

Farm Management Strategies in Modern Agriculture: Challenges, Innovations, And Policy Implications

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Abstract: *With the advent of rapid technological innovations and the challenges of environmental stress, farm management has emerged as a key factor influencing agricultural productivity, sustainability, and income stability. Climate variability, market uncertainty, and resource limitations have led to the growing complexity of modern agriculture, which requires effective and flexible management approaches. This article explores the major problems faced by the farm managers, reviews technological and institutional innovations and assesses the appropriateness of the innovations for different farming systems in developing countries like India. The study uses a mix of microeconomics theory and reality to illustrate the need for context-specific approaches. It calls for the technological innovations to have the possibility of changing everything, but it also needs to be accessible, supported by institutions and farmers' capabilities. The article then suggests some policy options to improve efficiency, inclusiveness, and sustainability within agricultural systems.*

Keywords: farm management, agricultural efficiency, sustainability, precision agriculture, policy reform

INTRODUCTION

Although agriculture is still a major part of food security and rural livelihoods, it is undergoing a huge transformation as a result of demographic pressures and constraints, as well as the acceleration of technology change. The current demand for efficient and sustainable farm management practices (Finger, 2023; Fragomeli et al., 2024) has been further increased by the need to meet the food demands of an increasing world population that is projected to reach 9 billion

by 2050. Meanwhile, agriculture is facing greater pressure with climate change, land degradation, water scarcity, and declining arable land affecting the systems, which pose a threat to productivity and sustainability (Finger, 2023; Pan et al., 2023).

In this context, farm management has shifted from experiential decision making to a process that is more complex, data-driven and relies on technology. Modern management of farms involves planning, organizing, monitoring and controlling the farm resources in order to ensure maximum productivity, profitability, and environmental sustainability (Tummers et al., 2019; Kamilaris et al., 2019). But the shift to more sophisticated management systems is far from easy. Some of the barriers to the adoption of good practices include the dominance of smallholders, limited access to credit, technological challenges, and digital illiteracy, especially in developing nations such as India (Agrawal & Bangale, 2024; Kumar, 2024).

The introduction of technologies like the Internet of Things (IoT), artificial intelligence (AI), big data analytics and robotics is transforming how farms are managed in the era of Agriculture 4.0. These innovations help precision farming, and real-time decision making, and use of resources efficiently which increase productivity while reducing environmental impacts (Araújo et al., 2021; Wolfert et al., 2020). Moreover, digital innovations have been found to enhance the resilience of farms, curb the loss in farm inputs and contribute to sustainable intensification in agriculture (Finger, 2023).

Yet, present day agriculture is confronted with a set of economic, social and institutional problems. Despite the advances in farm management, market volatility, policy inefficiencies, and land fragmentation and technology access remain obstacles to effective management (Bihari et al., 2019; Finger, 2023). In this context, the need for the incorporation of innovative practices together with supporting policy frameworks to enable sustainable and inclusive agricultural development is increasing.

In developing countries, agriculture remains an important sector for food security, jobs and rural livelihoods. The sector, however, is going through a structural change as a result of globalization, technologic advancement and environmental issues. This dynamic situation involves more than input-output decision-making, it involves farm management as a whole and involves risk management, sustainability, market integration and technology uptake. Theoretically, farm management is based on neoclassical production theory which sets the goals of the farmer to maximize profit under a condition of resource constraints, but in reality, imperfect information, risk and institutional barriers require more dynamic and adaptive farm management. It is important to keep the issues of scale, accessibility and inclusiveness in mind when designing farm management strategies in countries such as India, where small and marginal farmers are in majority. So the question of suitability comes in and the strategies that work in large scale mechanised production may not necessarily translate into to smallholder production.

In this context, the current article looks at the approaches of the farmers in modern agriculture with a focus on existing problems, technological and institutional innovations and policy implications. The study is designed to spur a holistic understanding of the role of farm management in enabling sustainable agricultural transformation in the 21st Century, by connecting traditional knowledge with the current developments.

