sdmimd
Shri Dharmasthala Manjunatheshwara Institute for Management Development, Mysuru, India
10th International Conference on
Economic Growth and Sustainable Development: Emerging Trends – November 27-28, 2025

Rural and agricultural challenges and development

Nalina D. B
Faculty of School of Law
University of Mysore
Mysore

Abstract

Agricultural and rural development innovations are crucial drivers of economic growth, poverty reduction, and sustainable progress. The use of advanced methods like precision agriculture, genetically improved crops, and smart irrigation boosts productivity, efficiency and resilience[1] in farming. These advancements not only lead to higher yields and better incomes for farmers but also strengthen food security and promote environmental sustainability. Although India is one of the countries that is quickly moving towards urbanisation, most Indians (61%) still live in rural regions, making rural development crucial for the efficient growth of the nation. This paper's primary goal is to examine and comprehend the issues and difficulties that rural communities currently face, as well as to explore and outline the causes of these issues. There are many hurdles looking upon towards the rural areas. So that it is important to make a research and overthrow the issues which have been raised in order to alert the decision makers, policy makers, and planners to the concerns. These advanced methods may bring a radical change in rural regions. So, it is well to adopt and make use of it for better improvement.

Key words: *Agriculture, Rural Development, India, Policy, Sustainability, Livelihood.*

Introduction

Rural and agricultural development are the challenging issues because of poor infrastructure, lack of access to essential services like health care and education often leads to urban migration[2] and poverty. Climate change may affect crop yields and rural livelihoods. There are many other issues like market volatility[3], high input costs. Addressing to all these it may requires sustainable development plans, community involvement and policies that promote technological adoption, equitable resource distribution to ensure rural prosperity and food security.

Agriculture: Rising temperature in earth and unpredictable weather patterns due to change in climate insist a farmer to shift the crop production. Through these farmers are adopting changes in land usage, labour and resource allocations, occupational patterns, irrigation systems and cropping methods.

Rural development: Rural development usually refers to the method of enhancing the quality of life and financial well- being of individuals especially who are living in populated and remote areas. Rural development still remains the core of the overall development of the country. More than 1/3rd of the country's population are dependent on agriculture for their livelihood and 1/3rd of rural India is still

[1] Resilience - The ability to bounce back from difficult situations and adapt to stress.
[2] Urban migration - The movement of people from rural areas to urban centers.
[3] Market volatility- The speed and size of price movements in the stock market.

ISBN code 978-93-83302-82-6.

below the poverty line. Rural development is important not only for the people who are residing in rural areas, but also for the overall economic expansion of the nation.

Sustainability: It protects the environment through resource conservation and biodiversity[4] and also fosters the economic growth. i.e., inclusive and fair. It ensures social well-being and equity for all people. It promotes peace and strong institutions and also builds global partnerships to achieve these goals.

Livelihood: Sustainable livelihood emerges at the intersection of development and environmental studies to offer a new way to think about work, production and distribution.

Key Challenges: III

Inadequate infrastructure: There is a lack of proper roads, electricity, clean water and storage facilities in rural areas. The people in rural areas are facing several problems. It is too difficult for the farmers or rural peoples to do something like economic activity and market access for agricultural produce.

Limited access to service: Farmers and rural people do not have proper health care facilities, education and financial services.

Economic Vulnerability: Completely depending on agriculture, especially small holder farming makes rural communities too vulnerable to market fluctuation and low wages. Sometimes there are high input costs and lack of market facilities may affect farmer's profits.

Climate change and Environmental Degradation: Change in weather, floods, droughts and soil degradation may threat the agricultural productivity and it may lead to food insecurity and loss of income.

Out dated techniques and Technology gaps: Many farmers are not updated to the modern techniques and new technology. There is a lack of knowledge and resources among the farmers to adopt these new forms.

Social and Gender inequalities: Even today there is a discrimination regarding the caste, gender and social hierarchies. There is a limited access to a rural women and she is not able to move freely and easily.

Post- Harvest Losses: Due to the lack of storage facilities and marketing in fracture it may lead to significant post-harvest losses[5] for farmers, further it may reduce their income also.

Governance and Implementation Gaps: Well-meaning rural development schemes often suffer due to: Corruption, Bureaucratic delays, Lack of local participation, poor monitoring and evaluation.

Development strategies: IV

Improve infrastructure: By investing more to the power supply, road networks and irrigation systems and also by supporting agricultural and non agricultural economic growth.

Promote sustainable agriculture: By encouraging the adoption of climate-resilient farming practices, through improved seed varieties, providing sufficient water management and soil conservation techniques.

