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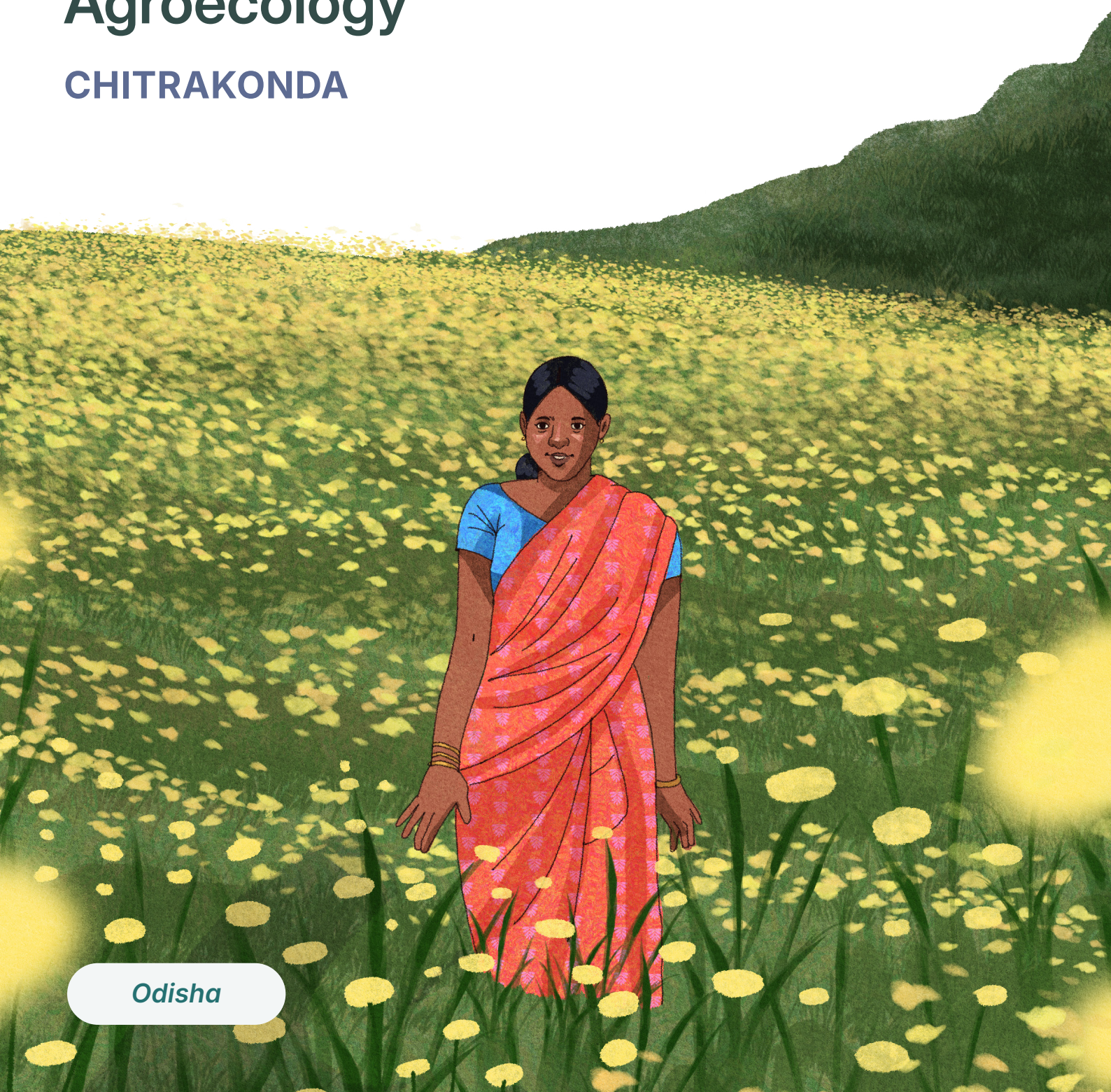
Landscape-Based Investment Plan for Mainstreaming Agroecology

CHITRAKONDA



Odisha

Landscape-Based Investment Plan for Mainstreaming Agroecology

Chitrakonda

MALKANGIRI DISTRICT, ODISHA

Consortium for Agroecological Transformations

Prepared by **The Consortium for Agroecological Transformations**
hosted at **The Centre for Sustainable Agriculture.**

Version 1, 2025

Consortium for Agroecological Transformations

Landscape-Based Investment Plan for Mainstreaming Agroecology - Chitrakonda

Prepared in collaboration with
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Introduction

This report is part of a broader initiative by the Consortium for Agroecological Transformations (CAT), which promotes agroecological transformations in India. The initiative aims to develop landscape-level investment plans to accelerate agroecological transformation in India. For more information on CAT, visit www.agroecologyindia.org.

In CAT's approach, **a landscape is defined as an administrative block**, considered the *minimum viable unit* for planning and action. Unlike the conventional understanding of a landscape as a contiguous area with shared geographical features, here it refers to a governance and planning unit where multiple actors, including farmers, institutions, markets, and governments, can coordinate effectively. The block-level focus enables a convergence of efforts, allowing systemic transformation across domains relevant to food, farming, natural resources, and rural livelihoods.

The six broad goals guiding CAT's landscape-based agroecological transformation are:

1. Improving the quality of natural resources such as land (soil), water, flora, and fauna.
2. Increasing income to make agriculture an attractive livelihood choice for the younger generation.
3. Preserving and enhancing biodiversity.
4. Ensuring the well-being of smallholder farmers, women, and landless labourers.
5. Enhancing food and nutrition security.
6. Addressing the climate crisis.

Agroecological transformation in this context means moving towards the use of no chemical fertilisers and pesticides, and no GMOs, while strengthening sustainable and resilient local food systems.

While pursuing these goals, the interventions in this report are also aligned with the 13 Agroecological Principles (HLPE, 2019) and the Sustainable Development Goals (SDGs). Chapter 7 of the report outlines how each proposed intervention contributes to the six transformation objectives, aligns with the thirteen agroecological principles, and supports progress toward the SDGs.

The interventions themselves are detailed in Chapters 5 and 6, which also present a blended financing model to support their implementation. Given the scale and complexity of the proposed initiatives, it may be necessary to develop a Detailed Project Report (DPR) to enable their effective implementation on the ground.

CHAPTER 1

Landscape Profile

1.1. Location and Area Coverage

Chitrakonda is located in the southernmost part of Odisha, within Malkangiri district—one of the eight districts that make up the Kalahandi-Bolangir-Koraput (KBK) region of southern and western Odisha. These districts are considered the most underdeveloped areas in the country by the former Planning Commission of India. Malkangiri District is named after its administrative headquarters, Malkangiri. When Odisha Province was formed in 1936, Malkangiri was designated as a 'Taluk' within the Nabrangpur subdivision of Koraput District, Odisha. In 1962, it was upgraded to a subdivision within the Koraput District. The current Malkangiri district was formed following the reorganisation of districts in Odisha, with a notification issued on October 1st, 1992, effective from October 2nd, 1992. The district covers an area of 5,791 square kilometres. It is located between latitudes 17°45'N and 18°40'N, and longitudes 81°10'E and 82°E, with elevations ranging from 600 to 1200 meters above mean sea level.

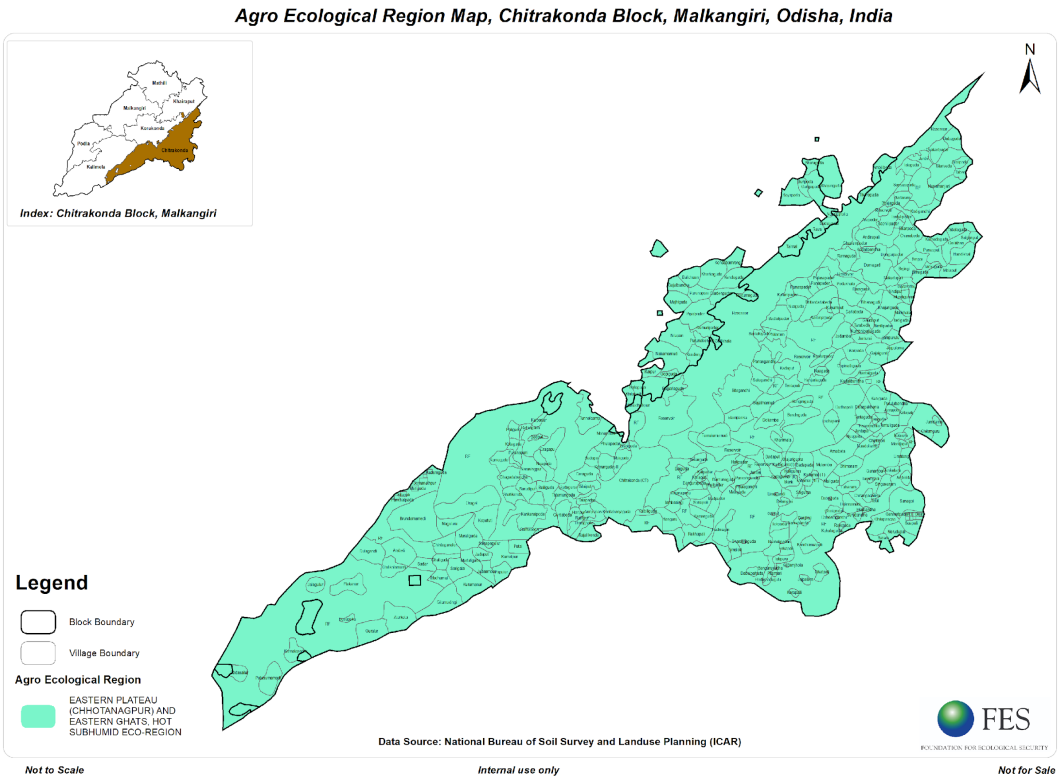

Fig. 1.1 – Agroecological Map of Chitrakonda

The administrative boundaries of the district are as follows:

- **East:** Koraput (Odisha), Visakhapatnam (Andhra Pradesh)
- **West:** Sukma (Chhattisgarh), Khammam (Telangana)
- **North:** Koraput (Odisha)
- **South:** Khammam (Telangana)

Malkangiri district includes seven administrative blocks: Malkangiri, Kalimela, Podia, Korukonda, Khiarput, Mathili, and Chitrakonda. The Chitrakonda block covers roughly 570 square kilometres, serving 287 villages and one urban area. It is mainly rural and relies heavily on forest resources, with rural land spanning 568.43 square kilometres and urban areas making up just 1.77 square kilometres.

The landscape of Chitrakonda features four major rivers—Saberi, Sileru, Potteru, and Kolab—that are vital for local agriculture and ecosystems. Forests make up nearly 58% of the district's area, which is part of the South Eastern Ghat region known for its rich biodiversity.

The district is situated approximately 630 miles from Bhubaneswar, the state capital, and is accessible via bus. Additionally, Chitrakonda can be reached by bus or car from Visakhapatnam in Andhra Pradesh, a journey that typically takes about 7 hours.

1.2. Topography & Agroclimatic Features

Chitrakonda is located in the Eastern Ghat Highland Agroclimatic Zone (Zone VII) of Odisha. Some parts of the area also extend into the Southern Tel River Basin Zone, showing a mix of watershed and upland influences on farming practices.

Geographical Features:

The Balimela Dam, built on the Sileru River for power generation, is the most notable feature of the landscape. It creates the Balimela Reservoir, which stretches about 65 miles. The area is characterised by steep hills, ridges, plateaus, and deep forested valleys. Although this rugged terrain makes connectivity difficult, it also protects a wide variety of natural resources.

Climate:

Chitrakonda experiences a hot and humid tropical climate typical of southern Odisha. The region receives annual precipitation ranging from 1,200 mm to 1,600 mm, predominantly during the southwest monsoon period from June to September. Winter temperatures fluctuate between 10°C and 15°C, whereas temperatures in May can escalate to as high as 39°C. This extensive seasonal variation significantly impacts local cropping practices and water resource management.

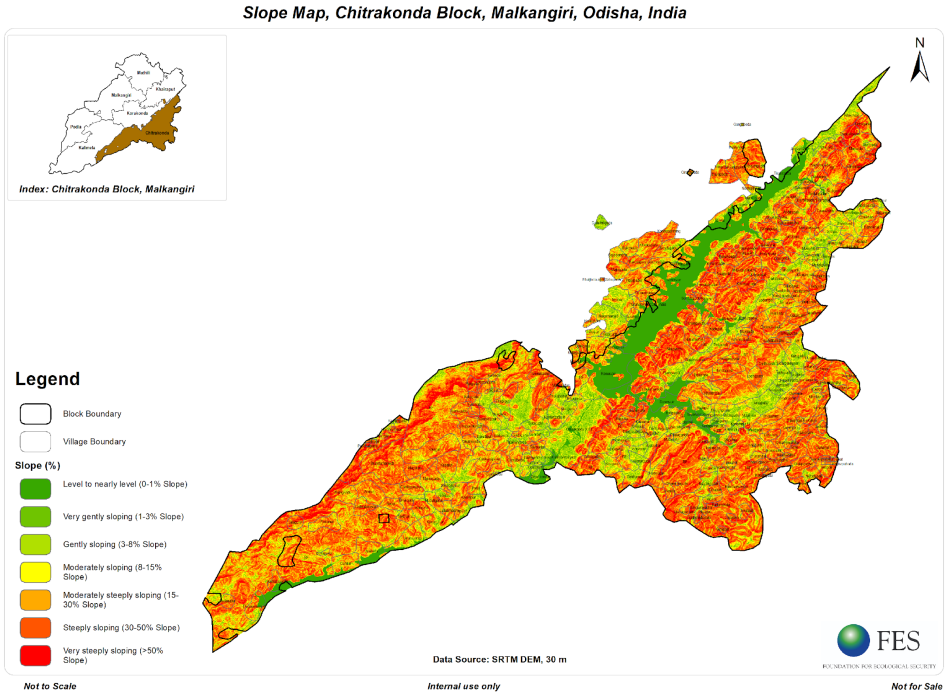

Fig. 1.2 – Slope Map

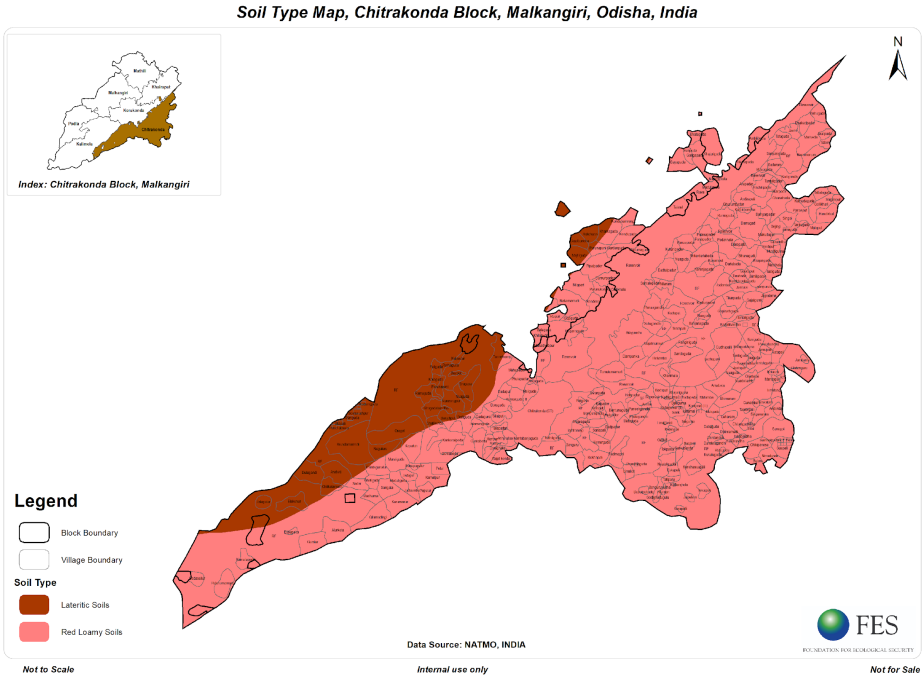

Fig. 1.3 – Soil Type Map

Soils:

The landscape features a mix of soil types, including:

- Brown Forest Soil
- Lateritic Soil
- Red Alluvial Soil
- Black Soil
- Mixed Red Soil

These different soil profiles influence the growth of traditional crops like millets and oilseeds; however, they are also prone to erosion, especially on sloped areas.

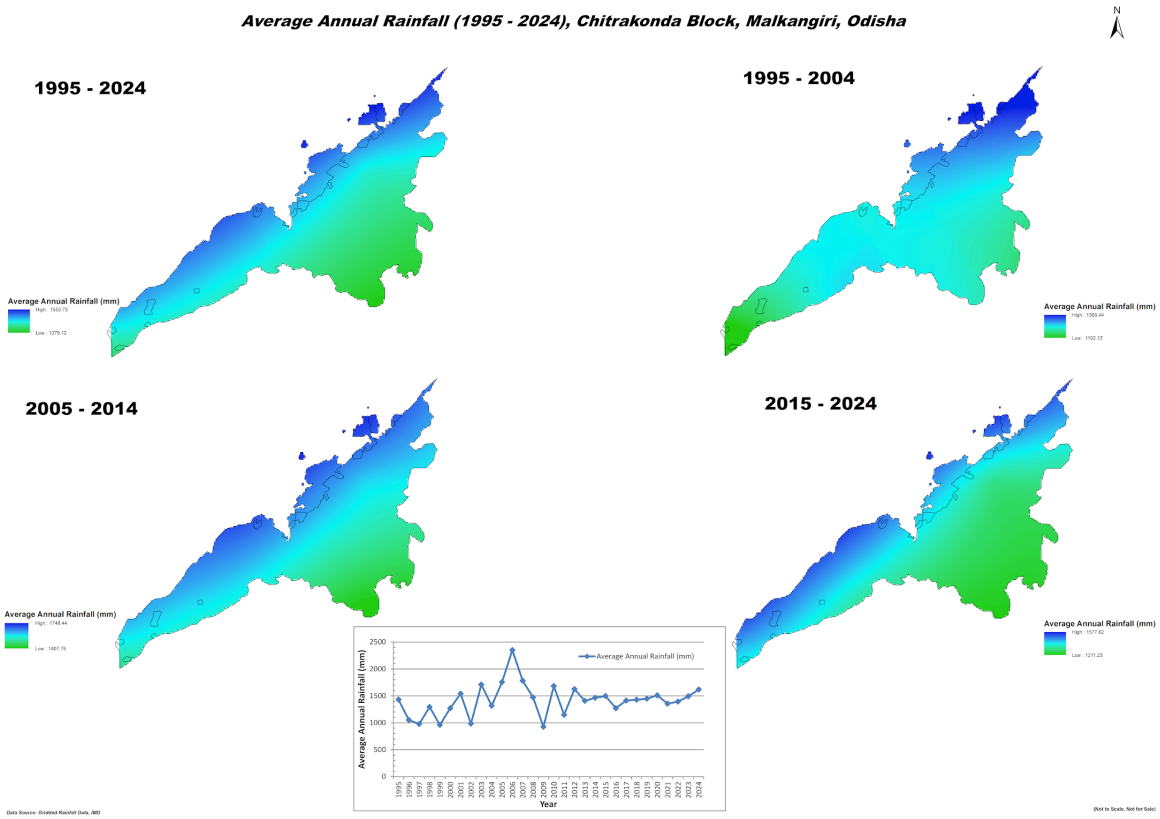

Fig. 1.4 – Average Annual Rainfall

1.3. Demographic and Social Profile

The demographic characteristics of Chitrakonda show a mainly tribal, rural community with low literacy rates but strong cultural connections to land, forests, and traditional knowledge systems. The data below comes from the 2011 Census and administrative records of the Kudumulguma block, which covered the same area before it was renamed.

The landscape is home to tribal communities like the Didayi, Bondas, Gadabas, Kondhs, and Koyas, each with unique cultural identities, languages, and agricultural practices.

Indicator	Value
Total Area	568.94 sq. km
Number of villages	271 (261 inhabited)
Total households	14,106
Total population	62,159
Male population	30,315
Female population	31,844
Sex Ratio	1,067 females per 1,000 males
Scheduled Tribes (ST)	68%
Scheduled Castes (SC)	15.40%
Children (0-6 years)	19.6% of population
Literacy Rate (Total)	42.14%
Literacy Rate (Urban)	70.44%
Literacy Rate (Rural)	34.43%
Primary Languages	Odia and tribal dialects

Table 1.1 – Demographic features of Chitrakonda

1.4. Socio-economic Conditions

Chitrakonda is one of the poorest areas in Odisha. People's livelihoods mainly depend on farming, forestry, and animal husbandry. Because the area has extensive forest cover and limited irrigation, Kharif farming is the main way people earn a living. Many families rely on gathering forest products, raising livestock, fishing, and shifting cultivation. Although growing cannabis is illegal, it remains tempting because of the high profits it can generate. The government has banned cannabis cultivation for the past few years. Poverty rates are very high. A 2019 study by the Nabakrushna Choudhury Centre for Development Studies in Bhubaneswar found that 95.3% of households surveyed in Malkangiri lived below the poverty line. Low income, crop failures, and limited job opportunities outside farming all contribute to this problem.

For a long time, the region was isolated because of the Balimela Reservoir and the surrounding forested area. This separation from the rest of the district, along with the spread of left-wing extremism, caused the area's underdevelopment. Government development projects struggled to reach this region. The Gurupriya Bridge, constructed in 2018, improved access. Although road infrastructure is improving, it remains limited in the hilly and forested areas.

In light of the bridge construction and improvements to the security landscape, the government has launched several development initiatives. These include the Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), which aims to create employment opportunities, the Prime Minister Awas Yojana (PMAY) for housing support, the Odisha Tribal Empowerment and Livelihoods Programme (OTELP), designed to enhance livelihoods, and the Odisha Millet Mission, which promotes millet cultivation. Moreover, the Government of Odisha has implemented a specialised program focused on the Socio-Economic Transformation and Upliftment (SETU) of tribal populations, as outlined in Chapter 2. Additionally, the government has promoted Women's Self-Help Groups (SHGs) and Farmer Producer Organisations (FPOs), although the potential of these organisations remains limited by existing financial and institutional challenges.

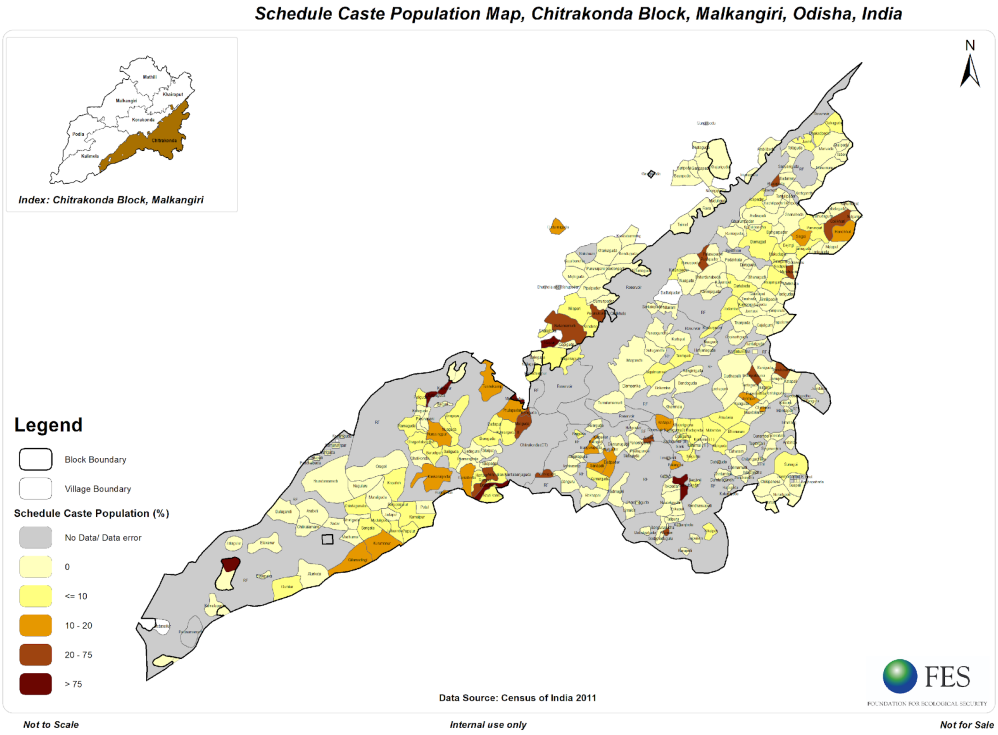

Fig. 1.5 – Schedule Caste Population Map

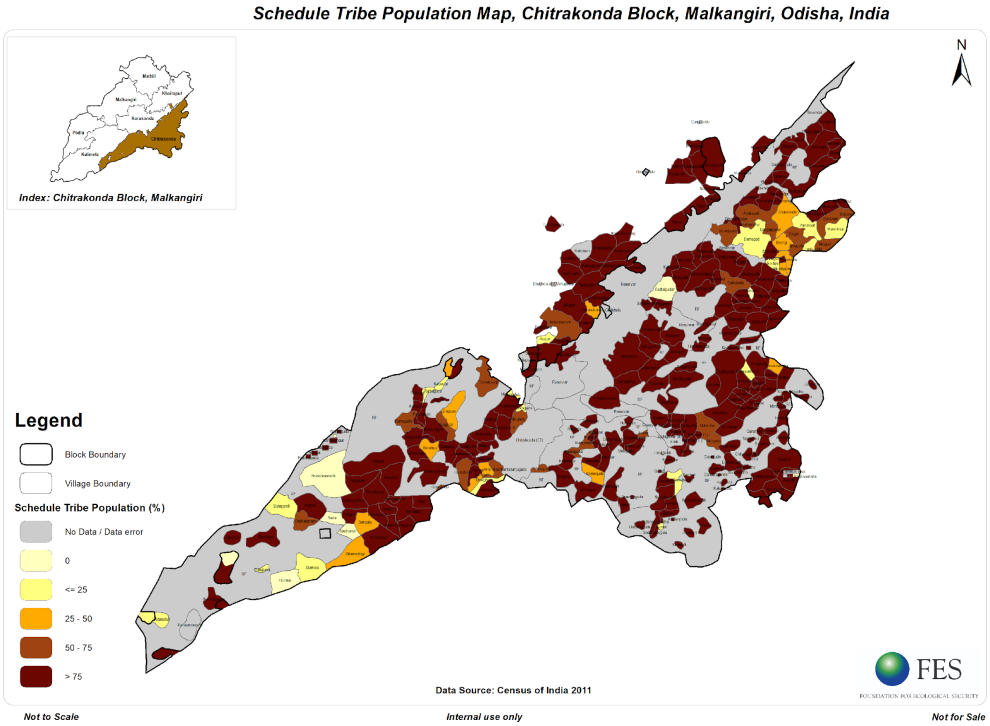

Fig. 1.6 – Schedule Tribe Population Map

Some ongoing challenges in the area include: (i) Remoteness and Accessibility: Certain parts of the block have traditionally been hard to reach, hindering development and the delivery of public services;

(ii) Dependence on Monsoons: Agriculture's reliance on rainfall makes the livelihoods of residents vulnerable to weather changes; (iii) Limited Economic Diversification: The lack of industries and alternative job opportunities limits income growth; and, (iv) Social Indicators: Low literacy rates along with potential issues in health and sanitation need targeted interventions.

Overall, the socio-economic conditions in Chitrakonda Block show a mainly rural area with a large tribal population that relies primarily on agriculture and natural resources. The region faces significant challenges related to poverty, infrastructure, and social development; however, many initiatives are currently underway to promote progress.

1.5. Land Use

Land utilisation pattern in Chitrakonda block, as per the Directorate of Economics and Statistics, Government of Odisha, listed in the District Statistical Handbook, 2022, is provided below:

Type	Land in Ha.
Forest	28,038
Non-Agricultural Use	2,053
Barren and non-cultivable land	9,719
Permanent pastures & Grazing	2,558
Misc. Tree, Crops & Groves (not included in the net sown area)	284
Cultivable Waste	837
Old Fallows	1,848
Current Fallows	2,482
Net Area Sown	11,326
Total Area	59,145

Table 1.2 – Land Use Pattern

Forest dominance significantly shapes the landscape, with about 47% of the total area covered by forests. This figure shows an ecologically rich and diverse environment. Large forest areas provide essential ecosystem services, such as carbon storage, water management, and habitat for many species. It also demonstrates dependence on forest-based livelihoods, including the use of Non-Timber Forest Products (NTFPs), firewood, and forest grazing. Any agroecological initiatives should incorporate forest ecosystems through practices such as agroforestry, biodiversity conservation, and community forestry programs.

Only 19% of the total area is under net cultivation, indicating limited cultivable land that is fragmented and mainly located in valleys or on flatter terrain. Increasing intensity and diversifying the use of existing farmland are viable options. Focus should be on improving soil health, practising multi-cropping, using water-efficient methods, and selecting climate-resilient varieties.

The total area of barren land, cultivable waste, old fallows, and current fallows exceeds 14,886 hectares (about 25%), indicating a significant amount of degraded or unproductive land. This is linked to poor soil fertility, water scarcity, and land tenure insecurity. Restoring degraded lands through agroecological methods can improve productivity, ecosystem services, and carbon sequestration. It is important to note that desertification is not a concern in this landscape.

About 2,558 hectares (4.3%) are used as permanent pasture or grazing land. For an area heavily dependent on livestock, this is relatively low. Agroecological methods might include promoting fodder crops, silvopasture, and better management of community grazing areas.

Only 284 hectares are used for miscellaneous trees and groves outside of forested areas. Tree-based agroforestry practices are limited. There is strong potential to promote agroforestry with native species that offer economic and ecological benefits.

1.6. Land Holding Pattern

Landholding pattern for Chitrakonda as per the 2011 Census and provided by the Chief District Agriculture Officer, Malkangiri, is given below:

Land Holding (Size)	No. of Farm Families
Marginal (<1.0 ha.)	4,825
Small (1.2 ha.)	2,540
Semi-Medium (2-4 ha.)	1,932
Medium (4-10 ha.)	135
Large (>10 ha.)	0
Total	**9,432**

Table 1.3 – Land Holding Pattern

Malkangiri district in Odisha has a landholding pattern mainly consisting of small and marginal farms. According to the Agriculture Census 2015-16, about 82% of the district's cultivators are classified as small and marginal farmers. This reflects the broader trend in Odisha, where around 90% of farmers are small and marginal. Many tribal families have scattered and fragmented plots on uneven terrain. Farmers in the area have limited access to formal credit, inputs, and markets. There are no reports of landholdings exceeding 10 hectares.

Although detailed data on land owned by private industries in Malkangiri is not available, the district's economy is primarily agricultural, with nearly the entire population engaged in farming and related primary sector activities. Large-scale industrial landholdings and agro-industrial value chains are absent.

1.7. Status of Community Forest Rights and Individual Forest Rights

Although The district supports the implementation of both Community Forest Rights (CFR) and Individual Forest Rights (IFR) through a collaborative effort involving the Integrated Tribal Development Agency (ITDA), the Revenue Department, and the Forest Department. The approval process for both CFR and IFR begins with endorsement by the Gram Sabha, followed by review and approval by the Sub-Divisional Committee and the District-Level Committee. Although many individuals have already received IFR titles, the implementation of CFR remains limited. However, recent discussions with the district administration suggest this is likely to improve, with a series of meetings planned to make the CFR entitlement process more efficient. According to talks with the ITDA, Malkangiri, about 3,615 farmers have received IFR titles, though the status of CFR implementation has yet to be updated.

1.8. Soil Testing Facility

A soil testing laboratory is also operational at the district level and is managed through a Mobile Soil Testing Laboratory (MSTL). This mobile unit is equipped with machinery to analyze key soil parameters such as pH, Electrical Conductivity (EC), Organic Carbon (%), Nitrogen (Kg/Ha), Phosphorus (Kg/Ha), Potassium (Kg/Ha), Sulphur (ppm), Zinc (ppm), Boron (ppm), Iron (ppm), Manganese (ppm), and Copper (ppm). Soil samples are gathered from various villages and Gram Panchayats and tested in the mobile lab. In addition to the MSTL, three Village Soil Testing Labs (VSTLs) have been established at Chitrakonda, Pandripani, and Malkangiri. These VSTLs are equipped with essential instruments, including an electronic weighing balance, analytical balance, drying oven, Soil Testing Fertiliser Recommendation (STFR) meter, shaker, single distillation unit, and a GPS device to facilitate field-level soil sample collection and analysis.

CHAPTER 2

History of Agroecology in the Landscape

Chitrakonda's agroecological history is closely linked to its isolation from the rest of the country, its indigenous roots, and the surrounding forests. Historically, this region was excluded from mainstream development due to natural barriers and ongoing conflicts. However, in the past decade, the landscape has changed considerably. This chapter examines how agroecology has evolved in the Chitrakonda district, focusing on the civil conflict, government efforts to improve connectivity, and the start of new development initiatives. The specialised program established by the Odisha government included elements of agroecological development.