Theoretical Foundations of Farm Management

Production and cost theories are the key tools used to inform farm management decisions, describing the way in which farm inputs are used to achieve farm outputs. Cobb-Douglas and Translog are commonly used production functions to measure the efficiency of the use of production factors like land, labour, capital and technology in producing agricultural output. Efficiency analysis using the Farrell framework puts the farm performance into three types, that is technical efficiency, allocative efficiency and economic efficiency. Further, uncertainty is an inherent feature of agriculture, as weather and product prices are variable, and will always need to be considered in decision-making processes. This application of the expected utility theory and stochastic production models contributes to the analysis of farmers' behaviour in such uncertain environments, thus enriching the analytical basis of farm management.

LITERATURE REVIEW

A shift in farm management practices, from traditional management to technology and sustainability based approaches has been discussed in recent literature. Climate change, increased input expenses and degradation of resources are identified as some of the key issues that pose risks to farm productivity and efficiency (Vijayakumar et al., 2025). Meanwhile, the technologies of Agriculture 4.0, such as the Internet of Things (IoT), Artificial Intelligence (AI) and big data, are known to facilitate precision farming, enhance input-use efficiency and facilitate real-time decision making (Abbasi et al., 2022; Araújo et al., 2021).

The use of such innovations is not uniform, however. There are several factors that hinder the use of AI, particularly in developing nations, including economic factors, limited digital infrastructure, and technical expertise (Fragomeli et al., 2024; Barman et al., 2026). In addition to these, policy support and institutional arrangements such as extension services and subsidy are also highlighted as important factors in the success of technology adoption and farm management outcomes (Derakhti et al., 2023). Besides, sustainable practices such as climate-smart agriculture are increasingly adopted into the agricultural management systems to ensure productivity without compromising the environment (Fragomeli et al., 2024).

Farm efficiency is one of the main points of the modern farming, it involves getting maximum output with minimum resources such as land, labour, water, technology, other resources and in the

optimum manner without causing the maximum possible harm to the environment (Mandal and Tok, 2024). Poor land fragmentation, resource scarcity, climate change and lack of access to markets still remain challenges to the sustainable agriculture development in India, they said. Mandal and Tok (2024) argue that strategic resource management, precision agriculture, technological innovation, and environmentally sustainable practices are crucial for enhancing the productivity of farms and ensuring food security in the long term. They observed that the sustainable and efficient agricultural activity should take into account both the economic and ecological considerations.

Mandal (2024) has investigated the measurement of farm efficiency in India and highlighted use of Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA) in measuring farm productivity and productivity use efficiency. The study highlighted the importance of scientific assessment techniques in enhancing farm management decisions. In yet another study, Mandal and Tok (2024) investigated the effect of environmental changes on the agriculture sector in India, and they found that climate variability, market distress, rising input costs, and environmental degradation are the factors that significantly impact the agriculture sector's resilience. They highlighted the need for adaptive capacity and institutional support, community-based intervention, and policy interventions to improve sustainable farming systems. Mandal and Tok (2024) also highlighted the importance of incorporating local knowledge, technology adaptation, environmental protection and governance support as crucial components of agricultural resilience to address the challenges faced by the agriculture sector in a changing world and enhance farmers' livelihoods.

Research Gap

These contributions are insufficient, however, to overcome some important gaps. The first is the absence of farm management frameworks that take a holistic approach that incorporates the technological, economic and policy aspects of farm management. Second, there is not much econometric evidence available on the effects of modern strategies on farm efficiency and cost optimisation. Thirdly, there is a lack of literature on smallholder agriculture in developing countries, especially in India. Last but not least, the effectiveness and sustainability of the Agriculture 4.0 technologies are under-explored.

Objectives of the Study

1. To explore the key challenges associated with farm management in contemporary agriculture, and their implications for the framework of developing economies, especially in the context of climate change, limited resources, imperfect markets, and structural issues.
2. To analyse the innovations of the farm management in context of its analytical evaluation and suitability.

3. To examine the efficiency of farm management and thereby policy implications.

RESEARCH METHODOLOGY

The study is based on microeconomic and econometric analysis of the farm level resource optimisation and cost efficiency in Indian agriculture. The approach combines the production theory with frontier efficiency models to analyse the efficiency of the farmers' input allocation and the minimisation of production costs.

Analytical Framework: Assuming the farmers' goal is to maximise production or minimise cost with fixed resources, the study is based on the micro-economic theory of production. Resource optimisation is studied with the help of production function and cost function by studying the relation between the input and output in the production process. Frontier approaches are especially appropriate since they assess performance deviations from optimal (efficient) performance (Battese, 1992; Coelli & Battese, 1996).

