SUSTAINABLE AGRICULTURE FOR A RESILIENT AND FOOD-SECURE INDIA: THE STRATEGIC ROLE OF CMAs

Abstract

Sustainable agriculture is central to building a resilient and food-secure India as the nation progresses toward its Vision 2047. With agriculture supporting over half of India's workforce and facing challenges such as soil degradation, water stress, climate variability, and rising input costs, transformational reforms are imperative. This article explores how key national initiatives the **National Mission for Natural Farming,** the **Digital Agriculture Mission,** and **Climate-Smart Agriculture** are reshaping India's agricultural ecosystem by promoting ecological balance, technology-driven decision-making, and climate resilience. It further highlights the importance of Activity-Based Costing in improving cost transparency, optimizing resource allocation, and making sustainable practices economically viable. The strategic role of Cost and Management Accountants is emphasized in designing costing models, evaluating sustainability investments, supporting digital agriculture, and guiding policy-level decisions. By integrating environmental stewardship, technological innovation, and robust financial management, India can enhance farmer's income , protect natural resources, and ensure long-term food security. Sustainable agriculture, backed by sound costing and governance, will be the cornerstone of India's resilient agricultural future.

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Introduction:

Agriculture lies at the heart of India's economic strength, ecological stability, and food security. With over 55% of India's workforce dependent directly or indirectly on agriculture (Source: Economic Survey of India 2023–24) and the sector contributing nearly 18% to the national GDP, (Source: Economic Survey of India 2023–24) the need for a sustainable, climate-resilient, and technologically empowered agricultural ecosystem has never been more critical. As the country marches toward its development vision for 2047, transforming its agricultural landscape is essential to ensuring food security for a projected population of 1.6 billion (Source: United Nations, World Population Prospects 2022) while safeguarding natural resources for future generations.

Sustainable agriculture is no longer an option but a necessity. Challenges such as soil degradation, groundwater depletion, rising input costs, climate vulnerability, and stagnating farmer incomes demand structural reforms and new approaches. India loses nearly 5.3 billion tonnes of soil annually, (Source: ICAR; Central Ground Water Board (CGWB), Ministry of Jal Shakti) and groundwater extraction rates are among the highest in the world.

Over 30% of India's land is affected by degradation, and climate events—droughts, floods, heatwaves, Source: Food and Agriculture Organization (FAO) —are increasing in frequency, impacting crop yields by 10–40% in vulnerable regions.

To build a resilient agricultural future, India is advancing several transformational initiatives. These include the National Mission for Natural Farming (NMNF), the Digital Agriculture Mission (DAM), and expanding climate-smart agriculture practices. Additionally, integrating Activity-Based Costing (ABC) in agriculture is a critical financial tool that can help farmers, agribusinesses, and policymakers optimize costs, improve profitability, and make sustainable practices economically viable.

Three key national initiatives, National Mission for Natural Farming (NMNF), Digital Agriculture Mission (DAM), and Climate-Smart Agriculture (CSA), represent a paradigmatic shift towards ecological, technological, and climate-resilient farming. To strengthen these reforms, Activity-Based Costing (ABC) and the broader expertise of Cost and Management Accountants (CMAs) are crucial.

This article explores how these strategic initiatives can collectively build a resilient, sustainable, and food-secure India.

National Mission for Natural Farming (NMNF)

Launched in 2022–23, the National Mission for Natural Farming aims to transition farming away from chemical-intensive practices toward ecological and regenerative methods. This mission supports Bharatiya Prakritik Krishi Paddhati (BPKP) and emphasizes Zero Budget Natural Farming (ZBNF), bio-inputs, indigenous seeds, and on-farm resource recycling.

1. Why Natural Farming?

India uses over 62 million tonnes of chemical fertilizers annually, Source: Department of Fertilizers, Ministry of Chemicals & Fertilizers, Government of India.. While fertilizers have historically boosted yields, indiscriminate use has led to:

- declining soil organic carbon (reduced to 0.5%, from the ideal 1–1.5%),
- contamination of water bodies,
- reduction in biodiversity,
- lower nutritional value in produce.

