



Climate-Resilient Agriculture

# ROADMAPS FOR PURULIA DISTRICT (2025-2035)

A Comprehensive Framework for  
Food Systems Transformation



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# List of Abbreviations and Full Forms

CSR	Corporate Social Responsibility
DACP	District Agriculture Contingency Plan
DAP	District Agriculture Plan
DRCS	Development Research Communication and Services Centre
DRC	District Resilience Cell
DRDC	District Rural Development Cell
FPO	Farmer-Producer Organization
IFS	Integrated Farming System
IVR	Interactive Voice Response
KVK	Krishi Vigyan Kendra
MEL	Monitoring, Evaluation, and Learning
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
NABARD	National Bank for Agriculture and Rural Development
NGO	Non-Governmental Organization
P&RD	Panchayati Raj and Rural Development
PKVY	Paramparagat Krishi Vikas Yojana
PRI	Panchayati Raj Institution
RKVY	Rashtriya Krishi Vikas Yojana
RIDF	Rural Infrastructure Development Fund
SHG	Self-Help Group
VCV	Village Climate Volunteer
WBADMIP	West Bengal Accelerated Development of Minor Irrigation Project
WRD	Water Resources Department
WDF	Watershed Development Fund
WUA	Water User Association

# Executive Summary

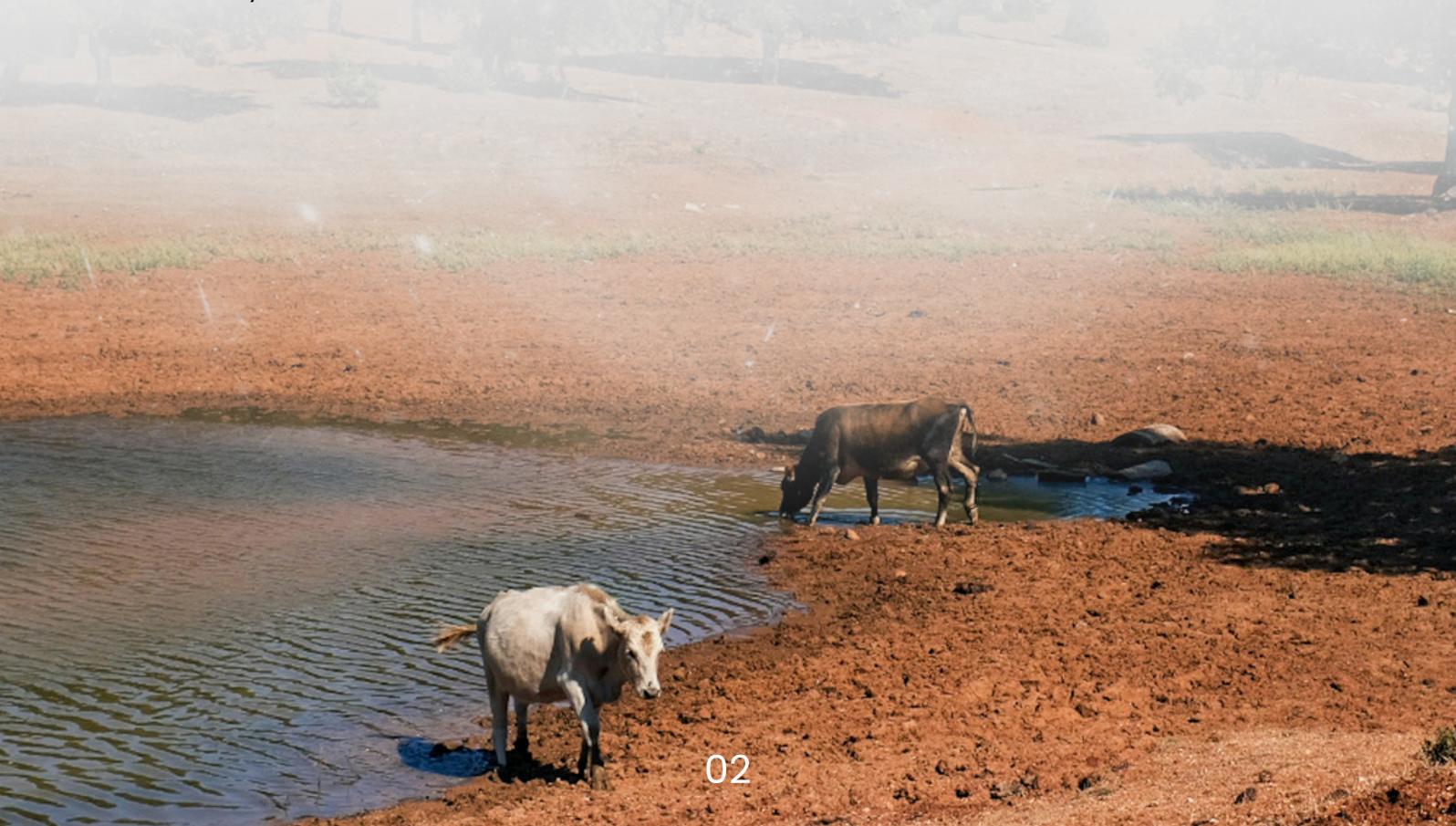
Purulia District, located in the western plateau region of West Bengal, is one of the most drought-prone and climate-vulnerable areas in the state. The district's undulating topography, red lateritic soils, erratic rainfall averaging 1,100–1,200 mm, and recurrent droughts have led to persistent water scarcity, low soil productivity, and declining groundwater availability. Agriculture is the main livelihood source for nearly 70% of the population, with over 85% of farmers classified as small and marginal, cultivating under highly variable rainfall conditions. Only about **23%** of the net sown area has access to assured irrigation, and the average annual farm income is around ₹70,000, which is significantly below the state average.