Conceptual Framework: A conceptual structure is created using micro-economic concepts of minimisation of cost and efficient resource usage to reinforce the connection between the theoretical and empirical aspects. The framework is based on the assumption that external factors like prices, technology, institutions and climate influence the farmers' decision making for input allocation. These decisions affect which inputs are used in the production process, and in turn, will affect cost efficiency. The conceptual relationship can be represented as: The external factors such as prices, technology, institutions and climate influence the farmer's decision making, which in turn affects input allocation which includes labour, capital, land, fertiliser, irrigation etc., which further affects the production process which affects the cost of cultivation which affects the cost efficiency outcome.

This emphasises the importance of cost efficiency as the result of using resources optimally. Inefficient input allocation results in minimising costs, while any deviations from optimum combinations are evidences of inefficiencies caused by the imperfection of the market, the technological limitation and the institutional limitation. Moreover, the conceptual framework serves as the foundations for the specification of the econometric models employed in the study, in particular the production and cost frontier functions.

Data and Sampling Design: The secondary data used for the analysis are the farm-level data, such as in the NSSO or Cost of Cultivation Scheme, to get a detailed picture of the input–output relationship. Cross sectional or panel data of farm households are widely used in agricultural studies to estimate efficiency and determine causes of efficiency (Coelli & Battese, 1996; Ashrit, 2023).

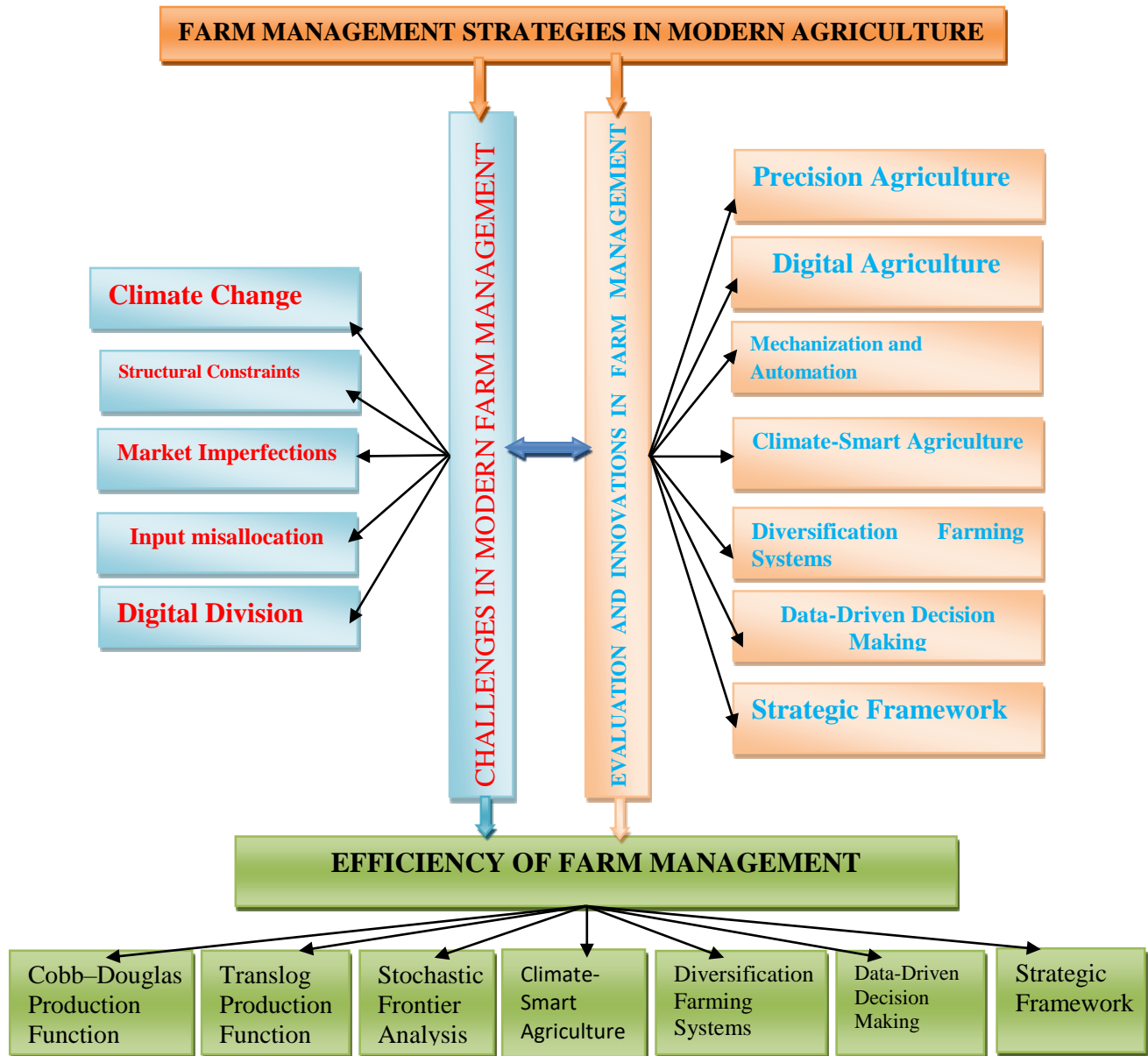
In the study, multi-stage analytical approach is used. The first phase involves description and comparison to highlight major challenges, innovations and policy interventions in farm management. During the second phase, econometric, efficiency models are used to assess the performance of farms.