2.1. Isolation and Lack of Development (Pre-2018)

Located near the Andhra Pradesh border, Chitrakonda's rugged terrain and dense forests made it an ideal place for Maoist insurgents. Over time, Chitrakonda became a main stronghold of the Andhra-Odisha Border Special Zonal Committee (AOBSZC) of the Communist Party of India (Maoist), making it very hard to control the area. From 2008 to 2021, the region experienced several Maoist-related incidents, resulting in the deaths of civilians and security personnel.

Chitrakonda was once part of the Kudumulguma block, comprising 170 villages spread across 372 square kilometres. It became physically cut off from the mainland after the construction of the Balimela reservoir in the early 1960s. The reservoir flooded large areas of hills and forests, isolating the villages in a terrain without motorable roads. Mud paths became impassable during monsoon seasons, and boats—controlled or monitored by Maoists—were the only means of transportation, taking 6–7 hours to reach the mainland. Routine trips required villagers to stay overnight at Chitrakonda, the block headquarters. These villages were known as the "cut-off area" and were later renamed "Swabhiman Anchal" in 2018.

Living in a state of isolation and insecurity, the development of the Malkangiri district was greatly limited. According to the National Multidimensional Poverty Index published by NITI Aayog, nearly 59% of the district's 600,000 residents were living below the poverty line. With literacy rates around 10%, schools and healthcare facilities were often in poor condition, leaving villagers without access to institutional healthcare, clean drinking water, or electricity. Most residents relied on subsistence farming, primarily growing finger millet and little millet as their main crops. The only profitable cash crop was cannabis, which was grown illegally and sold to traders from neighbouring Andhra Pradesh.

2.2. Construction of Gurupriya Bridge: A Turning Point (2018-2020)

After numerous failed attempts since 1986 due to Maoist threats, the Gurupriya Bridge over the Balimela reservoir was finally completed in 2018. Its construction marked a significant milestone for the region, reconnecting the “cut-off area” to Chitrakonda and the rest of Malkangiri district. The bridge not only significantly reduced travel time but also enabled the government's return to a region long controlled by insurgents.

To accelerate change, the Odisha government launched the Socio-Economic Transformation and Upliftment (SETU) scheme, allocating a ₹100 crore package to kick-start development and rebuild trust in nine out of 18 affected Gram Panchayats (GPs) in the region. As security improved, the Maoist influence began to wane. A major crackdown in 2016 had already damaged insurgent infrastructure. By 2020, further surrenders and operations—including the killing of key Maoist leaders and seizure of large ammunition stockpiles—strengthened state control.

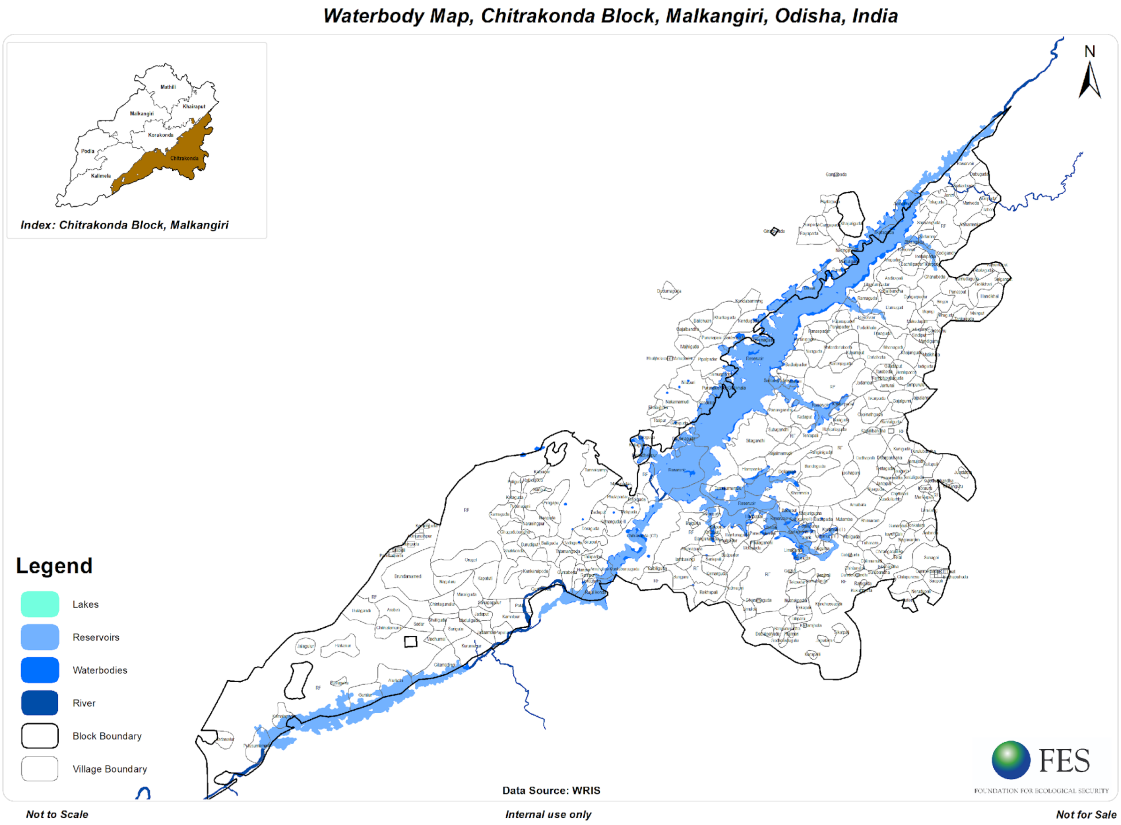

Fig. 2.1 – Waterbody Map, Chitrakonda Block

One major challenge in development was building roads through hilly terrain. A remarkable example of planning that adapts to its context shows how engineers used the natural paths taken by grazing cattle—choosing the easiest routes instinctively—to design roads for villages. This development connected the remote villages and hamlets, improving transportation and access.

By 2020, the SETU scheme had started livelihood interventions in nine Gram Panchayats (GPs) that were previously controlled by Maoists, increasing the reach of state-led programs. The remaining nine GPs, which already had basic infrastructure in place, continued to receive benefits from various ongoing programs.

2.3. Consolidation and Expansion of Developmental Services (2021 onwards)

After violence decreased and connectivity was restored, a range of development programs started to take hold in Chitrakonda. A major piped water supply project was launched to tap drinking water from the Balimela reservoir, tackling a long-standing public health issue. Three-phase electricity replaced the unreliable single-phase supply, boosting irrigation and household utility. Mobile network connectivity was introduced, closing the digital divide and allowing for communication and access to government services. New schools and healthcare facilities were set up, enhancing human development indicators. Additionally, the following key initiatives began active implementation:

1. **Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA):** Ensured guaranteed wage employment to improve livelihood security.
2. **National Rural Livelihoods Mission (NRLM):** Encouraged self-employment and organisation among the rural poor.
3. **Pradhan Mantri Awas Yojana (PMAY):** Provided affordable housing to the rural poor.
4. **Integrated Tribal Development Agency (ITDA):** Promoted the socio-economic development of tribal populations through various initiatives.
5. **Odisha Tribal Empowerment & Livelihoods Programme (OTELP):** Improved the quality of life for poor tribal households in remote areas through livelihood support and food security.

Currently, there's no systematic study that assesses the impact of these programs. However, the WASSAN team has observed some broader effects, which are outlined below:

- The population of the area, once seen as supporters of the outlawed Communist Party of India (Maoist), now interacts openly with government officials.
- Fear has dramatically decreased, enabling people to voice their complaints and engage more actively in discussions with the administration.
- Developmental projects have delivered essential services, created jobs, and enhanced living conditions, fostering a sense of community and trust in the government.

2.4. Emergence of Agroecological Programming

The improving governance environment created fertile ground for the revival and formalisation of agroecological approaches, particularly through two key programmes, i.e., (i) The Special Programme for Promotion of Integrated Farming (SPPIF) and Sustainable Integrated Farming Systems (SIFS), which have been detailed out in the sections below.

Over the past 15–20 years, the Government of Odisha, in collaboration with Civil Society Organisations, has undertaken a wide array of initiatives in the landscape to strengthen and enhance the livelihoods of farming communities. Notable among these are the programmes implemented by the Revitalising Rainfed Area Network (RRAN), the Odisha Tribal Empowerment and Livelihood Programme (OTELP) and its extension OTELP Plus, and the Odisha Particularly Vulnerable Tribal Groups Empowerment and Livelihoods Improvement Programme (OPELIP). Other important initiatives include the Promotion of Livelihood through Sustainable Vegetables Growers Cooperative (PLSTVGC) and the Mahila Kisan Sashaktikaran Pariyojana (MKSP) under the National Rural Livelihoods Mission (NRLM), aimed at empowering women engaged in agriculture and allied sectors.

In addition to these, a broad range of schemes has been implemented across the district, including the National Food Security Mission (NFSM), Agriculture Technology Management Agency (ATMA), and NABARD-funded watershed projects. Interventions led by organisations such as Action Aid, the Odisha Millets Mission, and projects promoting mechanised Direct Seeded Rice (DSR), indigenous paddy varieties, and rice-fallow management have also contributed significantly. Efforts towards afforestation and forest regeneration, as well as the implementation of the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), have further enriched the landscape's development. Complementary programmes such as Rainfed Area Development, Rashtriya Krishi Vikas Yojana (RKVY), and MGNREGA-supported plantation and water conservation activities—like the construction of farm ponds and promotion of agroforestry—have also played a crucial role. Additionally, the Rejuvenating Watersheds for Agricultural Resilience through Innovative Development (REWARD) project, horticulture development under various state and national missions, nutrition outreach initiatives, and irrigation development schemes such as river lift irrigation and the Jalanidhi scheme have been implemented. All these programmes incorporated components that directly or indirectly addressed some aspects of agroecology.

Further interventions in the region include measures to promote farm mechanisation and risk mitigation in agriculture through crop insurance under the Pradhan Mantri Fasal Bima Yojana (PMFBY), and support through the Mukhya Mantri Makka Mission (MMM). Tree plantation drives and soil moisture conservation activities have also been integral to the overall agroecological strategy. In the livestock sector, the government has introduced various support programs, including broiler farming units with a capacity of 500 birds, chick rearing units, and layer farming units of similar capacity. Goat rearing models, such as the (i) 30+2 and (ii) 10+1 formats, are being promoted through Women Self-Help Groups (WSHGs). Veterinary support services include the deployment of Mobile Veterinary Units to ensure animal health care reaches remote locations. In the fisheries sector, the government provides financial assistance under the State Sector Scheme and the Mukhyamantri Maschyajibi Kalyan Yojana (MMKY) for the purchase of new boats, engines, and fishing nets. Additional initiatives in this sector include the excavation of new tanks, promotion of reservoir-based fisheries, dissemination of modern fisheries equipment, and input support extended to Women Self-Help Groups engaged in fisheries-related livelihoods.

2.4.1. The Special Programme for Promotion of Integrated Farming (SPPIF) under SETU

The Special Programme for Promotion of Integrated Farming (SPPIF) under the Socio-Economic Transformation and Upliftment (SETU) scheme was implemented in the Chitrakonda block of Malkangiri district, Odisha, to promote sustainable farming and improve the livelihoods of tribal communities, especially in the area. The SPPIF, funded by the Government of Odisha and the Sustainable Integrated Farming System (SIFS) supported by Welthungerhilfe (WHH), aimed to boost agricultural productivity, diversify livelihoods, and strengthen community institutions. This programme was first launched in the Malkangiri district and later expanded to nine Gram Panchayats, covering 5,000 households, in partnership with WASSAN. The list of the nine GPs and the number of villages in each GP is provided below. The interventions reached 111 villages across nine Gram Panchayats in Chitrakonda block, benefiting 5,471 farmers. It was the only initiative that included elements of agroecology. Key interventions implemented under SPPIF were:

- **Crop Diversification:** Promoting oilseeds, pulses, and cereals through intercropping.
- **Seed Production:** Collaborated with Odisha State Seed Corporation to produce certified seeds of Groundnut, Black gram, and Niger.
- **Horticulture Promotion:** Adoption of the trellis system for cultivating creeper vegetables among 598 farmers.
- **Kitchen Gardens:** Established for 200 beneficiaries, who also received fruit saplings.

- **Liquid manure preparation and usage:** SHGs trained in liquid manure production, and FPOs were involved in marketing.
- **Livestock Management:** Building cow sheds, poultry houses, and goat shelters.
- **Indigenous Chick Production Units (ICPU):** 18 ICPUs established.

S No.	GP Name	Total Number of Villages
1	Badapada	13
2	Papermetla	17
3	Dhuliput	20
4	Ralegada	23
5	Andrapalli	9
6	Panasput	20
7	Jodambo	30
8	Gajalmamudi	13
9	Jantri	10
	Total	**155**

Table 2.1 – WASSAN's Implementation Area

During the early years, a large part of the funds went towards building infrastructure, including roads, bridges, electricity, and schools. Over the past seven years, around ₹350–400 crore has been invested in these infrastructure projects, which also cover funding for various activities related to livelihoods. On top of that, the state government sets aside ₹50 crore each year to support development initiatives, including programs that help farmers diversify their income sources.

2.4.2. Sustainable Integrated Farming Systems (SIFS)

The Sustainable Integrated Farming Systems (SIFS), funded by Welthungerhilfe, which was part of the special programme mentioned above, focused on the following:

- Capacity building of communities
- Policy advocacy for agroecological farming
- Integrated natural resource management
- FPO strengthening and market linkages
- Community-based agroecological planning

2.4.3. Impact of the Programmes

As shared by the WASSAN Team, the following were among the program's impacts. Farmers participated in training on farm management activities and adopted improved practices. Agricultural productivity increased. Some key departments, like the Department of Agriculture, the Department of Horticulture, and the Department of Animal Husbandry, supported the program's implementation, technical knowledge dissemination, and financial support. Changes were reported in:

- Cropped area, Cropping pattern, Cropping intensity;
- Increase in the use of agricultural inputs;
- Higher crop output, an Increase in production of high-value crops;

- Employment generation;
- Other socio-economic development.

Although many people participate in these initiatives, the long-term adoption of the promoted practices is still limited. Several challenges contribute to this, including a lack of awareness and weak ownership among farmers, ineffective delivery methods, and execution gaps. There's often a poor fit between the program design and local needs, customs, and traditions, which reduces its relevance and impact. Limited community involvement and weak institutional frameworks also hinder sustainability. Low literacy levels, inadequate outreach efforts, and disjointed coordination among departments create more barriers. The lack of robust stakeholder feedback mechanisms, along with selection and instances of gender and social exclusion, also undermines the effectiveness and inclusiveness of these interventions.

CHAPTER 3

Current State of Agroecology in the Landscape

3.1. Agriculture (field crops, vegetables, floriculture, fruit crops)

In this section, we analyse field crops, vegetables, floriculture, and fruit crops. For most of Chitrakonda's population, agriculture is the main source of livelihood. The district's rough terrain and extensive forests limit farming to the Kharif season, with Rabi cultivation happening only in areas with irrigation.

3.1.1. Crops and their Productivity

Major crops in the region include rice, corn, finger millet, green gram, black gram, horse gram, and sesame. Smaller amounts of groundnut, niger, and rajma are also grown. Turmeric is a high-value crop, but its productivity falls below the state average. According to the Directorate of Economics and Statistics, Government of Odisha, here are the paddy cultivation statistics for 2021-22 in Chitrakonda block:

Block/ District	Paddy Area in Ha.	Yield Rate in Quintals	Production in Quintals
Chitrakonda	3,830	27.90	1,06,869
Malkangiri	1,15,897	37.36	43,30,242

Table 3.1 – Paddy Production

Estimated area, yield rate, and production of selected crops for the Malkangiri district are presented below (block-level data not available):

Crops	Area in Ha.	Yield Rate in Quintals	Production in Quintals
Maize	780	15.91	12,704
Finger Millet	4,983	8.38	41,774

Crops	Area in Ha.	Yield Rate in Quintals	Production in Quintals
Green Gram	400	3.2	1,281
Black Gram	3,373	2.97	10,023
Horse Gram	1,299	2.97	3,858
Sesame	3,731	1.96	7,313
Ground Nut	4,651	37.14	1,72,738

Table 3.2 – Production of other Major Crops

Crop	Productivity (Quintal/ Ha.)
Paddy	33.75
Maize	15.91
Millet	8.38
Green Gram	3.2
Black Gram	2.97
Niger	4.10
Turmeric	22.92

Table 3.3 – Productivity of Crops

Crop Analysis Matrix

In the Chitrakonda landscape, land is categorized into four types: (i) steep slopes upland (*Dangar*); (ii) medium upland (*Pada*); (iii) medium land (*Saria*); and (iv) low land or terraced valley (*Beda*), each supporting various crops. Six main crops are cultivated during the Kharif season, including finger millet, little millet, black gram, black horse gram, niger, turmeric, and limited pockets of white Rajma. Currently, farmers rely on existing seed varieties without purification, which results in lower yields and seed admixtures. The use of farmyard manure (FYM) is common in some panchayats across all land types, whereas in others, crops are grown without FYM. Established finger millet markets (Mandis) have encouraged some farmers to start using weedicides for better weed control. However, in areas with low crop yields, chemical fertilizers such as DAP and urea are being used.

Cropping practices vary across different land types, with notable crop diversity observed in Finger Millet and Turmeric, particularly in *Dangar* and *Pada* lands. *Saria* and *Beda* lands are mainly used for paddy cultivation. Intercropping is common; Finger Millet is often grown with Black Gram, Black Horse Gram, Niger (on the edges), Red gram, and Sorghum (*Khedjana*). For Turmeric, the main intercrops are

Castor, Cowpea, and Red gram. Farmers primarily use broadcasting for sowing all crops, while transplanting is limited to finger millet and is more typical in Paddy.

The cropping calendar follows a seasonal pattern: Ragi and Little Millets are transplanted in July–August and harvested between December and January; pulses and oilseeds are sown in October and harvested by December; Red gram is transplanted in July and harvested in December; and Paddy is transplanted in August and harvested in December.

Land Type	Crops Grown	Existing/ Current Practices	Utilization pattern
Steep slopes upland (Dangar)	Finger Millet + Sorghum, Finger Millet + Black gram, Finger Millet + Red gram, Finger Millet + Niger, Finger Millet, Little millet, Horse gram, Niger, Rajma, Red gram, Sesame, Sorghum, Turmeric	• *Dangar* lands are mainly farmed with a few key crops, with finger millet showing the great diversity. • Farmers mainly use their traditional seed varieties, often without purification or selection. • Farmyard manure (FYM) is commonly used, although some farmers do not apply any soil inputs. • The use of chemical pesticides and fertilizers remains below 5%. At the same time, weedicides have only been introduced in the past three years, mainly for finger millet due to the availability of assured markets (mandis). • Broadcasting is the dominant method of sowing, with transplantation of finger millet practiced only on a small scale.	• Around 20% of Finger Millet produced is used for household consumption, and 80% is sold in the market. • Little millet is almost entirely sold (95%), with a small amount kept for personal use. • Black gram is mainly sold (80%), while 20% is reserved for home use. • Turmeric is completely market-oriented, with all of it sold. • Niger, sesame, and castor are primarily used for self-consumption, especially for making cooking oil and other household uses. • Black horse gram is cultivated only for household use. • Rajma is mainly marketed (80%), with the remaining 20% used for family needs. • However, a portion of the harvest is kept as seeds with the farmers for the next season.
Medium Upland/ Homestead (Pada)	Finger Millet + Sorghum, Finger Millet +Black gram, Finger Millet +Red gram, Finger Millet + Niger, Finger Millet, Little millet, Horse gram, Niger, Rajma, Red gram, Sesame, Sorghum, Turmeric, Vegetables, Maize, Cow pea.	• Pada lands are mainly farmed with a few key crops, with finger millet being one of the primary crops grown. • Farmers mostly use their own traditional seed varieties, often without any purification or selection process. • Farmyard manure (FYM) is commonly applied, though some farmers do not use any soil inputs. • The use of chemical pesticides and fertilizers remains below 5%. At the same time, weedicides have been introduced only in the past three years, mainly for finger millet due to the	• Finger millets used as 20% self-consumption and 80% market. • Little millet is entirely sold in the market. • Around 80% of the Black gram is sold in the market, and 20% is kept for self-consumption. • The entire Turmeric crop is sold. • Niger, Sesame, and Castor are kept for self-consumption. • Black horse gram, Cow Pea, and Horse Gram are kept for self-consumption. • As reported above, about 80% of the Rajma grown is

Land Type	Crops Grown	Existing/ Current Practices	Utilization pattern
		availability of assured markets. • Broadcasting remains the primary method of sowing, while finger millet transplantation is only done on a small scale.	sold, and only 20% is kept for self-consumption. • Maize – About 30% is sold in the market, and 70% is kept for consumption. • However, a few portions of grain are retained by the farmer for seed purposes for the following year.
Medium Land (*Saria & Beda*)	Paddy	• Paddy is the main crop in Saria land, although finger millet is also grown in some regions. • Farmers mostly rely on their own seed varieties, usually without any purification process. • Farmyard manure (FYM) is used on approximately 95% of the land. • The use of chemical fertilizers is very low, making up less than 5%. • Transplanting is the most common method, although a few farmers still practice broadcasting.	• All the paddy grown on these lands is kept for self-consumption. • Few households sell paddy at the weekly market to quickly generate cash for buying other essential items.

Table 3.4 – Crop Analysis Matrix

Existing Markets

The table provides a clear view of the cropping pattern, revealing that crops are grown for both personal use and to generate income through market sales. The traditional landraces being cultivated serve as both food grains and seeds for the next planting season, often without any basic cleaning process. The harvested produce is either sold locally or passed through village or local traders, with farmers typically selling to whoever offers the best price, usually without much thought. Although there are no permanent or official traders, a few regular traders operate in the village. Most farmers sell their produce at the village level, earning modest profits from each crop or item. Some farmers take their produce to nearby weekly markets to get slightly better prices. Additionally, some farmers sell small amounts at each market to get quick cash for buying other essentials. A similar pattern is seen with small ruminants like goats, sheep, and cattle, with markets in Andhra Pradesh being preferred due to better pricing opportunities.

For local traders, whether they're from nearby areas or outside markets, the Fair Average Quality standards don't usually pose a big challenge. They're willing to take whatever the farmers produce. However, if the crops or commodities have a high level of mixtures or foreign matter, the traders offer lower prices. Within the region, different categories or varieties of produce have their own separate pricing structures.

Name of the crops cater to the Market	Economic Impact	Environmental Impact
Finger Millets	High	High
Little Millets	High	High
Black gram	Medium	Medium
Turmeric	High	Low
Rajma	High	Medium
Maize	Low	Low
Proposed New Crops		
Green Gram	High	High
Bengal Gram	High	High
Organic High-value Vegetable cultivation focusing on kharif Onion, Ginger, Carrot.	High	High
Hill Banana	High	High

Table 3.5 – Economic & Environmental Impact of Crops

3.1.2. Horticulture

Chitrakonda's climate and soil conditions are ideal for growing a variety of fruits and vegetables. Some of the most important crops in the area include mango, jackfruit, banana, papaya, guava, and cashew. Local farmers also grow common vegetables like eggplant, tomato, okra, cucumber, gourds, and beans in their home gardens and small plots for their own use and to sell at local markets. The region is also home to many native vegetable varieties. Furthermore, root crops such as various types of yams and tubers are widely grown, especially in hilly areas, where the natural terrain and microclimate are conducive to their growth.

3.1.3. Seeds

Seeds for agricultural use come from various sources across the landscape. Certified seeds of high-yielding varieties (HYVs) for paddy and oilseeds are distributed through block-level agricultural offices and Primary Agricultural Cooperative Societies (PACS). However, their reach remains limited, and many remote farmers can't access these inputs promptly.

The Krishi Vigyan Kendra (KVK) supplies quality seeds for demonstration and limited distribution. It primarily focuses on climate-resilient varieties of rice, pulses, and vegetables. The KVK also encourages seed production by trained farmers through the Seed Village Programme, although its reach is limited due to insufficient funding and staffing.

The Department of Agriculture and Farmers' Empowerment distributes subsidised seeds through various schemes, including KALIA, the National Food Security Mission (NFSM), and the Odisha Integrated Irrigation Project for Climate Resilient Agriculture (OIIPCRA). It also supports community seed banks to preserve indigenous varieties. However, delays in seed delivery frequently disrupt sowing schedules, and awareness of these schemes remains low among tribal farmers. The KALIA scheme supports cultivators, small farmers, and landless agricultural labourers. It provides payments to farmers to encourage cultivation and related activities.

The Odisha University of Agriculture and Technology (OUAT) provides breeder and foundation seeds, mainly for rice, millets, and horticultural crops, through the Seeds Corporation and KVK. However, direct outreach remains limited.

Meanwhile, traditional seed systems continue to be strong. Farmers depend heavily on local seeds of millets (like finger millet and little millet), pulses (such as tur and moong), and vegetables. They preserve these using traditional methods and exchange them among farming families, especially for landraces suited to acidic soils and rainfed conditions. Although these seeds are hardy, their yields are generally lower than those of HYVs.

Small agricultural input shops in Chitrakonda town and nearby markets like Jeypore sell high-yielding variety (HYV) seeds for vegetables, such as tomatoes and eggplants, and cash crops like cotton. These shops also offer bio-pesticides, like neem-based solutions, and chemical pesticides through Integrated Pest Management (IPM) programs run by KVK and the Department of Agriculture. However, the adoption of these inputs is still very limited.

3.1.4. Fertilisers

Odisha has relatively low fertiliser consumption. The main reasons for this are limited availability, inadequate farmer education, and the frequent impact of natural disasters. State organisations such as the Odisha State Cooperative Marketing Federation (MARKFED) and the Odisha Agro Industries Corporation (OAIC) handle the procurement and distribution of fertilisers.

According to the Odisha Agriculture Statistics of 2017-18, the Government of Odisha reported that Malkangiri's per-hectare fertiliser consumption was 60.27 kg/ha. This was lower than the state average of 68.67 kg/ha for the same year and significantly below the national average of 128.02 kg/Ha.[1]

3.1.5. Irrigation

Access to irrigation is still a major challenge in the Chitrakonda landscape. The area, especially the nine Gram Panchayats (GPs) where WASSAN works, doesn't have large-scale irrigation systems. Whenever possible, mountain streams and dug wells are used for irrigation, mostly for Rabi crops. According to the Chief District Agriculture Officer in Malkangiri, the region's irrigation potential in 2021–22 was 84,234 hectares in the Kharif season and 43,594 hectares in the Rabi season. For the Chitrakonda block specifically, minor lift irrigation created 884 hectares of potential in the same year.

WASSAN, in partnership with the Water Resources Department, is working to boost water availability for farming and raise agricultural productivity by tapping and developing traditional water sources for both drinking water and irrigation.

3.1.6. Crop Insurance

Crop insurance in the district is managed under the Pradhan Mantri Fasal Bima Yojana (PMFBY), with the Agriculture Department acting as the main agency. According to recent guidelines from the Government of India and the Government of Odisha, farmers can only enrol through a certification process based on the Farmer Registry. This requires land being cultivated to be registered in the farmer’s own name, not that of their father or grandfather. In tribal areas like Malkangiri, land ownership is often held jointly or under ancestral names, with no formal procedure for division or individual titles. This creates a major obstacle during enrollment, as obtaining an affidavit for land

[1] ODISHA AGRICULTURE STATISTICS1_2017-18.pdf; accessed 10-Aug-2025

ownership is time-consuming. Additionally, the scheme requires over 60% crop loss at the Gram Panchayat level to qualify for compensation, which discourages farmers from paying premiums, resulting in low participation rates, reportedly under 20%.

3.1.7. Enterprises

Micro and small enterprises in the Chitrakonda block have been mainly supported through Women Self-Help Groups (WSHGs). However, these enterprises have not achieved much success. A key reason is the lack of community ownership, as many initiatives were externally driven and did not match local needs and capacities. Other issues include poor financial support, limited access to credit, and unreliable electricity, all of which have affected their sustainability and growth.

3.1.8. Credit

Agricultural credit is provided through the KALIA scheme and cooperative banks, but access remains difficult, especially for farmers in remote and hard-to-reach areas.

3.1.9. Storage

The lack of large storage facilities or warehouses in the landscape is a significant bottleneck. Most agricultural produce is stored at the household level, and traders from nearby villages or adjoining regions in Odisha and Andhra Pradesh directly collect the marketable surplus by visiting the villages.

3.1.10. Market Linkages

The primary agricultural crops include rice, millets, pulses, vegetables, cashew, and mango. The main markets are local markets and those in Chitrakonda and Jeypore. Farmers typically set aside part of their harvest for seed preservation and family use, depending on the crop type and household needs, while some crops are mainly grown for self-consumption. The surplus is sold to earn income. Most households use traditional, primary processing methods that are culturally rooted and passed down through generations. At the village level, local traders operate informally, collecting produce and selling it to intermediaries who visit directly or during weekly haats. There is no fixed buyer for all the produce; sales depend on who offers the best price, which is influenced by the quality of the produce. Some farmers store part of their harvest and sell small quantities at weekly markets to meet routine cash needs for other household expenses. The marketing landscape varies, with different trends across crops and commodities. For example, in goat trading, many farmers prefer to sell at nearby markets in Andhra Pradesh, where prices are more favourable than in local haats. However, those willing to accept lower prices sell locally.

Forest products, such as tamarind and jackfruit, also make up a significant part of the income for tribal households' income. Intermediaries in the village often purchase these, while other forest products are mainly used within the household.

The Odisha Rural Development and Marketing Society (ORMAS) manages marketing activities in the region and has assisted in establishing and certifying producer groups.

3.1.11. Payment for Ecosystem Services

Currently, there is no system in place for Payment for Ecosystem Services (PES) within the landscape.

3.1.12. Traditional Agricultural Knowledge and Agroecological Practices

Chitrakonda farmers rely on traditional farming methods that draw from a deep understanding of the land and local customs. Although these methods are mostly low-tech and low-maintenance, they're well-suited to the area's unique terrain, soil, and climate.

One key practice is mixed cropping, where tribal farmers plant a mix of millets, pulses, and oilseeds together. This approach not only cuts down the risk of crop failure but also boosts soil fertility through natural nutrient cycling.

People often use traditional methods to conserve seeds. They store local seeds, like millets and pulses, in clay pots or bamboo containers, usually lining them with ash or neem leaves to keep pests away. These time-honoured techniques are crucial for saving local varieties and maintaining genetic diversity.

Regarding nutrient management, farmers utilise cow dung, goat droppings, and compost. These inputs enhance soil structure and fertility while preserving the ecological balance of farms.

Another practice that's evolving is the use of bio-inputs, like *Handi Khata*—a fermented manure made in earthen pots. WASSAN has introduced and popularised this practice as part of its agroecological programming in the region.

These practices offer several benefits: they're cost-effective, environmentally friendly, and culturally accepted by local communities. However, they also have some limitations. For instance, traditional seed storage systems are not suitable for large-scale seed production because of inconsistent quality and the lack of protective infrastructure to safeguard the seeds from damage.

Modern technologies and digital agriculture are still developing and aren't widely adopted yet. The most commonly seen innovations include solar-powered irrigation pumps, improved seed varieties, and vermicompost units with vermi-beds. These are primarily found in isolated areas, so they haven't become mainstream just yet.

3.1.13. Community Collectives

Irrigation user groups called Pani Panchayats are active in the region, playing an important role. According to the 2021–22 District Statistical Handbook, there are around 129 Pani Panchayats in Malkangiri district, supporting 2,667 farmers and managing 2,580 hectares of land. Among these, 76 Pani Panchayats operate within Chitrakonda block, covering 1,520 hectares, helping local farmers with their needs.

Community-based organisations (CBOs) like Women Self-Help Groups (WSHGs) and their federations under Mission Shakti, along with Farmer Producer Organisations (FPOs), are vibrant parts of the community. These groups play a vital role in supporting livelihoods, encouraging enterprise growth, and promoting eco-friendly agricultural practices.

According to the Assistant Registrar of Cooperative Societies, Malkangiri district had eight Primary Agricultural Cooperative Societies (PACS) in 2021–22, with a total membership of 97,540. Of these, one PACS is located in the Chitrakonda block, serving a community of 9,381 members.

It's worth mentioning that Chitrakonda currently lacks Non-Agricultural Cooperative Societies or Marketing Cooperative Societies. This absence can make it more challenging for farmers to connect with broader markets and find support for non-farm enterprises, which could really help their growth and success.

3.1.14. Government Institutions

Several key government institutions and programs are actively supporting agricultural and related sectors in the Chitrakonda block, playing an essential role in boosting local development.

Odisha's Department of Agriculture and Farmers' Empowerment is key to agricultural development, overseeing extension services and scheme implementation. In Malkangiri, the District Agricultural Officer (DAO) coordinates block-level activities. At this level, an officer is in charge of managing agricultural operations. Meanwhile, the Directorate of Horticulture, Odisha, focuses on developing fruits, vegetables, and floriculture. It also helps set up nurseries and revitalise orchards to boost productivity.

