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Climate-Resilient Agriculture

ROADMAPS FOR DUMKA (2025-2035)

A Comprehensive Framework for Food SystemsTransformation

Table of Content

List of Abbreviations and Full Forms

ATMA	Agricultural Technology Management Agency
FPO	Farmer Producer Organization
SHG	Self-Help Group
JSLPS	Jharkhand State Livelihood Promotion Society
PACS	Primary Agricultural Credit Society
NABARD	National Bank for Agriculture and Rural Development
KVK	Krishi Vigyan Kendra
BAU	Birsa Agricultural University
PMFBY	Pradhan Mantri Fasal Bima Yojana
KCC	Kisan Credit Card
NTFP	Non-Timber Forest Produce
AI	Artificial Intelligence
WUA	Water User Association
CSR	Corporate Social Responsibility
e-NAM	Electronic National Agriculture Market
ONDC	Open Network for Digital Commerce
MEL	Monitoring, Evaluation, and Learning
GIS	Geographic Information System
CAMPA	Compensatory Afforestation Fund Management and Planning Authority
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
CBBO	Cluster-Based Business Organization
IFS	Integrated Farming System
GI	Geographical Indication
PRIs	Panchayati Raj Institutions
NRM	Natural Resource Management
CSO	Civil Society Organization

Sustainable Pathways:

Reimagining Agriculture and Rural Livelihoods in Dumka

Executive Summary

This roadmap presents a strategic vision to transform Jharkhand into a climate-resilient, tribal-centric agricultural model by 2035. Developed through extensive multi-stakeholder consultations, it addresses the state's key challenges, including water scarcity, soil degradation, erratic rainfall, weak market systems, and increasing climate risks. The framework is built on four core pillars: Climate Adaptation, Livelihood Enhancement, Ecological Restoration, and Institutional Strengthening. Collectively, these aim to achieve significant improvements—such as a substantial increase in farmer incomes, enhanced water-use efficiency, large-scale adoption of organic and natural farming practices, and strengthened climate resilience for tribal and smallholder farming communities across the state.

The transformation pathway is structured in three phases: initial demonstration of integrated climate-smart solutions, statewide scaling of successful models, and final consolidation into a self-sustaining agricultural system rooted in diversified farming, value addition, and market linkages. The roadmap emphasizes strong Sarkar–Samaj–Bazaar convergence through a revitalized institutional platform that brings together government departments, FPOs and SHGs, private sector partners, research and extension agencies, and civil society organizations. This long-term collaborative approach aims to establish a resilient and inclusive agricultural growth model for Jharkhand.

Keywords: **Climate Resilient Agriculture, Dumka, Tribal Livelihoods, Water Security, Agroecology, Integrated Farming Systems, Natural Farming, Climate Adaptation, Soil Health,, Livelihood Diversification**

1 Introduction and Context

1.1 The Imperative for Transformation

Dumka district, the sub-capital of Jharkhand, is a predominantly tribal (43.2%) region nestled in the Chota Nagpur Plateau. With over 92% of its population living in rural areas and heavily dependent on rain-fed agriculture, the sector is the backbone of its economy. This vital sector now faces unprecedented threats from climate change, manifested in erratic monsoons, frequent droughts, and extreme heatwaves, compounded by severe natural resource degradation like soil acidity and groundwater depletion. This roadmap is born from the clear recognition that achieving sustainable transformation in this fragile ecosystem requires the deep integration of advanced climate science, proven ecological principles, and the rich indigenous knowledge of Santhal communities.

1.2 A Participatory Foundation

This approach, which is based on current data and field information, has been designed for implementation through a comprehensive multi-stakeholder consultation process. A significant milestone in this effort was the District Consultation on Climate-Resilient Agriculture held in Dumka in November 2025, which brought together representatives from key government departments (Agriculture, Horticulture, Water Resources, Animal Husbandry, Forestry, etc.). Farmer Producer Organizations (FPOs), Women's Self-Help Groups (SHGs) under JSLPS, financial institutions such as NABARD and the Dumka Central Cooperative Bank, civil society organizations active in The plan is governed by systems thinking, resilience theory, and the sustainable livelihoods framework, which ensures that the roadmap incorporates both scientific insights and the lived reality of Dumka's tribal groups.

2 Current State Analysis: A District at a Crossroads

2.1 Demographic and Socio-Economic Profile

Dumka has a population of 1.32 million and a density of 351 people per square kilometer, which is lower than the state average. Agriculture is the primary source of income for the majority (92.3%) of the rural people. The literacy rate is 62.54%, with a clear gender discrepancy. Socially, Scheduled Tribes make up 44.5% of the population and Scheduled Castes 6.0%, emphasizing the crucial importance of inclusive and tribal-centric tactics.

Representational Image: Supratim Bhattacharjee/iStock

2.2 Agro-Ecological Assessment

- **Physiography & Climate:** Situated in the Chota Nagpur Plateau, the district features hilly terrain (150-640 meters) with 29.8% forest cover. The climate is humid subtropical with a mean annual rainfall of 1,422.5 mm but characterized by high variability, warm summers, and mild winters.
- **Soil Resources:** Soils are predominantly lateritic, acidic (pH 4.5-6.5), and shallow, with low fertility and poor water retention. Key challenges persist, with moderate yet declining organic carbon levels and widespread micronutrient deficiencies—particularly in Zinc, Boron, Iron, and Manganese.


