

A Study on the Need for Farm Management Practices in Indian Agriculture

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Abstract

The importance of good farm management is growing not just in industrialised and commercialised farming but also in emerging and subsistence systems. A farm manager's knowledge of production methods, costs, and profits is essential. Even after 73 years of independence, more than half of India's population still works in agriculture. However, the industry is not contributing more to GDP and is really declining. The study's goal is to find out why farming is losing money and then recommend farm management strategies that can turn a profit. Secondary information was used for the analysis. Farm management's overarching goal is to increase farm profits through efficient business procedures. This is possible if the farmer pays attention to selecting high-quality seed varieties, actively seeks out market-driven crops with desirable selling prices and high yielding cropping patterns, strives to keep input costs as low as possible, actively seeks out means of increasing production and productivity with high-quality short- and long-term financing at reasonable interest rates, and has a firm grasp on effective risk management. The farmer risks losing money or failing to break even if he or she doesn't use current best practises.

Keywords: farm management, agriculture, root cause problems, profitable

1.1 Introduction

India is a rural country, and the farmer is the foundation of the country, suggesting that agriculture is the fundamental sector and that without it, no other sectors can grow. The output of the agriculture sector serves as a raw material for the other sectors to add value to in order to meet consumer demands. As a result, the growth and development of a country's manufacturing and industrial sectors are directly related to its agricultural sector.

Any structural changes are likely to impact the current pattern of social justice because the agricultural sector is such a significant contributor to the Indian economy, around which socio-economic privileges and rights revolve. Ecologically sound farming practises are essential to the responsible management of resources like land, water, livestock, plant varieties, forests, weather, building materials, and topography. The agricultural sector in India struggles against a lack of materials, facilities, support systems, organisations, tools, and government assistance. Sustainable development is the orientation of technical and institutional progress toward the management and maintenance of the natural resource base necessary to meet the needs of both the immediate and long-term human population. This sort of sustainable growth in the agricultural, forestry, and fishery sectors is non-degradable from an ecological standpoint, makes use of available technology, is commercially and socially viable, and protects genetically modified resources such as land, water, plants, and animals. In order to achieve sustainable agriculture development, it is necessary to make the most of available natural, human, financial, and technical resources. India's agricultural sector is experiencing slowing growth due in large part to its dependence on rain for crop production.

In 2017–18, the agricultural industry, which employed 58% of the workers, contributed only 16% to GDP. Especially in the country's rural areas, underemployment, poverty, and hunger show that India's growth process is not well-rounded. Concerns about agriculture's potential to serve as a stabilising force for economic growth remain unanswered. Because of stagnant or declining income, many farmers have given up on the industry. Past suicide statistics are indicative of the mental strain that farmers are under. There were 197 farmer suicides in Karnataka in only one month in 2016.

Farmers have to make tough choices about things like which crops to grow together, how much of the harvest to sell and to whom, how much to store, how to transport it, whether or not to involve a middleman, and whether or not to involve the government.

In light of these issues, the research aims to demonstrate how better management can aid farmers in improving their financial performance and hence the agricultural industry as a whole. The government should work to enhance the agriculture industry's public image in order to draw more people into the field and help it recover. Given the aforementioned challenges, one would wonder why individuals in India continue to engage in agricultural activities and whether or not they can make a livelihood at it. Given that some farms' bottom

lines are healthier than others', it's intriguing to learn more about the personal traits and management techniques of prosperous farmers.

1.2 Objective of the study

1. To study the root cause of unprofitable Indian agriculture
2. To review literature and identify the need of management practices in farming
3. To suggest strategy to make Indian agriculture profitable

1.3 Research methodology

The present study is based on secondary data. Secondary data in terms of research papers published by different and eminent scholars in refereed and renowned journals and publications of ministry of agriculture at state and central level, world Bank, The Food and Agriculture Organization of the United Nations (FAO), Reserve Bank of India (RBI), The Federation of Indian Chambers of Commerce and Industry (FICCI) and so on are taken into consideration to address the above research objectives.