At the district level in Malkangiri, a Krishi Vigyan Kendra (KVK) is in operation, working as an independent institution with funding from both the State Government and the Indian Council of Agricultural Research (ICAR). The KVK's main goal is to test new crop varieties and see how they perform in local conditions. As part of this, the KVK gives out crop varieties that are well-suited to the area's conditions across a few small plots, using multi-location trials to assess how well they adapt and perform. The centre also has demonstration farms that show several recognised farming models, serving as hands-on learning platforms for farmers who visit for training and exposure programs. Along with on-field activities, the KVK has developed a range of publications on improved farming practices, tailored to the region's specific crops, to boost yield and income for farmers. The KVK also provides training, field demonstrations, and technology transfers to farmers, conducting frontline demonstrations on improved seed varieties, integrated pest management (IPM), and organic farming practices.

OUAT, located in Bhubaneshwar, conducts research and development through its regional stations, focusing on crops suited to the local agro-ecological zone, such as cashews and pulses. The Cashew Plantation Board actively promotes cashew cultivation and processing in Malkangiri district. As part of the Odisha Integrated Irrigation Project for Climate-Resilient Agriculture, the region has been introduced to climate-resilient pulse varieties and improved crop management practices. The district has no other agricultural research station besides the KVK.

3.1.15. Government Schemes

A wide range of government schemes is currently being implemented in the Chitrakonda block, many of which offer opportunities for integration with agroecological and sustainable agriculture initiatives. These schemes cover sectors such as crop production, irrigation, farm mechanisation, horticulture, nutrition, and climate resilience. Effective integration and localised implementation can help strengthen the ecological and economic foundation of smallholder farmers in the region. The key schemes currently underway include:

- Shree Anna Abhiyan
- Mechanised Direct Seeded Rice
- Aromatic Rice Promotion
- Mukhya Mantri Makka Mission
- Rice Fallow Management
- Special Programme for Promotion of Integrated Farming in Tribal Areas
- National Mission on Edible Oilseeds (yet to be started)
- National Food Security Mission (NFSM)
- Rashtriya Krishi Vikas Yojana (RKVY)
- Pradhan Mantri Fasal Bima Yojana (PMFBY)
- Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)
- Mukhya Mantri Krushi Udyog Yojana (MKUY)
- Agricultural Technology Management Agency (ATMA)

- Demonstration Schemes
- Farm Mechanization
- National Horticulture Mission
- NFSM – Oil Palm
- Development of Potato/Vegetables/Spices
- Cultivation of Spices (Ginger, Turmeric)
- Cultivation of Flowers and Mushrooms
- Jalanidhi / Farm Mechanisation
- Nutrition at Doorstep
- KALIA Scheme
- PM-KISAN / CM-KISAN
- Odisha Millet Mission

Many of these schemes include components relevant to agroecology, such as soil moisture conservation, use of natural or organic inputs, indigenous seeds, and low-input farming models. However, these interventions often remain fragmented. There is significant potential to integrate them into a coherent agroecological initiative, with better targeting, coordinated planning, and community involvement. Additionally, it is essential to address several gaps to strengthen the convergence of various schemes within the block, which include:

- Strengthening community institutions such as Pani Panchayats, FPOs, and WSHG Federations;
- Ensuring the timely release of funds and inputs;
- Increasing farmer awareness and access to scheme entitlements;
- Providing technical training and handholding support;

These schemes, if tailored to local needs and implemented through community participation, can significantly accelerate the agroecological transition in the landscape. They can also help tackle rural poverty, food insecurity, nutritional challenges, and ecological restoration.

3.1.16. Gendered Division of Labour

In the agricultural landscape of Chitrakonda, there's a noticeable division of labour between men and women, influenced by cultural norms and the physical demands of various tasks. Women play a vital role in labour-intensive activities and are actively involved in managing farms, despite often receiving limited recognition in formal institutional settings.

Women are primarily involved in:

- Weeding
- Cutting bushes
- Transplanting
- Harvesting
- Cleaning crops post-harvest

Men are typically involved in:

- Ploughing fields
- Line marking (locally referred to as Huda)
- Sowing seeds
- Harvesting
- Winnowing
- Packaging of produce

- Transport and sale of produce in local markets or haats
- Decision-making on crop selection, cultivation methods, and marketing (usually led by men, though women are consulted)

Women and men usually do together activities like weeding and harvesting. However, even though women play a vital part in farming, their contributions are often overlooked in planning, training, and access to inputs or credit.

3.1.17. Use of Forgotten Foods

WASSAN conducted a study in 23 villages across six Gram Panchayats in Chitrakonda Block, Malkangiri District. The focus was on the ethnobotanical knowledge of local tribal communities, including the Paraja, Gond, Kotia, Rana, Kamara, Kahmar, Gouda, Didai, and Kandha. These communities have lived in the area for over 80 years, having moved from Koraput to escape dam-related displacement. Despite relocating, they have maintained their traditional farming practices, growing more than 140-150 varieties of conventional crops. These include 28 cereals, 62 pulses, nine oilseeds, 12 tubers, 19 vegetables, nine fruits, and two types of leafy greens. Along with farming, they rely heavily on forest resources, gathering five types of wild oilseeds, 11 wild tubers, 9 wild fruits, 16 wild leafy greens, and 16 species of wild mushrooms. This emphasises their strong bond with the natural environment and their relationship with nature.

The food traditions of these communities are deeply rooted in cultural and ecological knowledge, with over 100 unique recipes documented that combine cultivated crops and foraged ingredients. These culinary traditions are closely connected to festivals, harvest seasons, and seasonal cycles, supporting biodiversity conservation and climate resilience. Recording these systems is vital for protecting traditional food wisdom, encouraging sustainable development, and safeguarding cultural heritage in tribal areas.

3.1.18. Findings from the TAPE Tool

Agriculture is the main livelihood in these villages, mainly relying on rain-fed subsistence farming. Farmers grow indigenous rice varieties such *as Bata Dhana, Mahul Kunchi, and Dasarabeti*, along with millets like Finger Millet and Little Millet. They also cultivate pulses such as Black Gram, Horse Gram, and Pigeon Pea, as well as oilseeds like Flaxseed. Turmeric is grown as a cash crop, and medicinal plants like *Pipala* are also cultivated in small amounts. However, because there is no irrigation infrastructure, farming is limited to the Kharif season, making crop yields highly dependent on monsoon patterns. Some farmers have turned to Cannabis cultivation for financial stability despite legal restrictions, highlighting the economic struggles they face.

Traditional farming methods remain prevalent, with farmers relying on organic manure from cattle and goats while avoiding chemical fertilisers and pesticides. Crop rotation is used to preserve soil fertility. However, limited access to improved farming techniques and market integration continues to constrain agricultural productivity.

Many farmers still rely on local seed varieties and age-old farming practices. They often take part in rituals that include livestock sacrifices, revealing a strong tie to their cultural heritage.

On farms, cow dung and goat droppings serve as organic fertiliser to keep the soil healthy. Chemical fertilisers aren't used, and old-fashioned farming methods like crop rotation help preserve the soil's quality. Still, without irrigation, farming relies heavily on seasonal rainfall. Some farmers also leave crop residue in the fields to break down naturally, which adds more nutrients to the soil.

Market access remains a major challenge. Farmers sell surplus Turmeric, Black Gram, and Rajma to traders who visit their villages, cutting out middlemen but also reducing bargaining power. Due to poor road connectivity, farmers have difficulty transporting their produce to larger markets. Additionally, there are no processing units for value addition, which lowers the profitability of farm produce.

Most borrowing happens informally, with villagers depending on family and neighbours for financial help. Access to formal credit institutions is limited, and government financial aid is scarce. The lack of organised savings or insurance options increases economic vulnerability.

Women's and men's involvement in agriculture:

Women are key players in agriculture, taking on tasks like transplanting, weeding, and harvesting while also managing household responsibilities. However, men still have a strong influence over economic decision-making. While women's self-help groups do exist, they're mostly inactive. By strengthening these groups, we could improve women's access to credit and economic opportunities.

Young men are increasingly migrating to Andhra Pradesh for daily wage jobs because they see limited opportunities in agriculture. Girls continue to work at home and on farms but have few chances for skill development or other ways to earn a living.

3.1.19. Opportunities for Agroecological Transformation

The landscape of Chitrakonda presents several unique opportunities for agroecological transformation. These opportunities are influenced by the region's current farming practices, cultural knowledge systems, institutional landscape, and natural resource base.

- Efficient water resource use: There is great potential to tap into local water sources—such as mountain streams and dug wells—for protective irrigation. This will promote the cultivation of additional crops during the Rabi season.
- Conservation of indigenous seed varieties: Traditional seed systems stay active and can be further strengthened to conserve, multiply, and spread indigenous landraces—especially millets, pulses, and vegetables that are well suited to local conditions.
- Promotion of bio-inputs: Bio-inputs like *Handi Khata* and vermicomposting have already been adopted and appreciated by farmers for their benefits. Other bio-inputs can also be promoted in the area.
- Adoption of multi-cropping systems: There is potential to promote diverse cropping methods—intercropping cereals, legumes, oilseeds, and vegetables—that support ecological sustainability and household food and nutritional security.
- Expansion of fruit-bearing plantations: Under MGNREGA and ATMA, horticultural plantations can be promoted to generate sustainable long-term income, especially on degraded or underutilised lands.

3.2. Forestry, Agroforestry and Non-timber Forest Produce

This section deals with forestry, agroforestry, and non-timber forest products. Information from Malkangiri has been utilised to provide a broader understanding of forest resources, as Chitrakonda-specific information is not available. In some cases, details about plant species have been supplemented using secondary sources.

Forestry is crucial to the economy and ecology of the Chitrakonda block. The total land area of Malkangiri district is 5,791 square kilometres. Forests cover 3,541.57 square kilometres, making up about 61% of the total area—a sign of the district's substantial forest resources.

Classification of Forest	Forest Area in Sq. Km.
Reserve Forest	352.56 sq. km
Demarcated Protected Forest	188.65 sq. km
Un-demarcated Forest	636.64 sq. km
Other Forests	1,408.61 sq. km
Unclassified Forests	0.3 sq. km

Table 3.6 – Classification of Forest

The Chitrakonda block is rich in biodiversity. The area is home to dense forests, a wide variety of species, and significant amounts of non-timber forest products (NTFP). Agroforestry has recently become a sustainable livelihood option in the region.

Chitrakonda's forests are part of the Malkangiri Forest Division, established in 2003. These forests are mainly tropical moist deciduous and tropical dry deciduous types, thriving on the region's hilly terrain. The forests are surrounded on three sides by the Balimela reservoir. The Odisha Forest Department manages these areas with the goal of promoting environmental stability, conserving biodiversity, and ensuring sustainable use of forest resources.

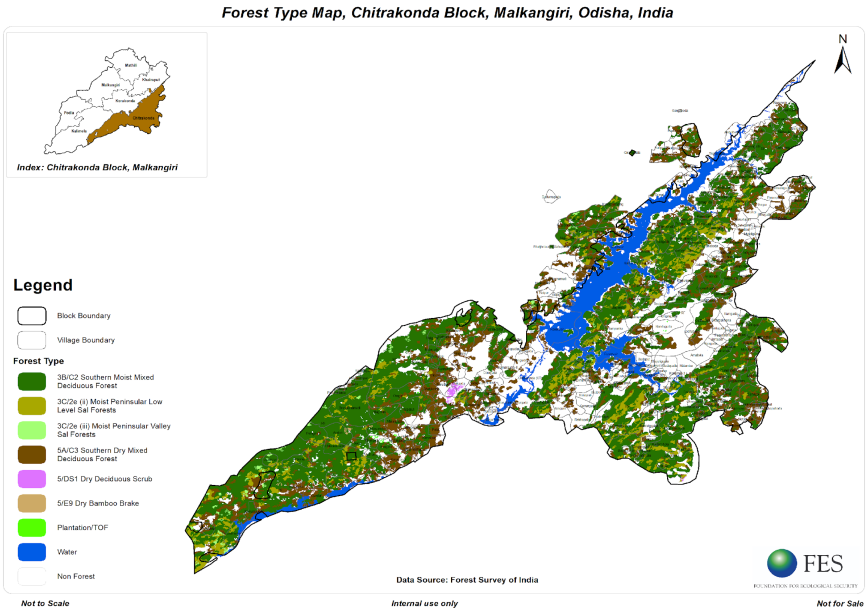

Fig. 3.1 – Forest Type Map, Chitrakonda Block

3.2.1. Flora

Chitrakonda's forests host a wide variety of flora and fauna. Prominent tree species include:

- **Sal (Shorea robusta):** A dominant species in moist deciduous forests, used for timber and resin.

- **Teak (Tectona grandis):** Found in drier zones, valued for timber.
- **Rosewood (Dalbergia latifolia):** A high-value timber species.
- **Piasal (Pterocarpus marsupium):** Used for both timber and medicinal purposes.
- **Haldi (Curcuma longa):** Wild turmeric, collected as NTFP.
- **Bamboo:** Widely used for construction and crafts.
- **Mahua (Madhuca longifolia):** Integral to tribal livelihoods for its flowers and seeds, but this is available in some parts of Chitrakonda.
- **Tendu (Diospyros melanoxylon):** Leaves are harvested for bidi (local cigarette) production.

Every year, timber is harvested. The VSS, working under the guidance of OFDC, cuts down trees and supplies them to the department. Half of the revenue from timber sales goes into the VSS account. Although the region has abundant forest resources, farmers often cut trees for firewood, fencing, and building materials. Currently, there are no regulations on cutting bamboo. In the past, bamboo was used to supply paper mills in Jeypore, but these mills have since switched to using eucalyptus, which is not native to the area's ecosystem. This has resulted in a loss of income for the farmers.

3.2.2. Fauna

The forests support a range of wildlife adapted to the rugged terrain:

- **Mammals:** Leopards, sloth bears, and wild boars.
- **Birds:** Hornbills, parakeets, and owls.
- **Reptiles and smaller mammals** also inhabit the dense forest cover.

While this biodiversity is part of the Eastern Ghats' ecological richness, specific data on wildlife populations in Chitrakonda is not available. Villagers reported sighting tigers seven or eight years ago. These big cats are no longer seen in the area due to deforestation and road construction, which have caused them to retreat to denser forest areas. Conservation efforts continue, aiming to document and protect native plant species.

3.2.3. Non-Timber Forest Produce

NTFPs are vital for the livelihoods of tribal communities such as Gadaba, Kondh, Kotia, Kondadora, and Paroja in Chitrakonda. These forest products serve as food, medicine, and sources of income, especially in areas where farming is less feasible. Key NTFPs include:

- **Mahua flowers and seeds:** Used for liquor brewing, cooking oil, and fodder.
- **Tendu leaves:** Used for local cigarette production. In recent years, the collection of Tendu leaves has declined due to delayed payments.
- **Siali leaves (Bauhinia Vahlii):** Used for making cups, plates and packaging.
- **Tamarind (Tamarindus Indica):** Used for culinary and medicinal purposes.
- **Honey:** Collected from wild beehives and considered a high-value product.
- **Resins and gums:** Extracted from sal and other species for adhesives and traditional medicine.
- **Medicinal plants:** Include wild turmeric (Curcuma Longa), Sarpagandha (Rauvolfia Serpentina), and Ashwagandha (Withania Somnifera).
- **Bamboo and Cane:** Used to make mats, baskets, and furniture.
- **Jafra/Sinduri (Bixa Orellana):** Grown increasingly in Chitrakonda for its pigment, used in food, cosmetics, and textiles.
- **Tubers:** Various forest-grown tubers are consumed locally.
- **Charkoli (Buchanania Lanzan):** Edible fruits; seeds (*Charmagaz*) are collected and sold.

However, reliance on NTFPs is declining. Trees have aged, climate conditions are no longer suitable for planting, and overgrazing is common. Staff shortages in departments further weaken forest and NTFP management. About 70 agroforestry species, such as Casuarina, Chakunda, and Silver Oak, have been banned due to limited ecosystem benefits. Community preferences have also shifted away from native species like Tamarind, Mahua, Harida, Bahada, and Amla to Jafra and Cashew, which have income potential.

While the Odisha Forest Department supports fair NTFP collection through community institutions, market access continues to be a challenge. Despite recent infrastructure upgrades, the area's remoteness still limits economic opportunities for collectors.

3.2.4. Agroforestry Practices

The government is actively promoting agroforestry in the landscape as a strategy to diversify livelihoods and reduce reliance on illicit crops, such as cannabis. Several initiatives are underway in this regard:

- **Crops and Trees Combination:** Farmers grow ginger, turmeric, millets, suan, alasi, and kangu alongside jafra trees. The Horticulture Department is also promoting vegetables, bananas, and mushrooms as viable alternatives to cannabis.
- **Jafra Farming:** Tribal farmers in some of the Panchayats are cultivating Jafra. Jafra’s bixin pigment is in high demand, especially in the dairy, textile, and pharmaceutical industries. The Integrated Tribal Development Agency (ITDA) plans to promote cashew and Jafra through agroforestry programs.
- **Block-Level Schemes:** The Block Development Officer of Chitrakonda has launched programs to promote agroforestry, including subsidies for alternative crops and farmer training initiatives.

The Forest Department undertakes afforestation efforts, but lacks a clear plan for tree planting. Despite the existence of local knowledge about forest species and their uses, this information isn't documented or organised, and it's disappearing. In the field, technology is rarely used, even though it's often claimed to be part of the process. Additionally, the department offers planting materials and technical assistance with planting methods and choosing the right species. However, this support is given without community involvement, and there are often delays in delivering high-quality planting materials. Practices that prioritise sustainability in harvesting are not given enough emphasis.

3.2.5. Processing, Technology, and Market Access

There are no large-scale processing units for forest products. Micro-processing units for Jafra, turmeric, and millets are available in villages. These units handle cleaning, sorting, drying, grinding, and marketing. Honey and Kendu leaf collection and sales continue on a small scale. However, there are no medium- or large-scale enterprises operating.

Although drone surveillance, GIS mapping, and mobile apps are reportedly used in forest and NTFP management, as noted by WASSAN, their deployment in Chitrakonda remains limited. Indigenous knowledge of species and their uses is extensive but largely undocumented and at risk of being lost. There are no organised markets or large-scale facilities for processing, drying, sorting, or storing forest products.

3.2.6. Community Collectives

Forest protection, development, and management activities are carried out through a joint forest management approach involving the Vana Sangrakshyana Samitee (VSS), a community-based organisation present in each village. The VSS works with the Odisha Forest Development Corporation (OFDC). Protection efforts focus on issues like encroachment, poaching, and illegal tree felling. The VSS comprises a president and members chosen from the community, while the member secretary is the local Forester. All community members aged 18 and older are eligible to join the VSS, with 50% of positions reserved for women. However, during community interactions, villagers struggled to remember the roles and activities of the VSS. Women, in particular, did not recall participating in any VSS meetings or events.

3.2.7. Government Schemes and Programmes

Several major schemes and programs are currently in place in the landscape and could be utilised for agroecological transformation. These include:

- Sub-Mission on Agroforestry
- Odisha Forest Development Corporation (OFDC) initiatives
- National Bamboo Mission
- Swabhiman Anchal Special Package
- Van Dhan Vikash Karyakram

Other smaller initiatives include planting in urban and roadside areas, distributing seedlings, planting on barren hills, maintaining nurseries, conserving soil moisture, implementing the Ama Jangala Yojana (which literally translates to Our Forest Project), and various agroforestry projects.

Various government departments have different perspectives and priorities on forest development. The Forest Department promotes slow-growing forestry species, while the Agriculture Department prioritises income-generating agroforestry species like cashew and Jafra, which are also popular with the local community.

3.2.8. Climate Challenges

The landscape is under growing pressure from climate-related stresses, including delayed monsoons, unpredictable rainfall, prolonged droughts, cyclones, flash floods, rising average temperatures, and heatwaves. These conditions have caused soil erosion, reduced fertility, lower seed germination rates for key forest species like sal, teak, and bamboo, and lower crop yields due to water scarcity.

3.2.9. Gender Division of Labour in Forestry and NTFP

The roles of women and men in forestry and NTFP activities vary, with responsibilities allocated as follows:

Women:

- Collect firewood
- Gather edible tubers
- Collect wild leafy vegetables

Men:

- Collect timber for house construction
- Gather wood for agricultural tools such as wooden ploughs

3.2.10. Findings from the TAPE Tool

The villages are surrounded by forests that provide both timber and non-timber forest products (NTFPs). Timber species such as Bija, Sishu, Dhauda, and Tangini are used for construction and the manufacture of farm tools. Fruit trees like mango, jackfruit, and tamarind are mainly grown for household use, with any extra sometimes sold in local markets. Medicinal plants like Amla, Bahada, and Harida are known for their healing properties, although they are not systematically cultivated. Villagers plant fruit trees near their homes, but there is no large-scale effort to incorporate tree cultivation into farmland. Firewood, collected from the forest, remains the primary cooking fuel; access to Liquefied Petroleum Gas is limited.

3.2.11. Opportunities for Agroecological Transition

WASSAN has identified several opportunities to strengthen agroecological approaches in forestry and NTFP sectors:

- Promote agroforestry and silvicultural models suited to the local agroecology; Krishi Vigyan Kendra has initiated demonstrations of some of these models.
- Introduce fruit-bearing forest trees such as mango, jackfruit, guava, and cashew for food security and additional income.
- Expand Jafra plantations, leveraging its market demand and economic potential.
- Strengthen Jangala Suraksha Samitee (Forest Protection Committees) for post-project maintenance.
- Engage FPOs in structured, market-based interventions.
- Promote certification of wild harvests and provide training on certification and sustainable practices.

3.3. Animal Husbandry

This section describes the state of animal husbandry in the landscape. Animal husbandry in Chitrakonda block is mainly subsistence-based, closely linked with agriculture and forest-dependent livelihoods. The remote location and the sector's mainly tribal population influence it, with practices based on low-input, traditional systems. The primary livestock species raised in the area include cattle, goats, sheep, native ponies, and poultry. These animals are mainly raised for meat, eggs, and draft work, with most production meant for household consumption rather than commercial sale.

3.3.1. Key Activities

Livestock rearing includes raising cattle used as draft animals. Tribals in Chitrakonda do not consume milk; therefore, there is no dairy farming in the area. Backyard poultry is common among tribal households, providing both eggs and meat. Goats and sheep are raised for meat and commercial purposes. These animals also hold cultural importance during festivals.

3.3.2. Livestock Population & Productivity

According to the 20th Livestock Census 2019 by the Directorate of Animal Husbandry & Veterinary Services, Cuttack, Odisha, the livestock population in Malkangiri and the estimated production of milk, meat, and eggs in Malkangiri district are provided below (data for Chitrakonda are not available).

Animal	Cattle	Buffalo	Goat	Sheep	Pig	Poultry
Population	3,00,811	6,400	1,26,516	20,532	17,040	5,98,650
Milk in MT	34.17	0.38	0.00	0.00	0.00	0.00
Meat in MT	0.00	0.00	1.54	0.28	0.15	1.09
Egg in MT	0.00	0.00	0.00	0.00	0.00	113.82

Table 3.7 – Livestock Population & Productivity of Milk, Meat & Egg

The production of milk, meat, and eggs from native animal breeds is highest in the region, indicating a preference for these breeds. Malyavanta Goat, Motu Cow, and native poultry are common. The Department of Animal Husbandry has used Black Bengal and Ganjam breeds for its buck breeding program. As reported by the Livestock Officer, in some tribal communities, tribals consume beef. The meat of the Motu cow breed is considered delicious.

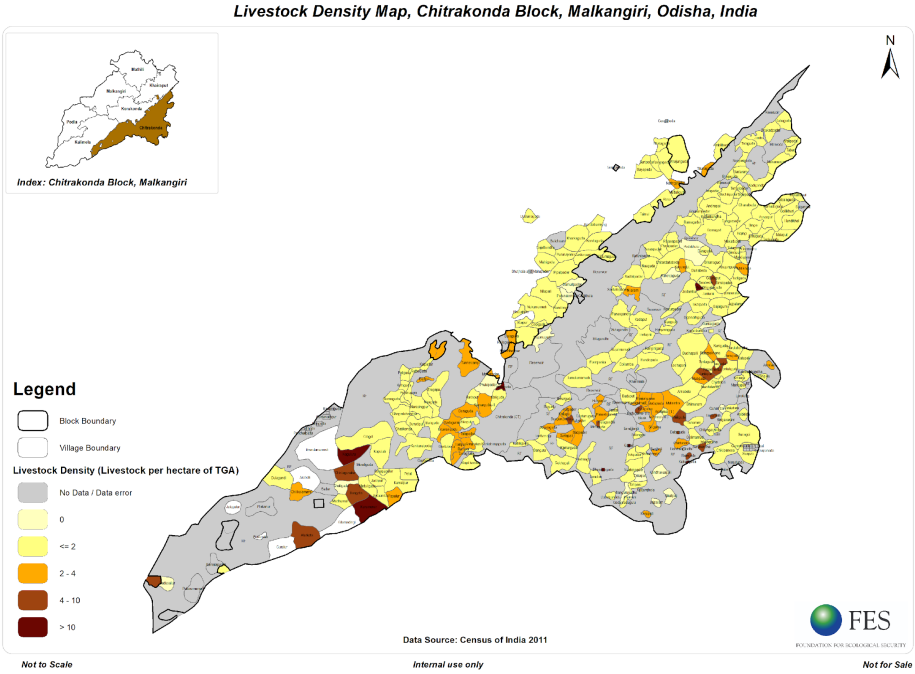

Fig. 3.2 – Livestock Density Map

3.3.3. Fodder and Feed

Fodder is primarily sourced from forests and crop residues, as there is limited cultivation of dedicated fodder crops. Grazing is common; animals are allowed to roam freely in nearby forests for feeding. After harvesting paddy, animals graze in the forests for several days. Although subsidised fodder seeds—such as maize—are available through government schemes, adoption remains low due to continued dependence on natural resources. Women play a crucial role in daily management—feeding, watering, cleaning sheds, and caring for sick animals—while men usually decide on buying or selling livestock and oversee grazing during the Kharif season.

3.3.4. Animal Health

Some common diseases affecting animals in the area include Foot-and-Mouth Disease (FMD), Peste des Petits Ruminants (PPR), and bird flu. The Department of Fisheries and Animal Resources Development Department, with help from the Odisha Livestock Resources Development Society, provides animal healthcare services. The department distributes vaccines, dewormers, and basic medicines at no cost or at reduced rates through veterinary clinics, with village-level delivery handled by Prani Mitras. However, vaccine shortages and a lack of extension staff limit full coverage, especially in remote villages where staff have to balance multiple responsibilities, including census and election duties.

Many tribal communities still depend on traditional methods of treating animals. They use remedies made from neem, turmeric, and herbs from the forest to treat wounds, control parasites, and manage fertility. These practices aren't part of the formal extension system, but they're part of the community's traditional knowledge.

Per the agricultural statistics report for Malkangiri, the region is home to 9,432 farm families from diverse social backgrounds. Right now, OLM has 16 Prani Mitras (Pashu Sakhi) working in the area, serving around 1,600 farm families. To provide proper animal healthcare across the entire landscape, an additional 79 Prani Mitras should be appointed.

3.3.5. Animal Insurance

The government provides livestock insurance through Go Bima Yojana (GBY) and the National Livelihood Mission (NLM). In these programs, farmers pay 15% of the insurance premium, while the government covers the remaining 85%. However, coverage remains limited, with less than 25% of cattle, goats, and sheep insured, and only 4–5% of farmers having filed claims so far. Farmers are largely unaware of these insurance schemes, and their participation is further hindered by their reluctance to pay their share of the premium. Additionally, they hesitate to tag their animals as required under livestock insurance protocols because they believe it might decrease the animals' market value.

3.3.6. Value Addition and Marketing

Chitrakonda lacks large-scale storage or cold-chain facilities. Livestock products are usually sold fresh at local weekly markets or consumed at home. Limited road access restricts entry to bigger markets, and private companies supplying feed, vaccines, or equipment are scarce, with most inputs coming from government agencies.

3.3.7. Government Institutions

Animal husbandry in Chitrakonda gets support from the Fisheries & Animal Resources Development (FARD) Department and the Directorate of Animal Husbandry & Veterinary Services (DAHVS). The District Livestock Resources Development Society (DLRDS), led by the District Collector, oversees livestock activities and contingency plans. Meanwhile, the Odisha Livestock Resources Development Society (OLRDS) works at the state level to boost rural livelihoods. The Society for Management of Information, Learning and Extension (SMILE) offers training to farmers and department staff on livestock development. However, Chitrakonda isn't designated as a Veterinary Block, which limits the benefits and services available locally.

3.3.8. Government Schemes

Various government schemes in operation include:

- The National Livestock Mission (NLM) promotes breed improvement, fodder cultivation, and entrepreneurship in poultry and goat rearing.
- Mukhyamantri Krushi Udyog Yojana (MKUY), offering financial support for agro-based enterprises such as dairy and poultry units.
- The Odisha Poultry Development Policy promotes both backyard and commercial poultry farming.
- The Fodder Development Scheme provides subsidised fodder seeds and training.
- The Livestock Health and Disease Control Programme funds vaccinations, health camps, and mobile veterinary units.
- Mission Shakti, which empowers women's Self-Help Groups (SHGs) to engage in livestock activities.

3.3.9. Division of Labour in Animal Husbandry

Husbandry work is clearly split along gender lines. Women are mostly in charge of cleaning sheds, fetching water, feeding animals with kitchen waste, and daily care of animals. Men take care of grazing during the Kharif season—letting animals roam free for the rest of the year—and make key decisions about buying and selling livestock.

3.3.10. Climate-Related Challenges

Animal husbandry in the district is increasingly impacted by climate variability. Changes in rainfall patterns are leading to water shortages, which affect both livestock and fodder supply. Rising temperatures are causing heat stress in animals, while shifting climatic conditions are altering disease patterns, thereby increasing the risk of disease outbreaks.

3.3.11. Findings from the TAPE Tool

For many households, livestock is a major source of income. Farmers in these villages raise cattle, goats, sheep, and poultry, with a strong market for goats driving demand. Traders from Andhra Pradesh regularly visit to buy goats, providing farmers with a steady income without the hassle of travelling to markets. Cattle are primarily used for farming and making fertiliser, while drinking milk is traditionally avoided for cultural reasons. Raising poultry is a secondary pursuit, with chickens mainly sold or reserved for special occasions.

One of the biggest hurdles in livestock management is the shortage of veterinary services. The closest veterinary clinic is 50-80 km away, forcing farmers to rely on traditional herbal remedies for sick animals. Although there haven't been any major disease outbreaks in recent years, occasional poultry deaths raise concerns about potential environmental factors, such as radiation from new cellphone towers.

Although farmers often incorporate livestock manure into their farming practices, no established system integrates crops, livestock, and aquaculture. Livestock grazing benefits from nearby forests, and crop residues are used as feed. However, aquaculture activities occur in the backwaters of the reservoir area; there are no ponds or water bodies available for aquaculture in the area.

Households deal with economic uncertainty by selling their livestock when they need to. But when crop failures happen due to unpredictable rainfall, they're left vulnerable. Without irrigation and veterinary services, these risks are even worse, making it essential to diversify their livelihoods.

3.3.12. Opportunities for Agroecological Transformation

There are several ways to align animal husbandry practices with agroecological principles. Combining livestock with crop production can enhance soil fertility through composting and mulching. Protecting resilient indigenous breeds can improve biodiversity and support climate adaptation. Growing drought-resistant fodder can also lessen grazing pressure on forests. Expanding backyard poultry systems can be implemented through self-help groups. Using Prani Mitras and self-help groups as local extension hubs, along with renewable energy-based cold-chain systems for vaccines, can significantly improve animal health services. Connecting producers to markets through farmer-producer organisations and ensuring government schemes are planned with the local context in mind can also strengthen the sector.

3.4. Fisheries

Fisheries in the Chitrakonda area remain small-scale and mainly subsistence-focused. According to the Directorate of Fisheries in Cuttack, Odisha, Malkangiri district produced 14,165 metric tons of fish in 2021–22, with Kudmulguma block contributing 231 metric tons. No specific data is available for Chitrakonda on production volumes, the number of active fishermen, or pond coverage, which makes it hard to determine the sector's exact size in the area.

3.4.1. Fishery Activites

There's no large-scale or commercial fishing in Chitrakonda. Most fishing is done by local villagers living near the Balimela reservoir and other nearby water bodies. Here are the main activities:

- **Traditional fishing** in the reservoirs and streams, targeting species like Rohu, Katla, Grass Carp, Silver Carp, and other native varieties.
- **Small-scale fish farming** in community ponds, Gram Panchayat (GP) tanks, and private farm ponds.

Most of the fish caught is consumed locally, with little to no significant export to markets outside the area. In fact, the local demand is partly satisfied by fish imported from Andhra Pradesh. As reported by WASSAN, there are 115 farm ponds and 68 community ponds spread across 18 GPs of Chitrakonda. However, only a few of these are perennial, which limits the potential for promoting inland fisheries.

3.4.2. Traditional Knowledge and Technology Use

During consultations, no significant traditional fishing knowledge was shared. Likewise, the area does not make substantial use of modern fishery technology.