Groundwater overextraction has reached a critical level of **65–70%** in some blocks, with water tables declining by **0.4 to 0.8** meters annually. Soil erosion and nutrient loss are widespread, while monocropping and high input dependency have degraded both farm productivity and ecological balance. Despite these challenges, Purulia holds immense potential for dryland transformation through climate-resilient technologies, improved watershed management, diversification, and community-driven institutional frameworks.

This roadmap envisions transforming Purulia into a climate-resilient, water-efficient, and livelihood-secure agricultural district by 2035. Over the next decade, it seeks to enhance the adaptive capacity of **50,000 smallholder** farming families, improve water-use efficiency by **40%**, bring **3,000 hectares** under certified organic or **10,000** ha under natural farming, and achieve a **75%** increase in real farmer incomes. The approach emphasizes convergence of resources, digital governance, and community-led planning through ATMA, FPOs, SHGs, and other local institutions.

By integrating soil–water–livelihood linkages, renewable energy solutions, and inclusive value-chain development, this roadmap aims to position Purulia as a model of sustainable dryland transformation in eastern India.

**Keywords**—Purulia, Climate Resilient Agriculture, Policy Framework, West Bengal, Agroecology, Rural Livelihoods





# 1. Introduction and Context

## 1.1 The Imperative for Transformation

Purulia district, a key agrarian region situated at the edge of the Chotanagpur Plateau, supports a large rural population that depends heavily on agriculture and allied sectors for their livelihoods. The district's farming systems, shaped by undulating terrain, drought-prone conditions, and limited irrigation, now face increasing stress from climate variability, declining soil health, and fluctuating market conditions.

This roadmap emerges from the recognition that sustainable transformation in Purulia requires the careful integration of climate science, ecological restoration practices, and deep engagement with community realities. It reflects a commitment to building a resilient agricultural economy that strengthens livelihoods, restores natural resources, and enhances the district's capacity to adapt to a rapidly changing climate.

## 1.2 A Participatory Foundation

During a one-day stakeholder consultation in September 2025, more than 100 participants from government, ministries, FPOs, SHGs, NABARD, banks, NGOs, and civil societies collaborated to design Purulia's climate-resilient development strategy. Under the direction of resilience theory, systems thinking, and the sustainable livelihoods framework, the process made sure that institutional viewpoints and local goals were included in a common long-term resilience roadmap.



# 2. Current State Analysis: A District at a Crossroads

## 2.1 Demographic and Socio-Economic Profile

Purulia district is characterized by a population density of approximately 468 persons per sq km, placing significant—but not extreme—pressure on land and natural resources. About 87.26% of its residents live in rural areas, underscoring its strong agrarian character. The overall literacy rate in Purulia is 64.48%, but there is a pronounced gender gap: male literacy stands at **77.86%**, while female literacy is **50.52%**. Scheduled Castes (19.38%) and Scheduled Tribes (18.45%) together account for a substantial portion of the population, highlighting the importance of inclusive, socially sensitive development strategies.

## 2.2 Agro-Ecological Assessment

- Physiography & Climate:** Purulia, part of the Eastern Plateau and Hill Region, is a dryland agro-ecosystem with undulating terrain, lateritic soils, and high climatic variability. Rainfall (1,100–1,400 mm) is irregular, making agriculture drought-prone, while temperatures from 8°C to 42°C create frequent heat and moisture stress. Limited irrigation—covering only 28–30% of the 3.2 lakh ha cultivated area—keeps cropping intensity low. Farming is dominated by rainfed paddy, maize, pulses, groundnut, and vegetables, with gradual diversification into millets and dryland horticulture. Recurrent droughts, soil erosion, and declining groundwater highlight the need for improved soil health, integrated water management, and resilient, diversified farming systems.
- Soil Resources:** In Purulia District, soils are predominantly red lateritic and sandy loam, generally acidic in nature (**pH 4.28–6.78; average 5.57**), with low fertility and poor water-holding capacity. A key concern is the consistently low organic carbon content (0.3–0.5%), which limits soil productivity. Micronutrient deficiencies are also widespread across the district, particularly zinc and boron, which regularly appear as critical gaps in soil health assessments.