2.1 Literature review

Management practices to make Indian agriculture profitable

Dasgupta et al (2001) examined through their research and documented the different trends in the usage of pesticide in Brazil in terms of environment costs and human health hazards associated with pesticide use in Brazil. According to them agricultural trade liberalization policy has fueled to an increase in pesticide use in agricultural production. It is harmful to human health and also harmful to the environment and soil quality. They identified that use of pesticides has increased among the high-income level, highly educated and big size of farm owners. Further they identified crops that consume more pesticide such as soya bean, sugarcane, cotton, fruits and tobacco. The researchers had prescribed integrated pest management programs, farmers education and research on alternative pest control methods to bring down the consumption levels of pesticides.

(Horrihan et al. 2002) Even if there is an increase in rainfall, it does not necessarily translate to increased crop output because rainfall is not a reliable indicator of soil moisture retention, which is crucial to plant growth. Instead of relying on predictions of weather and precipitation, farmers may find that monitoring soil moisture is a more reliable basis for

making important management decisions. As a result of the unpredictability of the link between rainfall and subsequent moisture retention, conventional agriculture is often unsuccessful. Lacking adequate storage, water is typically lost to evaporation or surface drainage. By tilling and aerating the surface, the soil's moisture content is lowered.

(Patil & Sheelavantar, 2004) Improvements in crop yields have been attributed to the increased availability of moisture throughout the crop's growth cycle, according to a study on in-situ moisture conservation. By preventing runoff in the field with compartmental bundling and a ridge-furrow, rainwater was collected on-site. That's why we're watering the ground with it. Some of it is retained as moisture in the soil, and the remainder seeps underground to become groundwater. Soil health can be enhanced through the addition of agricultural manure and other organic/natural resources, leading to increased porosity and infiltration rates. Therefore, in-situ soil and water conservation has matured into a viable option.

Chauhan R.P, Pande K.R & Thakur S (2014) observed from their detailed research study that Nepal was facing a severe problem of soil quality deterioration and decrease of crop yields and attributed the reasons thereof such as; i) increased deforestation, ii) intensive overgrazing, iii) burning crop residues (major cause for air (pollution also), iv) haphazard usage of agrochemicals or chemical fertilizers and pesticides v) decrease in the usage of organic manures and changes in land uses namely; vi) use of fertile land for non-agricultural purpose, vii) land fragmentation due to increase of divided families, viii) use of marginalized land pieces and slope lands for cultivation. They opined that sustainable land use to maintain fertile and healthy soil and suggested to use conservation tillage, organic inputs to protect soil health and to achieve good crop yield.

Kaushik VK and Pahari NC (2014) disclosed that there is an inverse relationship between expenditure on fertilizers and the size of holding/irrigated land in hectare. Further they did computation separately for irrigated and non-irrigated small holdings. It is proved that in case of small holdings, the fertilizer expenditure per hectare will be more on average when compared to that of non-irrigated small holdings. Further they revealed that incremental or marginal cost of fertilizers will be far greater in irrigated small holdings than that of non-irrigated small holding.

Kumar P and Kumar R (2018) revealed their research outcome saying that the conversion of forest land to agriculture leads to a decrease in soil (organic matter) content. The continuous cultivation on the piece of land will lead to aggregate soil erosion. They suggested

that natural vegetative cover plays a key role in maintaining the quality of soil. They cautioned that the changes of land use like from forest to agriculture and or from agriculture land to industrial land use definitely spoil the soil health.

Vijay Kumar et al (2018) disclosed the same observation about the expenditure on fertilizers based on their research in Karnal district. They computed the average quantity of fertilizer use per hectare of the cropped area for the state as whole and for the district under their study and revealed that the average consumption of fertilizers in quantity for the district is 142% greater than that of the State. Similarly, they computed average expenditure of fertilizers for small holdings and large farms separately and disclosed that the average expenditure on fertilizers on small farms is greater than that of larger farms. Unfortunately, in Nepal the percentage of irrigated area on small farms was more as compared with large farms implying the overall cost of cultivation per crop.