3.4.3. Government Institutions and their Role

Fishery development in Chitrakonda mainly relies on government programs, with limited evidence of ongoing private sector or NGO participation. The Fisheries and Animal Resources Development (FARD) Department and the Directorate of Fisheries focus on fisheries as a way to reduce poverty and support alternative livelihoods. Major interventions include:

- Mechanised boat services in the Chitrakonda reservoir resumed in 2021 after a COVID-related suspension, allowing fish transportation and market access.
- Promoting alternative livelihoods through fish farming, training, and technical support.
- Introduction of intensive aquaculture methods, such as bio-floc technology, to boost productivity in limited water areas.
- Formation of Women Self-Help Groups (WSHGs) and Primary Fishermen Cooperative Societies (PFCS) to promote fish farming and marketing.

Despite these initiatives, inputs, extension services, and marketing support remain limited. There are no enterprises related to fishing in the landscape.

3.4.4. Government Schemes

The Government of Odisha offers various types of support for fisheries through the Mukhyamantri Maschyajibi Kalyan Yojana (MMKY) and other state and central programs. Support available under state-level schemes is:

State-Level Schemes:

- Supply of mechanised boats, engines, nets, and other post-harvest equipment.
- Promotion of intensive aquaculture using Bio-floc Technology aimed at WSHGs (2023–24).
- Revolving funds support for WSHGs involved in fisheries.
- Reactivation of Primary Fishermen Cooperative Societies for better management of fishery resources.
- Promoting reservoir fishery production through stocking and management.
- Support for fish seed growers through the Early Breeding Program.
- Assistance for farm pond fish farming, including fish seeds and feed subsidies.
- Promotion of fisheries machinery (nets, aerators).
- Matsya Pokhari Yojana, which provides assistance for excavating a new pond.
- Support for the Training & Employment Program for Women: Training in pisciculture, with 90% funding from the central government.
- Rural Infrastructure Development Fund: Provides support for fishery infrastructure, including fish seed farms and landing centres.

Central Government Schemes:

Support available under the central government schemes is:

- National Welfare Fund for Fishermen (NWFF): Affordable housing, savings and relief programs, accident insurance.
- Fisheries Infrastructure Development Fund (FIDF): Funds allocated for landing centres and cold storage, extended till 2026.
- Pradhan Mantri Matsya Sampada Yojana (PMMSY): A flagship program for sustainable fishery growth, with potential support for reservoir and pond fisheries in the district.

Additionally, the Directorate of Fisheries runs awareness camps, training sessions, and village meetings to introduce new aquaculture practices. Fishery Extension Officers also offer technical support at the block level. Fishery activity mostly sticks to reservoir fishing, with very little post-harvest infrastructure or structured marketing channels in place.

Government efforts have focused on reservoir fisheries, covering 16,059 hectares and helping 1,635 fisherman households. Every year, fingerlings are released into these reservoirs to support their livelihoods. The government also recently introduced the "Jaladhara Scheme," which aims to build 550 farm ponds for critical irrigation during the Kharif season and to promote Rabi crops. This plan

prioritises integrated farming models to boost income. Given the limited potential for inland fisheries in this area, the landscape development plan doesn't include any specific fisheries-related interventions.

3.4.5. Division of Labour

Women in the area primarily engage in selling fish. A notable group includes Bangla-speaking women, who are descendants of migrant labourers who arrived decades ago to work on the Balimela reservoir. They play a significant role in retail fish sales. At local haats (markets), tribal women also sell dried and smoked fish, which is a valued local delicacy.

3.4.6. Opportunities for Development

Some possible ways to improve fisheries in Chitrakonda include:

- Expanding fishery resources in the Balimela reservoir corridor to serve the local market.
- Developing post-harvest infrastructure, such as cold storage, to minimise spoilage.
- Developing and implementing harvesting guidelines to promote sustainability.

3.5. Natural Resource Management

3.5.1. Landscape Context and Challenges

Chitrakonda’s hilly landscape and undulating terrain, paired with deforestation and shifting cultivation (also known as Podu), lead to severe soil erosion. Although Podu cultivation has decreased in recent years, it's still practised in some areas. The steep slopes and heavy monsoon rains cause runoff to accelerate, washing away nutrient-rich topsoil. This leads to reduced soil fertility, loss of organic matter and decline in agricultural productivity.

3.5.2. Fertility Status

Ongoing cultivation without proper soil enrichment—such as adding organic matter or nutrients—has led to poor soil health. According to KVK, Malkangiri, many tribal farmers don't use fertilisers, either synthetic or organic. Instead, they rely on simple weeding, without making any targeted efforts to improve the soil.

3.5.3. Soil Conservation and Fertility Management Practices

Multiple steps are being taken in the landscape to tackle soil erosion and fertility loss. The following are some key measures:

Government-led initiatives are:

- Soil and water conservation through MGNREGS and Rainfed Area Development schemes, focusing on watershed management.
- Integrated Farming Systems (IFS) are promoted through initiatives like the Odisha Millet Mission, focusing on water efficiency, soil health, and rainfed agriculture improvements.
- Community-based soil health management by organisations such as Madhyam Foundation, which supports seed systems and soil rejuvenation.

On-farm practices adopted:

- Agroforestry and bund plantations, with vegetables and other crops grown on bunds to protect soil and generate additional income.

Traditional and indigenous methods adopted are:

- Bamboo water barriers to decrease runoff.
- Stone wall bunding on slopes for soil retention and land preparation.
- Shallow earthen irrigation channels.
- Small percolation tanks or farm ponds.
- Building terraces on hilly terrain.

3.5.4. Technology Use

Although modern tools are available, adoption remains limited. Some of the modern technologies in use are:

- Soil Health Cards
- Digital planning tools
- Micro-irrigation systems
- Water budgeting tools

3.5.5. Climate and Water Constraints

Erratic rainfall patterns and extended dry periods—caused by climate change—further affect soil moisture retention and worsen degradation. Agriculture mainly relies on rain, with limited irrigation coverage. Many villages depend on mountain streams for drinking water and irrigation because of the absence of piped water or working borewells. These streams often run dry in summer or get contaminated during monsoons. Borewells only extract water below 200–300 ft, and many fail due to topographical conditions.

3.5.6. Government Institutions and Their Role

Most soil and water conservation efforts are led by the Watershed Department, which uses a ridge-to-valley approach. However, expanding irrigation infrastructure requires collaboration among multiple agencies, including the Odisha Agro-Industries Corporation (OAIC), Odisha Lift Irrigation Corporation (OLIC), Megalift, and the Water Resources Department. Unfortunately, many of these projects have been discontinued. Farmers consistently rank water as their top priority, while soil management receives less attention. Although capacity-building programs on soil and water conservation are conducted, institutional and technical gaps remain. Community participation is low, and women's involvement is minimal. Existing local bodies, such as Pani Panchayats and Water User Groups, lack a clear mandate for soil and water conservation.

3.5.7. Relevant Government Schemes

A number of ongoing government schemes could be leveraged for agroecological transformation, including:

- Pradhan Mantri Krishi Sinchayi Yojana
- Rainfed Area Development
- Rashtriya Krishi Vikas Yojana (RKVY)

- Plantation work under MGNREGA
- Farm Pond and Farm Pond+ programmes
- Agroforestry development by ATMA and ITDA
- Rejuvenating Watersheds for Agricultural Resilience through Innovative Development)

3.5.8. Findings from the TAPE Tool

Water scarcity is a major concern in all three villages, as farming relies entirely on rainfall. In Serubandha, some households have tried to divert stream water through pipes, but there are no large-scale irrigation systems in the area. The government-funded solar-powered water tank provides drinking water, but it doesn't meet the irrigation needs. Farmers also have limited knowledge of water conservation techniques, which reduces their ability to cope with droughts effectively.

3.6. Biodiversity

3.6.1. Overview of Agrobiodiversity

Chitrakonda is famous for its diverse agricultural ecosystem, especially its traditional crops like finger millet, little millet, turmeric, and other native varieties. The Odisha Millets Mission has been crucial in documenting and reviving these traditional crops, making sure they're grown in eco-friendly farms and preserved for their genetic purity. This rich diversity of crops is matched by a wide range of trees, medicinal plants, and fruits, along with various wildlife and domesticated animals, making Chitrakonda a vital hub of biodiversity in the Eastern Ghats. A detailed list of crops and plants found in the area, along with their scientific names, is provided in the annexe.

3.6.2. Flora Diversity

According to the Chitrakonda Range Office, the following plant species are found in the landscape:

- **Timber species**: Sala, Piasala, Balisisoo, Saguan, Asan, Arjun, Dhaura, Phasi, Mundi, Haluda, Sidha, Korada, Kasi, Bandhan, Bara Bakulia, Gambhari, Dhala Sirish, Kala Sirish.
- **Fruit species**: Amba, Ambda, Panasa, Tentuli, Jamu, Barakoli, Ram Phala, Ata, Ou, Kendu.
- **Medicinal species**: Nimba, Bela, Awnla, Harida, Bahada, Sunari, Chandan, Rakta Chandan, Gangseuli, Banabhalia, Khaira, Palash, Simile, Baula, Ritha, Ganduli, Phanaphana, Ashoka.
- **Oilseed species**: Maula, Kusum, Karanja, Kirchi.
- **Flowering species**: Champa, Krushnachuda, Bishunuchuda, Radhachuda, Mysore Queen, Kanchana, Borada, Kadamba, Nageswara.
- **Ficus species**: Bara, Aswatha, Dimri, Podei, Jori, Baidimiri.
- **Bamboo species**: Different varieties present.
- **Palm species**: Tal, Salap, and Gua.
- **Other categories**: Various spices, tubers, and leafy greens.

3.6.3. Fauna Diversity

The forests of Chitrakonda serve as a habitat for various wild animals, including:

- **Mammals:** Leopards, sloth bears, wild boars.
- **Birds:** Hornbills, parakeets, owls.
- **Reptiles and smaller mammals:** Supported by the dense forest cover.

While specific wildlife data for Chitrakonda is limited, the broader Eastern Ghats and Malkangiri district are known to support:

- **Birds**: 479 species
- **Mammals**: 86 species
- **Amphibians**: 19 species
- **Reptiles**: 110 species

This diversity is increasingly threatened by deforestation, hunting, and climate change. There are no recorded cases indicating a decline in the pollinator population.

3.6.4. Domesticated Animals

Domesticated breeds native to the area include:

- Malyavanta Goat
- Motu Cow
- Chitrakonda Pony

Efforts are underway to identify the Malyavanta Goat and register it with the National Bureau of Animal Genetic Resources (NBAGR). Similar work is being done for the Chitrakonda Pony to prevent further population decline.

3.6.5. Key Biodiversity Conservation Initiatives

Community-led Centre for Excellence for Agro-ecology and Agro-biodiversity

The Government of Odisha launched a community-led Centre for Excellence in Agro-ecology and Agro-biodiversity in Chitrakonda. This centre focuses on participatory research, in situ conservation, and maintaining the genetic purity of landraces. It works closely with Women Self-Help Groups (WSHGs), SHG Federations, and Farmer Producer Organisations (FPOs) to produce and distribute seeds of diverse endemic varieties. The centre collaborates with national and international experts, including the Food and Agriculture Organisation (FAO) and Coventry University. It functions as an on-farm custodian of genetic diversity in the KBK (Kalahandi–Bolangir–Koraput) region. It is also responsible for piloting alternative seed systems and reintroducing germplasm from cryogenic labs back to farmers' fields.

Odisha Millets Mission (OMM)

The Odisha Millet Mission (OMM) is reviving traditional crops like Finger Millet and Little Millet through agro-ecological practices such as the System of Millet Intensification (SMI). OMM collaborates with NGOs and community organisations to document traditional knowledge. It promotes participatory trials and supports Biodiversity Management Committees in creating biodiversity registers. WASSAN works closely with the Department of Agriculture and OMM in the landscape.

Biodiversity Management Committees (BMCs)

BMCs in Chitrakonda document traditional crops and associated indigenous knowledge through biodiversity registers. These are created with input from key informants from the tribal community. Currently, five such registers are being developed across Malkangiri's clusters, with Chitrakonda serving as a focal point.

While these initiatives demonstrate promise, they face several constraints: limited infrastructure, fewer resources, technical support gaps, and heavy reliance on community-led efforts.

3.6.6. Human Animal Conflict

For generations, people in this area have lived alongside wild animals, with relatively few recorded incidents of conflict between humans and wildlife. The relationship is largely shaped by deep-seated cultural respect, traditional beliefs, and flexible practices that allow people and wildlife to coexist in the same environment. Historically, elephants and tigers roamed the region, but factors like forest encroachment, agricultural expansion, increased human settlements, and the development of infrastructure and roads have driven these species into the Koraput–Rayagada–Gajapati belt. Although tigers are still occasionally spotted, it's been years since elephants were last seen in the area. Bears remain in the forests, while some other species have adapted to the changing landscape. Local tribal communities have traditionally revered wild animals, with surnames like Khillo reflecting this cultural connection. Many locals believe that wild animals act as protectors. This spirit of coexistence is reflected in how communities handle interactions with wildlife, even when animals cause trouble. Experiences of interaction with select species are provided below:

- **Peacocks:** Although they usually don't harm crops, they have occasionally attacked children. Efforts by locals to intervene often attract the attention and action of forest department officials.
- **Wild boars:** These often raid agricultural fields but are also hunted and eaten by locals, which helps balance damage and benefit.
- **Jackals:** Frequently seen at night, especially along roads, jackals hunt poultry and small animals. To prevent losses, households shelter their birds at night, which greatly reduces predation.
- **Monkeys:** Usually found in small numbers, monkeys generally do not harm crops because they have plenty of forest food. However, in areas where forest resources have decreased, they can pose a threat during the farming season. Following tradition, farmers sometimes leave a part of the final harvest for monkeys, supporting the idea of coexistence.

Compared to other districts in Odisha—such as Mayurbhanj, Keonjhar, Balasore, and Bhadrak, where elephant raids frequently occur during cropping seasons, or central India, where Nilgai often damage fields—the human–wildlife conflict in Chitrakonda remains minimal.

3.7. Renewable Energy – Solar and Biogas

The use of renewable energy in the Chitrakonda block remains very limited. Solar energy applications are mostly used for irrigation and drinking water supply. Biogas units are few, but most are not functioning. The Gobardhan scheme of the Government of India has been implemented in the area, though its results are not yet known. Below are some opportunities for utilising renewable energy sources to enhance facilities and services in the area.

Opportunities for Expansion

- Promoting solar energy for agro-processing facilities.
- Introducing solar-powered cold chain solutions for vaccine storage.

3.8. Institutions in the Landscape

The institutional ecosystem in Chitrakonda is a complex mix of formal government agencies, local self-governance structures, scheme-specific committees, and traditional tribal organisations. Collectively, they are intended to plan, execute, and oversee development, security, and welfare efforts in the area. However, in practice, their effectiveness and community involvement remain limited.

3.8.1. Formal Government Institutions

Formal government institutions serve as the foundation of administrative and developmental governance in Chitrakonda. They operate at both district and block levels, responsible for implementing policies, delivering schemes, and maintaining law and order.

District Administration

- Collector and District Magistrate – Manages district-level governance, including development projects, election planning, and the implementation of schemes like the Socio-Economic Transformation and Upliftment (SETU) scheme.
- Block Development Office (BDO) – Handles block-level development and administrative tasks, including organising Aadhar enrolment camps for residents.

Line Departments and Agencies

- Integrated Tribal Development Agency (ITDA) – Implements development programs and schemes aimed at tribal communities.
- District Welfare Office – Acts as a vital connection between the ITDA and rural development agencies, concentrating specifically on tribal welfare.
- District Rural Development Agency (DRDA) and Zilla Parishad plan and carry out developmental projects in tribal areas.

Security Institutions

- Odisha Police, Border Security Force (BSF), and Special Operations Group (SOG) engage in security management and counter-insurgency operations, which have a strong presence in the region due to its location and socio-political factors.

Social Sector Institutions

- Educational institutions, including government schools and Adarsh Vidyalayas, primarily serve tribal students to improve access to education.
- Anganwadi Centres under the Women and Child Development Department offer child nutrition, maternal health support, and related services.

3.8.2. Local Self-Government Bodies

Local self-governance structures act as the link between communities and the government. They are responsible for fostering grassroots involvement in governance, resource management, and development planning.

- Zilla Parishad functions at the district level and coordinates development across multiple blocks.

- Panchayat Samiti—Oversees governance at the block level and manages the functions of Gram Panchayats.
- Gram Panchayats – Village-level local government bodies established under the Odisha Gram Panchayat Act, 1964.
- Palli Sabhas and Gram Sabhas serve as public forums for discussion, decision-making, and community planning.

3.8.3. Scheme-specific and Project-based Institutions

The results in addition to the formal, elected governance structures, various committees have been established under specific schemes and development projects. These are intended to ensure targeted resource management, skill development, and income generation.

- Water User Groups – Established under irrigation and water resource programs to oversee water distribution and upkeep.
- Van Dhan Yojana Committees – Encourage value addition and marketing of Non-Timber Forest Products (NTFPs) through the Van Dhan Vikas Karyakram, emphasising tribal livelihoods.

3.8.4. Traditional Institutions

Traditional tribal governance systems remain vital to the social and cultural lives of Chitrakonda's communities. These informal institutions operate outside the official government structure but hold significant influence. Traditional leaders and village committees handle community decision-making, resolve disputes, and oversee the enforcement of customary practices. Their legitimacy is based on cultural traditions and the community's respect for tribal elders and leaders.

3.8.5. Institutional Functionality and Gaps

Despite the existence of several institutional structures, their real impact remains limited. Many community institutions promoted under various initiatives (see Annexe 8) are either non-existent or defunct. Community participation in these institutions is negligible, with residents often unaware of the scope or area of action of the bodies. In our interaction with villagers, we found that community members do not know how decisions are taken or implemented.

Various programs in the Odisha government aim to include women across all sectors, from extension workers to women farmers. The "Mission Shakti" and "Odisha Livelihood Mission" initiatives have helped establish Women Self-Help Groups (WSHGs) involved in agriculture and other livelihood projects. However, these efforts have had limited long-term effects. Though women participate in training programs and exposure visits, they often struggle to apply what they've learned due to the burden of multiple responsibilities. Some groups seem to have been formed just to fulfil program requirements, which affects their effectiveness. Challenges such as a shared commitment to goals, internal conflicts, weak leadership, and limited exposure also hinder their success. In contrast, WSHGs in coastal areas like Bhubaneswar, Cuttack, Balasore, and Bhadrak have successfully managed processing units and worked through agricultural value chains, helping sustain livelihoods. However, during village meetings and beneficiary selection, decision-making is still mostly driven by men, which limits women's participation and voice. Even when women attend meetings, they often lack decision-making power, discouraging further involvement.

Odisha Livelihood Mission has trained a group of women, including Prani Mitras, Krushi Mitras, Udyog Mitras, and Master Bookkeepers (MBKs) who are actively involved in implementing NRLM and related initiatives. Recently, the Integrated Tribal Development Agency (ITDA) established a "Centre of

Excellence" that integrates machinery for primary processing and value addition of tamarind, jackfruit, millets, and other products. WSHGs started operating these units in June, creating a promising model for replication in the landscape. However, concerns remain about the long-term sustainability of these institutions. Currently, such strong women's leadership is missing within the region.

3.8.6. Convergence Platform

In the Malkangiri district, several committees have been established to oversee and assess the programs carried out by various departments. Each department operates through its own dedicated committee to manage both central and state government schemes. In the agriculture and allied sectors, two key committees stand out: the ATMA Governing Body and the District Integrated Farming System Committee. Both are led by the District Magistrate, ensuring that agricultural initiatives are reviewed and guided at the highest administrative level.

The District Development Coordination and Monitoring Committee (DDCMC) plays a crucial role in overseeing development initiatives. Led by the local Member of Parliament, it brings together representatives from the Legislative Assembly and senior district officials, creating a multi-tiered platform for oversight and coordination.

Additionally, a district-level committee has been established to review activities under the SETU scheme, which is currently active in the area. This committee, also led by the District Magistrate, provides an essential forum for discussing program implementation and promotes inter-departmental collaboration.

Despite these arrangements, a major limitation is the lack of community institutions or local representatives on these committees. Without their participation, these bodies struggle to address local needs, understand the context, and incorporate traditional practices into program design. Including community voices would not only make the process more participatory but also help ensure interventions better align with the goals of agroecological transformation, rooted in the lived experiences of the people.

3.9. Nutrition Status

Data for Nutritional Status has been taken from the District Nutrition Profile of Malkangiri, 2022.

Indicator	Data
Females/ 1000 Males (Sex Ratio)	1,137
Number of women of Reproductive Age (15-49 Years)	157,428
Total number of Pregnant Women registered for ANC	15,025
Number of live births	12,727
Number of Institutional births	11,812
Infant Mortality Rate	48
Number of Children Stunted (<5 Years)	32,088
Number of Children Wasted (<5 Years)	13,995
Number of Children Anaemic (<5 Years)	51,161
Total number of children under 5 years	72,385
Nutrition outcomes amongst women (15 - 49 Years)	
-Underweight (BMI <18.5 kg/m^2)	39%
-Overweight/obesity	10%

-Hypertension	17%
-Diabetes	12%
-Anemia (non-pregnant)	72%
-Anaemia (pregnant)	7%
Total women (preg)	10%
Women with >= 10 years of education	14%
Women 20-24 years married before the age of 18	32%
Women 15-19 years with a child or pregnant	12%
Maternal Mortality Rate	245
Total Women	157,428

Table 3.8 – Nutritional Status of Malkangiri District

Demographics and Health Coverage - The sex ratio of 1,137 females per 1,000 males is notably higher than the national average, reflecting a favourable gender balance. Of the 157,428 women of reproductive age, 15,025 pregnant women were registered for Antenatal Care (ANC), which is approximately 9.5%. The number of live births (12,727) and institutional births (11,812) indicates a strong preference for institutional deliveries (93%), which benefits maternal and child health outcomes.

Nutritional and Health Status - 39% of women are underweight (BMI <18.5 kg/m^2), indicating significant malnutrition. Conversely, 10% are overweight or obese, reflecting a double burden of malnutrition. High rates of hypertension (17%) and diabetes (12%) may be associated with poor nutrition and lifestyle factors. Anaemia remains a major concern, affecting 72% of non-pregnant women and 7% of pregnant women, which increases the risk of maternal mortality and adverse birth outcomes.

Educational and Social Indicators - Only 14% of women have completed 10 or more years of education, indicating limited educational attainment and fewer opportunities for socio-economic mobility. 32% of women aged 20-24 were married before 18 years, showing a high rate of child marriage, which can lead to adverse health outcomes. Additionally, 12% of women aged 15-19 are either pregnant or already mothers, reflecting early pregnancies that further impact maternal and child health.

Source of information for IMR and MMR is the Society for Nutrition, Education & Health Action (SNEHA).

3.9.1. Findings from the TAPE Tool

Limited access to Anganwadi centres impacts maternal and child nutrition. Villagers mainly rely on self-grown millets, pulses, and vegetables, with wild fruits and edible roots as supplements. However, nutritional deficiencies remain, especially among children and pregnant women.

3.9.2. Dietary Diversity

Dietary diversity is widely used as a proxy for nutritional status because it reflects the likelihood of meeting nutrient requirements, is strongly associated with health outcomes, and can be measured quickly and cost-effectively in diverse populations. However, existing indicators such as the Minimum Dietary Diversity for Women (MDD-W) focus primarily on micronutrient adequacy and overlook important components related to NCD risk, including the consumption of ultra-processed foods and

sugar-sweetened beverages. The Diet Quality Questionnaire (DQQ), developed by the Global Diet Quality Project, addresses this gap.

The Diet Quality Questionnaire (DQQ) was used to assess food consumption in Dantewada block, adapted for local diets and administered in July–August 2025. Indicators analysed include Dietary Diversity Score (DDS), protective and risky food consumption, Global Dietary Recommendation (GDR) score, and food source (own production vs. market). Definitions of these indicators are provided in the main report.

Minimum Dietary Diversity

Four out of five respondents (82%) in Chitrakonda had a Minimum Dietary Diversity (MDD)[2] of five or above (Figure 1). There was minimal gender-based variability, with 84% of men and 81% of women having an MDD (or MDD-W) of 5 or above, significantly higher than the national MDD-W of just 33% for rural women (and 41% for all women). The mean dietary diversity score in surveyed households was 5.8 (national average is 4.6).

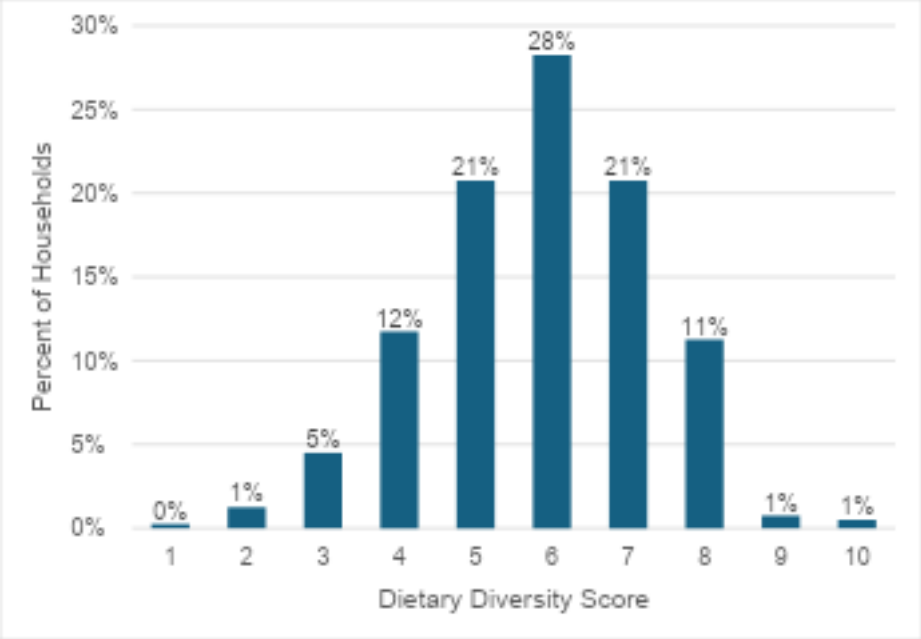

Fig. 3.3 – Dietary Diversity Score of Households in Chitrakonda

Consumption of Healthy and Unhealthy Foods

Three out of five households (63%) also consumed all five essential healthy food groups (All-5; cereals/starchy foods, pulses, vegetables, fruits, animal source foods), compared to just 28% nationally. Nearly all households (98%) consumed at least one fruit or vegetable in the past 24 hours, i.e., only 2% of households consumed zero fruits or vegetables, compared to 22% nationally. Individuals reported a significantly lower consumption of dairy products (9%) compared to the national average (70%) (Figure 2), while the intake of meat, poultry, and fish was notably higher in Chitrakonda (77% versus 28% nationally). This reflects the fact that dairy is not a traditional part of the local diet.

[2] The DDS was calculated based on reported consumption of the following 10 food groups: whole grains and starchy staples; pulses and legumes; nuts and seeds; dairy products; meat, poultry, and fish; eggs; dark green leafy vegetables; vitamin A-rich fruits and vegetables; other vegetables; and other fruits. A score of one is assigned for each food group consumed and a DDS of five or more was considered an indicator of minimum dietary adequacy, as per FAO guidelines

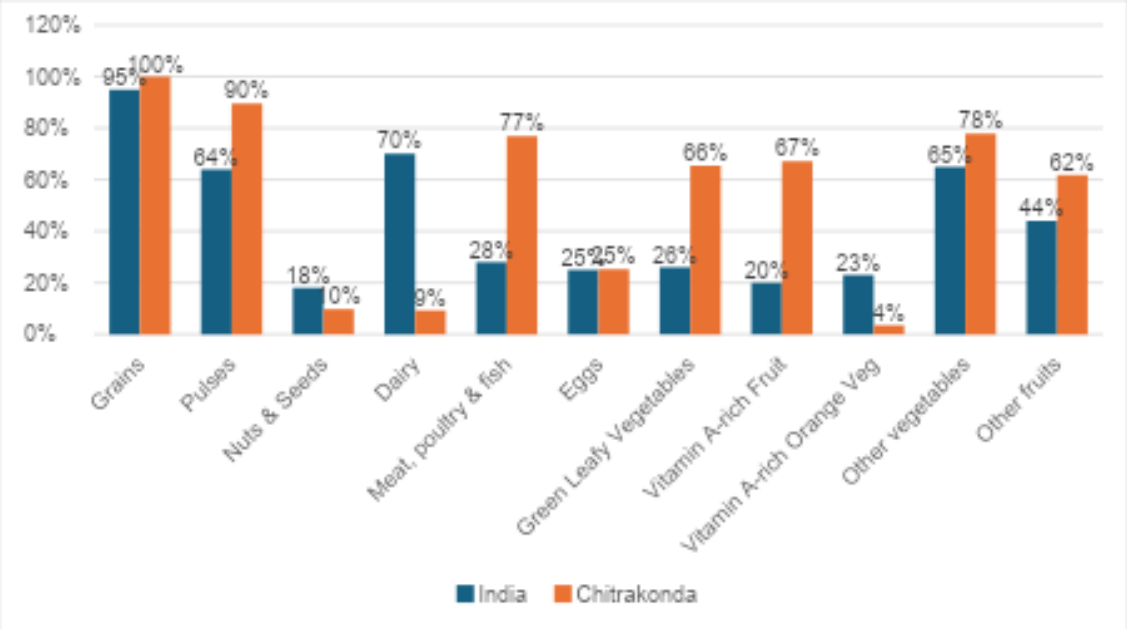

Fig. 3.4 – *Consumption of 10 food groups in India and in Chitrakonda*

Along with the higher consumption of healthy and protective foods, there was also a higher consumption of unhealthy foods, particularly sugary foods and beverages. Specifically, 65% of respondents reported consuming more than one sugary food or beverage, compared to the national rural average of 34% (Table 1), and 40% reported consuming a fried or salty snack.

Indicator	India Score	India Score for Rural Households	Total (n=399)	Female (n=201)	Male (n=198)
All-5	28%	24%	64%	62%	65%
At least one vegetable	71%	69%	93%	95%	90%
At least one fruit	44%	39%	83%	81%	84%
At least one pulse, nut or seed	67%	64%	90%	90%	90%
At least one animal-source food	78%	72%	86%	84%	87%
At least one starchy staple	95%	94%	100%	100%	100%
MDD-W	41%	33%	81%	81%	NaN
Dietary Diversity Score (DDS)	4.64	4.33	5.85	5.90	5.80
Zero vegetable or fruit consumption	22%	25%	2%	1%	3%
At least one vegetable or fruit	78%	75%	98%	99%	97%
Pulse consumption	64%	62%	90%	90%	89%
Nuts or seeds consumption	18%	17%	10%	10%	10%
Whole-grain consumption	67%	69%	95%	94%	96%
Processed meat consumption	6%	5%	0%	0%	0%
Salty or fried snack consumption	38%	36%	40%	36%	43%
Deep-fried food	23%	22%	13%	10%	15%

Sweet food consumption	39%	35%	62%	57%	67%
Soft drinks (sodas, energy drinks, sports drinks)	13%	11%	12%	10%	14%
NCD-Protect[3]	3.35	3.23	4.72	4.74	4.69
NCD-Risk[4]	1.49	1.37	1.46	1.34	1.58
GDR Score[5]	10.86	10.86	12.26	12.40	12.11
More than one sugary food or beverage	39%	34%	65%	60%	70%
More than one salty ultra-processed food	19%	17%	13%	11%	15%
Fast food or instant noodles	13%	11%	4%	4%	3%

Table 3.9 – Nutrition Indicators Calculated for India, Rural India, and Chitrakonda, Disaggregated by Gender

The consumption of sugary beverages was primarily due to the consumption of sugar-sweetened tea or coffee, as well as the consumption of sugary foods (like cakes or *mith*ai) (Table 2). Most respondents (88%) also reported consuming traditional drinks, which were primarily unsweetened fermented drinks made with millets or rice (see Supplementary Table A).

Food group	India	Chitrakonda
Sweet foods	39%	57%
Sugary tea, coffee, or milk	64%	59%
Fruit or packet juice	14%	3%
Soft drinks	13%	12%
Traditional drinks	-	88%

Table 3.10 – Consumption of Sweet Foods, Beverages, and Traditional Drinks in Chitrakonda

Own Production of Food Groups

[3] *Protective food consumption:* The NCD-protect score reflects the consumption of healthy foods, which are whole grains, pulses, nuts and seeds, fruits and vegetables and is calculated on a scale of 0-9, with a higher score reflecting higher consumption of healthy foods. These foods are considered to have a protective effect against malnutrition, infectious diseases, as well as non-communicable diseases.