[4] Biodiversity - The variety of all living things on earth, from tiny microorganisms to large plants and animals.
[5] Post harvest losses – A measurable quantitative and qualitative loss in a given product.

ISBN code 978-93-83302-82-6.

Enhance education and health care: Through investing for rural schools and health care centres it may reduce illiteracy and improve public health.

Foster non-farm employment: Rather than completely depending on agriculture, if the rural people are encouraged and supported to enter rural industries, to do small business, and giving vocational training[6], it may create employment opportunities and reduce dependence on agriculture.

Strengthening market linkages: Agricultural marketing systems should be improved and to be developed like farmer co-operatives and e- trading platforms to ensure fair prices and reduce losses.

Improve governance and policy implementation: Government policies and programs for rural development should be efficiently managed and to be implemented to reach the beneficiaries.

Comprehensive Analysis: V

Main Problems of Indian Agriculture & Sustainable Solutions for 2025

1. Dependence on Monsoons and Unpredictable Weather

A **significant portion** of Indian **agriculture remains highly vulnerable** due to its dependence on **monsoons and unpredictable weather.** Erratic rainfall**, droughts, floods,** and **unseasonal rains** disrupt **crop cycles.** With **climate change** exacerbating extreme events[7], the result is reduced yields and distress for **farmers.**

Solution: Efficient Irrigation, Climate-Resilient Crops & Advanced Forecasting

Investment in irrigation infrastructure (drip irrigation, rainwater harvesting, and expanded irrigation networks) can significantly reduce dependence on rainfall. Adoption of climate-resilient crop varieties and advanced weather forecasting technologies empower farmers to mitigate weather-related risks. Real-time tools can alert farmers to impending extreme weather events, allowing better resource planning and protective strategies.8

2. Fragmented Land Holdings

In India, **most farmers cultivate small and fragmented land**[9] **parcels**. This setup **limits the adoption of mechanization**, reduces **economies of scale**, and diminishes market competitiveness. The outcome is **inefficient resource use**, restricted **productivity**, and hindered rural development.

Solution: Land Consolidation, Cooperative Farming & Tech-Enabled Models

Land consolidation and cooperative farming models can pool resources, reduce redundancy, and enable mechanization and modern technologies. Platforms supporting collaborative resource utilization let smallholder's access machinery and infrastructure that was previously unaffordable. Policy-driven models also foster knowledge-sharing and market power, providing a stronger voice for small-scale farmers.

[6] Vocational training – A type of education focused on teaching the practical skills and knowledge needed for specific job.
[7] Exacerbating extreme events – Climate change is making extreme weather events, such as heat waves, floods, and droughts, more frequent, more intense, and more severe.
[8] Protective strategies – Plans and actions designed to safeguard individuals, assets, or health from harm.
[9] Fragmented land: the process where land is divided into smaller, non- contiguous parcels.

ISBN code 978-93-83302-82-6.

Inadequate Access to Modern Technology

Many Indian farmers especially in remote and economically weaker areas **lack access to modern technology**. This includes advanced machinery, precision farming tools, quality seeds, and efficient irrigation systems. The **technology gap** severely restricts farming productivity, sustainability, and competitiveness in global markets.

Solution: Technology Access, Training & Farmer-Friendly Platforms

Public and private sector schemes must bridge the affordability gap, making advanced agri-tech accessible to smallholders. Training and demonstration centres build digital literacy and technical knowledge regarding modern farming practices. Platforms that offer satellite monitoring, AI-based advisories or APIs simplify technology adoption at every scale enabling farmers to monitor field health, irrigation, and yield potential in real time. Explore Farmonaut's Agricultural APIs for integrating real-time satellite data, weather forecasts, and crop management tools tailored for developers and agri-businesses. Developer ensures seamless integration[10] for precision farming and monitoring systems.

Soil Degradation and Fertility Loss

Excessive chemical input use, monocropping[11], and improper irrigation have caused **significant soil degradation** across India's key agricultural zones. **This results in fertility loss, pH imbalance, erosion, and poor water retention, directly affecting crop output and rural incomes.**

Solution: Sustainable Soil Management, Organic Practice, and Monitoring

Soil-testing and mapping allows for **targeted fertilizer and irrigation application**, reducing environmental impact and improving yield. Adoption of **sustainable practices** such as **crop rotation**, green manuring[12], bio fertilizers, and reduced tillage helps restore soil health. **Organic farming practices** further reduce degradation, enhance biodiversity, and ensure long-term **agricultural sustainability.**