Kharal S, Ram B K and Panday D (2018) found that excessive soil erosion and degradation of soil quality in the mid-hills of Nepal were caused by improper land use and poor agricultural strategies. Soil health was shown to be much lower on traditional mixed grain farms compared to adjacent vegetable farms, grazing pastures, and forested areas. Changes in soil fertility parameters call for immediate action to restore conventional farms.

Shah, F & Wu, W (2019) states based on their research that reducing chemicals fertilizers and pesticides and other crop inputs to minimize greenhouse gases emissions while protecting the environment. Further they said that all nations - developed and developing –should stand together to attain the common goal to produce more food while generating less environmental pressure and supports and propagates for '*Sustainable Agriculture*'.

Lin W et al (2019) found in their research on tea crops with an aim to improving quality of tea by replacing chemical-based fertilizers and pesticides with organic fertilizer to shape the microbial composition and recruit beneficial bacteria into the rhizosphere of tea, leading to improved tea quality and reduced heavy metals content in rhizosphere soil and tea leaves.

(Yadav et al., 2019) Evidence on the integrated management of the biotic stress of oilseeds Brassica is insufficient, mainly through the use of safer interventions, especially in the area of input-based economics. As a result, the effect of plant-based extracts, biological control agents and chemical pesticides on a single and integrated basis in a multi-site study is to assess the yield of seeds and the economic benefits of some promising treatments of Indian mustard as part of the priority pest control strategy for the Brassica oilseed crop.

(Paramesh. V., 2022) An IFS is a set of practises that work together to produce food in a way that satisfies a variety of consumer needs (impart farm resilience, farmer livelihoods, food security, ecosystem services, and making farms adaptive and resilient, etc.). Integrated farming systems (IFS) are defined by the simultaneous and spatial integration of agricultural production, livestock husbandry, fisheries, and ancillary activities. It is hypothesised that these complex farms are more systemically productive than their simplified counterparts, are less susceptible to volatility, and generate less undesirable externalities.

2.3 Farm management

Farm management not only has become more important in developed and commercial agriculture throughout the world, but also in the development and subsistence of agriculture. A farm manager must understand not only the different farm production methods, but also their costs and returns. He must be aware of how scarce productive resources are allocated to the farm to achieve his objectives and react, at the same time, to economic forces arising from both inside and outside the farm. The necessity to manage a single farm arises from the following reasons:

- i. Farmers have twin targets, namely maximizing farm profit and improving their families' standard of living.
- ii. The resources available to achieve the objectives, i.e., production factors, are scarce in supply.
- iii. Agricultural profit has a biological, technological, social economic, political and institutional influence.
- iv. Alternative uses can be used for resources or production factors

Allocation of resources is a major aspect of farm management. Land, labour, farm structures, working capital, agricultural equipment, etc. are all relatively scarce commodities for a farmer to operate with. On the other side, the farmer has objectives, such as expanding their business and providing more employment opportunities for locals. The farmer, on the other hand, is adept at both ends and conscious of the connection between them. Several sensible choices on the multiple possible applications of agricultural resources bridge this chasm. The research into farm management would be helpful in increasing efficiency and profits by enhancing one's understanding of how to best utilise available resources.

Organizing and managing scarce resources to consistently achieve predetermined goals is at the heart of the farm planning process, which is an integral part of running any agricultural enterprise. Planning in agriculture entails picking the most lucrative option among available ones. Maximizing farmers' net income through better resource planning is the primary objective of farm planning, with raising farmers' living standards as an overarching goal. The primary aim is to maximise the yearly net income over the long run.