Technical efficiency and optimization of resources use are measured by the use of Data Envelopment Analysis (DEA) and Stochastic Frontier Analysis (SFA). For farms having more than one input and output, DEA is a non-parametric linear programming technique for measuring efficiency and SFA is a parametric technique that can distinguish between inefficiency and statistical noise (Kyrgiakos et al., 2023). These models can be used to calculate efficiency scores and determine the influences on farm performance including input use, access to credit, and technology adoption (Singh et al., 2020). This method can facilitate the relating of farm management practices and productivity results and policy variables.

The methodology is overall a combination of systems analysis, econometric modeling and policy evaluation for a full evaluation of management strategies in modern agriculture.

RESULTS AND DISCUSSION

DIAGRAM I



Interpretations of Diagram I

The diagram displays a detailed overview of the modern management of farms and its critical issues, along with innovative solutions and efficiency assessment methods within the agricultural context. It first outlines some of the challenges of modern agriculture, such as climate change, structural problems, market imperfections, input misallocation, and the digital divide. These factors can often decrease farm productivity, profitability and sustainability. To overcome these challenges, various innovative measures like precision agriculture, digital agriculture, mechanization and automation, climate-smart agriculture, diversification of farming systems and data-driven decision making are indicated in the diagram. The innovations allow farmers to make better use of resources and make better managerial decisions. The framework proposes that implementation of these strategies can enhance the performance and resilience of the farms. The diagram also highlights the need for using such analytical tools as the Cobb–Douglas Production Function, Translog Production Function and Stochastic Frontier Analysis to assess the efficiency of farm management. These techniques are useful to measure productivity, technical efficiency and resource-use efficiency. The efficiency assessment process also includes climate-smart agriculture, diversification and data-driven management. Lastly, the strategic framework demonstrates the need for the synergies to be achieved between technological innovation, resources optimisation and scientific evaluation for achieving sustainable agricultural development and long-term economic viability in effective managing of farms.

CHALLENGES IN MODERN FARM MANAGEMENT

Climate Change and Environmental Stress: Climate change poses a big challenge to modern agriculture due to irregular rainfall, rising temperatures and more frequent extreme weather events. These factors affect the cropping rotation, impact yields and provide uncertainty in farm planning. The threats to the environment, such as soil erosion, loss of soil fertility and depletion of groundwater resources, aggravate the situation by further decreasing the productivity of land. In this context farm management strategies should include adaptive options that increase the resilience of the farm, but some of these options may be inappropriate in agro-climatic conditions or due to farmers' awareness levels.

Structural Constraints: Small and Fragmented Holdings: An important feature of the small-scale agriculture prevalent in the developing countries such as India is the fragmentation and smallness of land holdings, thereby restricting the economies of scale and advanced technology use. Fragmentation adds to the costs of transactions, makes farming more complicated and confines access to credit and markets. Therefore, the management strategies on the farms need to be adapted to these structural realities, paying attention to the need for collective solutions, such as cooperative farming, farmer producer organisations and joint use of farm machinery, which are more appropriate to the smallholders.