[4] *Unhealthy food consumption:* The NCD-Risk score reflects the consumption of unhealthy foods, which are soft drinks, sugary foods, sugar-sweetened beverages, salty and fried foods, ultra-processed foods, instant noodles, and processed meats (like sausages). They are considered to be unhealthy foods that the global dietary recommendations recommend limiting or avoiding. The NCD-Risk score is also calculated on a scale of 0 to 9, with a higher score reflecting a higher consumption of unhealthy foods

[5] *Global Dietary Recommendations (GDR) score:* The GDR score is reported on a scale of 0 to 18, reflecting adherence to global dietary recommendations. The higher the GDR score, the better the adherence. GDR is calculated as: GDR = NCD-Protect - NCD-Risk + 9

A majority of households produced or gathered their own rice, tubers, millets, and local pulses and local tubers (Table 3). However, while most households consumed starchy roots and tubers (potato, sweet potato, turnip, arum root, tapioca, raw banana), only 12% produced them. Similarly, only a third (34%) of households produced common pulses (daal, chickpeas, kidney beans, soya) and just 15% of households produced their own common vegetables (tomatoes, eggplant, okra, French beans, cauliflower, cabbage, beetroot). Self-production of vegetables is likely dependent on the season. As data was collected at only one time-point in July-August 2025, this will need further investigation.

Market dependence was also high for sweets (cakes, biscuits, jilebi, laddo, halwa) and chips. Among animal-source foods, only 13% of households produced their own eggs, about a third (29%) produced their own chicken, and around half (48%) produced their own mutton. Self-production data are calculated only for food groups in which a minimum of 5% of individuals reported consumption.

Food Category (DQQ)	Food Item	% Own Production	Count
01. Foods made from grains	Rice	76%	398
	Wheat	57%	37
	Local starchy foods	93%	145
02. Whole grains	Finger millet	97%	322
	Little millet	90%	158
03. White roots or tubers	Starchy roots, tubers	12%	233
	Other tuber (local)	88%	232
04. Pulses	Common pulses	34%	219
	Other pulses (local)	94%	232
05. Vitamin A-rich orange vegetables	Orange vegetables	29%	14
06. Dark green leafy vegetables	Green leafy vegetables	90%	110
	Other green leafy vegetables	86%	131
	Other green leafy vegetables (local)	24%	85
07. Other vegetables	Common vegetables	15%	293
	Gourds	56%	55
08. Vitamin A-rich fruits	Yellow fruits	76%	269
	Orange fruits	-	-
10. Other fruits	Local seasonal fruits	-	-
	Common fruits	51%	67
	Other fruits	78%	226
	Local berries	-	-
11. Baked or grain-based sweets	Sweets	3%	221
	Traditional laddus	18%	85
12. Other sweets	Other sweets	0%	18
13. Eggs	Eggs	13%	101
14. Cheese	Cheese	-	-
15. Yoghurt	Curd	-	-
16. Processed meats	Processed meat	-	-
17. Red meat (ruminant)	Mutton	48%	52
18. Red meat (non-ruminant)	Pork	-	-
19. Poultry	Chicken	29%	188
	Gunduribird/Snail	-	-
20. Fish or seafood	Fish	48%	181

21. Nuts or seeds	Nuts	46%	39
22. Packaged salty snacks	Chips	10%	122
	Other snacks	6%	50
23. Instant noodles	Noodles	-	-
25. Milk	Milk	-	-
26. Sweet tea/coffee or local drinks	Sugar-sweetened tea/coffee	NA*	NA*
	Traditional/local drinks	88%	352
	Other drinks	-	-
27. Fruit juice or fruit drinks	Juice	-	-
29. Fast food	Burgers/Street food	-	-

*NA as making tea and coffee at home did not equate to self-production of milk

Table 3.11 – *Self-production of food groups consumed by households in Chitrakonda*

Discussion

The results from Chitrakonda present an encouraging picture of diet diversity and quality among households in this tribal region. A majority of households frequently consumed and produced their own cereals, pulses, millets, and green leafy vegetables. These patterns stand in contrast to the increasing homogenization and reliance on ultra-processed and market-purchased foods seen in many other rural and urban areas of India.

The high self-production of millets and pulses highlights a strong dependence on traditional dryland crops, which are known for their climate resilience, nutritional density, and cultural significance. These food groups are vital in combating micronutrient deficiencies, especially iron, calcium, and fibre.

Further investigation is necessary to understand nutritional adequacy for infants and young children under two years of age. While dairy is not a traditional part of the local food culture, context-appropriate supplementation strategies may be needed for young children depending on their nutritional status.

The data also indicates early signs of a nutrition transition. Although ultra-processed food consumption remains relatively low for items like chips, noodles, and soft drinks, a notable percentage of households reported consuming sweets (57%) and fried or salty snacks (40%), often sourced from the market. Additionally, nearly 60% of individuals consumed sugar-sweetened tea, coffee, or milk. If left unaddressed, this trend could erode diet quality over time, particularly among youth.

A significant majority (88%) of respondents consumed traditional/local drinks, including fermented rice, millets, and tree sap. These non-alcoholic beverages are typically low in sugar, culturally accepted, and often probiotic-rich, offering healthier alternatives to sugary soft drinks and packaged juices. Supporting and preserving these food traditions represents an effective nutrition-sensitive strategy that aligns with local values and practices.

The distinction between own production and market dependency is critical. Foods primarily sourced through self-production were predominantly healthy, such as millets, pulses, vegetables, and traditional animal-source foods. Conversely, nearly all ultra-processed and sugary foods were obtained from the market. This underscores the importance of protecting local food systems not only for environmental and economic sustainability but also as a public health imperative.

Overall, Chitrakonda's diet quality demonstrates commendable diversity with a strong reliance on self-production in key food groups. As market exposure increases, there is a clear need to prevent the rise

of ultra-processed food consumption. Programming should prioritise preserving this strong foundation while addressing critical gaps through a nutrition-sensitive, culturally anchored approach. This includes promoting small livestock rearing for nutrient-rich animal-source foods and implementing localised nutrition awareness campaigns to protect traditional dietary diversity and build food literacy, particularly to limit the consumption of unhealthy snacks, sweets, and sugar-sweetened beverages.

3.10. Access to Digital Technology

Mobile telephony and internet connectivity are available in Chitrakonda town. The internet connection is slow and unreliable. In rural areas, both young and older adults use mobile phones. However, internet access is not available there. Villagers use both smartphones and QWERTY phones.

3.11. Climate Challenges

Discussions with farmers reveal a significant shift in rainfall patterns, now occurring every other year, which affects the cropping schedule. Paddy transplantation, previously completed by mid-July, is now often delayed until August due to inconsistent rainfall. Additionally, the intensity of rainfall has increased. At the same time, the number of rainy days has slightly decreased, leading to 3–4 days of heavy downpours followed by dry spells lasting a week or more. This pattern causes topsoil erosion and moisture stress, mainly because of the soil type, and heavy rains in December often damage mature pulses and oilseeds. The irregular rainfall has disrupted crop cycles, resulting in lower yields and crop losses, particularly in water-stressed areas. Rising temperatures further increase evaporation, which reduces soil moisture and increases the demand for irrigation. Although the region has experienced mild droughts, prompt administrative actions have mostly mitigated their impact; however, some areas still suffer from moisture stress and irregular rainfall.

For Malkangiri district, the soil's available water holding capacity is 100–125 mm, and groundwater availability is limited to 0–20 ham/sq km. The flood vulnerability is low (0–3%), and there are no recorded risks of cyclones or droughts. Climate data shows a 3–6% increase in annual rainfall from 2020 to 2049 compared to 1976 to 2005, with June rainfall rising by 3–6% and July rainfall by 0–5%. The number of rainy days has changed by 0–1%, while both minimum and maximum temperatures have increased by 1.3–1.6°C. There is no significant change in dry spells longer than 14 days, and extreme rainfall events (>100mm) have increased by less than 0.5%. The average maximum rainfall has increased by only 0–0.1%. Overall, the vulnerability index is high, the historical hazard is low, and future hazard scenarios are moderately unfavourable. The agricultural risk index is medium.

WASSAN may consider creating a block-level climate vulnerability assessment using established criteria and indicators, which are already available for vulnerability assessment at the district level, and apply those criteria to develop a Resilience Plan for the block.

3.12. Employment Generation

Data from the MGNREGA program in Chitrakonda block shows both opportunities and challenges for promoting an agroecological transformation in the area. Generating employment through the program remains a key source of income for many people, especially for Scheduled Tribe communities, who make up over three-quarters of the total number of person-days worked. Women’s participation is also high, at nearly 48%, which is a strong sign of gender equity in labour-based rural development. However, the average number of days of employment per household has been declining - from 57.6 in

2023–24 to 47.4 in 2024–25 - indicating a weakening in job stability and limiting the potential for long-term income growth. Although wage rates have been increasing steadily, they are still relatively low and not enough to significantly improve rural incomes on their own.

From an ecological perspective, over half of the total projects (56% in 2024–25) fall under Category B—activities related to water conservation, drought mitigation, and land development—that align with agroecological priorities. About 31% of projects focus on agriculture and related sectors, supporting soil and water management, boosting land productivity, and creating diversification opportunities. However, the varying share of agricultural projects across years suggests that investment in ecological infrastructure is inconsistent, which may undermine its long-term impact on natural resource regeneration.

In terms of equity, the program demonstrates strong outreach to marginalised groups, especially ST communities and women, but participation of the Scheduled Castes remains below 10%. The limited number of households achieving 100 days of employment (665 out of 5,756 in 2024–25) indicates that while MGNREGA supports income supplementation, it has yet to provide full livelihood security. Enhancing coordination between MGNREGA's agriculture, allied works, and natural resource management activities could greatly enhance its role as a catalyst for agroecological transformation in Chitrakonda.

Category	Indicator	2024–25	2023–24	2022–23	2021–22	2020–21	2019–20
Basic Data	Total GPs	18	-	-	-	-	-
	Total Job Cards	13,218	-	-	-	-	-
	Total Workers	20,138	-	-	-	-	-
	Active Job Cards	10,750	-	-	-	-	-
	Active Workers	15,610	-	-	-	-	-
	SC Workers (%)	9.77	-	-	-	-	-
	ST Workers (%)	73.43	-	-	-	-	-
Employment Generation	Person days (Central Liability)	2,72,767	4,64,804	4,32,558	3,48,084	3,43,453	1,28,111
	SC Person days (%)	9.84	8.32	8.5	9.32	10.22	13.73
	ST Person days (%)	76.14	78.31	74.51	73.63	70.99	70.21
	Women Person days (%)	47.52	46.3	46.28	44.71	40.33	38.39
	Avg. Days Employment/HH	47.39	57.63	56.34	49.48	52.43	40.64
	Avg. Wage Rate (₹/day)	253.29	236.91	221.66	214.72	206.87	187.74
	HHs Completed 100 Days	665	1,383	1,172	476	565	93
	Total HHs Worked	5,756	8,066	7,678	7,038	6,551	3,152
	Individuals Worked	7,877	11,499	11,047	10,755	11,056	4,945
	Differently Abled Worked	124	130	64	34	42	11
Works	Total Works Taken Up	2,356	2,230	1,393	1,483	1,715	2,228
	Ongoing Works	1,313	1,835	753	920	983	1,144
	Completed Works	1,043	395	640	563	732	1,084
	Category B Works (%)	56.2	66.1	32.23	45.25	67.06	74.6
	Agri & Allied Works (%)	30.96	46.68	69.13	39.28	0	0

Category	Indicator	2024–25	2023–24	2022–23	2021–22	2020–21	2019–20
Financials	Total Exp. (₹ Lakhs)	970.77	1,081.73	1,105.90	1,090.23	718	310.99
	Wages (₹ Lakhs)	612.45	883.58	783.7	570.21	556.16	183.57
	Material & Skilled Wages (₹ Lakhs)	348.36	141.94	302.75	497.36	138.33	105.19
	Material (%)	36.26	13.84	27.87	46.59	19.92	36.43
	Admin Exp. (₹ Lakhs)	9.96	56.21	19.45	22.66	23.51	23.51
	Admin Exp. (%)	1.03	5.2	1.76	2.08	3.27	7.14
	Avg. Cost Per Day (₹)	383.03	284.02	322.62	392.55	267.21	297.78
	EFMS Payment (%)	100	100	100	100	100	100
	Payments within 15 days (%)	100	99.96	99.93	99.63	95.73	92.13

Table 3.12 – *Employment Generation through MGNREGS, Chitrakonda Block*

3.13. Implications for Agroecological Transformation

Chitrakonda block's distinct blend of ecological diversity, economic limitations, and social dynamics presents both opportunities and challenges for shifting towards an agroecological approach. The effects can be explored through three interconnected lenses—economy, ecology, and equity—each shaping how agroecological transformation could play out in this region.

3.13.1. Economic Implications

The local economy in Chitrakonda mainly depends on agriculture and livestock rearing, all of which are primarily for subsistence. These livelihood systems are weak because of low productivity, limited market access, and a lack of value addition.

- Low-input systems dominate: While this decreases reliance on external inputs, it also keeps productivity low, making farmers vulnerable to food insecurity and income shocks.
- Market constraints: Poor connectivity, lack of storage facilities, and primarily local marketing opportunities keep farmers dependent on local haats.
- Untapped value chains: Forest produce, indigenous millets, turmeric, and livestock products have potential for niche markets but need value addition, certification, and branding to improve returns.
- Limited private investment: The small number of agri-businesses and input suppliers means that government schemes are the main source of investment, which may restrict innovation and diversification.

Implication: There should be a focused effort to improve soil health and increase productivity through natural inputs. Agroecological transformation must be strategically planned to strengthen local processing, develop local value chains, connect smallholders to markets, and support local businesses—especially those led by women and operated by SHGs—to ensure economic sustainability.

3.13.2. Ecological Implications

Chitrakonda's ecology—diverse in biodiversity yet susceptible to degradation—serves as both a resource and a challenge for agroecological strategies. The following are some of the key observations:

- Soil degradation and erosion: Ongoing farming without adding nutrients, along with deforestation and shifting cultivation on steep slopes, has decreased soil fertility and productivity.
- Agro-biodiversity: Indigenous landraces of millets, pulses, and livestock breeds remain widespread, providing climate-resilient genetic resources for agroecological farming.
- Water scarcity: Rainfed farming prevails, with only seasonal streams and Balimela providing partial relief.
- Forest dependency: Forests supply timber, NTFPs, fodder, and medicinal plants, but deforestation, grazing, and the absence of agroforestry systems jeopardise long-term sustainability.
- Climate vulnerability: Irregular rainfall, rising temperatures, and increased occurrence of livestock and crop diseases are already evident, highlighting the necessity for climate-adaptive farming systems.

Implication: Agroecological transformation should prioritise soil and water conservation, the revival of traditional and resilient crop varieties, community-led biodiversity efforts, the use of bio-inputs and bioresources to enhance soil health, and the integration of forestry with farming systems.

3.13.3. Equity Implications

Chitrakonda's social structure and institutions show clear gender roles, limited community involvement in decision-making, and ongoing gaps in access to services.

- Gender roles in farming and livestock: Women do most of the daily agricultural and livestock work, but are often left out of decision-making.
- Marginalisation of tribal communities: Tribal farmers face infrastructural neglect, limited extension services, and reduced access to government schemes due to remoteness and security issues. Although this situation has improved in recent years, there is still much work that needs to be done.
- Weak local institutions: Many community organisations established through government programs are no longer active, weakening collective efforts for resource management.
- Nutrition and health: High levels of undernutrition, anaemia, and early pregnancies among women and girls weaken their ability to participate in agroecological initiatives fully.
- Knowledge gaps: Farmers have limited exposure to water conservation techniques, soil health management practices, or agroecological practices beyond traditional methods.

Key point: Agroecological transformation needs to be inclusive, with women, tribal communities, and marginalised groups playing a central role in decision-making and benefiting from the changes. To ensure equal participation, it's crucial to strengthen local institutions, build capacity, and improve nutrition and health outcomes.

CHAPTER 4

Rationale for the Recommendations

This chapter outlines the proposed interventions for the landscape across key areas identified in the previous chapters: (i) Agriculture, (ii) Agroforestry, (iii) Horticulture, (iv) Animal Husbandry, and (v) Natural Resource Management. In addition to these main areas, several targeted interventions are suggested, focusing on processing, small-scale machinery development, revolving fund mechanisms, and entrepreneurship promotion. These interventions have been carefully selected based on their feasibility within the landscape context and benefit from WASSAN's extensive experience in implementing the Special Programme for Promotion of Integrated Farming (SPPIF), a flagship initiative of the Government of Odisha aimed at improving the socio-economic conditions of the block. The proposed interventions under each domain are as follows:

Domain	Interventions
Agriculture	1. Crop Intensification of - Little Millet, Black Gram, White Rajma, Black Horse Gram, and Niger, with an emphasis on intercropping or poly-cropping 2. Green Gram, Bengal Gram, and other suitable crops in rice fallow areas during the Rabi season or winter crop 3. Intensification of Turmeric with poly-cropping models. 4. Breeder model – for conservation, production and multiplication of indigenous and suitable landraces 5. Organic Certification of crops through the Participatory Guarantee System (PGS) of India. 6. Establishing the Bio-Manure Centre for producing bio-fertilisers and bio-pesticides.
Agroforestry	1. Nursery Development for the production of Quality planting Materials (QPM). 2. Agroforestry through silvicultural models and others in marginal uplands, medium lands, cultivable fallows, and wastelands. 3. Agroforestry on agricultural land and boundaries.
Horticulture	1. Organic vegetable cultivation 2. Development of an orchard for Cashew, Mango, Banana, and Pomegranate 3. Pineapple cultivation 4. Floriculture 5. On-field packhouses 6. Cold storage units
Animal Husbandry	1. A multi-layered integrated farming system that integrates crop, feed and livestock development 2. Construction of a low-cost goat shelter. 3. Strengthening vaccination services and animal health care through Community Animal Health Workers. 4. Backyard duck rearing

Domain	Interventions
Natural Resource Management	1. Micro-irrigation through a piped diversion system using natural streams, springs, and streams. 2. Integrated watershed development 3. Construction of farm ponds 4. Construction of water harvesting structures. 5. Construction of solar/ electric Micro-river Lift projects.
Others	1. Electric or Solar-based primary processing infrastructure 2. Research and development of small-scale farm machinery 3. Provision of revolving fund for the FPOs to support business development activities 4. Entrepreneurship development

Table 4.1 – Domain-wise Proposed Interventions

In addition to the previously mentioned interventions, comprehensive capacity-building programs have been proposed to enhance the skills and knowledge of both farmers and community resource persons.

WASSAN has conducted a thorough mapping of all villages in the area, taking into account accessibility, proximity to markets, and forest cover. This map provides the basis for prioritising activities based on the level of stress on forests, land, and water resources. The proposed interventions are carefully aligned with current farming practices, requiring minimal technological inputs and only minor adjustments to existing methods. Instead of pursuing piecemeal, stand-alone measures, the plan takes a holistic, integrated approach to advance ecological sustainability, economic viability, and social equity simultaneously, resulting in lasting, transformative impacts across the landscape.

These interventions are specifically designed to benefit small and marginal farmers, who make up nearly 87% of all farm families in the block. Crop-based initiatives will provide these farmers with viable opportunities to boost cropping intensity and increase productivity on their existing land. Agroforestry and horticulture projects will enable the productive use of marginal uplands, field boundaries, and fallow lands, promoting the cultivation of perennial crops that offer sustainable, long-term income while strengthening farmers' resilience to environmental and economic shocks. Watershed development, micro-irrigation, and farm pond construction will further support these farmers by improving soil health and ensuring a reliable water supply, thereby reducing their vulnerability to unpredictable rainfall patterns. Overall, short-term crop interventions will bring immediate food security benefits. At the same time, tree-based systems and water-resource development will secure medium- and long-term income stability, laying the groundwork for a more resilient and prosperous farming community.

Landless families depend on wage labour, forest resources, or livestock as their main sources of income. Animal husbandry activities such as backyard poultry, duck rearing, integrated multilayer farms, and goat rearing will offer low-investment livelihood options that landless families can adopt. Initiatives related to natural resource management, infrastructure development, enterprise growth, and nursery development will create opportunities for self-employment or wage employment, especially when connected to SHGs or FPOs. Landless women will gain access to credit through SHGs and engage in value chain activities like packaging, branding, and marketing.

Households with livestock will gain from better shelters, access to feed, and improved animal care, which will boost productivity and income. Community members with expertise in veterinary care will provide veterinary care, ensuring healthy livestock and lower mortality rates. By combining fodder with crop and agroforestry systems, we can create a more circular economy. Backyard farms that integrate poultry, goats, feed, and horticulture will increase cash income and improve nutrition security.

Women-led SHGs can play a key role in developing nurseries, poultry, duck rearing, bio-manure centres, and other enterprises. Single women and vulnerable households will be prioritised for low-investment activities, group-based efforts, or wage-labour opportunities as entry points. Youth will participate in enterprise development and agro-processing activities.

Community contributions will be mobilised under each component to reduce intervention costs, promote ownership, and ensure long-term sustainability. Horticulture development, integrated watershed management, and the creation of land and water infrastructure will be carried out through integration with existing schemes. Activities not covered under current programs will be selected for direct intervention. Practical, culturally acceptable models suitable for local conditions will be prioritised for implementation.

While direct interventions within forest areas will be avoided according to departmental laws and guidelines, efforts to coordinate programmatic activities at the broader landscape level will be actively pursued. All actions will align with the provisions of the Community Forest Rights (CFR) and Individual Forest Rights (IFR) frameworks, with a special focus on agroforestry models that not only aid in forest regeneration but also offer sustainable income opportunities and higher economic returns for local communities.

The program will focus on promoting basic primary processing activities at the household level or through the setup of small-scale infrastructure for cleaning, grading, and packaging produce in airtight bags to reduce spoilage. Further value addition will not be pursued under this initiative. For example, in the case of turmeric, support will be provided for basic standardisation and essential machinery required for boiling, drying, polishing, and grading, as there is a clear market demand for polished turmeric. However, there is no plan to engage in the entire value chain, as it has limited market potential with only slightly higher price realisation, and it could introduce operational and management challenges. For self-consumption, small-scale machinery for processing paddy, pulses, and oilseeds will be promoted through enterprise-based models, leveraging available government subsidy schemes. The Government of Odisha is also prioritising the development of larger cold storage facilities in the region, which will help farmers avoid distress sales by enabling them to store produce longer and secure better market prices. Existing infrastructure will be utilised for crop storage and aggregation, with no plans for new investments in additional facilities. If further support is needed during implementation, it will be accessed through government schemes.

There is currently no need for new infrastructure in weekly haats. If temporary storage is needed for perishable items like vegetables, the requirement will be met through integration with existing schemes. Beyond local markets, the program will also target niche markets using certified, quality-assured products to ensure broader acceptance. Collective marketing models will be introduced to enhance price realization for farmers. Presenting produce in a clean and standardized form will help reach a broader market. Agencies such as APEDA, TDCC, ORMAS, and others will act as facilitative bodies for these efforts. Strengthening the capacity of local institutions will be a key goal to support production, certification, and market linkage activities across the landscape.

CHAPTER 5

Intervention Planning for Agroecological Transformation

PART 1 - DETAILS OF INTERVENTIONS

5.1. Agriculture

Proposed Interventions

In agriculture, the following interventions will be carried out:

1. The selection of crop varieties is based on current cropping practices and crop choices in the landscape. Crop intensification will focus on Little Millet, Black Gram, White Rajma, Black Horse Gram, and Niger, with an emphasis on intercropping or polycropping approaches. Out of the total cultivable area of 11,764 hectares for the landscape, 5,000 hectares will be used for the intensification of these crops. The intensification work will start in the second year, as in the first year, the promotion of breeder seeds will be carried out.
2. Growing Green Gram and Bengal Gram on rice fallow land will also boost land productivity by allowing an additional short-season crop after rice harvest and will support food security, soil health, and farmers' income. Rice-fallow cultivation aligns with the Government of Odisha's Comprehensive Rice Fallow Management Programme, which aims to increase farmer income and food security by promoting the planting of short-season pulses and oilseeds during the Rabi season on rice fallow land. Promoting Green Gram, Bengal Gram, and other suitable crops in rice fallow areas during the Rabi season will help increase overall cropping intensity. Out of the total cultivable area of 11,764 hectares, 4,139 hectares are used for paddy cultivation. Green Gram and Bengal Gram will be grown on 3,700 hectares of the 4,139 hectares under rice fallow.
3. Intensification of turmeric cultivation using poly-cropping models will be implemented across 300 hectares. Turmeric has long been a key cash crop in the region, with farmers planting it for many years as part of their agricultural routines. Although locally grown turmeric typically has lower curcumin content, it still provides an important source of additional income. The planned increase in turmeric cultivation is expected to boost household earnings further, reinforcing its role as a vital part of the local farming economy.

4. In the Breeder Model of seed production, high-quality breeder seeds are produced from nucleus seeds to preserve the genetic purity and integrity of new plant varieties. WASSAN has been actively involved in breeder seed development, and through this effort, superior-quality seeds of indigenous varieties and landraces will be generated. These seeds will play a key role in promoting crop intensification while maintaining the unique genetic traits and resilience inherent to these traditional varieties. The promotion of breeder models aims at conserving, producing, and multiplying indigenous and suitable landraces to establish a seed supply chain for the crops to farmers, with a focus on enhancing nutrition, productivity, and other key traits preferred by farmers. This will ensure the availability of quality seeds for farmers. For more information on the Breeder Model, see Annexure 11.
5. Organic certification will be provided for all crops under intensification, including Kharif crops, turmeric, and vegetables, through the Participatory Guarantee System (PGs) of the Government of India.
6. Setting up a Bio-Manure Centre under an entrepreneurship model, with a focus on producing bio-fertilisers and bio-pesticides. Bio-fertilisers and bio-pesticides will be produced. Bio-inputs and bio-stimulants are used as alternatives to synthetic inputs under the umbrella of natural farming or regenerative agriculture. Farmers can easily produce different types of concoctions with little or no technical input at the farm level using locally available materials, which reduces input costs and overall investment at the farm. Bio-manure improves soil health, boosts microbial activity and nutrient recycling, and enhances crop quality and productivity. Additionally, it has been observed that bio-inputs increase crop resilience. Farmers in the area have produced and used some bio-manures; WASSAN plans to expand the production and usage of various types of bio-manures. Four large units will be promoted in an enterprise mode. One unit will serve around 5 GPs, so five units will cover a total of 18 GPs in the region.

The changes in cropping practices across the landscape will be minimal, considering the existing diversity in upland and medium upland areas. However, the following key modifications are proposed:

- Crop intensification will be promoted through natural farming principles, focusing on reducing chemical inputs. Crop selection will match specific land categories and soil profiles, with a strong emphasis on improving soil fertility.
- A strengthened indigenous seed system will be key to revitalising and enhancing existing farmer-used varieties by analysing desirable traits. Focus will be on matching consumed crops with nutrient-rich, high-yielding varieties that meet market demands for income.
- Rice fallow lands will be strategically used to grow short-duration crops (60–75 days), such as green gram, Bengal gram, or sesame, to make effective use of post-harvest soil moisture.
- Organic vegetable cultivation will be prioritised year-round, especially in irrigated areas or through the development of additional irrigation infrastructure where needed. This also helps reduce economic outflows during the off-season.
- Primary processing facilities will be provided at the village or farmer level to enable basic processing, helping producers get better prices for their produce.

5.1.1. Who will Implement

WASSAN will carry out the interventions in partnership with DA&FE, KVK, OUAT, and other ICMR Institutions. On the community level, the interventions will be executed in close partnership with FPOs, SHGs, and Youth Groups.

5.1.2. Technical Feasibility and Financial Viability Issues

One of the main technical challenges lies in obtaining and adapting quality seeds. While the efforts focus on crop intensification with local varieties like Little Millet, Black Gram, Niger, and White Rajma, access to high-quality seeds suited to Chitrakonda's specific agroecological conditions remains limited. Without thorough performance trials in local climate conditions, farmers risk low yields, which could weaken their confidence in these initiatives. However, the Breeder Seed model has the potential to solve this issue.

While farmers in the area practice multiple cropping systems and use bio-inputs, these methods are not widely adopted. Extension services are weak, and the lack of a well-trained cadre of resource persons hinders the ongoing technical support needed for these practices to succeed. This may require intensive training and handholding support.

Soil and nutrient management increase the complexity. The landscape's soils are low in organic matter and fertility, and shifting to organic farming will require significant efforts to restore soil health. Setting up bio-manure and bio-pesticide production units can be technically challenging, needing strict quality control measures, which may be hard to maintain in the early stages. WASSAN's experience of working on soil health improvement will address this challenge to some extent.

Infrastructure constraints also limit technical feasibility. The lack of functional irrigation systems restricts the scope for crop intensification and Rabi cropping in rice fallows. Additionally, the absence of reliable post-harvest storage, processing, and transportation facilities increases the risk of spoilage and decreases the potential value farmers can derive from their produce. Organic certification through Participatory Guarantee Systems (PGS), while critical for accessing premium markets, requires strong organisational capacity for record-keeping, group inspections, and compliance—elements that may be difficult to achieve in remote tribal communities. Furthermore, climate variability, marked by erratic rainfall patterns and prolonged dry spells, presents a major risk to the success of all agricultural activities. Without access to drought-tolerant varieties or climate-adaptive technologies, farmers remain highly vulnerable to these uncertainties.

The financial sustainability of the proposed interventions is also limited. Many initiatives, like establishing bio-manure centres, nurseries for quality planting materials, and organic certification processes, require high upfront costs, with benefits that only become apparent in the medium to long term. For small and marginal farmers, who make up most households in Chitrakonda, the lack of working capital to invest in improved seeds, organic inputs, and diversified cropping systems is a major barrier to adoption. Initial grant support as seed money will help address some of these challenges.

Market access and price volatility further threaten financial viability. While the interventions aim to promote indigenous crops and organic produce, markets for these products remain underdeveloped and fragmented. Farmers often depend on local traders who offer low prices, and the lack of strong market connections means they cannot fully benefit from niche or premium markets. This problem is worsened by the absence of economies of scale, as small landholdings limit individual farmers' ability to generate enough surplus, making collective action through Farmer-Producer Organisations essential. However, forming and maintaining such groups in the region has historically been difficult. Successful leveraging of government initiatives in this area will help address some of these challenges.

Because these interventions depend heavily on external funding and government programs, their sustainability must be carefully considered. If such support is removed or delayed, many activities

might come to a halt. Moreover, farmers often expect quick and noticeable benefits; without rapid results, adoption rates could remain low, jeopardising the overall success of the transformation plan.

5.1.3. Ecological, Economic and Social Benefits

These interventions provide integrated ecological, economic, and social benefits, laying the foundation for sustainable landscape transformation.

By promoting crop intensification alongside organic and natural farming practices, these interventions greatly improve ecological resilience. They restore and sustain soil health through adding organic matter, reducing reliance on synthetic fertilisers and pesticides, and encouraging biodiversity within farming systems. The focus on agroecological methods enhances ecosystem services, such as pollination, nutrient cycling, and water conservation, creating a balanced, regenerative landscape that can withstand climate variability over time.

Economically, the interventions open multiple pathways for rural prosperity. Increasing cropping intensity beyond the kharif season ensures year-round farm productivity, while using high-quality indigenous seeds and bio-inputs reduces input costs and sustains yields. Better access to markets allows farmers to secure higher prices, and investments in processing, storage, and value addition create additional income sources. These efforts promote local enterprise growth, generate jobs, and strengthen rural economies that are less dependent on outside markets and more resilient to shocks.

Socially, these interventions boost community cohesion and empowerment. The promotion of Farmer-Producer Organisations (FPOs), Participatory Guarantee Systems (PGS), and collective action fosters shared learning, knowledge sharing, and joint decision-making. By creating local jobs, the interventions improve household stability and well-being. They also enhance food and nutritional security through dietary diversification into pulses, oilseeds, and millets, while ensuring access to safe, chemical-free produce. Importantly, these efforts strengthen communities' ability to adapt, helping them better handle both climatic and economic uncertainties with more confidence and independence.

5.1.4. Implementation Design and Human Resources

Our program will run through a collaborative approach that brings together technical know-how, community involvement, and institutional support to achieve lasting and scalable results. It will pair expert guidance with local mobilisation and innovative engagement to provide high-quality resources, proven technologies, and ongoing research support across the board.

Approach

The program will use a bottom-up, participatory approach, supported by technically skilled Community Resource Persons (CRPs) who will provide consistent guidance and on-the-ground support. A multi-layered capacity-building strategy will be put in place. Resource Farmers and Master Farmers will act as catalysts for farmer-to-farmer knowledge sharing, a proven way to spread adoption sustainably. Women’s participation will be a priority, with targeted efforts to include landless households, persons with disabilities, and single women to promote fairness and representation. Farmer Field Schools (FFS) and exposure visits will promote hands-on learning, while customised training modules will be tailored to local practices and cultural contexts to ensure they are relevant and well-received.

Institutional Mechanism

At the core of the institutional framework will be Farmer-Producer Organisations (FPOs), which will serve as the main institutions responsible for both service delivery and agribusiness activities.

- Enrol and organise farmers, ensuring access to inputs, extension services, and markets.
- Lead enterprise development for prioritised crops and commodities, including aggregation, processing, branding, and marketing.
- Serve as a bridge between farmers, entrepreneurs, and markets to promote economic sustainability.