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2.3 Water Resources: A Crisis in the Making

- **Surface Water:** A network of rivers, including the Mayurakshi, Brahmani, and Bansloi, provides surface water. The Massanjore Dam is a key asset. However, rapid runoff due to hilly terrain, siltation of water bodies, and seasonal flow variations cripple irrigation potential and ecosystem services.
- **Groundwater:** Groundwater is Dumka's main irrigation source but is being depleted faster than it recharges. Shallow aquifers show 3–6 meter seasonal declines, with many wells drying by February–March due to hard-rock geology and rapid runoff. While arsenic is not a concern, magnesium-related salinity pockets and rising nitrate levels from fertilizer use are emerging risks, threatening long-term irrigation and drinking water security.

2.4 Agricultural Production Systems and Infrastructure

- **Cropping Patterns:** Paddy-based monoculture in valleys dominates, leading to ecological simplification and vulnerability. A large proportion of uplands remain underutilized. Landholding patterns are highly fragmented, with over 80% of holdings classified as marginal or small, presenting both a challenge and an opportunity for collective action.

- **Irrigation Infrastructure:** Dumka is still primarily rain-fed, with only about 12-15% of the net sown land under guaranteed irrigation. The canal supply from the Mayurakshi Command Area spans less than 8,000 hectares, reaching just a few blocks, like Ramgarh and Masalia. Groundwater irrigation is limited by the district's hard-rock geology, which supports primarily shallow wells and lift irrigation with modest discharge. Micro-irrigation use remains below 2%, indicating a tremendous opportunity to expand Solar harnessed drip and sprinkler systems for improved water efficiency.

- **Marketing Infrastructure:** The marketing system relies largely on traditional channels, with few regulated markets and underused rural haats. Weak infrastructure, lack of storage (e.g., only one major cold storage in Sariyahat), and processing facilities lead to post-harvest losses of 20-30% for perishables.

2.5 Allied Sectors: Livestock, Fisheries, and Horticulture

- **Livestock:** Dumka hosts a diverse livestock population, with cattle, small ruminants, and backyard poultry forming the core of rural livelihoods. The district is known for its **Black Bengal goats,** which offer high economic returns to tribal households. Despite this potential, per capita milk availability is **only about 65.5 g/day,** far below national norms, reflecting gaps in breed quality, fodder availability, and veterinary services—areas that present significant scope for growth.

- **Fisheries:** Dumka has significant inland fishing potential because of its numerous ponds, village tanks, and medium reservoirs, although this resource is currently underdeveloped. Early achievements, such as cage culture trials in Nandna (Masalia), demonstrate strong prospects for expansion. However, low technical knowledge, insufficient seed availability, and poor pond management methods continue to impede wider adoption.

- **Horticulture:** Horticulture is a growing strength in Dumka, with strong potential across **mango, litchi, custard apple, jackfruit, vegetables, and emerging floriculture.** These crops offer a strong base for high-value diversification. However, orchard yields remain low due to limited irrigation, poor maintenance, inadequate pruning, and weak post-harvest practices, highlighting substantial opportunities for scientific orchard rejuvenation and market-linked floriculture development.

2.6 Institutional Landscape

A developing network of FPOs, including four registered Farmer Producer Organizations (FPOs) in Dumka district, such as Ranishwar Agro Service, and other women-led SHGs, displays a new collective spirit. SHGs, in particular, have had a good effect on women's empowerment. Key supporting organizations like the Agricultural Technology Management Agency (ATMA), Krishi Vigyan Kendra (KVK), Birsa Agricultural University (BAU), and NABARD serve as the foundation for extension, research, and finance.

3 Challenge Analysis and Problem Statement

3.1 The Water Security Crisis

- **Groundwater:** Dumka is under extreme groundwater stress, with declining water tables (over 20 m in numerous pockets) and low natural recharge due to hard-rock plateau geology. Over 70% of rural families face seasonal water constraints, jeopardizing irrigation and drinking water security.

- **Surface Water:** Chronic siltation and poor maintenance of traditional ponds/ahars, combined with failed minor irrigation schemes and rapid surface runoff, have degraded Dumka's surface-water storage and reduced recharge potential; according to CGWB data, parts of Dumka have seen seasonal groundwater-level declines of **2–4 m per year,** including zones with more than a 4 m drop._Emerging coal-mining projects pose added long-term risks of aquifer depletion and contamination.

3.2 Intensifying Climate Change Impacts

- **Temperature Trends:** Mean annual temperatures have risen by **1.0–1.5°C** in recent decades, driving more frequent and intense heatwaves, often exceeding **40°C** during peak summer.