Market Imperfections: Farmers face imperfect markets in which they have limited bargaining power, little information and volatile prices. The marketing infrastructure and institutional support is lacking, resulting in suboptimal decision making and farm incomes. Without adequate access to market information, better price discovery mechanisms and robust institutional structures, the management strategies of the markets cannot be effective.

Input misallocation and inefficiency: The inefficient use of inputs continues to be a challenge in agriculture, and farmers may overuse some inputs and underuse others, such as fertilizer or irrigation and improved seeds. This imbalance results in increased expenses, decreased productivity and environmental degradation. Input misallocation issues will need to be resolved with improved information, improved extension services and adoption of technologies that allow for precise application of inputs, though the affordability and accessibility of these technologies remain important issues.

Digital Divide and Knowledge Gaps: Digital technologies have been rapidly developed and advanced in agriculture, offering opportunities to enhance farm management, however, their adoption is not even as there are differences in digital literacy, infrastructure and access. There is a digital divide between those farming and the benefits of digital tools as many farmers lack the skills and resources needed to effectively use them. Capacity building and technologies that are easy to use and implement, therefore, need to be integrated into farm management strategies to ensure they are widely adopted.

ANALYTICAL EVALUATION AND INNOVATIONS IN FARM MANAGEMENT

Precision Agriculture: Precision Agriculture are a big step forward in the management of the farm as it uses technology like gps, remote sensing, data analysis etc to use the input in an efficient way. Precision farming can be used to reduce inputs, enhance productivity and minimize environmental impact by applying site-specific information to optimize input application. However, this is not widely available for smallholder farms as it is expensive, but could become more available for smallholders through shared service or government assistance.

Digital and Smart Agriculture: Digital agriculture is about farmers receiving real-time information and decision support through the mobile app, AI and the Internet of Things (IoT). These technologies can help farmers better manage their resources, improve forecasting, and keep track of the farm's activities. Although digital agriculture can be highly scalable, its implementation requires both infrastructure and digital literacy, as well as institutional support; interventions to specifically target digital agriculture are therefore needed to enable its application.

Mechanization and Automation: The use of machinery is very important in increasing labour productivity and efficiency, especially when labour is scarce. Precision farming techniques also

benefit from the use of automation technologies, which further increase precision and save manpower in farming activities. The extent of mechanisation varies however among different sizes of farms, with small farms needing access to mechanisation via custom hiring centres and co-operative schemes to be viable economically.

Climate-Smart Agriculture: Climate-smart agriculture combines approaches that aim to boost productivity, build resilience and lower GHG emissions. Crop diversification, conservation tillage, and water management are all examples of practices that can help achieve sustainable farm management. These are generally good practices irrespective of the farm size, but need to be made known, trained and supported in order to be adopted.

Diversification and Integrated Farming Systems: Diversification and integrated farming systems are those related to the multiple choice of activities (crop production, associated livestock, fisheries and horticulture) in order to generate several incomes. These will decrease the risk, increase the use of resources and make the income more stable, which is especially relevant for small and marginal farmers who are more susceptible to shocks.

Data-Driven Decision Making: Using big data and sophisticated analyses in agriculture allows for better decision-making and more accurate predictions of yields, efficient use of resources, and risk management. Data-driven approaches are a promising way forward, but these can be more easily implemented at the collective / organisational level than the individual farm level, due to the need for strong data infrastructure and institutional support.

The strategic framework for farm management: A sound management strategy for the farm should consider various aspects, such as resource use, risk management, market orientation, sustainability and institutional linkages. Resource allocation can be done efficiently to ensure that the inputs are used in a way that maximizes productivity, and risks can be reduced through diversification and insurance. Market-oriented production makes the production of the farm correspond to the demand of the market, and thereby increases the profitability of the farm. Supporting institutional linkages and sustainability considerations are important for the long-term viability of agricultural systems and effective strategy implementation.

EFFICIENCY OF FARM MANAGEMENT

The efficiency of farm management has been considered on the basis of an econometric model. An econometric model has been used for farm management efficiency. Econometric modelling is a tool which can quantify the relationship between inputs, outputs and efficiency levels and can enhance the empirical analysis of farm management strategies. The use of functional forms like the Cobb–Douglas and Translog production function, or frontier analysis such as the Stochastic Frontier Analysis (SFA) is common in modern agricultural economics to

analyse production and efficiency. In addition to estimating the responsiveness of output to inputs, these models can also estimate the degree of farm inefficiency.