To support FPOs, local entrepreneurs, especially the younger generation, will be encouraged to manage related business activities like input supply, value addition, logistics, and marketing, fostering a strong rural enterprise ecosystem.

Community Engagement

Recognising the vital role of youth in agricultural transformation, the program will reposition agriculture as a profitable, dignified, and future-oriented profession by:

- Attracting and retaining young farmers through entrepreneurship models that focus on value addition, diversified farming systems, and agri-business opportunities.
- Developing technical and business skills through structured training, exposure to successful agri-enterprises, and mentorship programs.
- Encouraging climate-smart and innovation-focused farming methods to attract younger generations looking for modern, tech-based careers.

Technical Backstopping

A core team of experts from WASSAN will oversee intervention design and execution, supported by ongoing action research to improve practices. Strategic partnerships will be formed with:

- Agricultural universities and research institutions for technology validation and adaptation.
- Departments of Agriculture, Horticulture, and allied sectors for integration with ongoing schemes.
- Krishi Vigyan Kendras (KVKs) provide field-level technical support.

Knowledge Management

Innovative Information, Education, and Communication (IEC) tools will be developed in local languages, enriched with visual content for better understanding. Lead farmers will be provided with Pico projectors to demonstrate improved practices within villages, fostering a strong peer-learning environment. Digital tools will also boost efficiency and engagement.

- Mobile advisories for real-time decision-making.
- E-marketing platforms enhance market access.
- Data-driven decision support systems for optimising production and resource utilisation.

Sustainability

The program emphasises self-reliance and ecosystem restoration by avoiding overdependence on external inputs through:

- Reviving traditional practices with modern scientific insights.

- Encouraging farmers to buy seeds from local seed hubs and bio-inputs from community-managed units, ensuring consistent demand, supporting rural businesses, and strengthening trust-based market connections.
- Facilitating organic certification through Participatory Guarantee Systems (PGS) in partnership with Regional Councils, following the guidelines of the Government of India and the State of Odisha.
- By bringing together farmers, researchers, experts, institutions, and entrepreneurs on a common platform, this initiative promotes ecological restoration, improves livelihoods, and builds resilient farming systems. The holistic approach combines local knowledge, scientific innovation, and inclusive participation to encourage long-term sustainability, food security, and fair economic growth across the Chitrakonda landscape.

5.2. Forestry, Agroforestry, and Non-Timber Forest Produce

Proposed Interventions

The proposed interventions in this area emphasise the promotion of scientifically designed agroforestry models that provide sustainable economic returns to farmers while restoring ecological balance. Silvicultural-based systems, which integrate trees with agricultural crops, will be prioritised to optimise land use, increase productivity, and ensure long-term benefits. These models will be based on scientific validation and adapted to local agro-ecological conditions, ensuring flexibility, reducing the risk of failure, and building resilience against adverse climatic events.

1. At the core of this initiative is establishing high-quality nurseries as a foundation for successful agroforestry adoption. We'll focus on forming partnerships with leading research institutions like the Indian Council of Forestry Research and Education, Tropical Forest Research Institute, Institute of Biodiversity, Institute of Wood Science and Technology, and the National Horticulture Board. These collaborations will ensure the genetic purity of planting materials, the application of scientific propagation methods, and effective nursery management practices, resulting in healthy saplings of both forest and horticultural species.
2. Nurseries will supply saplings directly to farmers. Operating under an entrepreneurship model, these nurseries will also serve as a dependable source of high-quality planting materials for other government and non-government initiatives, ensuring diverse markets and economic sustainability. Nurseries will be established in the first year of the project, and the saplings will be available from the second year onward. Six nurseries will be set up in the first, second, and third years of the project.
3. Agroforestry will be promoted through silvicultural models in marginal uplands, medium lands, cultivable fallows, and wastelands. A total of 88,000 saplings will be needed for 300 hectares of agroforestry. One nursery will produce 15,000 saplings. Therefore, six nurseries will produce around 88,000 saplings.
4. Implementation will primarily focus on individual forest rights (IFR) lands and agricultural lands, engaging farmers as active participants and beneficiaries of these initiatives. When additional saplings are needed, private sector involvement will be encouraged to reduce reliance on government nurseries, which are often limited by program-specific priorities, seasonal production cycles, manpower shortages, and inconsistent quality—all of which weaken sapling survival rates.
5. For this intervention to succeed, farmer contributions will be required. This hands-on approach not only promotes responsible resource management but also builds a lasting commitment to sustainability within the community. By sharing the costs, farmers become partners in their own future, guaranteeing that the benefits of agroforestry—economic

stability, ecological restoration, and intergenerational prosperity—are maintained long after the program ends.

A key requirement for successful implementation is access to Quality Planting Material (QPM), such as seeds, seedlings, clones, and improved, healthy, and climate-resilient varieties. Indigenous species will be prioritised to reduce plant mortality and ensure better adaptability. We'll promote the production and supply of QPM through local entrepreneurs or enterprises, as limited access to quality material remains a significant bottleneck in agroforestry systems.

To strengthen the model, strategic partnerships will be established with key research and development institutions such as the Indian Council of Forestry Research and Education (ICFRE), Indian Council of Agricultural Research (ICAR), Central Agroforestry Research Institute (CAFRI), Tropical Forest Research Institute (TFRI), Institute of Forest Biodiversity (IFB), Institute of Wood Science and Technology (IWST), and the Forest, Environment Department & Climate Change Department of the Government of Odisha. These collaborations will support the development of climate-resilient agroforestry models with a strong focus on improving livelihoods.

Based on the dense forest cover and feedback from veterinary officials in the area, it has been determined that the landscape contains ample natural fodder resources for commercial goat rearing. However, since there are no designated common grazing lands, which are already under cultivation, household-level fodder cultivation will be prioritized. Community-managed fodder models have not proven successful in this region or in nearby districts.

To address this, fodder trees such as Mulberry, Agasti, Kanchana, Subabul, Gliricidia, Arjuna, and Super Napier will be promoted. Supplementary fodder needs will be met by cultivating crops such as sorghum and others, in collaboration with veterinary experts, to enhance animal nutrition and increase livestock productivity. Additionally, an organic food chain system will be established and maintained to improve meat quality, animal health, and market value, promoting a sustainable and high-value livestock economy. As suggested by the Livestock Expert, the Plastic Drum Silage method will also be helpful in meeting fodder requirements. Plastic drum silage involves preserving chopped green fodder by packing it into plastic drums, sealing them to create anaerobic conditions, and fermenting to produce silage. This technique is beneficial for small-scale farms, helping to extend the supply of nutritious feed for livestock, particularly during periods of feed shortage.

5.2.1. Who will Implement

WASSAN will take the lead in planning, implementation, community mobilisation, capacity building, and monitoring to ensure effective adoption and long-term sustainability. WASSAN will work in partnership with ICFRE, TFRI, IFB, the Institute of IWST, and the NHB.

5.2.2. Ecological, Economic and Social Benefits

The proposed agroforestry interventions provide a broad range of ecological, economic, and social benefits, supporting the goal of sustainable, climate-resilient, and inclusive development in the Chitrakonda landscape.

Agroforestry plays a vital role in environmental restoration and resilience. By combining trees with crops and livestock systems, these practices help conserve soil and water, enhance moisture retention, and prevent the degradation of fragile upland and marginal areas. The presence of a diverse range of plant species restores and maintains biodiversity, providing habitats for pollinators, birds, and beneficial organisms essential to ecosystem health. Moreover, increased carbon sequestration through tree cover directly aids climate change mitigation, boosting the ability of local ecosystems to withstand

extreme weather events. The sustainable use of natural resources ensures agroecosystems remain productive, balanced, and resilient for the future.

From an economic perspective, agroforestry offers diversified and steady income streams, reducing farmers' dependence on a single crop and shielding them from market or climate shocks. The integration of timber, fruit, fodder, and non-timber forest products (NTFPs) creates multiple revenue opportunities throughout the year, supporting household financial stability. Improvements in soil fertility and structure, driven by organic matter from trees and enhanced nutrient cycling, lead to higher crop yields and lessen reliance on expensive external inputs. These benefits lay the foundation for value addition and entrepreneurship, allowing farmers to explore niche markets such as organic and sustainably sourced products. Overall, these strategies boost rural employment, decrease distress-driven migration, and strengthen local economies based on sustainable resource management.

The social benefits of agroforestry go beyond improving livelihoods to enhance resilience, equity, and overall well-being. By stabilising agricultural systems and lessening vulnerability to droughts and climate fluctuations, agroforestry bolsters community-level adaptive capacity. Including nutritionally rich fruit and food crops increases dietary variety and food security, leading to better health outcomes. Securing livelihoods through ecological restoration and income generation enables communities to invest in education, healthcare, and improved living standards. Additionally, these initiatives foster collective action and strengthen social cohesion, as communities work together in planning, managing, and sharing resources. This inclusive strategy ensures that marginalised groups—such as women, landless labourers, and smallholders—are active participants and beneficiaries, promoting long-term social stability and equitable growth.

5.2.3. Technical Feasibility and Financial Viability Issues

The landscape features fragmented landholdings and poor soil quality, which limit the scale and success of agroforestry models. Unpredictable rainfall patterns and long dry spells decrease plant survival, especially during critical establishment phases. Open grazing during off-seasons worsens mortality rates, as young saplings are vulnerable to damage by free-ranging livestock. These problems are made worse by limited extension services and insufficient technical knowledge among farmers, which slow the adoption of scientific agroforestry practices such as species-site matching, proper spacing, pruning, and long-term management. The delivery of high-quality saplings in a timely manner remains a constant challenge, as existing nurseries cannot meet demand in terms of both quantity and quality. Additionally, water scarcity can add another layer of difficulty, limiting the ability to provide vital irrigation during dry periods and reducing success rates.

On the financial viability front, agroforestry models face structural disincentives for small and marginal farmers. The long gestation period of many tree species delays income generation, often making farmers hesitant to invest in interventions with no short-term returns. Species such as fodder trees, nitrogen-fixing varieties, and firewood species, while ecologically beneficial, provide little to no direct cash income, reducing their perceived value to farmers focused on immediate livelihood needs. Market uncertainties also pose a significant risk—prices for timber, non-timber forest products, and horticultural produce are highly volatile, and the absence of price support mechanisms or assured procurement systems discourages long-term commitments. Furthermore, the initial costs of establishing plantations—such as fencing to protect against grazing, purchasing inputs, and labour—are often beyond the financial capacity of resource-poor households without external support.

5.2.4. Implementation Design and Human Resources

The agroforestry interventions in the landscape will be carried out through a collaborative, community-led framework designed to combine technical expertise, institutional systems, and local ownership. The approach highlights inclusivity, sustainability, and resilience, making sure the program provides long-term ecological, economic, and social benefits.

Approach

The agroforestry interventions will be carried out using a collaborative, bottom-up approach that combines ecological restoration with improving livelihoods. The strategy highlights local ownership, capacity building, and gradual adoption, making sure communities transition from initial hesitation to active engagement. The design concentrates on the following:

1. Effective resource management to lessen pressure on forests, soil, and water.
2. Diversification of farm income by integrating cash crops, fodder plants, fruit trees, and locally adapted species.
3. Strengthening local economies by analysing financial inflows and outflows at the village level to identify gaps and opportunities.
4. Holistic transformation connecting agriculture, forestry, livestock, and markets for long-term resilience and sustainability.

Institutional Mechanism

The program will leverage existing local and formal institutions to ensure effective delivery. Farmer-Producer Organisations (FPOs) will act as the main coordinating bodies, responsible for enrolling farmers, supporting nursery operations, and facilitating collective marketing and value addition. Nurseries will be managed by local entrepreneurs with support from FPOs, ensuring a steady supply of high-quality planting materials. Profit-sharing mechanisms will be established to sustain partnerships between entrepreneurs, FPOs, and farmers, promoting mutual benefits and long-term economic sustainability. Village Committees will serve as collective decision-making bodies, replacing external oversight with community-led governance for planning, resource allocation, and implementation. Custodian Committees for Forest Protection will be created at the village level to protect forests and align agroforestry activities with CFR and IFR rights.

Community Engagement

To promote community participation, Resource Farmers and Master Farmers will be trained to lead peer-to-peer knowledge transfer, which has proven more effective than external facilitation. Technically skilled Community Resource Persons will offer hands-on support to ensure smooth adoption of practices. Farmer Field Schools (FFS), exposure visits, and inclusive training programs will help build capacity across all segments of society, with a focus on women, landless households, single women, and persons with disabilities. Participatory exercises, including e-PRA, will guide community decisions on priorities, ensuring interventions address real needs and aspirations.

Technical Backstopping

Strong technical support will guarantee the success and sustainability of agroforestry projects. WASSAN's expert team will lead core efforts, offering ongoing guidance and oversight. Collaborations with research and academic institutions such as ICFRE, TFRI, IWST, NHB, agricultural universities, forest and horticulture departments, and KVKs will provide scientifically validated models and access to the latest innovations. Supporting Technical Agencies will be involved to help with community rights (CFR, IFR) and specialised forest management tasks. Research and feedback systems will be set up to improve practices and adapt interventions to changing climatic and socio-economic conditions.

Knowledge Management

Knowledge dissemination and learning will be integrated throughout the program. Localised training modules, customised to reflect indigenous farming systems rather than generic external models, will be developed. IEC materials in local languages, enhanced with pictorial guides, will ensure accessibility. Pico projectors will be provided to lead farmers for on-field demonstrations in villages. Continuous documentation of successes, challenges, and innovations will support learning exchanges at local and regional levels.

Sustainability

Mandatory farmer contributions will promote ownership and accountability. Entrepreneurship-focused nursery models will guarantee reliable supply chains and income beyond project durations. Multiple income sources from agroforestry will lessen reliance on external aid and strengthen resilience against climate and market shocks. Community institutions like FPOs and *Jangala Suraksha Sameeti* will ensure governance and oversight support. Integrated ecological restoration will align improved livelihoods with sustainable resource use, securing benefits for future generations.

5.3. Horticulture

Proposed Interventions

The horticulture activities will mainly focus on promoting organic vegetable cultivation using a cluster-based approach during the off-season. Priority will be given to irrigation patches developed by various departments to support this effort. Instead of relying on hybrid seeds, the program will emphasise open-pollinated seed varieties, which are better adapted to local conditions, more resilient to climate variations, and allow farmers to save seeds for several seasons. Open-pollinated seeds also require fewer external inputs than hybrids, helping increase farmers' incomes. On the other hand, hybrid seeds, created through the controlled cross-pollination of specific parent lines, must be purchased annually to maintain consistent yields. Vegetable cultivation will be carried out on 1,000 hectares, aligning with the government's mandate to promote vegetable cultivation in the landscape.

Alongside vegetable cultivation, orchard development (for horticulture crops like cashew, mango, banana, pomegranate, and floriculture) and PMKSY schemes will be implemented in collaboration with the horticulture department, with farmers receiving subsidies according to approved government funding standards. Regarding mechanisation, the focus will be on introducing innovative, small-scale machinery to reduce reliance on labour, lower costs, and save time. This will enable farm households to engage in other income-generating activities during peak seasons. Post-harvest infrastructure, such as pack houses for sorting, grading, and packaging, will be connected with vegetable clusters to ensure high-quality produce reaches the market. Approximately 50 pack houses will be established for this purpose. Additionally, decentralised cold storage facilities will be created at the weekly market level to prevent forced distress sales, thereby increasing farmers' incomes. A total of 20 cold storage units will be set up at the weekly haat level.

This approach combines organic and natural farming principles, with certification through the Participatory Guarantee System (PGS) and a gradual shift to natural farming in areas where synthetic fertiliser use is already low. Dedicated bio-input units will be set up to produce bio-fertilisers, bio-pesticides, and other organic products, giving farmers access to sustainable inputs alongside those available through government schemes. These efforts will facilitate a smooth transition to agroecological farming, improving soil health, increasing productivity, and enhancing household nutrition.

Additionally, connections will be made with government programs, schools, hostels, camps, and institutions to ensure a consistent demand for vegetables and fruits. As organic and natural farming expand, premium and distant markets will be targeted with support from APEDA. In later stages, farmers who fully switch to organic production will seek NPOP certification to access both national and international markets. The program will begin by distributing high-quality open-pollinated vegetable seeds to farmers in clusters to establish the foundation for production.

This component requires a mandatory contribution from farmers, promoting their ownership and accountability. This participatory method enhances the community's role in managing resources effectively, ensuring responsible use and long-term sustainability. By investing in this program, farmers not only benefit now but also secure lasting advantages for future generations.

5.3.1. Who will Implement

WASSAN, in collaboration with the Horticulture Department and FPO, will be responsible for planning, implementing, and monitoring the interventions.

5.3.2. Ecological, Economic, and Social Benefits

From an ecological perspective, these interventions are firmly based on agroecological principles, restoring and maintaining the health of the natural resource base. The emphasis on organic and natural farming practices improves soil fertility by boosting organic matter, microbial activity, and nutrient cycling, while reducing reliance on synthetic fertilisers and pesticides. This not only supports ecosystem restoration but also helps rebuild degraded soils. The choice of open-pollinated seed varieties ensures adaptability to local agroclimatic conditions, making the system more resilient to temperature changes, pest infestations, and disease outbreaks. The strategic use of irrigation patches developed by various departments further promotes efficient water use, thereby easing pressure on fragile water resources. By encouraging diversified vegetable cultivation, fruit orchards such as cashew, mango, banana, pomegranate, and pineapple, and localised bio-input production units, the program enhances agricultural biodiversity and fosters ecological stability. Additionally, by minimizing the use of chemical inputs and external resources, these interventions reduce environmental impact, contributing to climate change mitigation through lower emissions and healthier ecosystems.

The economic benefits of the horticulture program are equally significant. By promoting organic vegetable cultivation across 1,000 hectares and supporting orchard development, farmers will see higher productivity at lower input costs, increasing their profitability. The creation of 50 pack houses for sorting, grading, and packaging, combined with 20 decentralized cold storage units at weekly markets, addresses one of the most persistent challenges faced by smallholders—post-harvest losses and distress sales. These facilities ensure that produce reaches markets in better condition and at fair prices. Furthermore, by linking production clusters to local demand from schools, hostels, and other institutions, and facilitating access to premium markets through APEDA, the program expands market opportunities and supports higher price realization. Organic certification through the Participatory Guarantee System (PGS) and eventual adoption of NPOP certification will open national and international markets, unlocking additional income potential. Employment and entrepreneurship opportunities will emerge from bio-input production, orchard management, and post-harvest operations. At the same time, small-scale mechanization reduces labor drudgery, lowers production costs, and frees up time for farmers to engage in other income-generating activities. Importantly, diversification into vegetables, fruits, and organic farming reduces farmers' dependence on single crops, minimizing risks linked to price fluctuations and climate variability, and ensuring greater financial stability.

On the social front, the interventions strengthen community resilience, improve nutrition, and empower marginalized groups. The increased availability of vegetables and fruits directly enhances dietary diversity, providing households with safe, chemical-free, and nutrient-rich food. The cluster-based approach, coupled with mandatory farmer contributions, promotes collective responsibility and ownership, ensuring that resources are used efficiently and managed sustainably. Inclusivity is a key principle of the program, with active participation encouraged from women farmers, smallholders, and disadvantaged households, ensuring that benefits are fairly distributed across the community. Training initiatives in organic cultivation, post-harvest management, and market linkages build farmers' skills, enabling them to become self-reliant and better prepared to navigate changing climatic and market conditions. By creating sustainable, year-round income opportunities through vegetable cultivation, orchards, and value addition, the program also reduces distress-driven migration, helping families stay in their communities and improving overall rural well-being.

5.3.3. Technical Feasibility and Financial Viability

From a technical feasibility perspective, irrigation remains a major challenge. Although some irrigation patches have been established, large parts of the landscape still depend on unpredictable rainfall, making year-round vegetable and orchard farming uncertain, especially in upland and remote areas. The availability and timely delivery of high-quality open-pollinated seeds and saplings is another obstacle, as current systems are often fragmented, leading to poor germination rates and low survival of orchard species. Transitioning to organic practices adds further complexity, as farmers have limited access to effective bio-pesticides and lack sufficient knowledge of Integrated Pest Management (IPM), leaving crops vulnerable to pests and diseases. Additionally, maintaining essential infrastructure like pack houses and cold storage units in remote tribal areas requires skilled technicians, a reliable energy supply, and ongoing maintenance. Farmers also need continuous training in orchard management, pruning, pest control, and post-harvest handling; without this, reaching productivity and quality goals will be difficult. Moreover, certain proposed crops such as pomegranate and banana may face site-specific issues like poor soils, waterlogging, or extreme temperatures.

From a financial standpoint, the high upfront costs of establishing orchards, building cold storage facilities, and setting up bio-input units create significant obstacles for small and marginal farmers, even when subsidies are available. The delayed payoff from perennial crops like cashew, mango, and pomegranate can discourage resource-poor households that need quicker income. Market volatility adds to the uncertainty; while premium markets are targeted, volatile prices for fruits and vegetables can hurt profits without price stabilization tools or guaranteed procurement. The long-term sustainability of infrastructure such as pack houses and cold storages also depends on steady production levels and good management—factors that are not assured in scattered, smallholder systems. Moreover, certification under PGS or NPOP, although crucial for accessing high-value markets, involves costs and compliance burdens that many farmers may struggle to sustain without strong institutional support. Finally, heavy reliance on subsidies and external funding raises concerns about the long-term viability once such support diminishes or stops.

5.3.4. Implementation Design and Human Resources

Approach

The program adopts a holistic, bottom-up approach that combines traditional practices with modern innovations. It prioritizes access to quality inputs, proven technologies, and ongoing research while focusing on farmer empowerment and localized solutions. The approach aims to align horticulture with agroecological principles, thereby reducing dependency on external inputs and promoting sustainable production systems. It positions horticulture as a viable and profitable livelihood, particularly for

smallholders and youth. It ensures that farmers transition toward improved practices through a phased, inclusive process that builds trust and ownership.

Institutional Mechanism

WASSAN's expert team will lead interventions by providing guidance, coordination, and integration with broader landscape-level efforts. Farmer Producer Organizations (FPOs) will serve as primary platforms, enrolling farmers, facilitating access to inputs, and managing business operations related to horticultural commodities. Youth-led entrepreneurship will be encouraged, supporting young individuals in managing business activities such as value addition, aggregation, and marketing. Regional Councils will oversee organic certification under the Participatory Guarantee System (PGS), ensuring compliance with state and national standards. Partnerships with agricultural universities, research institutions, departments of horticulture, and KVKs will offer technical expertise and connect farmers to suitable agro-climatic practices.

Technical Backstopping

Customized training modules will be developed specifically for local farming conditions. Community Resource Persons (CRPs) with technical skills will provide hands-on support, ensuring timely guidance to farmers. Master farmers and resource farmers will be nurtured to lead farmer-to-farmer knowledge sharing, encouraging peer learning and wider adoption. Bio-input units will be established to supply sustainable inputs such as bio-fertilizers and bio-pesticides, reducing dependence on external sources. Digital tools—mobile advisories, e-marketing platforms, and decision-support systems—will be integrated to make horticulture more efficient, market-oriented, and appealing to the younger generation.

Community Engagement

A participatory, bottom-up approach will ensure farmers' voices are at the heart of planning and implementation. Farmer Field Schools (FFS) and exposure visits will serve as platforms for hands-on learning, collective action, and sharing knowledge. IEC materials in local languages, enhanced with visuals, will help improve understanding and encourage the adoption of practices. Lead farmers will use pico projectors for village-level demonstrations, making learning more accessible.

Sustainability

The interventions will strengthen local ecosystems by reducing dependency on external inputs and revitalizing natural resources. Farmers will be encouraged to contribute financially to key activities, fostering ownership and accountability. Market linkages, value addition, and certification will ensure economic viability, while youth engagement will help maintain practices. By building resilient farmer institutions and promoting diversified, climate-resilient horticulture, the program will secure steady incomes, food security, and improved nutrition for communities, supporting ecological restoration and long-term rural prosperity.

5.4. Animal Husbandry

Proposed Interventions

Under Animal Husbandry, the focus will be on developing multilayer integrated backyard farms and promoting goat shelters with proper feed and fodder arrangements at the household level. 3,000 such

farms will be established in the first 7 years of the intervention. The multilayer farms will incorporate poultry night shelters, azolla pits, compost pits for waste recycling, low-cost irrigation systems, vegetable cultivation, orchards, cereals and legumes, and fodder plants. Together, these components will create a balanced ecosystem that enhances animal productivity, reduces disease incidence, promotes circularity and synergy in animal health, and provides diversified income. Additionally, year-round cultivation will decrease dependence on market purchases, while improving dietary diversity and nutritional security.

Special emphasis will be placed on indigenous poultry, goats, and draft animal healthcare to boost income, while goat shelters will be promoted to ensure disease-free rearing environments. These shelters will also have fodder arrangements and improved feed mixtures made from local resources, allowing for faster growth compared to traditional methods. Instead of procuring improved breeds, the program will focus on strengthening indigenous breeds through improved practices with minor modifications. In reservoir-adjacent areas, backyard duck rearing will also be encouraged as an additional income source.

High mortality rates caused by inconsistent vaccination will be addressed by establishing a decentralized vaccination system. This will involve training local vaccinators, providing hybrid vaccine chambers at decentralized locations, and supplying vaccine carriers, along with covering vaccine costs for the first three years to facilitate adoption. Ethnoveterinary practices will be promoted as affordable, eco-friendly, locally available methods of animal healthcare, reducing reliance on external medicines while preserving biodiversity through the use of local plant species. The infrastructure development will cost INR 25,00,000. The operational cost for vaccination will be INR 15,00,000 for the first three years.

For marketing, collective models will be introduced, initially engaging local traders to gain experience before expanding to larger markets. Cross-border markets in Andhra Pradesh and local hubs will be developed, especially for goat and sheep trading. Additionally, livestock insurance will be linked with existing schemes of the Department of Animal Husbandry & Veterinary Services, Government of Odisha, to protect farmers' investments.

Ecologically sustainable shelter models for livestock will be implemented on a limited scale, as farmers increasingly choose climate-resilient and durable housing structures for their animals. Traditional shelters made from bamboo or *bullah* tend to have a shorter lifespan and become less preferred over time. With a shift towards larger, more permanent shelters that support better animal care, the focus will be on constructing cemented structures.

The component is designed to require mandatory farmer contributions, thereby encouraging ownership and accountability within the community. This participatory method enhances the sense of responsibility in resource management, ensuring their effective use and long-term sustainability. By contributing, farmers not only invest in the current intervention but also help guarantee the ongoing benefits for future generations.

5.4.1. Who will implement

WASSAN will be responsible for planning, implementing, and monitoring the assignment, and will collaborate with the Animal Husbandry department.

5.4.2. Ecological, Economic and Social Benefits

Backyard farms that use multiple layers and systems are a great example of regenerative and circular farming. By bringing together poultry shelters, azolla pits, compost pits, and systems that combine crops and livestock, these farms make the most of nutrients, reduce their reliance on outside inputs,

and improve soil health by using organic waste. Adding fodder crops and legumes helps cover the ground and prevents soil erosion, while using local plants and practices keeps animals healthy and reduces the need for synthetic medicines. This focus on local breeds and plants also helps preserve genetic diversity. The use of sturdy, cemented shelters that can withstand harsh weather also helps reduce the pressure on forests and materials like bamboo, which in turn helps stop deforestation and keep the landscape healthy.

These interventions bring economic stability by diversifying income sources. By integrating backyard farms, farmers can earn multiple income streams from raising poultry, goats, ducks, vegetables, and fodder. This reduces their reliance on a single source of income and protects them from market fluctuations. Better feed and disease management practices boost animal productivity, resulting in higher yields of meat, milk, and eggs. Decentralized vaccination systems also lower livestock mortality, safeguarding farmer investments. By linking up with collective marketing models and cross-border trade hubs, farmers gain access to profitable markets. Additionally, livestock insurance schemes help mitigate financial risks, encouraging farmers to invest with confidence in animal husbandry. By reducing reliance on external feed and market purchases, households can lower their expenses. Meanwhile, opportunities in value-added products and entrepreneurship can strengthen the rural economy and create jobs.

On a social level, these interventions promote nutritional security, especially for vulnerable households, by making eggs and meat available throughout the year, alongside a variety of food crops. By involving farmers in the design process, the program encourages a sense of ownership, accountability, and shared responsibility, helping to build strong community institutions. Training local vaccinators and sharing traditional veterinary knowledge also empowers communities by giving them valuable skills, promoting self-reliance, and preserving important cultural traditions. Women, who often care for small livestock, gain significant opportunities to improve their income, make decisions, and have a greater say in their households and producer groups. Additionally, by providing stable, diversified incomes that reduce migration pressures, these interventions strengthen family relationships and community bonds, setting the stage for long-term resilience and well-being.

5.4.3. Technical Feasibility and Financial Viability

The region's geography poses a significant obstacle to effective implementation. The inadequate road network, with many villages only reachable via dirt roads, hampers the timely delivery of veterinary services and vital animal healthcare. The distance from major markets adds to the difficulty of supplying inputs like vaccines, feed supplements, and equipment. Frequent power outages disrupt essential infrastructure, including cold storage facilities for vaccines and other veterinary supplies.

Farmer-level adoption challenges still exist. Many farmers are hesitant to adopt multi-layer integrated farms because they require changes to traditional feeding practices and the promotion of fodder trees in their backyards, which some view as inconvenient or resource-intensive. To overcome these barriers and ensure the proposed productivity-enhancing practices are widely adopted, ongoing engagement and capacity-building will be crucial.

From a financial perspective, livestock livelihoods in the region remain fragile. Farmers face seasonal market fluctuations that cut into profits and discourage investment. The lack of strong value chains and heavy dependence on middlemen further reduces returns, leaving farmers with little bargaining power. Financial security mechanisms are also underdeveloped. The low uptake of livestock insurance exposes farmers to devastating losses in cases of disease outbreaks or mortality. Limited access to affordable credit worsens this vulnerability, as farmers often cannot recover quickly from shocks or invest in improved practices. Without interventions to stabilize markets, strengthen value chains, and

provide accessible financial services, the long-term viability of animal husbandry enterprises will stay uncertain.

5.4.4. Implementation Design and Human Resources

Approach

The program will use a bottom-up, participatory approach, utilising local resources and ensuring community ownership. It will focus on creating multi-layered integrated backyard farms and better goat shelters with comprehensive feed, fodder, and healthcare plans. The approach merges traditional ethnoveterinary methods with modern veterinary support, forming a low-cost, eco-friendly, and culturally appropriate model. Emphasis will be on gradual adoption, building trust through early successes, and expanding efforts as community confidence increases.

Institutional Mechanism

Farmer Producer Organizations (FPOs) will serve as the leading institutions, supporting input supply, aggregation, collective marketing, and financial linkages. They will also act as business platforms for youth-led enterprises in animal husbandry. At the village level, collective village committees will guide planning, prioritization (using participatory tools like PRA), and oversight of interventions. These committees will also ensure alignment with community needs, equitable benefit-sharing, and the integration of livestock activities into broader resource management strategies.

Technical Backstopping

Technical support will be led by WASSAN's team of experts, working closely with Veterinary Departments, Agricultural Universities, research institutions, and Krishi Vigyan Kendras (KVKs). Decentralized veterinary services will be established through hybrid vaccine storage units, ensuring timely access to vaccines and medicines. Trained personnel, including local youth and Prani Mitras (under Odisha Livelihood Mission), will deliver vaccination, basic healthcare, and emergency assistance, reducing dependence on distant veterinary facilities. Ethnoveterinary practices will be incorporated into training modules, enabling households to manage common diseases with locally available resources. A business plan will be developed to ensure the financial sustainability of health services, with revenues reinvested into maintaining local veterinary infrastructure.

Community Engagement

Resource and Master Farmers will be trained to lead farmer-to-farmer knowledge sharing, ensuring locally relevant solutions and trust-based adoption. IEC materials in local languages, with visuals and demonstrations using Pico projectors, will make technical information accessible. Special attention will be given to women farmers, landless households, persons with disabilities, and single women—ensuring that benefits reach marginalized groups. Village committees will oversee collective marketing, resource mobilization, and conflict resolution, positioning the community as the program's custodian.

Knowledge Management

Customized training modules will be created, rooted in local practices and enhanced with scientific insights. Farmer Field Schools (FFS) and exposure visits will boost practical skills in animal health, nutrition, and management. Collaborations with research institutions will support ongoing innovation while documenting best practices for replication across the landscape.

Sustainability

Economic sustainability will be achieved through diverse income sources like meat, eggs, compost, and vegetables, as well as market connections. Community resource persons, empowered FPOs, and community-managed veterinary systems will support institutional sustainability. Ecological sustainability will be maintained by promoting integrated, low-input farming methods and reducing deforestation caused by traditional shelter construction.

5.5. Natural Resource Management

Proposed Interventions

The focus will be on developing diversion-based and solar-powered irrigation infrastructure, with an emphasis on micro irrigation systems. The area has abundant upstream water resources that can be tapped, and with the help of a subsurface pipe network, an irrigation system can be established to water the command area across varied terrain and slopes easily. Similarly, where electricity is unavailable, solar-powered irrigation can be implemented. In addition to micro-irrigation, integrated watershed development, farm ponds, water harvesting structures, and solar-powered micro-river lift projects will be carried out in coordination with various schemes from the Government of Odisha and the Government of India. The infrastructure created will be linked to crop production, organic vegetable cultivation, and horticulture activities.