## 2.3 Water Resources: A Crisis in the Making

- **Water Scarcity and Drought Recurrence:** Water availability remains the most critical limiting factor for agriculture in Purulia. Seasonal tanks and ponds, which serve as the main irrigation sources, often dry up before the Rabi season due to inadequate surface water retention and high evaporation. Nearly 60 percent of the upland areas suffer from poor infiltration and low groundwater recharge. Recurrent droughts and prolonged dry spells result in frequent crop failures and water stress for both humans and livestock.
- **Low Irrigation Infrastructure and Poor Water Use Efficiency:** The irrigation network in Purulia is fragmented and insufficient to support intensive agriculture. Canal systems are limited, traditional lift irrigation schemes remain underutilized, and the adoption of modern irrigation technologies such as drip, solar pumps or sprinkler systems is minimal. Consequently, water-use efficiency is low, and most of the *Rabi* area remains uncultivated, constraining cropping intensity and diversification.

## 2.4 Agricultural Production Systems and Infrastructure

- **Mono-cropping and Low Diversification:** Agriculture is dominated by rainfed Aman paddy, with little diversification into pulses, millets, or vegetables. This mono-cropping pattern exposes farmers to high production risk and income volatility, especially in drought years. Diversification into resilient crops and horticultural systems remains limited due to inadequate irrigation, weak extension support, and poor market access.
- **Soil Erosion and Nutrient Depletion:** Soil degradation is widespread in Purulia's uplands, where erosion, runoff, and nutrient loss are common. Soils are inherently poor in organic matter, and decades of cultivation without replenishment have further reduced fertility.

Studies indicate a decline of nearly 10–15 percent in soil productivity over the past decade. This calls for urgent attention to soil organic carbon enrichment through composting, green manuring, and biofertilizer application.

- **Weak Market Linkages and Storage Infrastructure:** Marketing infrastructure in Purulia is underdeveloped, leading to high post-harvest losses, particularly in horticulture, vegetables, lac, and tasar products. The absence of aggregation centers or mandis (3), cold storage facilities (29), and organized buyer–seller networks limits farmers' bargaining power and restricts access to remunerative markets.

## 2.5 Allied Sectors: Livestock, Fisheries and Horticulture

- **Livestock:** Purulia has a substantial and diverse livestock population, including cattle, goats, sheep, and poultry. The district's per capita milk availability is 155 g/day, which is higher than the state average but below the national average, indicating strong potential for growth through improved breeds, fodder development, and dairy-based enterprises.
- **Horticulture:** Purulia has a strong base in vegetables (brinjal, tomato, cabbage, cauliflower) and fruits such as mango, guava, and ber, well-suited to its dryland ecology. There is considerable potential for high-value horticulture, orchard expansion, nursery development, protected cultivation, and improved post-harvest management.

## 2.6 Institutional Gaps and Fragmented Planning

Despite multiple programs in agriculture, water resources, and rural development, institutional coordination remains weak. There is limited integration between departments, and water management often operates in silos from agricultural planning. A comprehensive, district-level convergence mechanism is lacking, which affects timely and effective adaptation planning.

### 3. Challenge Analysis and Problem Statement

Despite multiple programs in agriculture, water resources, and rural development, institutional coordination remains weak. There is limited integration between departments, and water management often operates in silos from agricultural planning. A comprehensive, district-level convergence mechanism is lacking, which affects timely and effective adaptation planning.

#### 3.1 The Water Security Crisis—Purulia

##### Groundwater:

- Hard-rock geology, low recharge, and rainfall dependence cause chronic groundwater stress.
- Shallow wells dry seasonally; deeper borewells are often tapped, sometimes with elevated fluoride, affecting public health.
- Only ~21% of agricultural land relies on groundwater for irrigation; <33% households have functional tap connections.

##### Surface Water:

- Tanks, ponds, and minor canals are silted, seasonally dry, or inefficient, reducing irrigation coverage.
- Wetland and catchment degradation weaken groundwater recharge, moisture retention, and ecosystem services.

#### 3.2 Intensifying Climate Change Impacts

- **Temperature Trends:** Summers are increasingly hot (up to 50°C), shortening crop duration, stressing crops, livestock, and labour, and raising irrigation demand due to high ET losses.
- **Extreme Weather Events:** Erratic rainfall, dry spells, and sudden heavy downpours with hailstorms often damage crops, orchards, roads, and water structures.
- Crop yields fluctuate 20–30% in bad years, increasing livelihood risks and prompting seasonal migration.

#### 3.3 Soil Health Degradation

- **Chemical Degradation:** Red, lateritic soils are naturally low in fertility, with declining organic carbon, rising acidity, and micronutrient deficiencies. Imbalanced fertilizer use persists due to limited soil testing and advisory support.
- **Physical Degradation:** Erosion, compaction, crusting, and shallow soils limit root growth, reduce infiltration, and lower moisture retention. Topsoil loss and plough pan formation reduce productivity and crop resilience.



### 3.4 Market and Value Chain Constraints — Purulia

- **Limited Value Addition:** Most produce is sold raw; minimal grading, processing, or packaging reduces farmer margins.
- **FPO role:** FPOs help small farmers collectively market produce and explore small-scale processing, though coverage is limited (19 active FPOs as per NABARD/NGO records).
- **Financial Exclusion:** Marginal and women farmers have restricted access to credit; crop insurance penetration is low.
- **Infrastructure Gaps:** Cold storage (1 potato + 2 multipurpose), weak aggregation, and poor market info systems increase post-harvest losses.
- **Labour Shortage & Low Mechanization:** Seasonal outmigration causes labour shortages; limited mechanization delays operations and reduces productivity (22 Custom Hiring Centers only).