Cobb–Douglas Production Function: The Cobb–Douglas production function is a very common and simple production function used as a tool for analysing the relationship between inputs and outputs in agriculture. It is assumed to be a log-linear function and that elasticity of substitution between inputs is constant. The model is represented by:

$$\ln Y_i = \beta_0 + \beta_1 \ln L_i + \beta_2 \ln K_i + \beta_3 \ln F_i + \beta_4 \ln W_i + \varepsilon_i$$

The agricultural output of the i th farm is denoted by (Y_i) ; the labour used by the i th farm denoted by (L_i) ; the capital (machinery) used by the i th farm denoted by (K_i) ; the fertilizer used by the i th farm denoted by (F_i) ; and the irrigation or water used of the i th farm denoted by (W_i) ; and the error term, capturing random shocks, by ε_i .

The estimated coefficients in this specification $(\beta_1, \beta_2, \beta_3, \beta_4)$ represent the elasticity of output with regard to each of the inputs, that is, the percentage change in output for a one per cent change in the corresponding input. The totals of these coefficients offer insight into the returns to scale, the sum of one means that returns to scale is constant, the sum greater than one means increasing returns and the sum less than one means decreasing returns. The Cobb–Douglas model is very convenient to use because of its simplicity and its easy interpretation, and because it makes some restrictive assumptions regarding substitutions between the inputs.

Translog Production Function: The Cobb–Douglas function has some drawbacks, such as the requirement for constant elasticities and the absence of interaction effects between the inputs; the Translog production function overcomes these shortcomings and has a more flexible specification. The model is given by:

$$\ln Y_i = \beta_0 + \sum_j \beta_j \ln X_{ji} + \frac{1}{2} \sum_j \sum_k \beta_{jk} \ln X_{ji} \ln X_{ki} + \varepsilon_i$$

X_{ij} is the i th input in the j th farm, while the interaction terms reflect the substitutability or complementarity between the inputs of the various farms.

Unlike the constant elasticity model, the Translog model can include more realistic production processes in agriculture due to the absence of fixed elasticity of substitution and constant elasticity. The interaction coefficients (β_{jk}) provide more insight into efficiency of resource use, as they give information on substitution and complementarity between the inputs. The model, however, needs more information and if mis-specified, may exhibit multicollinearity.

Stochastic Frontier Analysis (SFA): Production functions represent average relationships, but don't capture inefficiency across farms. The difficulty is overcome by using the Stochastic Frontier Analysis, which separates the error term into two parts: random noise and technical inefficiency. The stochastic frontier production function can be specified as:

$$\ln Y_i = \beta_0 + \sum_j \beta_j \ln X_{ji} + v_i - u_i$$

The error term v_i is a symmetric random error that represents statistical noise (weather shocks and measurement errors), while u_i is a technical inefficiency. The technical efficiency (TE) of each farm is obtained as:

$$TE_i = e^{-u_i}, \quad 0 < TE_i \leq 1$$

A higher value closer to one means a higher efficiency. This structure allows one to estimate the distance of a farm from the optimal production frontier. The inefficiency term can be modeled as a function of characteristics of the farm to further analyze determinants of inefficiency:

$$U_i = \delta_0 + \delta_1 Z_{1i} + \delta_2 Z_{2i} + \delta_3 Z_{3i} + w_i$$

The Z_{1i} , Z_{2i} , Z_{3i} are variables that include farmer education, extension services, farm size, or farm credit, while the w_i is a random variable.

This model can be used to gain an understanding of the socio-economic and institutional determinants of inefficiency based on the model's coefficients. Thus, if the coefficient were negative for education, it would indicate that education decreases the inefficiency and increases farm management performance.

Climate-Smart Agriculture: CSA combines techniques for: higher productivity, greater resilience and lower greenhouse gas emissions. Crop diversification, conservation tillage and water use efficiency are examples of practices that help to maintain sustainable farm management. These practices are mostly appropriate for all sizes of farms and need awareness, training and enabling policies to be adopted.

Diversification and Integrated Farming Systems: Diversification and integrated farming systems include the integration of allied activities (livestock, fisheries and horticulture) with the farming system for generating different income streams. This strategy mitigates risk, optimizes resource use, and increases income security, especially for small and marginal farmers who are at greater risk.