The proposed interventions require mandatory contributions from farmers, which fosters ownership and accountability in the community. The participatory method fosters a sense of responsibility in resource management, ensuring that resources are used effectively and sustainably in the long term. By contributing, farmers not only invest in the current intervention but also help secure ongoing benefits for future generations.

5.5.1. Who will implement

WASSAN will primarily be responsible for planning, carrying out, and monitoring the interventions.

5.5.2. Ecological, Economic and Social Benefits

These interventions significantly improve the ecological health of the landscape by promoting efficient use and conservation of vital natural resources. Measures such as diversion-based irrigation, solar-powered micro-irrigation systems, integrated watershed management, and water harvesting structures collectively enhance groundwater recharge, soil moisture retention, and soil fertility, while decreasing over-extraction of water resources. They help build climate resilience by lessening the adverse effects of unpredictable rainfall, droughts, and dry spells, and support biodiversity restoration through increased vegetation cover and reduced stress on fragile ecosystems.

The development of reliable and sustainable irrigation infrastructure directly boosts agricultural productivity and income. Farmers gain the ability to diversify crops, use multiple cropping systems, and reduce reliance on unpredictable rainfall, thereby lowering the risk of crop failure. Higher yields lead to increased farm incomes, while building and maintaining water infrastructure create local jobs. By providing a steady water supply, these efforts support the growth of related sectors like horticulture and livestock, promoting long-term economic stability for farming households.

Socially, these interventions act as a catalyst for community empowerment and inclusive growth. Creating and strengthening Water User Groups promotes collective action, participatory resource

management, and fair water distribution. Year-round water access reduces distress migration, ensuring stable livelihoods and keeping families together. Women and marginalized farmers particularly benefit through better access to productive resources, increased participation in decision-making, and more income opportunities. By securing livelihoods and ensuring resource fairness, these measures support social cohesion, resilience, and overall community well-being.

5.5.3. Technical Feasibility and Financial Viability

The main technical challenge involves operating and maintaining water infrastructure, which heavily relies on the effectiveness of Water User Groups (WUGs). While these systems are meant to be sustainable, they need regular maintenance, timely repairs, and coordinated management. Poor community participation or a lack of technical knowledge within WUGs can threaten the systems' functionality. Solar-powered irrigation systems struggle during cloudy or low-sunlight days, which impacts their efficiency. Additionally, maintaining these systems requires a skilled workforce familiar with solar technologies—an area often lacking in remote regions. Integrated watershed management depends on scientific planning, careful soil and water conservation, and active community involvement to work well. Without these, structures may not deliver the expected benefits. Farm ponds and water harvesting structures face technical problems like seepage, evaporation, and site-specific limitations that can reduce their effectiveness. Similarly, electric irrigation systems face challenges due to unreliable power supply, making them less feasible in many areas.

Financially, these interventions require significant upfront investment in infrastructure such as solar panels, pipelines, farm ponds, and watershed structures. While they offer long-term benefits, the delay between investing and seeing returns can discourage small and marginal farmers. Maintenance costs also present challenges. Solar systems, although inexpensive to operate, need periodic servicing and part replacements. Farm ponds and watershed structures incur ongoing costs for desilting, repairs, and water management. Electric-based irrigation adds recurring electricity expenses, further burdening farmers. During years with unpredictable or low rainfall, the economic feasibility of these projects drops sharply, as structures like farm ponds may remain underused, making it difficult to recover costs.

5.5.4. Implementation Design and Human Resources

Approach

The program adopts a bottom-up, participatory approach that emphasizes community ownership and sustainable resource management. Interventions such as diversion-based irrigation, solar micro-irrigation, watershed development, and farm ponds will be integrated with agricultural and livelihood programs to maximize impact. The approach highlights gradual adoption, acknowledging initial community hesitation, and ensures interventions build on existing practices with minor technological improvements.

Institutional Mechanism

Farmer Producer Organizations (FPOs) will function as the main institutional framework, coordinating the planning, implementation, and management of NRM activities. Village-level collective committees will oversee resource management, replacing the need for separate committees. Within these groups, Water User Groups (WUGs) will be established to manage irrigation infrastructure, ensuring fair access and long-term functionality. Bylaws will specify member responsibilities, leadership roles, election procedures, and system operation protocols. These committees will also lead participatory exercises, including PRA, to determine priorities for interventions that match local needs.

Technical Backstopping

Experts from WASSAN will lead the program, providing high-quality technical guidance and fostering ongoing innovation. Community Resource Persons (CRPs) with specialized skills will offer hands-on support in the field. Resource and master farmers will promote farmer-to-farmer knowledge sharing, a proven method to boost adoption. Collaborations with agricultural universities, research institutions, and the Water Resources Department will ensure continuous technical input on water budgeting, irrigation technologies, and soil-water conservation practices.

Community Engagement

Community engagement in natural resources management interventions will be ensured through the WUGs and FPOs.

Knowledge Management

IEC materials will be created in local languages with rich visual content. Lead farmers will use PICO projectors to demonstrate better practices. Customized training modules will target local challenges and offer solutions. Farmer Field Schools (FFS) and exposure visits will develop technical and managerial skills, ensuring hands-on learning and skill growth.

Sustainability

Long-term sustainability will be achieved through strong community ownership backed by mandatory farmer contributions, which foster accountability. WUG's capacity will be developed to ensure proper operation, maintenance, and water stewardship. Integrating NRM with livelihoods will boost productivity and income.

5.6. Biodiversity

The landscape project focuses purposefully and practically on biodiversity relevant to agriculture, highlighting species and ecological functions that directly support farming systems. At the start of the project, a team of agrobiodiversity experts will visit the landscape and map beneficial agrobiodiversity in terms of crops, trees, pollinators (e.g., bees, butterflies), pest predators (e.g., birds, insects), soil organisms (e.g., earthworms, microbes), amphibians (e.g., frogs), and livestock breeds. This team will improve the biodiversity register and other documentation using participatory methods and traditional knowledge to update the People's Biodiversity Register (PBR), recording habitats, landraces, and community practices. They will help identify key ecosystem services provided by local biodiversity, such as pollination, pest control, soil health, and water management, and suggest ways to boost agriculture-related biodiversity in the landscape. They will also assist in identifying and managing organisms that are not beneficial, including invasive species and pest hosts. Additionally, the team will work to strengthen the capacity of local students and youth to monitor and document biodiversity using participatory tools, including registers, species surveys, and digital platforms.

As part of this, a *Biodiversity Volunteering and Management Programme* will be introduced, engaging trained community representatives who will function as a local cadre to regularly monitor, record, and support the management of biodiversity in their areas, ensuring continued community participation and long-term stewardship of local ecosystems.

5.7. Other Interventions

Proposed Intervention

Apart from the initiatives proposed across various sectors, some other interventions relevant to agroecological development will also be implemented. The focus will be on establishing primary processing infrastructure for crops and commodities. Given the challenges of frequent power fluctuations, hybrid models will be promoted, although rising electricity tariffs remain a concern for operating these units initially. The initiative will encourage rural youth entrepreneurs to lead these enterprises, creating livelihood opportunities. Initially, processing will concentrate on basic activities such as sorting, grading, polishing, and packaging, rather than high-value addition, which can be explored later through appropriate government schemes. The goal is to create a platform where produce can undergo primary processing and reach both domestic and international markets with certification standards. With the promotion of organic farming, opportunities will also be created for distant markets through agencies such as the Agricultural and Processed Food Products Export Development Authority, Odisha State Agricultural Marketing Board, Tribal Development Cooperative Corporation of Odisha Ltd., MARKFED, and TDCCOL. Online trading platforms may also be considered alongside local collaborations with schools, colleges, hostels, and institutions for supply. Both major crops and minor NTFPs will be included.

Instead of establishing additional custom hiring centres, focus will be on small-scale farm machinery by conducting research and making modifications to ensure they are user-friendly, affordable, eco-friendly, and easy for adoption, especially by women who spend more time in agriculture and related activities. These improved tools and small machines will be promoted through entrepreneurship models, emphasising design, repair, and accessibility for small and marginal farmers at minimal cost. The same approach will be used for primary processing infrastructure to ensure portability, energy efficiency, multi-crop capability, safety, labour savings, and low maintenance.

Additionally, a revolving fund will be provided to FPOs for business operations while supporting microfinance activities at the village level. Microfinance will foster trust between producers and FPOs, thereby enhancing their bargaining power during procurement. Farmers tend to rely more on those who offer timely support, making prompt engagement essential. During marketing, certified produce will command higher prices, encouraging more farmers to participate. Since immediate liquidity is crucial for FPOs to procure directly from the farm gate, access to stable working capital will not only guarantee timely payments to farmers but also help prevent exploitation by middlemen. Other procurement models may also be developed to strengthen this process.

5.7.1. Who will implement

WASSAN will mainly be responsible for planning, implementing, and monitoring the interventions. WASSAN will collaborate closely with the FPOs and the government departments mentioned above.

5.7.2. Ecological, Economic, and Social Benefits

The tools developed under the program will be more environmentally sustainable, as they are customized for different land types, soil conditions, and harsh weather. Farmers will be able to access these tools either by purchasing them directly or by paying user fees, as businesses are planned for their distribution and management. The focus on eco-friendly, energy-efficient, and portable machinery reduces carbon emissions, minimizes power dependence.

The initiative provides income opportunities for rural youth and women through entrepreneurship models, helps farmers get better prices by meeting certification standards, and reduces reliance on exploitative middlemen through direct procurement and online trading platforms. It also enhances local value chains, diversifies farmer income, and boosts competitiveness in distant and export markets.

The model builds trust between farmers and FPOs by ensuring instant payments, enhances women's participation in agriculture through accessible tools, and promotes collective action at the village level. Collaborations with schools, hostels, and institutions for supply also foster community integration, while microfinance activities empower producers with financial inclusion and bargaining power.

5.7.3. Technical Feasibility and Financial Viability

Existing machinery is bulky, crop-specific, and not user-friendly, and requires modification. The skills needed to operate and repair the machines add an extra layer of challenge. High initial investments for infrastructure, machinery modifications, and certification standards, along with rising power tariffs, make early-stage operations costly. Since the initial focus is on basic processing such as sorting, grading, polishing, and packaging, returns stay low compared to value-added products, putting pressure on cash flow. Additionally, uncertainty in accessing external and distant markets through various agencies and online platforms increases the risk. Limited access to affordable finance, especially for rural youth and women entrepreneurs, remains a critical bottleneck, affecting the long-term sustainability of these efforts. Furthermore, there may be trust issues from farmers' side, as introducing a new framework could make them hesitant, especially considering their longstanding relationships with local buyers.

Farmers may also be hesitant to supply their produce if FPOs cannot provide immediate payments in the early stages, making grant-based support essential. Building trust will largely depend on ensuring payments are made on time. From a financing standpoint, there is also the risk that some farmers may default on repayments, highlighting the need to create diverse income opportunities at the household level to enhance financial resilience. Additionally, researching and developing small-scale farm machinery and equipment will take time, as it involves repeated testing by users and developers, along with ongoing impact assessments before final adoption. Collaboration with local schools and institutions may face obstacles, since procurement in many such platforms requires tenders, which FPOs often lack experience in effectively participating. Moreover, delayed payments under current government systems can further strain FPOs' cash flow, making it harder for them to engage confidently in such arrangements.

5.7.4. Implementation Design and Human Resources

FPOs will play a central role in implementing these interventions. Potential entrepreneurs, especially rural youth willing to invest, will be encouraged to take the lead. WASSAN will anchor this initiative, leveraging its extensive experience in machinery development and in modifying existing primary processing equipment to make it more gender-friendly and accessible for women. For machinery development, partnerships will be formed with institutions such as the Odisha Farm Machinery Research and Development Centre (OFMRDC), the College of Agricultural Engineering & Technology (CAET), OUAT, and the Farm Machinery Training & Testing Institutes (FMTTIs). Overall, the initiative will adopt a multi-stakeholder and multi-level approach, bringing together the expertise of researchers, universities, experts, and farmers on a common platform.

5.8. Nutrition

5.8.1. Community-based Nutrition Education

To A preliminary assessment of diet diversity and quality in the three landscapes reveals that, while dietary diversity is relatively high, indicating access to a variety of food groups, there is also an unexpectedly high consumption of snacks, processed foods, and sugar-sweetened beverages. This trend is shocking, given that these areas are remote, which have historically been less exposed to the commercial food industry.

These findings highlight the need to address the double burden of nutrition, promoting healthy, diverse diets while also reducing the consumption of ultra-processed and unhealthy foods. Interventions promoting healthy diets are critical as these communities are likely in the midst of a nutrition transition. Consequently, interventions in these regions must be designed to address both dimensions.

Education-based interventions have been planned for the landscape, aiming to build awareness and shift everyday food choices. Targeted programs within communities include school programs, community-based awareness campaigns, and training of government frontline workers.

Feasibility

Technical Feasibility and Financial Viability Considerations

- In the context of agroecological landscapes in India, education-based strategies must be locally relevant and community-driven.
- Success depends on the quality, accessibility, and cultural relevance of behaviour change materials, as well as the capacity of local actors to deliver consistent messaging.
- Cost-efficiency can be improved by integrating nutrition training with ongoing capacity-building efforts for government functionaries and women leaders in the landscape.

Potential Risks and Unknowns:

- Resistance to behaviour change may occur due to ingrained food habits or social norms. Community-led action to reinforce healthy diets and curb the rise of non-communicable diseases is critical to the success of these strategies.
- Effective monitoring and periodic reinforcement are needed to ensure sustainability and scale.

Ecological, Economic, and Social Benefits

Social Benefits

- Improved public health and nutrition outcomes through reduced consumption of ultra-processed foods and better-informed dietary choices.
- Empowerment of women leaders and frontline workers through skill-building and increased visibility in the community.
- Enhanced intergenerational impact through school-based education, potentially shifting dietary behaviours from a young age.

Economic Benefits

- Improved dietary practices with long-term adherence can contribute to reduced health expenditures at the household level over time.

Implementation Design and HR

Implementation is planned over 5 years, with phased roll-out starting with content development and initial training in Year 1, followed by implementation and periodic reinforcement. Beyond the five years, nutrition-related interventions and community engagement can be implemented by local stakeholders and the community based on their specific needs.

How Will It Be Implemented?

A multi-level behaviour change strategy will be used, focusing on education and community-led action:

- **School Programs**
  - Children will learn to identify healthy foods and understand the harms of processed and sugary foods.
- **Community-based Awareness Campaigns**
  - Led by trained women leaders inspired by successful models like *Health Karyakarta* (Deccan Development Society) and *Poshan Vanitha* (WASSAN).
- **Training Frontline Government Workers**
  - ASHAs, Anganwadi workers, and schoolteachers will be trained as key influencers of nutrition.
- **Supportive Materials**

  To implement this strategy effectively, financial support is required for the development and testing of resource material, training programs, and behaviour change campaigns within the community. These interventions should be supported by a suite of accessible, high-quality resources, including:

  - Nutrition-focused school curriculum materials,
  - Practical guides and flipbooks for frontline workers, and
  - Audio-visual content (radio, short videos) is periodically developed and disseminated in local languages, ready for circulation via WhatsApp or community screenings.

Key Stakeholders in Implementation

- Anchor Organisations in each landscape will lead coordination and oversight.
- Trained women leaders leading community-based awareness efforts
- Frontline government workers (ASHA, Anganwadi workers, schoolteachers), and local schools will implement ground-level activities.
- Nutrition experts will be engaged for content development.
- District Administration will support the integration with existing schemes, providing policy and budget support.
- The Gram Panchayat will support ground-level implementation, mobilise other stakeholders, and facilitate community engagement.

Additional Human Resources Required

- Nutrition communication specialist (content development and training)
- Audio-visual content creator (local language expertise)
- Community facilitators (to coordinate school and village-level efforts)

Institutions Required, If Any

No new institutions are proposed; the intervention will leverage existing public health and education systems.

5.8.2. Agroecology in Schools: Integrated Food and Farming System Curriculum

The children today are growing far away from the idea of how their food is grown and where it is coming from. There is a need for generating an environmental literature in today's school curriculum enabling the students to learn about their food, how it is grown, what sources are being used, and various other environmental issues.

The Solution: Learning Rooted in Life

This intervention takes from a solution designed by the Centre for Sustainable Agriculture (CSA), Hyderabad, in collaboration with Help Us Help Them (HUHT), Kolkata, launched a pioneering initiative at Adhigam Bhoomi, a residential school for 1000 underprivileged girls in West Bengal. The goal: to integrate food and farming systems into the formal school curriculum, turning the act of growing food into a core learning experience.

The solution positions farming not as a peripheral vocational option, but as a core knowledge system with cross-disciplinary value. By aligning classroom education with hands-on agricultural practice, the curriculum promotes:

- Environmental literacy
- Understanding of food systems
- Healthier food habits
- Life skills and teamwork
- Emotional and psychological development

Primary Objectives

- To design and implement an age-appropriate food and farming curriculum for children aged 6–16 years (Grades 1–10)
- To promote food literacy, healthy food habits, and nutrition security
- To connect academic subjects with practical farming experiences
- To build environmental consciousness and local market awareness
- To develop leadership, responsibility, and teamwork among students
- To create a learning ecosystem that supports holistic child development

Strategy and Implementation Plan

1. **Curriculum Development**
   - CSA has developed a full curriculum framework and prepared teacher and student manuals for Grades 1 to 10, reaching to 1000 girls, from the backward classes in the Sundarbans district of West Bengal.
   - Curriculum is divided into three categories with different themes:
     1) Understanding Food for children aged 6 to 8 years
     2) Natural resources, health & nutrition, biodiversity, ecosystems, for children aged 9 to 12 years and
     3) Understanding local agriculture and hands-on experience in farming for children aged 13 to 15 years.

2. **Teacher Training and Support**
   - Teachers from HUHT's residential school were trained by CSA.

3. **Field-Based Learning**
    - Students engage in hands-on activities such as soil preparation, sowing, weeding, harvesting, and basic cooking.
    - The curriculum integrates with the NIOS academic framework, ensuring learning continuity while innovating pedagogy.

4. **Linking Home and School**
    - Students return to their villages for two months annually and apply their learning at the household or community level, reinforcing practical knowledge.

The project envisions a future where every child learns not just how to read and write, but also how to grow food, eat well, and care for the planet. By integrating food and farming into mainstream education, we nurture children who are healthier, wiser, and more connected to their environment.

This Integrated Learning is not just a curriculum—it is a philosophy of education that roots learning in the soil, shapes it through experience, and harvests it in the form of healthier, more resilient future generations.

5.9. Enterprise Development

5.9.1. Promotion of Enterprise Models

To foster enterprise, drive economic development, and inspire youth, we suggest a dedicated investment of ₹1 crore. This investment could be channelled to a specialised agency (which could also be an anchor organisation) tasked with implementation. It is proposed that the funding be phased over three years, with approximately ₹33 lakhs released annually, contingent on achieving key project milestones. These funds would be intended to cover the agency's operational costs and provide technical expertise for enterprise development.

This would support the creation of a strong local team, including a manager, coordinators, and field staff, who would provide hands-on support to new businesses. The aim is to establish 8-10 diverse, economically viable, and environmentally friendly enterprises. A portion of the funds would also be allocated for crucial activities such as training, branding, and integrating clean energy solutions like solar power to enhance profitability and sustainability. The ultimate goal of this proposed investment is to build resilient local economies and empower rural communities, with a particular focus on women and young people.

Examples of the types of enterprises that could be supported include:

- Primary Processing Units: Small-scale, community-run units for milling rice, pulses, and oilseeds, often powered by renewable energy.
- Millet and Ready-to-Eat (RTE) Enterprises: businesses that process local millets into flour, snacks, and other value-added food products for local and urban markets.
- Renewable Energy-Powered Enterprises: Using solar or other clean energy to power irrigation, processing units, and other agricultural equipment to reduce fuel costs and improve productivity.

PART 2 – INVESTMENT PLANNING FOR INTERVENTIONS

The linked plan provides a detailed and consolidated overview of investments and their breakdowns for Chitrakonda's agroecological transformation plan over the total implementation period. The implementation cost for each intervention in each domain, as well as a breakdown of the expenses from primary sources, including community contributions, government scheme convergences, grants, debt, and guarantees, has been calculated and presented categorically.

INVESTMENT PLAN FOR AGROECOLOGICAL TRANSFORMATION IN CHITRAKONDA


FACTAMFOS
20-20-0

CHAPTER 6

Landscape Investment Plan for Chitrakonda

6.1. Introduction to the Investment Framework

The landscape investment plan for Chitrakonda block in Malkangiri district, Odisha, represents a comprehensive strategy for agroecological transformation across 287 villages spanning approximately 570 square kilometres. This investment framework addresses the unique challenges of a landscape emerging from decades of isolation and conflict, while capitalising on its rich biodiversity, strong tribal cultural heritage, and recent infrastructure improvements following the 2018 completion of the Gurupriya Bridge.

The investment plan is structured around four thematic areas as detailed in the previous sections. The **total investment requirement stands at ₹66.37 crores** (net investment after government funds and community contributions), with implementation phased over three stages to ensure sustainable adoption and institutional capacity building.

6.2. Investment Architecture and Financing Strategy

6.2.1. Overall Investment Structure

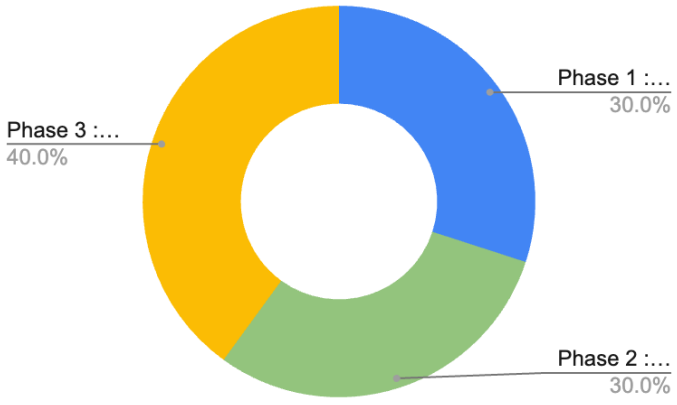

Fig. 6.1 – Overall Investment Structure

The total cost of the agroecological transformation program is estimated at ₹114.69 crores, with ₹25.26 crores available through existing government schemes and ₹23.06 crores as community contribution, leaving a net investment requirement of ₹66.37 crores. **The investment requirement of ₹66.37 crores leverages ₹48.32 crores in combined government and community resources, achieving a 1:0.73 ratio that amplifies impact while ensuring local ownership and sustainability.** The full details can be found in the sheet here. This investment is distributed across three implementation phases:

- **Phase 1 (Years 1-3)**: ₹19.91 crores, focusing on establishing foundational infrastructure, capacity building, and piloting key interventions
- **Phase 2 (Years 4-6)**: ₹19.91 crores for scaling successful models and strengthening institutional frameworks
- **Phase 3 (Years 7-10)**: ₹26.54 crores for full-scale implementation and sustainability mechanisms

The financing mix employs multiple instruments tailored to intervention types, CSO maturity and target population capacities. Grants comprise the largest share for capacity building and non-revenue generating activities, while returnable grants, results-based financing, and debt instruments support productive investments. Guarantee mechanisms and interest subventions are strategically deployed to de-risk private investments and reduce the cost of capital for smallholder farmers and community institutions.

6.2.2 Financing Instruments and Allocation

The investment plan utilises six primary financing instruments, each serving specific purposes within the agroecological transformation:

Grants (Technical Assistance/Pilots)

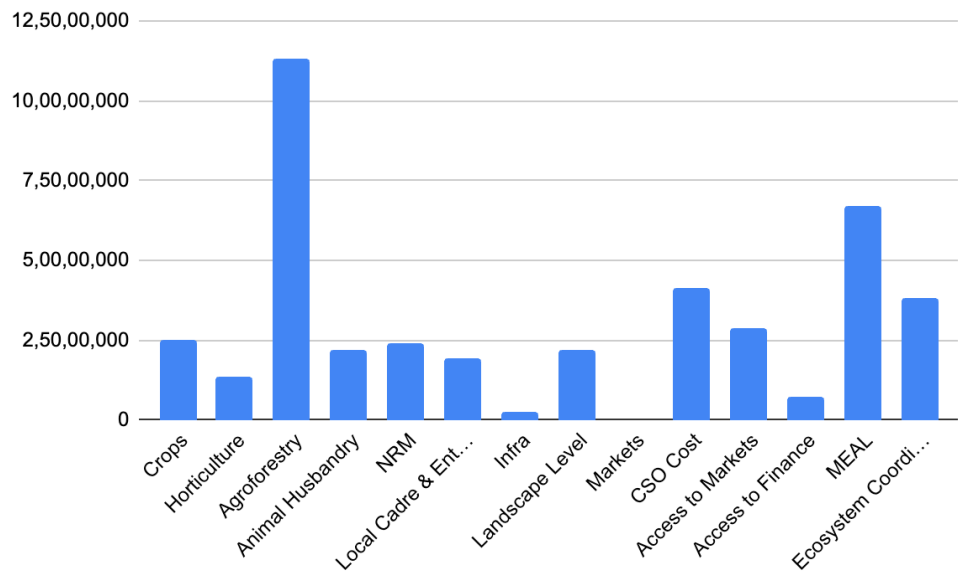

Fig. 6.2 – Grants Allocation

Grants constitute 42.42 crores (63% of the total investment needed) and 45-100% of funding for ecosystem coordination, social capital development, and agroforestry. These non-returnable funds support activities like capacity building programs (84 lakhs), creation of community-level soil conservation and water harvesting structures (5.27 crores), nutrition education interventions (₹1.51 crores), and payments for agroforestry on private lands (₹14.02 crores). Grants are particularly

important in Phase 1 to build foundational capabilities and test innovative approaches. Total grant allocation across all phases amounts to 42 crores, of which ₹15.99 crores in Phase 1 landscape investments alone.

Returnable Grants

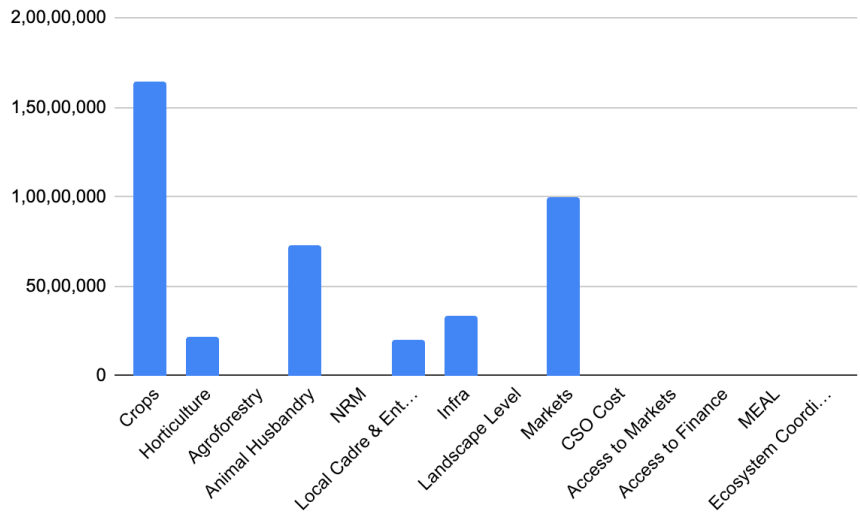

Fig. 6.3 – Returnable Grants

Returnable Grants provide 6% of the total investment stack. They are largely allocated for revenue-generating physical infrastructure such as processing units, nurseries, and pack houses. Since FPOs in Chitrakonda district are still nascent, working capital has been assumed to be fully met through revolving funds of 1 crore across all 3 phases. Other interventions, like the creation of physical capital, such as bio resource centres, are initially met with a mix between grants and returnable grants, eventually transitioning to debt. This instrument bridges the gap between full grants and commercial loans, recognising the medium-term revenue potential of these investments.

Results-Based Financing

Results-Based Financing accounts for ₹6.12 crores (9.5% of total net investment), strategically deployed where performance can be directly measured. The largest allocation goes to agroforestry (₹3.27 crores), linking payments to actual tree survival and growth rather than just planting activities. Animal husbandry (₹82.70 lakhs) ties funding to livestock health and productivity improvements, while natural resource management (₹39.53 lakhs) rewards verified soil and water conservation outcomes. Ecosystem coordination through CSO costs (₹1.16 crores) and access to finance (₹21.03 lakhs) link payments to institutional development milestones. This payment-for-results framework builds accountability while providing flexibility for communities to innovate in achieving agreed-upon outcomes.

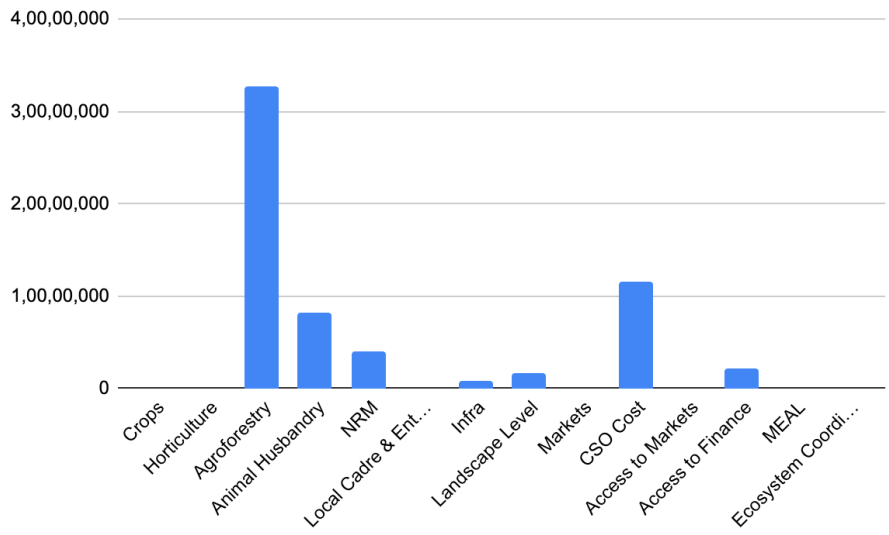

Fig. 6.4 – Results-based Financing

Debt Financing

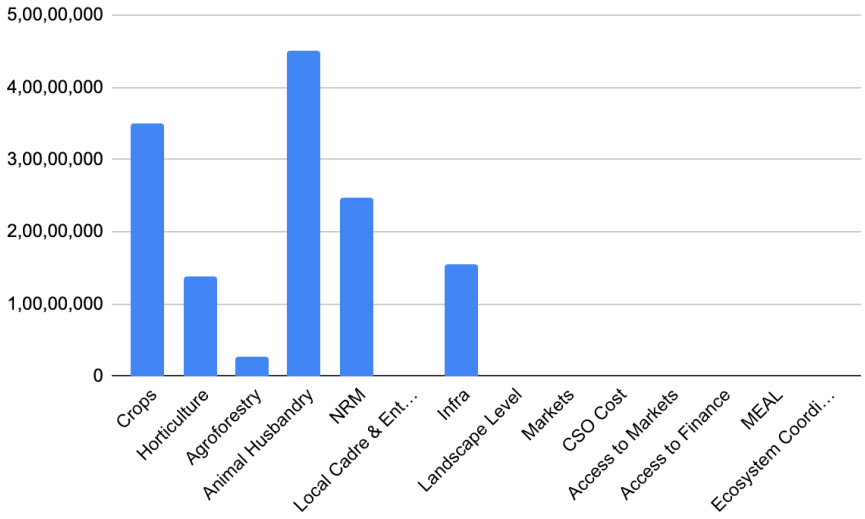

Fig. 6.5 – Debt Financing

Debt Financing totals ₹13.69 crores (21.1% of total net investment), concentrated in sectors with shorter payback periods and proven revenue generation. Animal husbandry leads with ₹4.51 crores in debt for integrated farming systems and shelter construction, supported by ₹65.82 lakhs in guarantees and ₹55.92 lakhs in interest subvention. Crops receive ₹3.49 crores in debt with ₹38.99 lakhs in guarantees and interest subvention for input supply and cultivation expenses. Natural resource management (₹2.48 crores debt) and infrastructure development (₹1.55 crores debt) employ debt financing for assets with clear income generation potential, while horticulture (₹1.39 crores debt) uses borrowing for working capital and post-harvest facilities. The debt architecture, de-risked through ₹1.72 crores in guarantees and ₹1.62 crores in interest subvention, builds financial inclusion while establishing creditworthiness for future commercial financing.

Guarantee Mechanisms totalling ₹1.72 crores (12.6% of debt financing) support borrowing by covering default risks, particularly important for first-time borrowers from tribal communities and nascent

Farmer Producer Organisations. Animal husbandry carries the highest guarantee coverage at ₹65.82 lakhs, followed by crops (₹38.99 lakhs), natural resource management (₹28.72 lakhs), infrastructure (₹19.24 lakhs), and horticulture (₹16.13 lakhs). This instrument is critical for unlocking commercial finance in a region with limited credit history.