## 4. Vision, Strategic Framework, and 2030 Target

Despite multiple programs in agriculture, water resources, and rural development, institutional coordination remains weak. There is limited integration between departments, and water management often operates in silos from agricultural planning. A comprehensive, district-level convergence mechanism is lacking, which affects timely and effective adaptation planning.

### 4.1. Vision Statement:

To build a climate-resilient, economically vibrant, and socially inclusive agricultural system in Purulia that ensures sustainable livelihoods, efficient use of natural resources, and reduced vulnerability to droughts and climate shocks through diversification, innovation, and community-driven development.

### 4.2. Theory of Change:

Purulia's Theory of Change aims to change the district's drought-prone, low-productivity agriculture system into one that is climate resilient and secure in terms of livelihoods. The method begins by improving natural resource management, encouraging water-efficient and diverse agriculture, and empowering local institutions for participatory planning. Improving irrigation availability, implementing climate-smart technologies, boosting capacity, and integrating markets are all important factors. These initiatives will boost productivity, income, stability, and adaptive capability, ultimately resulting in less distress migration, more household resilience, and long-term rural growth.

### 4.3. Strategic Objectives and Quantifiable (2035 Targets):

#### Objective 1: Climate Adaptation and Resource Resilience

**Primary Target:** Strengthen the adaptive capacity of 50,000 smallholder families.

#### Supporting Targets:

- Adoption of climate-smart practices across **1,20,000** ha of cultivated area.
- Achieve 40% improvement in water-use efficiency through micro-irrigation and watershed-based soil moisture management.
- **Watershed Development:** Covering 5,000–7,000 ha in priority micro-watersheds for soil and water conservation.
- **Water Harvesting Structures:** Construction of 100 check dams and farm ponds to enhance water availability.
- **Groundwater Recharge:** Installation of 100 recharge wells in critical areas.
- **Micro-Irrigation:** Promoting drip and sprinkler systems across 3,000–4,000 ha, aiming to improve water-use efficiency by 30–40%.
- 60% of irrigation energy is to come from solar or other clean energy sources.
- Establish block-level early warning systems and weather advisories for 80% of farmers.

This integrated approach will enhance water security, reduce drought vulnerability, and support climate-resilient agriculture in Purulia.

**Objective 2:** Livelihood Enhancement and Diversification

**Primary Target:** Achieve a 75% increase in real farmer income (₹70,000 → ₹1.22 lakh per annum).

**Supporting Targets:**

- 20% increase in crop productivity through improved agronomic and soil health practices.
- 30% of agricultural produce is processed or marketed locally through FPOs and rural enterprises.
- Establish **500** women-led agri-enterprises in poultry, dairy, composting, and food processing.
- Develop 5 district-branded products such as Purulia Millets, Tamarind, Mahua, Custard Apple, and Lac.
- 30% of total farm income is diversified from livestock, fisheries, and non-farm activities.

**Objective 3:** Ecological Restoration and Sustainability

**Primary Target:** Restore degraded ecosystems and strengthen soil–water–vegetation linkages.

**Supporting Targets:**

- Bring 3,000 ha under certified organic/natural farming and 15,000 ha under regenerative soil management.
- Achieve a 30% reduction in fertilizer use and a 60% reduction in pesticide use.
- Promote 2,000 ha of agroforestry systems on uplands and common lands.
- Restoration and ecological management of 100 critical water bodies.

**Objective 4:** Institutional Strengthening and Convergence

**Primary Target:** Build efficient, accountable, and inclusive governance mechanisms.

**Supporting Targets:**

- Achieve **40%** convergence among departmental schemes by 2035.
- **40%** of farmers access institutional credit and insurance coverage.
- **30%** of FPOs to achieve operational and financial sustainability.
- **35%** of farmers accessing institutional credit (KCC and other loans).
- Fully functional ATMA-led District Convergence Platform to ensure interdepartmental alignment and data-driven monitoring.

## 4.4. The Four Pillars Strategic Framework

### 1. Pillar I: Water Security and Irrigation Infrastructure

**Objective:** Ensure water security and drought resilience through decentralized, community-managed systems that provide equitable access and efficient use of water resources. The approach focuses on watershed-based management, micro-irrigation, and participatory governance, leveraging convergence with programs such as MGNREGA, WBADMIP, and NABARD-WDF.



## Key Interventions:

### Watershed Management

- Implement ridge-to-valley watershed treatments across 10 priority blocks (Baghmundi, Hura, Jhalda, Bandwan, Joypur etc.).
- Activities include contour trenches, vegetative bunds, check dams, and farm ponds to enhance soil moisture and recharge groundwater.

### Community Water Harvesting

- Renovate and rejuvenate 100 community tanks, ponds, and small check dams.
- Promote decentralized water harvesting structures linked to farm-level irrigation networks through MGNREGA and PRI convergence.