- **Extreme Weather:** Dumka's predominantly rain-fed agriculture is increasingly influenced by variable rainfall patterns, including occasional heavy rains, localized floods, and intermittent dry periods. These conditions contribute to fluctuations in crop productivity and present challenges for farmers in achieving consistent yields.

3.3 Soil Health Degradation: The Foundation is Failing

- **Chemical Degradation:** Persistent soil acidity (average **pH ~5.34**), coupled with widespread micronutrient deficiencies (Zn, B, Fe, Mn) and low-to-moderate soil organic carbon, significantly limits productivity and crop resilience.
- **Physical Degradation:** The undulating terrain and high-intensity monsoon rains trigger severe sheet, rill, and gully erosion, reducing effective soil depth, moisture retention, and root development.

3.4 Market and Value Chain Constraints

- **Limited Value Addition:** Only a small proportion of produce is processed locally, leading to lost income opportunities—particularly for tribal communities with perishable horticultural and NTFP products.
- **Financial Exclusion:** Formal credit access remains limited (only 40–45% of farmers), while crop insurance coverage under PMFBY is extremely low, increasing vulnerability to climate shocks.
- **Infrastructure Gaps:** Absence of modern cold storage, processing, and aggregation facilities—combined with weak market information systems—results in 20–30% post-harvest losses and restricted market access.
- **Institutional Coordination Challenges:** Around 70% of FPOs struggle with weak governance, inadequate business planning, and poor member participation, limiting their ability to drive collective marketing and input delivery.

4 Vision, Strategic Framework, and 2035 Targets

4.1 Vision Statement

To create a climate-resilient, economically vibrant, and socially inclusive agricultural system in Dumka that ensures sustainable livelihoods for its tribal communities, efficient use of natural resources, and reduced vulnerability to droughts and climate shocks through diversification, innovation, and community-led development.

4.2 Theory of Change

The roadmap takes a systems transformation approach, recognizing that Dumka's difficulties are interconnected and necessitate collaborative action across natural resources, production, markets, and institutions. The Dumka District Consultation (11 November 2025) and the Ranchi State Symposium (22 August 2025) highlighted the importance of convergence, community-led planning, and integrated value-chain development The district may achieve self-sufficiency by improving institutional coordination under ATMA, empowering tribal farmer collectives and women's SHGs, and encouraging climate-smart production, value addition, and market access. This collaborative endeavor aims to improve climate resilience, diversify rural incomes, and restore ecological health to Dumka's vulnerable plateau landscape.

4.3 Strategic Objectives and Quantifiable (2035 Targets)

Objective 1: Climate Adaptation & Resilience

Primary Target: Strengthen the adaptive capacity of 30,000 small and marginal farming families across climate-vulnerable blocks of Dumka.

Supporting Targets:

- Promote adoption of **climate-smart agricultural practices on 20,000 hectares** of cultivated land.
- Achieve a **60% improvement in water-use efficiency** through micro-irrigation, mulching, and water harvesting structures.
- Ensure that **60% of farmers adopt community-based disaster preparedness plans.**
- Facilitate installation of **600+ solar-powered irrigation systems** to reduce dependence on diesel and improve access to reliable irrigation.
- Scale **Integrated Farming Systems (IFS) models across 7,500 farming households,** promoting diversified income streams through combined crop–livestock–horticulture–fishery systems to improve resource efficiency, recycling, and year-round income stability.
- Expand **agroforestry coverage to 3,000 hectares** by 2035, with potential cumulative expansion of **6,000–7,500** ha through joint efforts of ATMA, the Forest Department, CSOs, NGOs, and convergence with MGNREGA and CAMPA to promote fruit–fodder–timber plantations on uplands, bunds, and degraded lands.

Objective 2: Livelihood Enhancement & Diversification

Primary Target: Achieve a **75% increase in real farmer incomes** through integrated livelihood diversification and value-chain development. With Dumka's current average annual farmer income estimated at **₹58,740,** this target would raise incomes to approximately ₹1,03000 by 2035 through improvements in production, market access, and enterprise development.

Supporting Targets:

- Ensure a **20% increase in productivity** of major crops such as paddy, maize, pulses, and millets.
- Promote local processing of at least **35% of agricultural produce** through community-based units and FPOs.
- Facilitate the creation of **2,000+ women- and youth-led agri-enterprises** in areas such as processing, mushroom cultivation, Tasar, livestock, and NTFP-based products—supported through convergence of NRLM, JSLPS, and industry partners.
- Develop and market **5–7 strong Dumka-branded products** under "One District One Product" (e.g., Dumka Millets, Dumka Jaggery, Dumka Mango, Tasar silk, bamboo crafts, honey).
- Establish **100 value-chain clusters** across the state integrating production, aggregation, processing, and marketing, supported through public–private partnerships and FPO strengthening.
- Support training and skilling of **10,000 rural youth** in agribusiness, processing, and digital market systems to build a future-ready rural enterprise ecosystem.

Objective 3: Ecological Restoration & Sustainability

Primary Target: Restore and sustainably manage 15,000 hectares of degraded and cultivated land through eco-friendly interventions.