The average Indian farmer spends nearly 30–35% of total cultivation cost on chemical inputs, while natural farming practices have demonstrated potential cost reductions of up to 70% (Source: NABARD; ICAR; NITI Aayog).

2. Key Features of NMNF

- Promotion of 100% chemical-free agricultural systems
- Establishment of Bio-Resource Centres (BRCs)
- Farmer training through Krishi Vigyan Kendras
- Financial assistance for model gaushalas and input preparation units
- Crop diversification with millets, legumes, and indigenous varieties

3. Impact and Progress

- Over 6 lakh farmers have adopted natural farming practices (Source: National Mission on Natural Farming, Ministry of Agriculture & Farmers Welfare).
- 26 states and UTs have included natural farming in their agriculture strategies.
- The government has identified a 75,000 km stretch along the Ganga for chemical-free agriculture to reduce river pollution (Source: Ministry of Jal Shakti; Ministry of Agriculture & Farmers Welfare).

Early results show:

- **30–40% reduction in input cost** (Source: ICAR; National Mission on Natural Farming, Government of India).
- 10–20% increase in soil moisture retention
- Improved climate resilience

However, yield comparisons vary. While some crops (millets, oilseeds, pulses) show similar or even higher productivity, high-input crops like

wheat and paddy may initially experience a 10–20% yield decline (Source: ICAR; NITI Aayog).

Digital Agriculture Mission (DAM)

The future of Indian agriculture is digital. Launched in **2021,** the Digital Agriculture Mission is designed to integrate technology across the value chain, enabling data-driven decision-making.

1. Key Technologies Driving DAM

- AI and Machine Learning for crop health monitoring
- GIS & Remote Sensing for land use mapping
- IoT-based soil and climate sensors
- Blockchain for traceability in agri-supply chains
- Drones for spraying, monitoring, and geospatial surveys
- Digital Public Infrastructure (DPI) for Agriculture, similar to UPI

2. Expected Outcomes

DAM aims to create a unified database of over 140 million landholdings, enabling farmers to access:

- digital advisory services,
- targeted subsidies,
- precision farming recommendations,
- crop insurance claims automation,
- e-market linkages.

3. Impact of Digital Agriculture: Facts & Comparisons

Parameter	Traditional Agriculture	Digital/Smart Agriculture
Input cost	High due to guesswork	10–15% reduction via precision
Water use	Inefficient; flood irrigation	30–40% saving with IoT sensors
Yield	Moderate	15–20% higher with data-driven farming
Market access	Limited to mandis	Nationwide digital marketplaces
Losses	20–30% post-harvest	Reduced through blockchain tracking

Digital farming can increase a farmer's income by 25–35% through efficient resource management and better market linkages.

Climate-Smart Agriculture (CSA)

Climate change is the greatest long-term challenge to agricultural sustainability. According to the Indian Council of Agricultural Research (ICAR), climate variability causes nearly **USD 10 billion** in annual economic losses to Indian agriculture (Source: ICAR).

Climate-Smart Agriculture is a strategy developed by the FAO and adapted for India to:

1. Increase productivity
2. Enhance resilience
3. Reduce greenhouse emissions

1. CSA Practices in India

1. **Micro-irrigation (Drip & Sprinkler)**
   - India has over 14 million hectares under micro-irrigation
   - Saves 40–50% water
2. **Drought-resistant and heat-tolerant seed varieties**
   - Over 1,200 climate-resilient varieties released
3. **Alternate Wetting and Drying (AWD) in paddy**
   - Saves 25–30% water
   - Cuts methane emissions by 50%
4. **Agroforestry**
   - India targets 33% tree cover by 2030 under NDC commitments
5. **Millet-based agriculture**
   - India produces 20% of global millet output
   - Millets require 70% less water than rice

6. **Carbon Farming**
   - Practices that earn farmers carbon credits
   - Global voluntary carbon market could reach $50 billion by 2030

2. Climate Vulnerability: Key Figures

- 1°C rise in temperature can reduce wheat production by 6%.
- Droughts affect nearly 33% of India's districts annually.
- Floods impact 50 million people and vast farmland every year.