### Micro-Irrigation and Solar Systems

- Promote 3,000 ha under drip and sprinkler irrigation integrated with solar-powered lift systems for horticulture and vegetable clusters.
- Demonstrate smallholder-scale water-efficient irrigation cooperatives.
- Implementing partners: Department of Horticulture, WBADMIP, and Agriculture Engineering Wing.

### Innovation and Technology

- Introduce low-cost solar-dual irrigation models and community-based irrigation cooperatives.
- Deploy IoT-based tank and soil moisture sensors for real-time water monitoring at pilot sites (Hura and Baghmundi).

### Water Budgeting and User Groups

- Establish and train 250 Water User Associations (WUAs) to enable participatory water budgeting, equitable distribution, and maintenance of water infrastructure.
- Implementing partners: Panchayati Raj Institutions, ATMA, NGOs, and community-based organizations.

## 2. Pillar II: Climate-Resilient Agriculture and Horticulture

### Objective:

- To promote diversified, adaptive, and regenerative agriculture suited to the dryland and semi-arid conditions of Purulia, enhancing productivity, farm income, and ecological stability.

## Key Interventions:

### Crop Diversification and Millet Promotion

- Promote resilient cropping systems on **2,000 ha** of highland to reduce monocropping.
- Demonstration clusters under RKVY and ATMA for low-input, climate-smart techniques.
- Integrate crops like foxtail millet, little millet, red gram, and sesame to improve soil health, water efficiency, and nutrition.

### Integrated Farming Systems (IFS)

- Establish **5-10** model IFS farms combining crops, horticulture, livestock, and fisheries.
- Recommended mix: 40% horticulture, 30% field crops, 20% livestock/poultry, 10% fisheries/duckery.
- Ensure year-round income, resource recycling, and climate resilience.

### Dryland Horticulture Development

- Support **2,500 ha** of fruit plantations (mango, guava, ber, papaya, custard apple) with drip irrigation.
- Develop 10 decentralized nurseries run by FPOs and SHGs for high-quality seedlings.
- Promote mixed fruit-based cropping systems suitable for Purulia's drylands.

### WADI Model (Watershed + Horticulture + Livelihoods)

- Establish 5,000-6,000 ha of WADI clusters on degraded lands.
- Integrate soil and water conservation structures (trenches, bunds, and farm ponds) to enhance moisture and productivity.
- Promote community management for equitable resource use and livelihood support.

### Agroforestry

- Introduce tree-crop combinations on farmland and wastelands to improve soil fertility, carbon sequestration, and income diversification.
- Focus on fuelwood, fodder, and fruit trees integrated with field crops to enhance resilience against climate variability.

### Soil and Crop Health Management

- Establish 50 SHG-run compost, vermicompost, and biofertilizer units to enhance soil fertility.
- Distribute Soil Health Cards annually and encourage organic/bio inputs.
- Promote green manuring, crop residue management, and biofertilizer use to reduce chemical inputs.

- **Community Agro-Advisory Network**

- Set up the “Hura Climate Advisory Hub”, an ICT-enabled decentralized system for timely crop and weather advisories.
- Train and deploy 250 Village Climate Volunteers (VCVs) for grassroots dissemination.
- Use WhatsApp, IVR, SMS, and community radio to deliver weekly localized advisories.

### 3. Pillar III: Livestock, Fisheries and Allied Sectors

**Objective:** Enhance rural incomes, nutrition security, and resilience through diversified livestock and allied enterprises.

- **Goatery (Black Bengal):**

- Establish 20 SHG-based goat units with 10–20 goats per unit.
- Led by the ARD Department in collaboration with NGOs.

- **Backyard Poultry:**

- Set up 100+ dual-purpose bird units (Gramapriya, Vanaraja).
- Supported by the ARD Department and ATMA.

- **Dairy Development:**

- Develop mini milk-chilling centers and facilitate cooperative linkages implemented by ARD Department and Cooperative Societies.

- **Fisheries and Fodder Banks:**

- Create integrated fish–fish–horticulture ponds covering 100 ha.
- Establish 100 community fodder plots with Napier grass, Guinea Grass, Lucerne, Subabul, Sorghum, Stylo etc.

#### **Apiculture & Mushrooms:**

Support 25 women SHG-led micro-units for mushroom cultivation and community-based beekeeping, focusing on honey production, pollination benefits, and small-scale value addition coordinated by the Horticulture Department/KVKs and all concerned NGOs/CSOs.

#### **Impact:**

Builds a resilient, inclusive, and diversified rural economy. Promotes women’s participation, smallholder livelihoods, and climate-resilient income sources.

### 4. Pillar IV: Market, Institutional, and Knowledge Systems

#### **Objective:**

To enhance value addition, financial inclusion, and institutional convergence for building long-term climate resilience and economic stability across sectors in Purulia.

- **Establish Agri-Horti Market Hubs**

- Set up three hubs at Hura, Joypur, and Baghmundi for aggregation, grading, packaging, and cold storage.
- Enable direct linkages between FPOs/SHGs and private buyers to reduce distress sales and improve price realization.

- **Launch “Purulia Naturals” Brand**

- Create a district-level brand highlighting millets, mangoes, lac, and other eco-friendly produce.
- Position Purulia as a hub for sustainable, value-added rural products.

