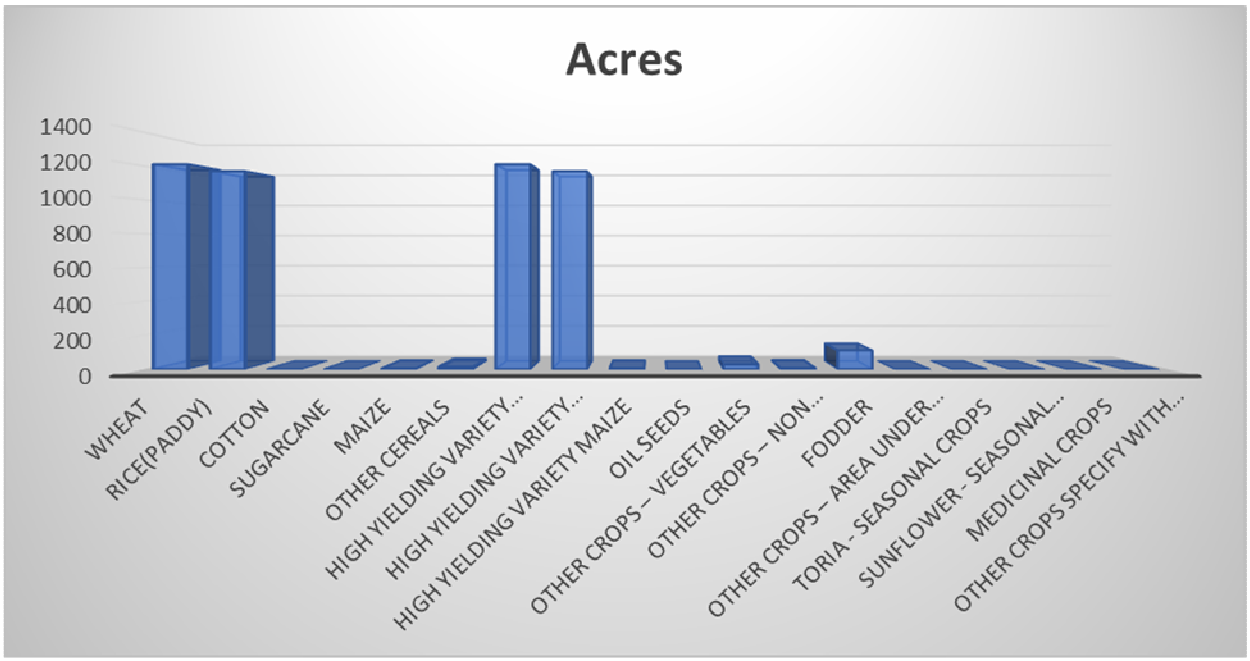

Fig. 2 : Data analysis Cropping pattern of Jagraon

The above data (crop vs land covered in acres) analysis represents that the major cropping pattern adopted is wheat – paddy cropping system with fodder on the higher side among the rest in comparison. Furthermore, variety in land allocation to other crops comprising of maize, other cereals, pulses and vegetables is exceptionally low indicating the farmers are not satisfied with the yield output obtained from other crops, which was forcing to increase wheat- rice land allocation for lesser inputs and more yield.

Table 2 : (Seasonal Cropping pattern of Jagraon)

Crops/season	Average area	% to GCA (gross cropped area)
Kharif		
Paddy	6.80	45.48
Maize	0.05	0.33
Fodder (Bajra)	0.60	4.01
Total	7.45	49.83
Rabi		
Wheat	6.34	42.41
Fodder (Barseem)	0.54	3.61
Potato	0.57	3.81
Total	7.45	49.83
Other season (Zaid)		
Spring Maize	0.05	0.33
Gross cropped area (GCA)	14.95	100.00
Cropping intensity	200.67	