Supporting Targets:

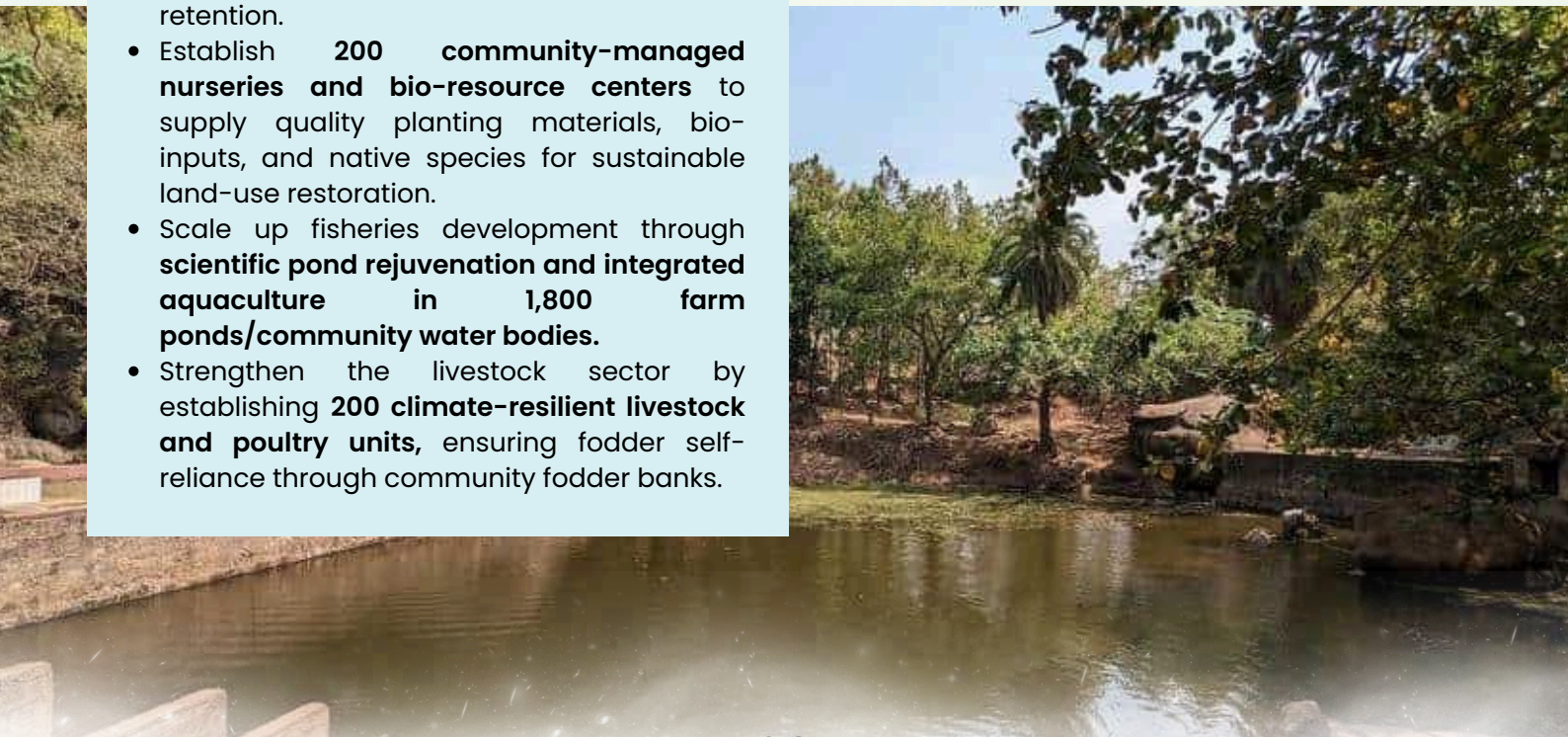
- Bringing **3,000 hectares under natural farming practices,** emphasizing traditional water-conserving systems such as kuruwa and don.
- Additionally, **2,500 hectares** will be brought under **certified organic farming practices** to strengthen soil health, enhance biodiversity, and promote sustainable agricultural production.
- Achieve a **50% reduction in synthetic pesticide use** through integrated pest management and bio-input promotion.
- Achieve a **40% reduction in synthetic fertilizer use** by scaling up composting and green manuring.
- Rejuvenate **1,800 key water bodies and ponds and check dams** to enhance groundwater recharge and ecological restoration.
- Implement **soil and water conservation measures across 10,000 hectares,** including contour trenching, bunding, and mulching to reduce erosion and enhance moisture retention.
- Establish **200 community-managed nurseries and bio-resource centers** to supply quality planting materials, bio-inputs, and native species for sustainable land-use restoration.
- Scale up fisheries development through **scientific pond rejuvenation and integrated aquaculture in 1,800 farm ponds/community water bodies.**
- Strengthen the livestock sector by establishing **200 climate-resilient livestock and poultry units,** ensuring fodder self-reliance through community fodder banks.

Objective 4: Institutional Strengthening & Governance

Primary Target: Establish effective multi-stakeholder governance mechanisms that ensure coordination among departments, FPOs, and community institutions.