To put it simply, a farm plan is a comprehensive outline of a farmer's intended agricultural endeavours. All farm-level resource constraints can be accommodated by a strategy that is optimal for farming.

3.1 Root causes of unprofitable agriculture

It was found that there are many causes for the failure or unprofitable agriculture and is discussed as follows:

1) Excessive dependency on Land

The heavy dependency of population on land is a major cause for the limited growth of employment opportunities in the non-agricultural sector for rural people and disguised employment and under employment in the Agri sector.

2) Fragmentation of land holdings

The rapid growth of rural population low literacy and education are major factors for the fragmentation of land holdings resulting in low productivity and unprofitable agriculture. Further it is observed in table 8 that marginal land (less than 1 hectare) holding is more than 67% followed by small (between 1 and 2 hectares) 18%, semi-medium (2 to 4 hectares) 10%, medium (4 to 10 hectares) 4% and large (> 10 hectares) 0.7%. Hence 80% of the agricultural holdings are in less than 2 hectare which is far less than optimum size of the holdings for a profitable agriculture.

3) Superstitious beliefs and resistance to technology adoption are also limiting factors for the low agricultural productivity and unprofitability nature of agriculture.

4) Land Degradation due to heavy usage of chemicals-based fertilizers and pesticides which also spoiled the quality of the soil and hence no profitability of the agriculture.

5) Lack of infrastructural facilities such as transportation facility, electricity and power

causes for the loss in agriculture.

- 6) Indian farming is subsistence in nature implying that the majority of the farm produce is consumed for the domestic needs. Hence nothing is surplus to sell or to look for value addition.
- 7) Low and inadequate agricultural capital formation due to no profitability in agriculture, the propensity to save on the part of farmers found to be negative and lack public participation in agriculture resulting in insufficient capital formation. Further its contribution India's GDP is hardly 16% and is declining incessantly.
- 8) Inadequate credit and marketing facilities forces the farmers to barrow from indigenious bankers for high rate of interest and lack of marketing guidance the farmers sell to local mediators for lesser prices and finally landing in losses.
- 9) Increasing cost of agricultural inputs such as cost of seeds, fertilizers, pesticides and other factors.
- 10) Lack of minimum support price is another major reason for the losses to the Indian Farmers.
- 11) Unscientific use of fertilizers and pesticides due to lack of education and knowledge the use of those inputs makes the crops low yielding with low quality.
- 12) Lack of sufficient irrigation facilities: In table 1.8, the details of irrigated land and different sources are provided. It is interpreted that tube wells are the major source of irrigation followed by other wells, canals however the Indian agriculture majorly is rain-fed (more than 50% arable land is rain-fed). Further uncertainty of monsoons also is one of the crucial factors for less productivity and losses.

4.1 Strategy Scheme to for Management Practices in farming

The special institutions like agricultural universities, research institutes, Krishi Vigyan Kendra's (KVK) have been striving and keeping incessant research efforts and innovate abundant technologies to perk up the productivity and profitability of the farmers. But the question is whether the innovations and technologies are reaching the farmers. Enhancement in agricultural productivity and profitability can be achieved through the following:

- 1) Blending practical experience with scientific technologies in consultation with KVKs, for example, there are new methods of farming evolved such as hydroponic and aquaponic methods of farming aiming for more yield with less area of land and controlling the temperature of the cultivated area by the use of green houses and or poly houses whereby pests' threat can be minimized for the healthy growth of plants and yielding maximum crop. The figure 2 depicts about aquaponic cultivation which is the combination of aqua culture and of hydroponic wherein the used water of aquacultures after removing ammonia is shifted to plants and again from there the water is re-shifted (because in hydroponic soil is not used for the growth of the plants) to aquaculture whereby the use of water is minimized. This is called integrated farming technique.
- 2) Efficient use of natural resources – Farm inputs such as land, labour, capital, equipment's, tools, seeds, fertilizer, pesticide, livestock etc. we are living in the sharing world. The machinery such as ploughing equipment, tools tractors, etc. meant for agriculture can be shared by the farmers on rental basis hence become cheaper for everybody. This arrangement can be done by an individual or group of farmers. This can also be looked after through micro finance hence interest rate will be less and can be maintained by educated youth who are trained in using the equipment and hence get employment opportunities in the villages.
Similarly, Ag BSc graduates are to be trained in the feeding of fertilizers, pesticides etc., for the healthy growth of the plants. The training should be specific with respect to different crops and the soil of the locality hence their suggestions would be risk-free to the farmers.
- 3) Adopting time specific management practices – related to Rabi and Kharif seasons, monsoon condition, and the good practices needed through the life cycle of the crops hence plants are reared pleasantly and healthier manner and yield good results. Post-harvest requirements such as sorting, grading, drying, milling, packing, branding etc. all are to be taught to the farmers hence his produce gets transformed from commodity to product and marketability becomes easy. For example, there is good awareness about the uses of millets like, kodo millets, foxtail millets, and finger millets. One kg of Kodo millets is sold for Rs.100 (more

than the price of rice or wheat and whose cultivation cost is far less compared to that paddy or wheat) because of health benefits.

- 4) Giving priority for quality driven production so as to look for export opportunity to gain more revenue. For example, red and yellow capsicum, yellow water melon, dragon fruits, Israeli dates, blood lime (red lime) and so on rare fruits and vegetables are demanded abroad. Farmers can be advised based on their soil condition what can be grown and hence they can maximize the income.
- 5) Adopting suitable farming systems include selection of crop that suits the soil, climatic conditions of the locality, availability of skilled labour, proximity to the market to sell the produce. The crops that we grow and yield on black soil cannot be the same on red soil. Hence farmers should be aware of their land soil and its strength and what crops he can grow and how much care he should provide to gain more income. They should be guided to search the buyers through internet and sell their produce for better price instead of depending solely on the local buyers.
- 6) Adoption of region or location specific technology implying such technology which is adoptable by the farming community. If the farmers belong to a tribe, (in tribal farmers literacy level will be zero) their farming techniques are purely traditional and completely manual. In such cases we cannot expect them using modern tools run electrically. Similarly, we cannot expect every farmer to use poly houses or go for green houses. Based on the situation we can bring in modern methods gradually.
- 7) Market demand driven production – the produce which is demanded and easily and quickly be sold at good and attractive prices. For example, *sathavari*, a medicinal plant is in good demand from Ayurveda medicine producers like Patanjali, Himalaya Drugs, and Bydyanath etc. When we keep in touch with the business environment, we get updated about the demand and supply of various produce and according one can capitalize the opportunity.
- 8) Adopting low cost and no cost technologies include primitive and ancient technologies which are at zero or negligible cost, organic farming, integrated farming, micro irrigation, precision farming. In traditional agriculture farmers use animals instead of machines, and also use more simple methods to plant, collect,

and sell the crops planted. Where as in modern agriculture, the farmers use hybrid seeds (developed through biotechnology) of the same plant, technologically advanced equipment, and uses pesticides etc.