Post-Harvest Losses and Poor Storage Facilities

A **substantial portion of Indian farm produce** is lost post-harvest, primarily due to **inadequate storage, substandard transportation, and lack of agro-processing units**. These losses diminish **farmer profitability** and represent a severe challenge to **food security** and the overall **development of the agricultural sector.**

Solution: Cold Chains, Modern Storage Infrastructure & Logistics Technology[13]

Investment in post-harvest infrastructure including **cold storage chains, digital logistics, and processing centres** reduces spoilage and preserves crop quality. **Technology-enabled supply chains** connect farmers directly to **markets** and consumers, improving timely delivery and reducing intermediary costs. **Block chain-based traceability platforms** further increase transparency and authenticity in the supply chain, especially for high-value crops.

[10] Seamless integration – The process of connecting different systems or components so they work together as one unified system.
[11] Monocropping – A practice where a field is utilized for the production of pure stands of one crop only.
[12] Green manure – Crops grown to be incorporated into the soil, enhancing its organic matter.
[13] Logistics technology – Any technology that allows players in the logistics industry to manage the flow of goods.

ISBN code 978-93-83302-82-6.

Lack of Access to Credit and Fair Pricing

Small holder farmers often struggle to get **affordable institutional credit**[14] due to lack of collateral or formal credit history. Meanwhile, the dominance of **middlemen** and absence of fair price discovery mechanisms undermine **profitability** and threaten **long term stability.**

Solution: Expanding Credit, Digital Payments, FPOs & Crop Insurance

Promotion of Farmer Producer Organizations (FPOs) increases collective bargaining, access to formal finance, and fair market presence. **Institutionalized credit and digital payment platforms** (including direct benefit transfer schemes) rapidly increase transparent, timely financial access. **Crop insurance schemes** protect against losses due to adverse weather, pests and market price fluctuations[15].

Market Uncertainties and Price Volatility

Unpredictable market prices whether due to **supply demand imbalances, policy changes,** or **export restrictions** create high **income uncertainty** for farmers. These **main problems in agriculture hinder sustainability** and discourage **investment in improved practices.**

Solution: Strengthened MSP, Price Data Systems & Smart Policies

Expansion and effective implementation of Minimum Support Prices (MSP) shields farmers from extreme price crashes and market shocks .**Real-time digital market information systems** provide accurate data on demand, supply, and regional prices, levelling the playing field for smallholders. **Promotion of contract farming** offers price stability, assured markets, and introduces modern best practices.

Labour Shortages

The **Indian agricultural sector faces a growing labor shortage** due to rapid urban migration, demographic shifts, and low rural wages. This is especially acute during **peak farming seasons, affecting timely sowing, harvesting, and post-harvest handling.**

Solution: Mechanization, Automation & Farm Management Tech

Mechanization and the adoption of labour-saving technologies (like drones, automated planters, and harvesters) can significantly **reduce dependence on manual labour.** Affordable leasing models[16] and cooperative ownership of machinery make modern equipment accessible to even small farms. Digital workforce platforms can supplement on-farm labour during critical periods.

[14] Affordable institutional credit – Financial assistance provided by regulated institutions like commercial banks, co-operatives and RRBs often at lower interest rates and with supportive policies to help farmers and businesses.
[15] Price fluctuation – An economic metric that is used to determine the rate of increase or decrease in the price of goods and services within a market.
[16] Affordable leasing model: Can refer to a residential housing scheme like the Affordable Rental Housing complexes (ARHCs) in India, which offers low-cost rentals to urban migrants.

ISBN code 978-93-83302-82-6.

9. Limited Agricultural Extension Services

Many farmers do not receive timely information on best practices, weather, or **government schemes**. This **information gap** leads to outdated, inefficient, or environmentally unsustainable practices[17] on Indian farms.

Solution: Digital Advisory, Knowledge Centres & Scalable Extension

Digital platforms mobile apps, web portals, and API integrations can deliver personalized agricultural advisory services at scale. Satellite-driven extension systems (like those integrated through Farmonaut's advisory and monitoring solutions) provide localized, real-time insights and weather updates to farmers. **Community resource centres** can enhance adoption and support among digitally less literate farmers, ensuring inclusivity.

Environmental Concerns and Sustainability

Excessive use of water, pesticides, and monoculture practices threaten India's agricultural sustainability**, leading to biodiversity loss, soil and water contamination, and increased carbon emissions.**

Solution: Agro forestry, Carbon Monitoring & Diversification

Agro forestry[18] **and diversified cropping systems** enhance biodiversity and improve soil and water conservation. **Precision farming and resource monitoring** reduce waste and environmental damage. Tools for **carbon monitoring and reporting** support compliance and promote climate-smart agricultural practices.