Source: Economic and statistical organization (ESO), Ludhiana

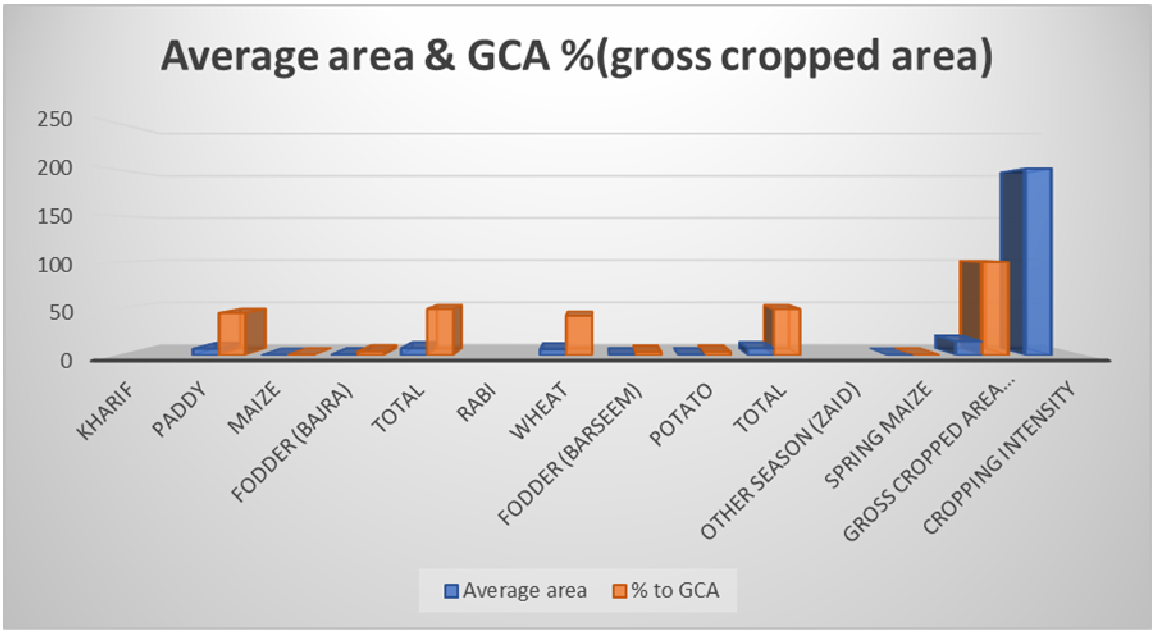

Fig. 3 : Analysis for Gross cropped area (GCA) and average area cultivation in Jagraon Block

With an average area allocation of 6.80 for paddy and 6.34 for wheat, this shows that rice dominates the Kharif season and wheat dominates the Rabi season.

Conclusion

The majority of tested homes (65% farming and 83% nonfarming) believe the village's economic situation is same, while the remainder believe it has improved. Recently, village infrastructure has undergone significant upgrades, including road paving, pond construction/cleaning, and street lighting installation. Over the last decade, 81% of families reported improvement, with agricultural households accounting for 88%.

The agriculture situation is critical, especially for farm households. 98% of families, both farm and non-farm, believe there has been no change in the past decade, while 1% believe it has deteriorated. The unchanging agricultural state was attributed to rising cultivation costs and lower profit margins.

In conclusion, embracing changing cropping patterns offers numerous advantages for the agricultural sector, the environment, and society as a whole. A robust and sustainable food system may be developed with the help of alternative crops by increasing agricultural diversity, mitigating climate change, fostering biodiversity, and generating income.

This move to alternative crops has the potential to revolutionise agriculture and guarantee food security for coming generations if it is supported and funded appropriately. Everyone will have access to a steady and plentiful supply of food as a result.

References

Benin, S., Smale, M., Pender, J., Gebremedhin, B., & Ehui, S. (2004). The economic determinants of cereal crop diversity on farms in the Ethiopian highlands. *Agricultural Economics*, ***31***(2-3), 197-208.

Brar, H. S., Sharma, A., & Gill, J. S. (2020). Adaptation strategies being followed by paddy growers towards climate change in Punjab state. *Indian Journal of Extension Education*, ***56***(3), 107-110.

Chavas, J. P., & Aliber, M. (1993). An analysis of economic efficiency in agriculture: A nonparametric approach. *Journal of Agricultural and Resource Economics*, 1-16.

Cui, X. (2020). Climate change and adaptation in agriculture: Evidence from US cropping patterns. *Journal of Environmental Economics and Management*, ***101***, 102306.

de Bruin, K., Dellink, R. B., Ruijs, A., Bolwidt, L., van Buuren, A., Graveland, J., & Van Ierland, E. C. (2009). Adapting to climate change in The Netherlands: an inventory of climate adaptation options and ranking of alternatives. *Climatic change*, ***95***, 23-45.

Firdaus, G. (2016). Changing Cropping Pattern around the Urban Centre: Analyzing the Role of Consumption Pattern of the People. *Journal of Agricultural Research and Development*, ***6***(3), 56-64.

Gautam, R., & Sangwan, B. (2021). A Geographical Analysis of Changing Cropping Pattern in Haryana. *Turkish Online Journal of Qualitative Inquiry*, ***12***(9).

Heyd, T., & Brooks, N. (2009). Exploring cultural dimensions of adaptation to climate change. *Adapting to climate change: Thresholds, values, governance*, 269-282.