- 9) Training in use of modern technology is very essential as the farmers in the country are with low education background specifically the preparation and sowing the seed, use of right fertilizer and pesticides at the right time and right quantity in right frequency to yield as per the expectations. Also new forming techniques like hydroponic farming and aquaponic farming with automation, use of drones in Precision farming to identify the each and every plant with its needs in terms of water, fertilizer for the effective and healthy growth of plants and trees, also if there is any threat of pests and its control and finally meeting the expected yields.
- 10) Better and fast credit facility from credit institutions to stop farmers going to money lenders at high rate of interest. Encourage the formation of SHGs among the marginal and small farmers and get connected to the concerned bank manager to smoothen the process of sanction of loans to speed up the economic and agricultural activity.
- 11) Irrigation facility through rain water harvesting by creating small pools as per the topology of the farm land hence water can be flown from pond to down-slope farm land without using motor pump sets and electricity. Thereby of cultivation become cheaper and therefore farmers' income will increase.
- 12) Proper linkage between and among farmers, agricultural universities and research institutes to see that farmer is given right information at the right time to enable him to use the knowledge to choose better crops, better and cost-effective farming methods, better seeds, fertilizers, pesticides (if necessary) for better yield to gain better income.
- 13) Cooperative farming marketing is the best solution by bringing together all the marginal and small farmers hence the size of the land will be optimum to undertake large scale operations of farming with automation tools and equipment with the latest technologies and modern methods to gain accelerated farm output. Similarly, in marketing the farm produces also there will not be any challenge for

the cooperative societies. They can deal corporate and bulk buyers for better prices and quick payments.

- 14) Local governments try to encourage and promote sustainable farm operations through appropriate incentives so as to make the farmers aware of appropriate input use, use of renewable energy, and emphasizing soil health.
- 15) Balanced use of organic and inorganic fertilizers may be permitted in view of its direct impact on soil fertility and slowly the farmers are to be transformed from totally inorganic farming to pure organic farming with which soil health becomes strong and farmers income also raises and the consumers' health be safe as they organic farm produce.
- 16) Training on farm financial management cost recording budget preparation and project preparation to apply for a loan from bank is very important hence one can look for filling the strategic gap during the crop life cycle to gain maximum revenue and avoid maximum loss or expense.
- 17) Crop insurance is very essential especially rain-fed land farmers. Awareness on various crop insurance schemes and the rules etc., is explained in the simplest manner hence farmer should not feel that payment of premium is a loss for him rather it is a protection to him in case crop goes failure. In table 1.11 the state wise insured area in million hectares is provided.

As per the table in some states around 50% of the gross cropped area is insured such as Rajasthan, Bihar and Madhya Pradesh. In Andhra Pradesh not even 4% of the gross cropped area is insured. On all India basis only 23% of the gross cropped area is insured during 2014-15. This calls for immediate attention of the stake holders and policy makers to see that farmers show interest and feel that crop insurance is a financial protection scheme for them. This possible when insurance premium is small, a liberal sum assured to cover the full loss of the farmer (in case he loses), insurance rules are simplified and government funds a major part or full of the premium.

- 18) Awareness of the Govt schemes (both central and state) like subsidies for poly houses, drip irrigation systems, use of renewable energy in farming, growing millets and pulses, digging bore wells, incentives for horticultural crops and so on

so as to enable and motivate the farmer to grow such crop (suitable to the soil) for which he can claim more financial benefit to minimize the cost of farming.

- 19) Technical workshops about soil testing, how to strengthen the health of soil, how to prepare seed, methods of farming, use of newly introduced farming equipment, introduction of new crops due to climate changes, profitable foreign fruits and vegetable farming, what care is needed for such crops etc. periodically be organized in slack season at free of cost for the benefit of the farmers.

Conclusion

Besides the above mentioned, there are miscellaneous causes for the lack of proper focus on agriculture for its lagging behind. Present the Indian agriculture economy is badly in need of professional, scientific and managerial approach to farm management. In addition, the sector faces many challenges, such as low yield per hectare, rising input costs, an insufficient supply of inputs at subsidised costs, an inadequate irrigation facility, a large number of marginal farmers (farms with an area of less than one hectare), uneconomical farm sizes, a lack of entrepreneurial ability among farmers, poor soil management, excessive use of chemical fertilisers, and other issues. Soil, fertiliser, pesticide, seed, labour, water, cover crop, crop rotation, conservation agriculture, technology adoption, financial and infrastructural managerial issues, and so on are all increasingly in demand as a result.