Supporting Targets:

- Achieve **30% scheme convergence at the block level** through integrated planning under ATMA and joint implementation across key departments (Agriculture, Horticulture, Rural Development, and Water Resources).
- Ensure that at least **40% of FPOs in Dumka** (including the four active ones) attain financial sustainability through capacity building, professional management, and market linkage support from NABARD, KVK, SFAC, and JSLPS.
- Link **30% of farmers to formal markets** via FPOs, cooperatives, and emerging digital platforms such as e-NAM and ONDC, leveraging ongoing state-level agri-marketing reforms.
- Enable **30% of farmers to access institutional credit** through banks, cooperatives, and SHGs, in alignment with the NABARD Financial Inclusion Plan and Jharkhand State Rural Livelihood Mission (JSLPS) credit mobilization initiatives.



4.4 The Four Pillars Strategic Framework

Pillar 1: On-Farm Production Systems

Scope: Transforming Dumka's predominantly rain-fed, tribal, and upland farming systems by introducing climate-resilient practices that improve productivity, reduce risk, and enhance ecological sustainability.

Core Components:

- **Sustainable Crop Production:** Promote drought-tolerant crops suited to Dumka's plateau ecology—millets (mandua, kodo), pulses (arhar, urad), oilseeds, and improved upland paddy—to reduce dependency on erratic monsoons and strengthen food security.
- **Integrated Farming Systems (IFS)**: Develop diversified crop–livestock–Tasar silk–horticulture models for Santhal and other tribal communities, enhancing resource recycling, reducing climate risk, and generating multiple livelihood streams.
- **Soil Health Management:** Address Dumka's widespread soil acidity (pH ~5.3) through systematic liming, and promote composting, green manuring, and bio-fertilizers to improve soil organic carbon and correct micronutrient deficiencies.
- **Water Conservation:** Adopt in-situ moisture conservation suited to Dumka's undulating terrain—contour bunding, trenches, mulching, farm ponds—and expand micro-irrigation (drip/sprinkler) to combat seasonal moisture stress.
- **Biodiversity Enhancement:** Integrate indigenous trees and NTFP-linked species—Mahua, Sal, Palash, Kusum, Ber—through agroforestry and lac cultivation to boost ecological resilience and provide high-value tribal livelihoods.

Pillar 2: Off-Farm Value Addition

Scope: Enhancing tribal and smallholder incomes in Dumka by strengthening post-harvest processing, value addition, and market access for agriculture, NTFPs, and forest-linked products.

Core Components:

- **Primary Processing Infrastructure:** Establish decentralized units for **millets, pulses, spices, and bamboo** processing at block and cluster levels to reduce drudgery, cut post-harvest losses, and improve product quality.
- **Secondary Processing & Rural Enterprises:** Promote small-scale units for **pickles, mango pulp, jackfruit products, custard apple pulp,** and **packaged Tasar silk** to drive women-led and tribal entrepreneurship.
- **Quality Assurance & Certification:** Support certification for **Organic/PGS clusters,** and promote **GI-tagged "Dumka Bamboo"** and authentic Tasar-based products to access premium markets.
- **Branding & Marketing:** Develop a unified tribal value-chain brand—**"Dumka Naturals"**—and integrate FPOs/SHGs with e-commerce, artisan platforms, and institutional buyers for wider market reach.

Pillar 3: Commons and Natural Resource Management (NRM)

Scope: Scientific restoration, climate-proofing, and community-governed management of Dumka's shared natural resources—including surface water bodies, upland catchments, forest-agriculture interfaces, and groundwater recharge zones—to enhance ecosystem services and long-term resilience in a predominantly tribal, rain-fed agro-ecology.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Core Components:

- **Community-based Water Resource Management:** Promote hydrological restoration of **traditional ponds, ahars, johads, and minor irrigation structures** using evidence-based planning (bathymetric surveys, hydrogeological mapping). Establish and capacitate **Water User Associations (WUAs)** to ensure regulated water use, seasonal irrigation scheduling, and equitable access, thereby improving recharge rates and reducing pre-monsoon water stress.

- **Ridge-to-Valley Watershed Development:** Implement comprehensive watershed engineering—**contour trenches, staggered trenches, check dams, gully plugs, vegetative barriers, and percolation tanks**—to mitigate erosive runoff from Dumka's undulating terrain. This approach enhances **soil moisture retention,** reduces sediment load, and strengthens shallow aquifer recharge essential for sustaining kharif–rabi transitions.

- **Agroforestry and NTFP Intensification on Commons:** Establish scientifically designed **multi-strata agroforestry systems** on community lands using climate-resilient native species such as **Mahua (Madhuca longifolia), Sal (Shorea robusta), Kusum (Schleichera oleosa for lac), bamboo species, jackfruit, and fodder grasses.** This promotes carbon sequestration, soil stabilization, and diverse NTFP-based income streams for tribal households.