Jalota, S. K., Vashisht, B. B., Kaur, H., Kaur, S., & Kaur, P. (2014). Location specific climate change scenario and its impact on rice and wheat in Central Indian Punjab. *Agricultural Systems*, ***131***, 77-86.

Javed, M. I., Adil, S. A., Javed, M. S., & Hassan, S. (2008). Efficiency analysis of rice- wheat system in Punjab, Pakistan. *Pakistan Journal of Agricultural Sciences*, ***45***(3), 95- 100.

Joshi, P. K. (2004). Diversification of agriculture in more competitive environment. *Agricultural Diversification and International Competitiveness. Tokyo: Asian Productivity Organization*.

Kaur, M., Mahal, A. K., Sekhon, M. K., & Kingra, H. S. (2010). Technical efficiency of wheat production in Punjab: A Regional Analysis. *Agricultural economics research review*, ***23***(347-2016-17029), 173-180.

Lindsay, D. S., Gonzales, V., & Eso, K. (1995). Aware and unaware uses of memories of postevent suggestions.

Majhi, B., & Kumar, A. (2018). Changing cropping pattern in Indian agriculture. *Journal of Economics and Social Development*.

Mujtaba, A., Nabi, G., Masood, M., Iqbal, M., Asfahan, H. M., Sultan, M., & Nasirahmadi, A. (2022). Impact of cropping pattern and climatic parameters in lower Chenab Canal system-Case study from Punjab Pakistan. *Agriculture*, ***12***(5), 708.

Panigrahy, S., Ray, S. S., Sood, A., Patel, L. B., Sharma, P. K., & Parihar, J. S. (2004). Analysis of cropping pattern changes in Bathinda District, Punjab. *Journal of the Indian Society of Remote Sensing*, ***32***, 209-216.

Parikh, A., Ali, F., & Shah, M. K. (1995). Measurement of economic efficiency in Pakistani agriculture. *American Journal of agricultural economics*, ***77***(3), 675-685.

Rani, P., & Sahoo, A. K. (2023). Assessment of Productivity and Crop Diversification Pattern in Punjab Agriculture. *Arthaniti: Journal of Economic Theory and Practice*, ***22***(2), 251-270.

Rehima, M., Belay, K., Dawit, A., & Rashid, S. (2013). Factors affecting farmers' crops diversification: Evidence from SNNPR, Ethiopia. *International Journal of Agricultural Sciences*, ***3***(6), 558-565.

Shanmugam, K. R., & Venkataramani, A. (2006). Technical efficiency in agricultural production and its determinants: An exploratory study at the district level. *Indian Journal of Agricultural Economics*, ***61***(2).

Sichoongwe, K., Mapemba, L., Ng'ong'ola, D., & Tembo, G. (2014). *The determinants and extent of crop diversification among smallholder farmers: A case study of Southern Province, Zambia* (Vol. 5). Intl Food Policy Res Inst.

Singh, J., Srivastava, S. K., Kaur, A. P., Jain, R., Immaneulraj, K., Raju, S. S., & Kaur, Singh, P., Thakur, R. K., & Singh, A. (2021). Changing dynamics of cropping pattern and constraints perceived by the vegetable growers in Himachal Pradesh. *Indian Journal of Economics and Development*, ***17***(4), 810-820.

Singh, S. (2020). Farmers' perception of climate change and adaptation decisions: Micro-level evidence from Bundelkhand Region, India. *Ecological Indicators*, ***116***, 106475.

Tariq, A., Yan, J., Gagnon, A. S., Riaz Khan, M., & Mumtaz, F. (2023). Mapping of cropland, cropping patterns and crop types by combining optical remote sensing images with decision tree classifier and random forest. *Geo-Spatial Information Science*, ***26***(3), 302-320.

Vashisht, B. B., Mulla, D. J., Jalota, S. K., Kaur, S., Kaur, H., & Singh, S. (2013). Productivity of rainfed wheat as affected by climate change scenario in northeastern Punjab, India. *Regional Environmental Change*, ***13***, 989-998.

Venkataramanan, L. S., & Prahaladachar, M. (1978). Study of Cropping Pattern Changes in Andhra Pradesh During 1950-1975. *Indian Economic Review*, ***13***(2), 117- 142.

Waha, K., Dietrich, J. P., Portmann, F. T., Siebert, S., Thornton, P. K., Bondeau, A., & Herrero, M. (2020). Multiple cropping systems of the world and the potential for increasing cropping intensity. *Global Environmental Change*, ***64***, 102131.