- **Strengthen Market Linkages**

- Organize regular Buyer–Seller Meets to connect FPOs, SHGs, aggregators, and cooperatives.
- Build consistent market demand and transparent, trust-based partnerships.

- **Digital Integration for Smart Resilience**

- Develop a Digital Resilience Dashboard integrating weather, market, and advisory data.
- Link with Agro-Advisory Hubs and Village Climate Volunteers for real-time alerts and last-mile delivery.

- **Institutional Convergence and Governance**

- Strengthen the District Resilience Cell (DRC) under ATMA as the central coordination platform.
- Ensure cross-departmental convergence for scalable and efficient implementation across agriculture and allied sectors.





# 5. Integrated Implementation Framework and Strategic Way Forward (2025–2035)

By 2035, Purulia District will evolve into a leading example of climate-resilient, water-secure, and market-driven agriculture—where tribal communities, women’s collectives, and youth entrepreneurs are at the forefront of inclusive growth. The long-term vision aims to transform Purulia’s dryland farming into a diversified, resource-efficient, and value-added agricultural ecosystem. Through strengthened market linkages, decentralized water management, digital integration, and strong institutional coordination, Purulia will restore its natural resources, enhance farm incomes, and build a future-ready rural economy driven by collective action and community resilience.

## 5.1 Phase I: Foundation Building (2025–2027)

The foundation phase prioritizes proof-of-concept interventions in the most climate-vulnerable landscapes while simultaneously strengthening institutional capacity and building a comprehensive data baseline.

### Core Components of Phase I

#### A. Baseline Assessment

Conduct a district-wide climate–soil–water–livelihood diagnostic covering:

- Soil fertility, organic carbon, and erosion hotspots,
- Groundwater stress and tank/surface water capacity.
- Livestock productivity, fodder deficits.
- Cropping patterns, yield variability, and input use,
- Socioeconomic and migration patterns.

#### B. On-Farm Interventions

**Promote climate-resilient millet–pulse–oilseed combinations on uplands.**

- Demonstrate low-cost dryland technologies (mulching, intercropping, moisture conservation).
- Developing or Promoting 5-10 millet clusters.
- Establish 5-10 IFS demonstration plots across the District, integrating crops, goats, poultry, horticulture, and fish.

#### C. Water Security Interventions

- **Renovate 20 community tanks**, ponds, and small check dams.
- Install 150-200 solar-based lift irrigation units for horticulture clusters.
- Establish **1,000** ha of drip and sprinkler micro-irrigation.
- Promote in-situ moisture conservation (trenches, bunds, staggered trenches).
- Introduce AWD for paddy in canal-command and tank-fed areas to enhance WUE by almost **20-30%**.

#### D. Institutional and Digital Strengthening

- Activate ATMA-led Block Convergence Committees.
- Develop the Purulia Climate Advisory Hub (WhatsApp/IVR/SMS-based).
- Train **200** Village Climate Volunteers (VCVs).
- Strengthen 5 FPOs with governance training and business planning.

#### E. Scheme Convergence

Utilize RKVY, PKVY, MGNREGA, WBADMIP, and NABARD for infrastructure, training, and pilot-scale innovations.

#### Expected Outputs of Phase I

- **1,000** ha micro-irrigation
- 20 rejuvenated tanks
- 5 IFS demonstration farms
- 5-10 millet clusters
- **2,000–3,000** farmers accessing digital advisories

## 5.2 Phase II: Scaling and Diversification (2028–2030)

Building on Phase I success, Phase II expands core interventions across 5–7 priority blocks (Hura, Baghmundi, Bandwan, Jhalda, Joypur, Arsha, and Kashipur). Efforts will focus on value chain development, renewable energy expansion, enterprise development, and strengthening local institutions.



### A. Geographical Expansion

- Replicate successful models in all priority blocks.
- Customize intervention packages for upland, midland, and lowland systems.

### B. Water Resource Scaling

- Renovate an additional 100–150 tanks.
- Expand solar lift irrigation to 500 units and **2,000 ha**.
- Create micro-watershed clusters covering **5,000 ha**.
- Promote community water budgeting through WUAs.

### C. Dryland Horticulture & Agroforestry

- Scale dryland fruit orchards (mango, guava, ber, tamarind, and custard apple) to **2,000–2,500 ha**.
- Develop 10 decentralized nurseries managed by SHGs and FPOs.
- Expand agroforestry to 1,200+ ha.

### D. Rural Enterprise Development

- Establish **200** women-led enterprises in poultry, goatery, fodder production, organic inputs, and food processing.
- Expand tasar and lac-based enterprises, especially in forest-fringe areas.
- Create cluster-level processing units (millets, pulses, fruits, lac).

### E. Digital & Market Integration

- E-NAM onboarding for all large FPOs.
- Block-level Agri-Horti Market Hubs at Hura, Bagmundi, and Joypur.
- Branding initiatives: “Purulia Naturals”.
- Real-time digital dashboards for rainfall, tank levels, and advisories.