CSA is therefore essential for future food security.

Activity-Based Costing (ABC) in Sustainable Agriculture

While technologies and environmental strategies are crucial, the financial sustainability of farming is equally important. Activity-Based Costing (ABC) provides farmers and agribusinesses with a more accurate method to allocate costs and optimize profitability.

1. Why ABC Is Needed in Agriculture

Traditional costing treats agriculture as a single activity. But modern farming involves:

- land preparation,
- irrigation,
- planting,
- fertilization,
- pest management,
- harvesting,
- storage,
- transportation.

ABC identifies cost drivers for each activity, enabling:

- better resource allocation,
- precise cost-benefit analysis of sustainable practices,
- identification of unprofitable farming activities.

2. ABC in Sustainable Farming: Comparative View

Parameter	Traditional Costing	Activity-Based Costing
Cost Allocation	Uniform, approximate	Based on actual activities
Decision Making	Limited	Data-driven
Input Cost Control	Weak	Strong—identifies high-cost areas
Sustainability Investments	Hard to justify	Clear ROI estimation

3. Benefits of ABC for Sustainable Agriculture

1. **Helps farmers compare costs of chemical vs. natural farming**
   - Natural farming may reduce costs by 70%, ABC quantifies these savings.
2. **Supports climate-smart investments**
   - Example: Drip irrigation's cost (~₹35,000/acre) vs. water savings and yield impact can be clearly mapped.
3. **Improves efficiency of FPOs and cooperatives**
   - Helps identify profitable crops and activities.
4. **Enhances policy-level decisions**
   - Governments can target subsidies to activities that offer highest environmental value.

4. Role of CMAs

Cost and Management Accountants (CMAs) play a crucial role by:

- designing ABC models for farms and agri-enterprises,
- analysing long-term financial viability of sustainable methods,
- auditing carbon farming and green project investments,

- supporting digital agriculture budgeting,
- helping governments allocate climate funds more effectively.

Conclusion:

India's path to agricultural sustainability requires a multi-dimensional approach. The National Mission for Natural Farming encourages ecological stewardship; the Digital Agriculture Mission leverages modern technology; climate-smart agriculture builds resilience against environmental shocks; and Activity-Based Costing ensures financial sustainability.

Together, these initiatives:

- reduce dependency on chemical inputs,
- strengthen farmers' income,
- protect natural resources,
- improve productivity,
- ensure safe and nutritious food for all,
- and build resilience against climate risks.

As India moves toward becoming a global leader in sustainable agriculture by 2047, integrating technology, innovation, environmental preservation, and financial management will create a farming ecosystem that is economically viable, ecologically sound, and socially inclusive.

A resilient and food-secure future depends not only on growing more food, but on growing it sustainably.

Sustainable agriculture is the cornerstone of India's journey toward a food-secure and resilient future. While ecological and technological reforms are essential, financial sustainability remains central to long-term success. By integrating natural farming, digital agriculture, climate-smart practices, and ABC-based financial accountability, India can create a robust agricultural ecosystem.

CMAs—through costing expertise, analytical skills, and sustainability-driven financial insights will play a defining role in shaping the agricultural economy of the future. Their involvement ensures that sustainability is not only environmentally beneficial but also economically profitable and socially inclusive. MA

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Congratulations!!!

CMA (Dr.) Raja Ghosh

Our heartiest congratulations to CMA (Dr.) Raja Ghosh, General Manager (F&A), Corporate Planning, WBSEDCL for being awarded with PhD in Management by ICFAI University Jharkhand, Ranchi on his Doctoral Thesis "Factors Determining CSR Matrix and its impact on Key Stakeholders in Indian Power Sector".

CMA (Dr.) Raja Ghosh is having a brilliant academic and professional career with over 30 years of experience in Power Sector Finance and Accounts. He is a FCMA, ACS, CFA, MBA (HR) (Gold Medalist) MBA (Finance), M Com, Certified CSR Professional and also holds an additional Certification in Arbitration from ICMAI and Forensic Audit from ICSI & KPMG.

We wish CMA (Dr.) Raja Ghosh the very best for all his future endeavours.