- **Disaster Risk Reduction and Climate-Resilient Infrastructure:** Strengthen climate hazard preparedness through **micro-watershed flood modelling,** installation of **rainfall and runoff monitoring stations,** development of **community flood shelters,** and slope stabilization in erosion-prone pockets. Integrate village-level **Climate Risk Maps** and early-warning protocols to reduce vulnerability to extreme rainfall events and seasonal drought cycles.

Pillar 4: Enablers (Markets, Finance, Institutions)

Scope: To establish an integrated, market-responsive, financially inclusive, and institutionally coordinated ecosystem that enables large-scale agricultural transformation in Dumka by strengthening service delivery systems, improving market efficiency, and ensuring effective governance across tribal-dominated rural landscapes.

Core Components:

- **Financial Inclusion and Risk Mitigation:** Expand access to **Kisan Credit Cards (KCC),** climate-resilient credit products, and **PMFBY crop insurance** through Dumka Central Cooperative Bank, PACS, and commercial banks. Promote bundled credit solutions covering seeds, micro-irrigation, bio-inputs, and livestock to reduce financial vulnerability and enhance adaptive capacity of smallholder tribal farmers.

- **Market Development and Value Chain Integration:** Modernize and digitize Dumka's traditional haats, create aggregation platforms for FPOs, and link tribal produce—such as millets, lac, Tasar silk, mango, jackfruit, bamboo, and NTFPs—to **e-NAM, ONDC,** and institutional buyers. Establish district-level price intelligence systems and rural logistics hubs to reduce transaction costs and post-harvest losses.

- **Institutional Capacity Building:** Strengthen managerial, financial, and technical capabilities of **FPOs, SHG federations, and Water User Associations (WUAs)** through targeted training in business planning, digital bookkeeping, value chain assessment, and climate-smart practices. Promote professional management of FPOs through CBBO support and market-oriented governance structures.

- **Knowledge, Innovation & Extension Systems:** Enhance extension delivery using digital advisory platforms, AI-driven weather alerts, farmer field schools, and participatory technology demonstrations tailored to Dumka's tribal farming systems. Integrate local indigenous knowledge with scientific advisories to foster context-specific climate adaptation.

- **Policy Convergence and Governance Mechanisms:** Strengthen an ATMA-led district convergence architecture to synchronize planning and implementation across Agriculture, Horticulture, Water Resources, Animal Husbandry, JSLPS, and the Forest Department. Establish joint review mechanisms, integrated annual action plans, and shared monitoring dashboards to ensure coherent and science-driven decision-making.

5 Integrated Implementation Framework (2025–2035)

By 2035, Dumka District will emerge as a model of climate-resilient, tribal-centric agriculture, where farmers' incomes rise sustainably, women and youth are central to growth, and natural resources are restored through collective action.

5.1 Phase 1:Foundation Building & Piloting (2025–2028)

Focus: **Baseline assessments, initial scaling of climate-resilient agriculture, water security strengthening, digital advisory setup, and institutional activation.**

Comprehensive Baseline:

- Conduct detailed surveys on soil health, groundwater levels, fisheries productivity, livestock assets, and horticulture potential.
- Map cropping patterns, livestock distribution, fish pond status, and climate risks.
- Document the socio-economic profile of tribal smallholders and landless families for targeted support.

On-Farm Interventions:

- Establish **50 demonstration plots** showcasing **millet–pulse–vegetable, Integrated Farming Systems (IFS), and agroforestry** models integrating livestock, fisheries & horticulture.

- Restore **4,500 hectares** of degraded and cultivated land under eco-friendly practices.

- Introduce **1,200 hectares** of horticulture (fruit/vegetable/nursery) interventions.

- Promote **5 organic/natural farming clusters over 2000 ha** using traditional systems like **kuruwa & don.**

- Distribute **drought-tolerant and short-duration seed varieties to 5,000 farmers.**

- Introduce **200 horticulture orchard demonstrations** (mango, guava, lemon, jackfruit, and moringa).

- Piloting **Integrated Livestock Nutrition Management** with community fodder plots and azolla units (200 units).
- Establish **agroforestry plantations across 1,200 hectares.**
- Establish **150 livestock and backyard poultry units** with climate-resilient shelters.
- Upgrade/renovate **100 small fish ponds** with improved carp culture and fisheries-based livelihood training.

Water Security

- Rejuvenate **150 farm ponds/community tanks** for irrigation and fisheries.
- Construct/rejuvenate **25 check dams** for surface and groundwater recharge.
- Install **300 micro-irrigation units** (drip & sprinkler).
- Deploy **300 solar-powered irrigation pumps**, prioritizing **women and tribal farmers.**

Institutional Strengthening

- Provide enterprise and governance training to **15 FPOs,** including livestock, fisheries & horticulture FPOs.
- Form and operationalize **50 Water User Associations (WUAs).**
- Activate **Block-Level ATMA Convergence Committees** for coordinated program delivery.

Digital & Advisory Services

- Launch a **district-level AI agro-advisory dashboard** for crop, livestock, fishery, climate, and market advisories.
- Deliver advisory outreach to **25,000 farming families** across Dumka.

5.2 Phase 2: Scaling and Integration (2028–2030)

Transition from pilot interventions to district-wide adoption across 5–7 vulnerable blocks.