REFERENCES

- 1) Balakrishnan, Pulapre (2000), Agriculture and Economic Reforms: Growth and Welfare. Economic and Political Weekly, 35 (12), Pp. 999-1004.
- 2) Chand, Ramesh, P Shinoj, Ashok Gulati and Kavary Ganguly (2011), Managing Food Inflation in India: Reforms and Policy Options. Policy Brief 35, National Centre for Agricultural Economics and Policy Research (NCAP), New Delhi
- 3) Deshpande, R S, M J Bhende, P Thippaiah and M Vivekananda (2004), Crops and Cultivation, State of the Indian Farmer A Millennium Study, Volume 9. Academic Foundation New Delhi.
- 4) FAO (2009), State of Food Insecurity in the World 2009, Rome: Food and Agriculture Organization (FAO).
- 5) Joshi, P K, Pratap Singh Birthal and Nicholas Minot (2006), Sources of Agricultural Growth in India: Role of Diversification towards High Value Crops,

- MTID Discussion Paper No. 98. Washington, D.C.:International Food Policy Research Institute.
- 6) Kannan, K P (2011), Agricultural Development in an Emerging Non-Agrarian Regional Economy: Kerala's Challenges, *Economic and Political Weekly*, 46 (9), Pp. 64-70.
 - 7) Majumdar, Kakali and Partha Basu (2005), Growth Decomposition of Food grains Output in West Bengal: A District Level Study, *Indian Journal of Agricultural Economics*, 60 (2).
 - 8) Radhakrishna, R (2002), Agricultural Growth, Employment and Poverty: A Policy Perspective, *Economic and Political Weekly*, 37 (3).
 - 9) Rao, C H Hanumantha (1998), Agricultural Growth, Sustainability and Poverty Alleviation - Recent Trends and Major Issues of Reforms, *Economic and Political Weekly*, 33 (29 & 30), Pp. 1943-1948.
 - 10) Rao, C H Hanumantha (2003), Reform Agenda for Agriculture, *Economic and Political Weekly*, 33 (29), Pp. 615-620.
 - 11) Sawant, S D and C V Achuthan (1995), Agricultural Growth Across Crops and Regions: Emerging Trends and Patterns, *Economic and Political Weekly*, 30 (12), Pp. 2-13.
 - 12) Thamarajakshi, R (1999), Agriculture and Economic Reforms, *Economic and Political Weekly*, 34 (14), Pp. 2393-2395.
 - 13) Vaidyanathan A (1992), Instability in Agriculture: Extent, Causes and Consequences: A Review Article, *Indian Economic Review*, 27 (2).
 - 14) Vyas, V S (2001), Agriculture: Second Round of Economic Reforms, *Economic and Political Weekly*, 36 (14), 829-836.
 - 15) Shah, F., & Wu, W. (2019). Soil and crop management strategies to ensure higher crop productivity within sustainable environments. *Sustainability*, 11(5), 1485.
 - 16) Han, S. S., & Lin, W. (2019). Transforming rural housing land to farmland in Chongqing, China: The land coupon approach and farmers' complaints. *Land Use Policy*, 83, 370-378.

- 17) Khatri-Chhetri, A., Pant, A., Aggarwal, P. K., Vasireddy, V. V., & Yadav, A. (2019). Stakeholders prioritization of climate-smart agriculture interventions: Evaluation of a framework. *Agricultural systems*, 174, 23-31.
- 18) Pretty, J., Attwood, S., Bawden, R., Van Den Berg, H., Bharucha, Z. P., Dixon, J., ... & Yang, P. (2020). Assessment of the growth in social groups for sustainable agriculture and land management. *Global Sustainability*, 3, e23.
- 19) Paramesh, V., Ravisankar, N., Behera, U., Arunachalam, V., Kumar, P., Solomon Rajkumar, R., & Rajkumar, S. (2022). Integrated farming system approaches to achieve food and nutritional security for enhancing profitability, employment, and climate resilience in India. *Food and Energy Security*, 11(2), e321.