Data-Driven Decision Making: In agriculture, big data and sophisticated analytics can help make better decisions based on forecasting crop production, resource optimization, and risk assessment. Data-driven approaches have great potential and can be applied at a collective/organisational level but probably not at the individual farm level as they depend on strong data infrastructure and institutional support.

Strategic Framework For Farm Management: A good farm management strategy should embrace various aspects of farm management such as optimisation of resources, risk management, market orientation, sustainability and institutional linkages. Allocation of resources is efficient so that resources are utilised in a way that produces maximum productivity and risk management measures like diversification and insurance reduce risk. Production for the market is oriented to meet consumer demand, increasing the profit. Sustainability aspects are necessary to ensure the long-term viability of agricultural systems and sound institutional linkages are essential to support their effective implementation.

Interpretation and Policy Relevance: The farm management strategies can be quantitatively evaluated using the econometric models used in the above discussion. The Cobb–Douglas model provides a basic sense of input productivity, and the Translog model includes more intricate relationships between the inputs. The SFA framework takes it one step further by determining the efficiency inefficiencies and their causes, so as to provide direct policy insights.

These models can be used from a policy perspective to determine if the cause of low productivity was due to inadequate use of input, poor technology adoption, or inefficiency in management practice. If it is determined that a significant lack of education or extension services is a major cause of inefficiency, for example, the farm performance can be enhanced by specific capacity development and knowledge transfer initiatives. In the same fashion, if returns to scale are increasing, policies that encourage farm consolidation or cooperative farming might be warranted.

Overall, econometric modelling is a useful tool to develop a farm management strategy and/or policy that is grounded in evidence and scientifically valid.

POLICY IMPLICATIONS

Policy interventions are critical in influencing farm management practices as they affect access to resource, technology and markets. Context specific policies are needed which encourage the appropriate use of technologies as per farm size and regional conditions. A robust extension system is necessary to spread the information and enhance farmers' decision-making skills. Market access and bargaining power can be improved by institutional innovations like farmer producer organizations and cooperatives. To gain access to credit and insurance, which is essential for farmers to embrace modern farming practices, financial inclusion is of major importance. Further,

investment in infrastructure and incentives for sustainable practices can have a significant impact on improving farm management outcomes.

Limitations of the Study

1. The study uses secondary data sources: published literature, reports, existing datasets, etc. and the results may be limited by the quality, reliability, and availability of the secondary information.
2. The analysis is mostly based on general trends and theoretical concepts on modern agriculture and may not reflect the regional differences in the farm management activities particularly under different agro-climatic and socio-economic conditions in India.
3. While the study covers advanced technologies of Agriculture, the potential for these technologies to be implemented and adopted by smallholder farmers will differ due to various factors, including infrastructure, affordability, digital literacy, and institutional support.

CONCLUSION

To meet the multifaceted challenges of climate change, resource limitations and market dynamics, the management strategies in modern agricultural practices must adapt and progress. Technological innovations have significant potential to increase efficiency and productivity, but can only be successful if they are appropriate to local conditions and if farmers can adopt them. This balance between technological innovation, institutional support and policy intervention is crucial for sustainable and inclusive agricultural development. The study identifies innovations linked to Agriculture 4.0, including precision farming, monitoring and data analysis, and advanced analytics, as potential opportunities to enhance input use efficiency and mitigate environmental impacts, as well as bolster farm resilience. Despite these innovations, however, the advantages have not been equally shared, with several issues such as high costs of innovation, infrastructure and technical knowledge, especially by smallholder farmers, persisting.

Institutional support and policy frameworks are equally important in determining farm management outcomes. Access to credit, better extension, investments in digital infrastructure, and capacity building are essential for the implementation of modern practices through effective policies. Technological progress cannot bring about inclusive and sustainable agricultural change without support. Thus, to attain efficient and sustainable farm management, it is essential to take a comprehensive approach that incorporates technological innovation, economic efficiency, environmental care and supportive governance. A path forward should include greater inclusiveness, particularly for small and marginal farmers and should aim to develop adaptive and resilient farming systems. Modern farm management can be a key factor in achieving long-term sustainability and rural development through linking farm-level decisions with overall policy goals.

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