### F. Bio-Resource Centres (BRCs)

**Establish Bio-Resource Centres (BRCs) in 50% of Gram Panchayats (85 GPs) to enable:**

- Bio-input production (compost, biofertilizers, botanicals)
- Seed treatment and nursery raising
- Farmer training and capacity-building on climate-resilient practices

### Expected Outputs of Phase II

- 20,000+ farmers trained
- 2,00 women-led enterprises
- 2,500 ha horticulture
- 500 solar irrigation units
- 3–5 processing clusters

## 5.3 Phase III: Consolidation and Replication (2031–2035)

The third phase ensures sustainability, institutional maturity, and district-wide replication.

### A. Institutional Strengthening

- 10 FPOs become financially self-reliant.
- SHG federations manage input supply and micro-enterprises.
- ATMA evolved into the District Resilience Mission Cell.

### B. Climate & Resource Management

- **1,20,000** ha under climate-smart systems.
- **50% reduction in diesel** usage through solarization.
- All major water bodies are mapped and monitored digitally.
- GIS-enabled water budgeting integrated into GP plans.

### C. Value Chain & Markets

- 5 Purulia-branded products reach state/national markets.
- 50% of produce is processed or aggregated through FPO channels.
- District-level Agri-Value Hub operational.

### D. Livelihoods & Inclusion

- Additional **300+ women-led enterprises fully functional**.
- 75% increase in average farm income.
- Youth trained under Purulia Agri-Innovation Fellowship.

### E. Knowledge, Monitoring & Financing

- Automated localized community-specific advisory systems scaled district-wide.
- Annual “Purulia Resilience Report Card.”
- Creation of a revolving Purulia Climate Fund (NABARD + CSR + community contributions).



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

The implementation in Purulia will adopt a systems-based framework integrating Sarkar (Government), Bazaar (Market), and Samaj (Community) to ensure scientific, inclusive, and scalable outcomes tailored to the district's dryland and drought-prone environment.

**Sarkar:** Acts as the institutional backbone, facilitating interdepartmental convergence, evidence-based planning, and infrastructure development through ATMA-led coordination. It will anchor climate-resilient interventions in water management, crop diversification, livestock strengthening, and digital advisory services across Purulia.

**Bazaar:** Functions as the economic driver, strengthening agri-value chains for millets, pulses, horticulture, lac, tasar, livestock, and dryland fruits. It will enhance post-harvest systems, aggregation, primary processing, and input-output market networks to improve farmer profitability and price efficiency.

**Samaj:** Serves as the social catalyst, promoting participatory planning, gender inclusion, SHG-led enterprises, and local governance for sustained behavioral, ecological, and livelihood resilience. Community ownership of water structures, nurseries, enterprises, and value addition will be a core feature.

A scientifically designed Monitoring, Evaluation, and Learning (MEL) framework will ensure accountability and adaptive management. It will employ Key Performance Indicators (KPIs) covering productivity, water-use efficiency, livelihood diversification, adoption of climate-smart practices, and institutional performance –monitored through administrative databases, remote-sensing tools, field surveys, and community-based monitoring systems.

A digital district resilience dashboard will enable real-time tracking, analytics, and visualization of progress. The three-tier review mechanism will include:

- **Monthly:** Block-level technical reviews by ATMA.
- **Quarterly:** District-level assessments led by the District Magistrate.
- **Annual:** Integrated performance evaluation, learning workshops, and cross-stakeholder knowledge exchange.

This science-driven approach will foster feedback-based learning and adaptive decision-making, supporting a resilient agricultural transformation across Purulia.



## 6.0 Institutional Framework – Sarkar, Bazaar, and Samaj

- The integrated framework of Sarkar (Government), Bazaar (Market), and Samaj (Community) forms the foundation for implementing climate-resilient and inclusive agricultural development in Purulia.
- Sarkar enables policy convergence, infrastructure development, extension services, and resource mobilization.
- Bazaar drives value chains, processing, aggregation, market access, and enterprise development.
- Samaj anchors social mobilization, local governance, women’s empowerment, and community-driven natural resource management.

Together, these three pillars create a self-sustaining ecosystem that enhances productivity, resilience, and livelihood security in one of West Bengal’s most drought-prone districts.

### 6.1 Government Departments (The Sarkar Arm)

#### ATMA

##### Role:

- The nodal agency for convergence. It will be strengthened to:
- Prepare integrated district agricultural and dryland development plans,
- Chair monthly interdepartmental convergence meetings,
- Coordinate extension services and farmer training,
- Operate a district-wide climate advisory and MIS system.

#### Department of Agriculture

##### Role:

- Promoting climate-resilient varieties (millets, pulses, drought-tolerant paddy),
- Soil health management (organic carbon restoration, micronutrient management),
- Natural farming and bio-input clusters,
- Crop diversification across upland and midland systems.

#### Ramkrishna Mission Vidyapeeth College, Purulia

##### Role:

- Supports research and academic collaboration on agriculture, environment, and rural development.
- Conducts student-led field outreach, surveys, and awareness programmes in nearby villages.
- Assists in disseminating climate-resilient practices and sustainable livelihood techniques.
- Partners with district agencies for training, capacity building, and community engagement.