Geographical Scaling:

Geographical Expansion:

- Scale climate-resilient agriculture, fisheries and livestock interventions across **7 blocks:** Masaliya, Ramgarh, Shikaripara, Gopikandar, Jama, Saraiyahat, and Dumka Sadar.
- Expand land restoration by an additional **7,500 hectares.**
- Increase total natural/organic farming coverage to **5,500 hectares.**
- Scale up **IFS to 3,800 hectares** with stronger market linkages.
- Establish **200 more livestock units** with decentralized fodder support.
- Expand **horticulture clusters by 2,000 hectares.**
- Enhance **agroforestry plantations across 1,800 hectares.**
- Strengthen convergence across ATMA, Agriculture, AH&VS, Fisheries, Water Resources, JSLPS, Forest Departments, and CSOs.

Value Chain Development:

- Establish **6 integrated value-chain hubs** for **Millets, Mango, Jaggery, Jackfruit, Tasar Silk & Bamboo/NTFP,** including livestock & fisheries linkages.
- Promote **cold chain, fish feed, hatchery, and livestock health service networks.**

Livestock & Fisheries Expansion

- Support 10,000 livestock farmers through breed improvement, fodder development, vaccination, and AI services.
- Establish 500 backyard poultry units, 300 goatery units, and 150 dairy micro-enterprises.
- Expand fisheries to 500 ponds with improved culture systems & market linkages.

Renewable Energy Expansion

- Scale up 200+ solar irrigation systems using subsidies, bank credit, CSR, and farmer contribution.
- Promote solar cold storage, feed units & fish drying units.
- Provide technical support through agri-tech and renewable energy partners.

Enterprise Development:

- Promote 2,000 women and youth-led enterprises in poultry, dairy, sericulture, mushrooms, composting, beekeeping, and value-added foods.
- Offer training, credit linkage, and market facilitation to strengthen rural entrepreneurship.

Digital Integration:

- Enable e-NAM onboarding, AI/SMS advisories, and mobile-based tools.
- Deliver real-time updates on weather, pests, markets, and recommended practices to tribal farmers.

5.3 Phase 3: Consolidation and Replication (2031–2035)

Dumka becomes a self-sustaining climate-smart agricultural district with strong market and institutional systems.

Target Scale-up

- Achieve total restoration of **20,000 hectares.**
- Reach **5,500 hectares** under certified organic/natural farming.
- Achieve **6,000 hectares** of IFS adoption supported by rural processing & market infrastructure.
- Complete rejuvenation of **1,800 ponds** for fisheries and livelihood diversification.
- Achieve establishment of **350 livestock units** linked with nutrition & bioenergy.
- Expand **horticulture to a total of 4,500 hectares.**
- Achieve **3,000 hectares of agroforestry** contributing to carbon neutrality.

Institutional Maturity

- 15 FPOs achieve financial viability & professional management.
- SHG federations manage livestock, fishery, and enterprise ecosystems.

Climate & Resource Management

- Expand climate-smart, IFS & organic agriculture to 20,000 ha.
-
- Achieve a 60% reduction in diesel dependency through renewable systems.
-
- Rejuvenate all major water bodies, ponds, tanks, and watershed systems.

Value Chain and Market Integration

- Promote 5-7 Dumka-branded agricultural, livestock, and fisheries products (e.g., Dumka Millets, Dumka Jaggery, Dumka Mango, Tasar, Dumka Honey, etc.).
- Ensure 35% of produce is locally processed & marketed.

Knowledge & Finance

- Integrate AI-based precision advisories for crops, livestock, and fisheries.
- Conduct independent impact evaluations.
- Establish a Dumka Climate Resilience & Rural Enterprise Fund.

5.4. Implementation and Monitoring Framework – Sarkar, Bazaar, and Samaj

The implementation in Dumka, Jharkhand, will adopt a systems-based framework integrating Sarkar (Government), Bazaar (Market), and Samaj (Community) to ensure scientific, inclusive, and scalable outcomes across the district's diverse agro-ecological zones.

- **Sarkar (Government):** Acts as the institutional backbone, enabling interdepartmental convergence and evidence-based planning for climate-resilient agriculture.
- ATMA will coordinate block-level technical planning and capacity building.
- Agriculture, Water Resources, Horticulture, JSLPS, and Forest Departments will support irrigation expansion, soil-water conservation, farm mechanization, and livelihood diversification.
- Infrastructure development—solar irrigation, storage, and aggregation points—will be aligned with departmental schemes and district development plans.
- **Bazaar (Market):** Functions as the economic driver, strengthening value chains and market systems central to Dumka's rural economy.
- Focus on mango, millet, jaggery, jackfruit, tasar silk, and NTFP/bamboo value chains.
- Improve post-harvest management through cluster-based processing hubs and FPO-led aggregation systems.
- Integrate climate-resilient value chains for agriculture, horticulture, livestock & fisheries.
- Strengthen post-harvest, cold chain & processing hubs.
- Strengthen linkages with private buyers, processors, and digital marketplaces to ensure better price realization, reduced losses, and improved profitability.
- **Samaj (Community):** Serves as the social catalyst, ensuring participatory, inclusive, and equitable development.
- SHGs, farmer groups, tribal communities, and village institutions will lead planning and implementation.
- Emphasis on gender inclusion, youth engagement, and community ownership of assets.
- Promote behavioral change and ecological stewardship through locally adapted climate-smart practices.
- **Monitoring, Evaluation, and Learning (MEL):** A scientifically designed MEL system will ensure accountability, transparency, and adaptive management in Dumka.
- KPIs will track productivity gains, water-use efficiency, livelihood diversification, community participation, and institutional performance.
- Monitoring will utilize administrative records, remote sensing, GIS tools, field surveys, and community-based monitoring platforms.