Remedies: VI

It focuses on improving productivity through irrigation, modern farming techniques, and technology adoption and developing infrastructure, promoting diversified economic opportunities beyond farming and providing education and skill development.

Agricultural remedies

Water management: By implementing efficient irrigation systems like micro- irrigation and improve water resource management.

Technological integration: By adopting modern technologies like high-yield seeds, advanced management system.

Sustainable practices: By introducing sustainable farming methods and covering crops to improve soil health and reduce environmental impact.

Post harvest management: By investing into improved storage facilities, grading, packaging, transportation.

[17] Unsustainable practices: Actions that deplete natural resources faster than they can be replenished, causing long-term environmental, social and economic damage.

[18] Agro forestry –It is a land use management system that integrates trees with crops or pasture. It combines agricultural and forestry technologies.

ISBN code 978-93-83302-82-6.

Rural remedies

Economic diversification: By fostering non- agricultural employment through skill development, promoting self-employment.

Community empowerment: By supporting community-based programs where it helps the self-help groups and it increases community savings.

Access to basic services: Basic services like education, health care, and sanitation in rural areas should be improved to enhance the quality of life.

Suggestions and Recommendations: VII

Expanding micro-irrigation and water shed development[19]: In our country irrigation efficiency is too critical because 45% of India's farmers in the farm land still they depend on monsoon seasons. Drip irrigation and sprinkle irrigation are treated as wastewater reuse. Rainwater harvesting must be covered in semi- arid regions[20].

Promote sustainable farming practices: If organic farming, crop rotation and conservation tillage[21] is used and practiced, then it will improve the soil health and resilience.

Enhance irrigation and water management: Rather to depend on monsoons better to move towards alternative modern efficient water technologies like drip and sprinkle irrigation and water harvesting.

Develop rural infrastructure and services: If there is proper road and transportation facilities, it is easier for farmers to access markets providing storage facilities and agro processing units, education and health care facilities in rural areas to build a human capital.

Reform credit and market access: If there is low interest loans and financial services for small farmers is given through microfinance institutions it will help the rural people in a better way. Crop insurance schemes may cover production and price risks. Farmer producer organizations (FPOs) encourage the formation and support of FPOs to empower farmers with collective bargaining power and better market linkages.

Support economic diversification: Allied sectors like animal husbandry, dairy farming and fisheries provide additional income streams and build resilience. If the rural people invest in this they will get more benefit. Non-farm employment opportunities such as cottage industries and small enterprises may be a supportive nature.

Conclusion: VIII

The **problems of Indian agriculture** are complex, interlinked, and critical to the nation's future food and environmental security. As we've explored throughout this article, **addressing these challenges requires coordinated technological, institutional, and policy interventions** with a focus on sustainability and inclusion. **By integrating innovative solutions such as efficient irrigation, cooperative farming, sustainable practices, affordable modern technology, and robust digital**

[19] Water shed development: The process of managing and conserving natural resources like soil, water and vegetation within a specific area called a watershed to improve overall productivity and sustainability.
[20] Semi-arid region – A dry area with light to moderate rainfall, typically between 10 and 20 inches (25 to 50cm) per year, receiving more precipitation than an arid desert but less than a humid climate.
[21] Conservation tillage – A farming method that minimizes soil disturbance by leaving crop residue on the soil surface to reduce erosion.

ISBN code 978-93-83302-82-6.

platforms, India can ensure higher yields, better rural livelihoods, and reduced environmental impact. It is imperative for all stakeholders, farmers, governments, businesses, and technology providers to collaborate proactively, making sustainability and profitability the dual cornerstones of agricultural transformation for 2025 and beyond.

For farmers, agri-businesses, and government agencies seeking to join this journey, affordable, satellite-based insight platforms like those developed by Farmonaut are already making a real-world impact bridging knowledge gaps, optimizing resource use, and building the foundation for a resilient, prosperous, and sustainable Indian agricultural sector. Sustainable rural development is needed more than that of agricultural improvements because it depends on parallel advances in education, health care, and non-farm employment. There is a need for supportive policies that harmonize agricultural strategies. Through this, there is a way for a more food secure equitable and prosperous future for populations and society.

References : IX

Icecd .org/bog/challenges-in –rural development-in- India- key- issues.

https: /farmonaut.com

https://www.worldbank.org

www.ijrpr.com

https://conservealliance.org

https://www.linkedin.com

ISBN code 978-93-83302-82-6.