#### Krishi Vigyan Kendra (KVK), Purulia

##### Role:

Provides district-level technical support, research–extension linkage, and validation of climate-resilient practices.

##### Functions:

- Conduct on-farm trials and demonstrations on dryland crops, horticulture, and IFS.
- Deliver climate advisories, soil testing, and farmer training.
- Support SHGs, FPOs, and ATMA with scientific inputs for planning and implementation.

#### Department of Water Resources / WBADMIP

##### Role:

- Repair and renovation of tanks, check dams, and minor irrigation systems,
- watershed development and recharge structures,
- Hydrological assessments and technical support for micro-irrigation expansion.

#### Department of Horticulture

- Planting material for dryland horticulture (ber, guava, mango, custard apple, tamarind).
- Support for nurseries, shade nets, polyhouses,
- Orchard establishment on uplands and fallows.

#### Animal Resources Development (ARD)

##### Role:

- Breed improvement of goats (Black Bengal), local cattle, and backyard poultry.
- Fodder development on community lands.
- Strengthening veterinary services and mobile units
- Promoting SHG-led goatery and poultry enterprises.



## Department of Fisheries

### Role:

- Pond renovation and tank-based fisheries,
- Supply of fingerlings and inputs,
- Promotion and Scheme linkage towards Integrated fish-based farming systems.

## Department of Agricultural Marketing & Food Supplies

### Role:

- Developing aggregation centers and storage,
- Linking FPOs with wholesale markets and e-NAM,
- Strengthening market intelligence and real-time price reporting.

## WBSRLM

### Role:

- SHG-led enterprises (composting, nurseries, processing, goatery, poultry),
- Livelihood diversification for women and youth,
- Financial inclusion and credit access through community institutions.

## WBLDC

**Role:** Will support dairy and livestock value chains, including:

- Milk collection points, chilling units,
- Animal health services.

## WBCADC

### Role:

- Cluster-based integrated farming demonstrations,
- Capacity-building programs,
- Support for bio-input production and rural enterprises.

## 6.2 Community Organizations (The Samaj Arm)

### Farmer Producer Organizations (FPOs)

**Role:** Primary aggregators for seeds, inputs, credit, and output marketing. Lead processing and value addition for millets, pulses, dryland fruits, lac, and tasar.

### Support Needed:

- Business planning and governance training,
- Access to working capital and credit,
- Facilitation of stable market linkages.

### Self-Help Groups (SHGs)

**Role:** Backbone of women-led enterprises in composting, nurseries, goatery, poultry, processing, and lac/tasar value addition.

### Support Needed:

- Financial literacy, technical training,
- Incubation support for micro-enterprises,
- Linkage with marketing and credit institutions.

### Civil Society Organizations (NGOs/CSOs)

**Role:** Facilitate community mobilization, social inclusion, dryland agriculture training, and participatory water governance.

### Support Needed:

- Formal collaboration frameworks,
- Involvement in district planning and MEL systems.
- Cluster-Based Business Organizations (CBBOs)

**Role:** Provide technical support to FPOs on market intelligence, business planning, and digital operations.

### Support Needed:

- Enhanced capacity in value chain analysis,
- Digital record keeping and MIS,
- Training on compliance and standards.

### Cooperatives/PACS

**Role:** Strengthen rural credit, support collective procurement, and serve as rural economic hubs.

### Support Needed:

- Governance improvements,
- Digitalization,
- Linkage with FPOs and SHGs.

## 6.3 Private Sector and Financial Institutions (The Bazaar Arm)

### Banks & NABARD

**Role:** Provide credit for irrigation, horticulture, livestock, enterprises, and FPOs.

### Action:

- Introduce bundled climate-smart credit products.
- Simplify KCC and PMFBY processes,
- Promote credit guarantees for FPOs and SHGs.

### Agri-Businesses & Processors

**Role:** Ensure fair pricing and market assurance through buy-back agreements.

### Action:

- Engage with FPOs for processing and marketing of millets, pulses, fruits, tasar, lac, goat meat, milk, and fish.
- Set up decentralized procurement centers.

## Technology Providers

**Role: Supply drip/sprinkler systems, solar pumps, sensors, and digital farm tools.**

**Action:**

- Set up local sales and service hubs for drip/sprinkler systems, solar pumps, sensors, and farm advisory tools.
- Offer customized, affordable packages for small and marginal dryland farmers.

## 7. Conclusion

The Climate Resilient Agriculture Roadmaps for Purulia District (2025–2035) outlines a practical and inclusive pathway to transform Purulia from a drought-prone to a resilient and water-secure district. Centered on convergence, community participation, and feasible interventions, the roadmap integrates traditional wisdom with modern innovations—such as solar irrigation, decentralized water management, and climate-smart farming.

Through coordinated efforts of departments, NGOs, and Panchayats, and the demonstration of the Hura Model Block, Purulia can emerge as a living example of climate adaptation in dryland regions. The focus on achievable targets, community ownership, and institutional linkages ensures sustainability beyond project timelines.

With continued collaboration and support, this roadmap envisions Purulia as a model for climate-resilient agriculture and livelihoods in Eastern India, where water security, productivity, and rural prosperity reinforce each other for a sustainable future.





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