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A digital dashboard will facilitate real-time tracking and visualization of progress.

Review Mechanism (Three Tiers):

- Monthly: Block-level technical reviews led by ATMA.
- Quarterly: District-level assessments chaired by the Deputy Commissioner, Dumka.
- Annual: Integrated performance review and knowledge-sharing across all stakeholders.

6 Institutional Framework – Sarkar, Bazaar, and Samaj

The execution of the plan in Dumka will take a systems-based approach, combining the powers of Sarkar (government), Bazaar (market), and Samaj (community). This comprehensive approach will ensure that treatments are scientifically sound, socially inclusive, and scalable throughout Dumka's diverse plateau and valley landscapes. Government agencies will foster convergence and resource mobilization; market players will reinforce value chains and ensure fair pricing; and community institutions—FPOs, SHGs, and tribal collectives—will anchor local ownership and long-term viability. This tri-sector strategy will enable climate-resilient production, enhanced livelihoods, and strengthened institutional capacity throughout the area.

6.1 Government Departments (The Sarkar Arm)

- **ATMA Dumka:** The nodal agency for convergence. To be strengthened to prepare integrated plans and chair interdepartmental meetings.
- **Dept. of Agriculture, Animal Husbandry, and Cooperation:** Lead on promoting climate-resilient varieties, soil health management, and natural farming clusters.
- **Water Resource Department:** Responsible for minor irrigation, watershed structures, and technical support for water harvesting.
- **Directorate of Horticulture:** Drive crop diversification, provide planting material, and support nurseries.
- **Directorate of Animal Husbandry & Fisheries:** Implement breed improvement, fodder development, and integrated aquaculture.
- **JSLPS (Rural Livelihoods Mission):** Promote women-led SHGs and community-based enterprises.

6.2 Community Organizations (The Samaj Arm)

- **Farmer Producer Organizations (FPOs):** Act as the primary aggregators for seeds, fertilizers, farm machinery, credit, and collective marketing. In Jharkhand—especially in tribal districts like Dumka—FPOs require **intensive handholding** in business planning, governance, post-harvest management, and establishing market linkages for crops such as **millets, mango, tasar, NTFPs, and vegetables.**

- **Self-Help Groups (SHGs): Form** the backbone of **women-led livelihood activities** under JSLPS.
- SHGs play a critical role in promoting micro-enterprises in **poultry, piggery, mushroom cultivation, composting, value-added foods, and NTFP processing.** Their strong social mobilization networks make them key drivers of behavioral change, savings, and community-led climate adaptation

- **Cooperatives/PACS:** Support **rural credit delivery** and the procurement and distribution of essential agricultural inputs. In Jharkhand, PACS can be better integrated with **FPO and SHG networks** to strengthen last-mile service delivery, facilitate warehousing, and expand access to KCC-linked credit and crop procurement systems.

6.3 Private Sector and Financial Institutions (The Bazaar Arm)

- **Banks & NABARD:** Provide timely credit, develop bundled climate-smart loan products, support crop insurance, and facilitate low-interest loans for renewable energy and irrigation infrastructure.

- **Agri-Businesses & Processors:** Collaborate with FPOs for contract farming, aggregation, and value addition of high-value commodities like millets, mango pulp, jackfruit, and tasar silk; support market linkages and branding.

- **Technology Providers:** Supply efficient irrigation systems, solar energy solutions, mechanization, and digital farm management tools; offer training and after-sales support to ensure adoption.

- **Input Suppliers:** Provide quality seeds, bio-fertilizers, and organic inputs tailored for climate-resilient agriculture.

- **Logistics & Cold Chain Partners:** Facilitate storage, transport, and distribution, reducing post-harvest losses and enhancing market access.

7 Conclusion: A Collective Covenant for Tribal Prosperity

Beyond just a blueprint, the Dumka Climate-Resilient Agriculture Roadmap is a social commitment for a safe, successful, and sustainable agricultural future for its tribal communities. Unwavering political resolve, tenacious bureaucratic dedication, and the proactive, empowered agency of Dumka's farmers are all necessary for its accomplishment. By pursuing this path with tenacity and a shared vision, Dumka will not only ensure its own food, water, and livelihood security but will also pave the way as a model of tribal-centric, climate-resilient development for the entire Santhal Pargana region and Jharkhand. The moment has come to take action.

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