Interest Subvention totalling ₹1.62 crores reduces the effective interest rate on loans, making debt more affordable for smallholders and community institutions. Animal husbandry receives the largest subsidy at ₹55.92 lakhs, reflecting the significant capital costs for livestock infrastructure with gradual returns. Crops (₹38.99 lakhs), natural resource management (₹28.72 lakhs), infrastructure (₹19.24 lakhs), and horticulture (₹16.13 lakhs) also benefit from interest rate reductions, enabling communities to access formal credit while managing repayment burdens during the gestation period of investments.

6.3 Sectoral Investment Priorities

6.3.1 Sustainable Production Systems (Crops)

Crop Production Investments: The agricultural inputs investment totalling ₹14.39 crores aims to transition the landscape from low-input subsistence farming to productive organic agriculture. The supply of seeds and bio-inputs for consumption crops requires a net investment of ₹2.77 crores (recurring annually), with government funds of ₹1.40 crores (13%) and community contribution of ₹6.66 crores (62%) covering most of the ₹10.83 crore total cost, leaving ₹2.77 crores to be sourced. For cash crops, the net investment needed is ₹1.58 crores annually from a total cost of ₹3.56 crores, with ₹71.30 lakhs (20%) from government funds and ₹1.27 crores (36%) as community contribution. Additionally, critical infrastructure investments include ₹2.85 crores for Bio-Resource Centre infrastructure and ₹47.57 lakhs for seed production facilities, both requiring full net investment as they lack existing government or community funding sources.

Agroforestry and Afforestation represent a critical sectoral investment with a net requirement of ₹14.85 crores (total cost of ₹27.38 crores), primarily driven by payments for afforestation on private land (₹26.55 crores total cost, with ₹14.03 crores net investment after ₹12.53 crores in community contribution). This substantial recurring investment reflects both the ecological imperative of restoring and maintaining the region's forest cover and the livelihood potential of non-timber forest products (NTFPs). The supply of quality planting materials requires ₹82.5 lakhs in net investment to establish nurseries capable of producing saplings annually, featuring high-value species like jafra, cashew, and medicinal plants alongside traditional forestry species.

By integrating timber, fruit, and NTFP species into farming systems through Self-Help Groups (SHGs) and Joint Liability Groups (JLGs), these investments create multiple revenue streams while enhancing ecosystem services like soil conservation and watershed protection in the hilly terrain. In Phase 1, this is funded entirely through community and external contributions, with the financing structure evolving in subsequent phases as forest products begin generating returns.

Horticulture Development (₹2.50 crores total cost, fully funded by the government) focuses on establishing critical post-harvest infrastructure to address losses currently experienced by farmers. The investment in fixed capital for warehousing, processing, and transportation facilities, including land and building, will be managed by Farmer-Producer Organisations (FPOs), ensuring community ownership and equitable benefit distribution. This infrastructure is essential for capitalising on the landscape's favourable agroclimatic conditions for vegetables, fruits, and floriculture.

The horticultural strategy emphasises indigenous varieties alongside improved cultivars, recognising the market potential of tribal organic produce. While bio-inputs for organic vegetable production, floriculture, and orchards are supplied through Self-Help Groups (SHGs) and Joint Liability Groups (JLGs) without requiring net investment in this phase, the real value lies in the post-harvest infrastructure. The success of earlier interventions, kitchen gardens (200 households) and trellis

systems for creeper vegetables (598 farmers), demonstrated under SPPIF, will be scaled across all villages, enhancing household nutrition while generating surplus for local markets in Chitrakonda and Jeypore.

6.3.2 Livelihood and Economic Empowerment

Animal Husbandry Investments totalling ₹8.25 crores net (₹9.70 crores total) recognise livestock as a critical livelihood component for the tribal population. Multi-layer integrated farming infrastructure (₹3.60 crores net, ₹4.20 crores total with ₹60 lakhs community contribution) will establish integrated farming units combining crops, livestock, and potentially aquaculture, demonstrating the principles of nutrient cycling and diversified income. These recurring investments directly benefit farmers and employ an innovative financing structure that evolves across phases, starting with substantial grant components and shifting toward higher debt proportions as systems mature and demonstrate returns.

Low-cost shelter construction (₹4.00 crores net, ₹4.60 crores total with ₹60 lakhs community contribution as one-time investment) addresses immediate animal welfare and productivity concerns. Improved housing directly translates to reduced mortality and enhanced productivity, critical given the current challenges of diseases like goat pox and PPR, and the lack of adequate veterinary services (nearest facility 50 to 80 km away). These shelters will significantly improve animal health outcomes while providing farmers with proper facilities for their livestock.

The creation of healthcare infrastructure (₹65 lakhs net investment) addresses the critical gap in veterinary services by establishing vaccination storage and treatment facilities managed through SHGs and JLGs. This investment will reduce the current dependence on traditional herbal remedies alone, though indigenous ethno-veterinary knowledge will be documented and integrated where effective. Supply of chicks and ducks for backyard rearing (₹25 lakhs total, fully government funded) will strengthen household food security and provide supplementary income.

The emphasis on indigenous breeds, including Malkangiri goats and Motu cows, aligns with agroecological principles while preserving genetic resources adapted to local conditions.

Market Development Infrastructure (₹1.00 crore net investment) bridges the production-market gap through working capital for Community-Based Organisations, including FPOs and Women Federations. This revolving fund mechanism will provide flexible capital for FPOs and entrepreneurs to respond to market opportunities without being constrained by formal credit timelines. This patient capital is essential in a landscape where commercial banking infrastructure remains limited and where the current market system relies heavily on visiting traders from Andhra Pradesh who purchase produce like goats, turmeric, and cannabis directly from villages.

6.3.3 Natural Resource Management

Natural Resource Management investments address the fundamental constraint of water scarcity in this rain-dependent landscape, where agriculture is currently limited to the Kharif season only. These recurring investments will expand beyond the current 884 hectares of minor lift irrigation potential created in 2021 to 2022, supplementing existing surface water systems and creating farm ponds and percolation tanks. By harnessing mountain streams, currently the primary water source for many villages, and rainwater, the program aims to extend the cropping season beyond Kharif, enabling farmers to grow vegetables, pulses, and fodder crops in Rabi and summer seasons. This is critical given that several villages visited by the TAPE assessment team had no irrigation whatsoever, relying entirely on monsoon rainfall.

The integration of traditional practices, including bamboo water barriers, stone bunding, and terracing already used by farmers, with modern techniques like micro-irrigation and water budgeting tools, ensures culturally appropriate and technically sound solutions. Community ownership through Pani

Panchayats (currently 76 in Chitrakonda, covering 1,520 hectares with 2,667 farmers) will be strengthened to ensure equitable water distribution and sustainable resource management.

6.3.4 Governance and Ecosystem Coordination

Governance and Ecosystem Coordination represents a comprehensive investment in institutional strengthening and program management. Social Capital Development (₹4.50 crores net investment) forms the backbone of the agroecological transformation, recognising that technical interventions alone cannot succeed without strong community institutions and enhanced capacities. Capacity building programs for farmers (₹84 lakhs recurring), community cadre expenses (₹1.15 crores for honorarium, incentives, capacity building, and exposure visits), entrepreneur development (₹1.00 crore), and nutrition education interventions (₹1.51 crores) are entirely funded through net investment requirements, reflecting their foundational importance.

The investment in nutrition education directly addresses the critical malnutrition indicators documented in the 2022 District Nutrition Profile, with 72% anaemia among non-pregnant women, 39% underweight women, 32% child stunting (32,088 children), and 19% wasting (13,995 children under 5 years). By promoting production and consumption of nutritious traditional foods like finger millet, little millet, pulses, and indigenous vegetables, these interventions link agricultural transformation with health outcomes.

Strengthening of Gram Panchayats (₹10 lakhs annually, fully government funded) recognises the critical role of local governance in landscape transformation, particularly important given the historical isolation and Maoist control that prevented government presence until 2018.

Ecosystem Coordination (₹19.61 crores net investment) funds the operational machinery necessary for landscape-level implementation. The anchor organisation costs (₹5.28 crores annually) support field teams, monitoring systems, and coordination mechanisms, which are essential given the challenging terrain where some villages are still 50 to 80 km from basic services. Specialised support for finance mechanisms (₹95.58 lakhs), market development (₹2.87 crores), policy and communications (₹1.91 crores), research and MEL (₹4.78 crores), and ecosystem coordination for CAT (₹3.82 crores) ensure that the program operates as a coherent system rather than disconnected projects.

This coordination layer, entirely requiring net investment, represents a significant allocation given the complexity of transforming a 570 sq. km landscape with 62,159 people across 287 villages while coordinating multiple departments (Agriculture, Forest, Animal Husbandry, Watershed, ITDA), community institutions (SHGs, FPOs, Pani Panchayats, Vana Sangrakshyana Samitees), and financing sources. The MEL component ensures rigorous documentation of this pioneering tribal agroecology transformation for replication elsewhere in the Eastern Ghats.

6.4 Implementation Phasing and Risk Mitigation

The implementation strategy balances the urgency of addressing poverty (95.3% below the poverty line per the 2019 NCDS survey) and food insecurity with the reality of institutional capacity constraints and the need for learning and adaptation. The total net investment of ₹64.73 crores employs a diverse financing mix: ₹42.43 crores in grants (65.5%), ₹4.13 crores in returnable grants (6.4%), ₹6.12 crores in results-based financing (9.5%), ₹13.69 crores in debt (21.1%), with ₹1.72 crores in guarantees and ₹1.62 crores in interest subvention to de-risk lending and borrowing.

The financing architecture reflects the nature of investments across sectors. Social interventions including landscape level programs (₹2.18 crores grants, ₹16.80 lakhs RBF), local cadre and entrepreneurs (₹1.95 crores grants, ₹20 lakhs returnable grants), and ecosystem coordination including CSO costs, access to markets, access to finance, MEAL, and CAT coordination (₹18.24 crores entirely in grants) are predominantly grant funded, recognizing their foundational and public good nature.

Productive sector investments employ blended finance to build bankability. Crops (₹2.54 crores grants, ₹1.64 crores returnable grants, ₹3.49 crores debt with ₹38.99 lakhs guarantees and interest subvention) and animal husbandry (₹2.18 crores grants, ₹73.20 lakhs returnable grants, ₹82.70 lakhs RBF, ₹4.51 crores debt with ₹65.82 lakhs guarantees and ₹55.92 lakhs interest subvention) demonstrate the highest debt proportions, reflecting their shorter payback periods and proven market demand. Agroforestry (₹11.32 crores grants, ₹3.27 crores RBF, ₹26.40 lakhs debt with ₹2.64 lakhs guarantees and interest subvention) uses substantial RBF given the longer gestation period for tree crops, while horticulture (₹1.35 crores grants, ₹22.20 lakhs returnable grants, ₹1.39 crores debt with ₹16.13 lakhs guarantees and interest subvention) balances grant support for infrastructure with debt for working capital.

Natural resource management (₹2.40 crores grants, ₹39.53 lakhs RBF, ₹2.48 crores debt with ₹28.72 lakhs guarantees and interest subvention) combines public investment with community co-financing, while infrastructure development (₹27 lakhs grants, ₹33.75 lakhs returnable grants, ₹9 lakhs RBF, ₹1.55 crores debt with ₹19.24 lakhs guarantees and interest subvention) prepares for eventual commercial viability. Markets (₹1 crore entirely in returnable grants) establish revolving funds that will be recycled across the landscape.

Risk mitigation is embedded through multiple mechanisms: (1) diversified financing sources reducing dependence on any single channel; (2) guarantee mechanisms and interest subventions (totalling ₹3.33 crores) reducing lender and borrower risk in a landscape with limited credit history; (3) strong emphasis on community institutions including WSHGs under Mission Shakti, FPOs, and Pani Panchayats ensuring local ownership beyond project life; and (4) strategic convergence with ongoing government schemes including KALIA, NRLM, Odisha Millet Mission (already active in Chitrakonda), MGNREGA (for watershed work and plantation), National Livestock Mission, and the SETU scheme providing ongoing support.

The investment plan positions Chitrakonda for transformation from an isolated, conflict-affected, subsistence-based landscape to a model of tribal agroecological development in India's Eastern Ghats region, which can achieve food security, livelihood diversification, and ecological restoration through carefully structured, community-owned investments that respect cultural heritage while building economic resilience.

CHAPTER 7

Potential Impact of Interventions

It is possible to draw connections between the outcomes of interventions and their resulting impacts on key focus areas relevant to agroecology, using multiple frameworks. At this stage, there is insufficient data to quantify the extent of the impacts of these interventions using different frameworks. In the following sections, efforts have been made to connect the potential impacts of interventions, either in qualitative terms or in terms of rough estimates, which are more directional than specific.

7.1. Interventions and Agroecological Principles

Table 7.1 presents the assessment of how each of the thirteen agroecological principles is currently reflected in the landscape, using a scoring scale of 0 to 4. These scores draw on discussions held through the TAPE tool in selected villages and are refined through the judgment of the anchor organisation based on its field experience. The accompanying rationale explains the basis for each current score.

For each principle, the table also identifies the interventions proposed in the landscape that are expected to strengthen its expression in practice. These interventions indicate pathways for strengthening the integration of each principle into farm systems and the broader food system.

Scoring Criteria - Scores have been given according to the following scale of integration/presence: 0 (Non-existent) - 1 (Very Low) - 2 (Low) - 3 (High) - 4 (Very High)				
S. No.	**Agroecological Principles (Revised)**	**Current Assessment of the Landscape (Score based on TAPE Assessment)**	**Rationale for the current score**	**Interventions that potentially improve the integration of the agroecology principle**
1	**Recycling** - Preferentially use local renewable resources and close as far as possible resource cycles of nutrients and biomass.	1	Community practice basic recycling by using cattle and goat manure and leaving some crop residues in the fields, low level of integration of composting or other techniques.	- Setting up a Bio-Manure Centre under an entrepreneurship model (Systematically converts local biomass and animal waste into valuable compost, closing the nutrient loop). - Establishment of a multi-layer integrated farming system (Ensures animal manure fertilises crops and crop residues feed animals, creating a tight on-farm cycle). - Backyard Duck rearing (Integrates ducks with water bodies, where their manure fertilises the aquatic ecosystem).
2	**Input reduction** - Reduce or eliminate dependency on purchased inputs and increase self-sufficiency.	3	The community demonstrates a high degree of self-sufficiency, primarily using indigenous seeds and avoiding purchased chemical fertilisers and pesticides. This score is not 'Very High' because this self-sufficiency is largely a consequence of isolation and poor market access, rather than a consciously designed, resilient agricultural system. This passive approach makes the community vulnerable to production shocks, such as erratic weather, and limits overall productivity, as evidenced by the lack of irrigation infrastructure.	- Setting up a Bio-Manure Centre (*Produces on-farm bio-fertilisers and bio-pesticides, directly replacing the need for purchased chemical inputs*). - Promotion of Breeder models for indigenous seeds (*Creates a local, self-sufficient seed supply, eliminating reliance on external seed companies*). - Promotion of solar-powered community-based irrigation infrastructure (*Increases self-sufficiency by reducing dependence on unpredictable monsoon patterns and external energy for irrigation*).
3	**Soil health** - Secure and enhance soil health and functioning for improved plant growth, particularly by managing organic matter and enhancing soil biological activity.	3	There is a complete avoidance of chemical fertilisers, which prevents soil degradation, and they use organic manure from their livestock and incorporate crop residues. The score is not 'very high' because there are no specific practices followed for systematic composting to enrich soil microbiota or organic carbon content, or specific measures are followed to reduce soil runoff and erosion, making the topsoil vulnerable during heavy monsoon rains.	- Setting up a Bio-Manure Centre *(Directly produces compost rich in organic matter and beneficial microbes to enhance soil biological activity*). - Integrated watershed Development (*Implements measures to reduce soil erosion and improve water retention, protecting the topsoil*). - Promotion of agroforestry in marginal uplands and field boundaries (*Uses trees to stabilize soil with dense root structure, build organic matter through leaf litter, and prevent erosion*). - Promotion of Green Gram and Bengal Gram in rice fallow areas (*Uses legumes as cover crops to fix atmospheric nitrogen and naturally enrich the soil).*
4	**Animal health** - Ensure animal health and welfare.	1	Animal health is a significant vulnerability. The lack of access to veterinary services is severe, leaving community members reliant on traditional herbal treatments for diseased	- Strengthening vaccination services and animal healthcare through Community Animal health cadres (*Directly addresses the core problem of lacking access to veterinary care*).

Scoring Criteria - Scores have been given according to the following scale of integration/presence: 0 (Non-existent) - 1 (Very Low) - 2 (Low) - 3 (High) - 4 (Very High)				
S. No.	**Agroecological Principles (Revised)**	**Current Assessment of the Landscape (Score based on TAPE Assessment)**	**Rationale for the current score**	**Interventions that potentially improve the integration of the agroecology principle**
			animals. Periodic poultry deaths raise unaddressed concerns, indicating a very low capacity to ensure animal health.	- Construction of low-cost goat shelters *that incorporate dedicated areas for fodder cultivation, improving animal welfare by protecting livestock and ensuring local feed availability*. - Establishment of a multi-layer integrated farming system *where fodder production is a key component, improving animal nutrition through diverse, on-farm feed.*
5	**Biodiversity** - Maintain and enhance diversity of species, functional diversity and genetic resources and thereby maintain overall agroecosystem biodiversity in time and space at field, farm and landscape scales.	3	The landscape has a high degree of existing biodiversity, including multiple indigenous crop varieties, diverse livestock, and rich forest resources. However, this biodiversity is not being systematically managed or enhanced.	- Promotion of intercropping or polycropping approaches *(Increases the number of crop species grown together, enhancing functional diversity in the field*). - Promotion of Breeder models for indigenous landraces (*Actively conserves and enhances the genetic diversity of local crops*). - Promotion of agroforestry (*Introduces tree and shrub species into the farming system, increasing overall structural and species diversity*). - Development of diverse Horticulture (Vegetable, Cashew, Mango, etc.) (*Adds a wide range of new plant species and varieties to the farm landscape*).
6	**Synergy** - Enhance positive ecological interaction, synergy, integration and complementarity amongst the elements of agroecosystems (animals, crops, trees, soil and water).	1	Basic, passive synergies are present, such as using animal manure on crops. However, other potential linkages are weak; crop residues are minimally used for fodder and are often left at the threshing yard. While reservoir fishing is practiced, it is not synergistically integrated with other farm components. Overall, there is no structured system for integrating crops and livestock and no formal agroforestry, indicating a very low level of planned, complementary interactions.	- Establishment of a multi-layer integrated farming system (*Explicitly designed to create beneficial interactions where animal waste feeds crops and crop residue feeds animals*). - Promotion of agroforestry *(Integrates trees with crops and/or livestock for synergies like pest control, shade, fodder, and nutrient cycling)*. - Promotion of intercropping or polycropping approaches (*Leverages complementary relationships between different plants for mutual benefits like pest repulsion or nutrient support*). - Backyard Duck rearing and Construction of Farm ponds *(Integrates aquaculture where ducks control pests in paddies while their manure provides fertilizer*).
7	**Economic diversification** - Diversify on-farm incomes by ensuring that small-scale farmers have greater financial independence and value addition opportunities while	1	Economic diversification is very low. Livelihoods are heavily dependent on subsistence farming with limited cash crop sales. The absence of processing units, poor market access, and a lack of formal credit all point to a failure to build financial	- Establishment of hybrid primary processing infrastructure (*Creates new income by adding value to raw produce before it is sold*). - Development of Horticulture (Cashew, Mango, Floriculture, etc.) (*Introduces new high-value cash crops to diversify income sources beyond staples*). - Promotion of Animal Husbandry (Goat, Poultry, Duckery)

Scoring Criteria - Scores have been given according to the following scale of integration/presence: 0 (Non-existent) - 1 (Very Low) - 2 (Low) - 3 (High) - 4 (Very High)				
S. No.	**Agroecological Principles (Revised)**	**Current Assessment of the Landscape (Score based on TAPE Assessment)**	**Rationale for the current score**	**Interventions that potentially improve the integration of the agroecology principle**
	enabling them to respond to demand from consumers.		independence and diverse income streams for the community.	(*Adds livestock-based income streams to the existing crop-based livelihood*). - Entrepreneurship Development and provision of a revolving fund to FPOs (*Directly fosters new businesses and provides the capital to start them*). - Promotion of Organic Certification through Participatory Guarantee System (PGS) *(Provides an economic upscale by enabling access to premium markets for certified crops and commodities*). - Strengthening a collective marketing framework through FPOs (*Improves income upliftment by aggregating produce to increase farmers' bargaining power*).
8	**Co-creation of knowledge** - Enhance co-creation and horizontal sharing of knowledge including local and scientific innovation, especially through farmer-to-farmer exchange.	1	The findings explicitly mention a "lack of access to improved farming techniques" and provide no evidence of community-level exchanges or other platforms for sharing and co-creating knowledge.	- Operation Farmer Field School (*Provides a proven platform for farmers to learn together, experiment, and share knowledge horizontally*). - Capacity Building Training Programs for farmers and lead farmers (*Facilitates the transfer of new skills and encourages peer-to-peer exchange)*. - Research and development of small-scale farm machinery (*Requires collaboration between farmers and technicians to co-create locally appropriate solutions*). - Developing a cadre of local Resource and Master Farmers to act as community-based trainers and champions of agroecological practices. - Establishing demonstration units to visually showcase improved practices and serve as local learning hubs. - Exposure visits for farmers to other successful farms and projects within the landscape to foster peer-to-peer learning and innovation.
9	**Social values and diets** - Build food systems based on the culture, identity, tradition, social and gender equity of local communities that provide healthy, diversified, seasonally and culturally appropriate diets	1	The food system is deeply intertwined with local culture, showcasing reliance on indigenous crops and seasonal foods, alongside cultural agricultural practices. However, social and gender inequities persist, with women heavily involved in agricultural work yet excluded from economic decision-making, and inactive women's self-help groups limiting empowerment opportunities. Health outcomes are concerning, as nutritional	- Promotion of Organic Vegetable cultivation and fruit orchards (*Directly increases the local availability and consumption of diverse, nutritious foods)*. - Establishment of a multi-layer integrated farming system (*Designed to produce a variety of foods, eggs, meat, pulses, grains, vegetables, leafy greens, and fruits, for improved household nutrition*). - Research and development of small-scale farm machinery (*Would reduce the heavy physical workload (drudgery) that disproportionately falls on women, addressing a key gender inequity*).

Scoring Criteria - Scores have been given according to the following scale of integration/presence: 0 (Non-existent) - 1 (Very Low) - 2 (Low) - 3 (High) - 4 (Very High)				
S. No.	**Agroecological Principles (Revised)**	**Current Assessment of the Landscape (Score based on TAPE Assessment)**	**Rationale for the current score**	**Interventions that potentially improve the integration of the agroecology principle**
			deficiencies are prevalent among children and pregnant women, exacerbated by limited access to Anganwadi centres.	- Establishing village-level planning committees to collaboratively prioritise interventions, ensuring a focus on marginalised groups to improve both nutrition and income equity.
10	**Fairness** - Support dignified and robust livelihoods for all actors engaged in food systems, especially small-scale food producers, based on fair trade, fair employment and fair treatment of intellectual property rights.	1	The principle of fairness is critically weak, as evidenced by shortcomings in three key areas directly mentioned in the assessment: - The community's ability to engage in fair trade is severely limited. The findings explicitly state they have "limited bargaining power" when dealing with traders who visit their villages. This unequal power dynamic prevents them from receiving a fair price for their surplus produce. - The agricultural livelihood is not robust or secure. It is described as "subsistence farming" that is "highly dependent on monsoon patterns" and vulnerable to "crop failures." This instability is so pronounced that young men see "limited prospects in agriculture" and are compelled to migrate for "daily wage labour," a clear indicator that the local system fails to provide a stable or appealing livelihood. The "absence of structured savings or insurance mechanisms" further confirms this precarity. - There is a fundamental lack of fairness within the community's social structure. The assessment notes a stark divide: women perform a central role in agricultural labour (handling transplanting, weeding, and harvesting), yet "economic decision-making remains largely controlled by men." This is a clear instance of unfair distribution of power and control relative to labour contribution.	- Provision of a revolving fund to FPOs for collective marketing (*Empowers farmers to aggregate produce and bargain collectively, securing fairer prices*). - Establishment of hybrid primary processing infrastructure (*Allows the community to capture a larger share of the product's final value*). - Organic Certification through Participatory Guarantee System (PGS) *(Provides access to premium markets and fairer prices for their products*). - Development of Pack House and Cold Storage Units (*Would give farmers the power to avoid distress sales during harvest gluts and sell when prices are better*).
11	**Connectivity** - Ensure proximity and confidence between producers and consumers through promotion of fair and short	1	The community's connection to markets is a major constraint, defined by two primary, interconnected issues: i. While physical road infrastructure has improved, it has not translated into active	- Organic Certification through Participatory Guarantee System (*Builds a story of trust and transparency that can connect producers directly with conscious consumers*). - Development of Functional Pack House and storage units (*Provides the necessary infrastructure to prepare*

Scoring Criteria - Scores have been given according to the following scale of integration/presence: 0 (Non-existent) - 1 (Very Low) - 2 (Low) - 3 (High) - 4 (Very High)				
S. No.	**Agroecological Principles (Revised)**	**Current Assessment of the Landscape (Score based on TAPE Assessment)**	**Rationale for the current score**	**Interventions that potentially improve the integration of the agroecology principle**
	distribution networks and by re-embedding food systems into local economies.		market participation. The community remains in a passive, dependent position characterised by: - Reliance on Intermediaries: They are entirely reliant on outside traders coming to the village to purchase their goods. (This is true for both surplus crops like turmeric and black gram, and for high-value livestock, with "traders from Andhra Pradesh" visiting to purchase goats) - Negative Consequences: This dynamic creates a dependent relationship where producers have "limited bargaining power" and are prevented from building direct, trust-based relationships with consumers. ii. The Digital Divide: Connectivity to modern, information-driven markets is further hindered by a significant digital divide, which includes: -Limited Digital Literacy: A knowledge gap, particularly among middle-aged and older farmers, prevents the use of digital tools for market access. - Poor Network Infrastructure: Some areas still lack reliable network coverage, creating a physical barrier to digital information. This combination of a passive trading system and a growing digital divide prevents the community from achieving the "proximity and confidence" between producers and consumers that this principle calls for.	*and store goods for direct market linkage*). - Provision of a revolving fund to FPOs to support packaging, branding, and marketing (*Helps create a unique product identity to build a direct relationship with consumers*).
12	**Land and natural resource governance** - Strengthen institutional arrangements to improve, including the recognition and support of family farmers, smallholders and peasant	1	Key community institutions like Women's SHGs are inactive due to a "lack of institutional support," and government financial aid is minimal. This indicates weak institutional arrangements to recognize and support the community as resource managers.	- Establishment of Village Stewardship Committees to act as the primary local institution for governing program activities, working in support of the Farmer-Producer Organisation (FPO). Empowering these Stewardship Committees to lead participatory planning processes, ensuring that resource allocation for all interventions is prioritised based on community demand.

Scoring Criteria - Scores have been given according to the following scale of integration/presence: 0 (Non-existent) - 1 (Very Low) - 2 (Low) - 3 (High) - 4 (Very High)				
S. No.	**Agroecological Principles (Revised)**	**Current Assessment of the Landscape (Score based on TAPE Assessment)**	**Rationale for the current score**	**Interventions that potentially improve the integration of the agroecology principle**
	food producers as sustainable managers of natural and genetic resources.			- Integrated watershed Development (Requires community-level agreements on governing shared land and water resources, facilitated by the Stewardship Committee). -Promotion of solar-powered community-based irrigation (Strengthens the Stewardship Committee by giving them responsibility for managing a critical shared resource). - Provision of a revolving fund to FPOs and entrepreneurs (Financially empowers local institutions, with the Stewardship Committee helping to guide its use based on community priorities).
13	**Participation** - Encourage social organisation and greater participation in decision-making by food producers and consumers to support decentralised governance and local adaptive management of agricultural and food systems.	1	Participation in governance and decision-making is very low. Economic choices are controlled by men, excluding the women who perform a central role in agriculture. The primary vehicles for social organization, the SHGs, are mostly inactive, indicating a lack of collective action and participatory management.	- Operation Farmer Field School (*The methodology is inherently participatory, built on group learning and joint decision-making)*. - Capacity Building Training Programs (*Equips community members, including women, with the skills and confidence to participate actively in planning*). - Provision of a revolving fund to FPOs (*Strengthens Farmer-Producer Organisations, which act as key platforms for collective action and economic participation*). - Organic Certification through Participatory Guarantee System (*The entire certification process is managed by the farmers themselves, making it a prime example of participatory governance)*. - Formation of a unified Women's Collective by federating existing SHGs and including other women from the community. This common group will act as the primary driver for all initiatives, working collectively towards the common goal of community upliftment.

Table 7.1 – Integration of the 13 principles of agroecology

7.2. Response to the Climate Crisis

The response to the climate crisis can be seen as measures taken towards mitigation, adaptation and building resilience. **Table 7.2** outlines the potential impacts of the intervention outcomes. For e.g., carbon sequestration and reduced emissions achieved through some interventions lead to climate change mitigation. An effort has been made to connect various interventions and their outputs to these desirable outcomes. At this stage, quantifying the extent of the effect of the interventions is outside the current scope due to a lack of relevant data.

This framework is an adapted version of the approach and principles outlined in the FAO's 2020 report, 'The potential of agroecology to build climate-resilient livelihoods and food systems' (FAO, 2020). It draws on the core elements of agroecology, as well as the pathways and indicators for resilience identified in the FAO study, and contextualizes them for block-level agroecological planning and intervention assessment.

Intervention	Output	Mitigation		Adaptation			Resilience					
		Carbon Sequestration	Reduced Emissions	Diversification	Soil and Water Conservation	Knowledge & Capacity	Social Resilience	Ecological Resilience	Economic Resilience	Health & Nutrition Resilience	Traditional Knowledge	Reflective Learning
Promotion of crop intensification focusing on Little Millet, Black Gram, White Rajma, Black Horse Gram, and Niger, with an emphasis on intercropping or polycropping approaches	Increased cropping intensity, higher yield stability, improved soil fertility through legumes	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Promotion of Green Gram and Bengal Gram and other suitable crops in rice fallow areas during the Rabi season, to enhance overall cropping intensity.	Better land use efficiency, additional income during Rabi, enhanced nitrogen fixation	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Intensification of Turmeric with polycropping models.	Diversified income, improved pest control, organic matter addition	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Promotion of Breeder models aimed at conservation, Production and multiplication of indigenous and suitable landraces aiming to establish a supply chain of seed distribution to farmers, with a focus on enhancing nutrition, productivity, and other key traits.	Conservation of landraces, improved seed availability, enhanced nutrition	N	N	Y		Y	Y	Y	Y	Y	Y	Y
Organic Certification through Participatory Guarantee System (PGS)	Certified organic produce, market access, reduced input dependency	N	N	N	N	N	Y	Y	Y	N	N	N
Setting up a Bio-Manure Centre under an entrepreneurship model, with a focus on producing bio-fertilizers and bio-pesticides.	Local bio-input production, reduced chemical dependency	N	N	Y	N	Y	Y	Y	Y	N	Y	Y
Nursery Development for the production of Quality planting Materials (QPM) through Local institutions and Entrepreneurs.	Local supply of healthy saplings, livelihood generation	N	N	Y	N	Y	Y	Y	Y	N	Y	Y
Promotion of agroforestry through silvicultural models and others in marginal uplands, medium lands, cultivable fallows, and wastelands.	Improved soil health, biodiversity restoration, carbon storage	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Intervention	Output	Mitigation		Adaptation			Resilience					
		Carbon Sequestration	Reduced Emissions	Diversification	Soil and Water Conservation	Knowledge & Capacity	Social Resilience	Ecological Resilience	Economic Resilience	Health & Nutrition Resilience	Traditional Knowledge	Reflective Learning
Promotion of Agroforestry in agricultural field and boundaries.	Windbreaks, additional income, ecological buffers	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Promotion of Organic Vegetable cultivation in cluster mode in Rabi season.	Diversified nutrition, reduced pesticide use, higher incomes	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y
Development of Cashew Orchard	Long-term perennial income, improved soil stability	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Development of Mango Orchard	Fruit-based income diversification, carbon capture	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Development of Banana Orchard	Year-round income, local consumption	N	N	Y	N	Y	Y	N	Y	Y	Y	Y
Development of Pomegranate Orchard	Drought-tolerant crop, high-value produce	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pineapple cultivation	Soil cover, income diversification	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
Promotion of PMKSY Scheme	Expanded irrigation access, improved water efficiency	N	Y	N	Y	Y	N	Y	Y	N	Y	N
Promotion of Floriculture Cultivation	High-value crop diversification, women's enterprise	N	N	Y	N	Y	Y	Y	Y	N	Y	Y

Intervention	Output	Mitigation		Adaptation			Resilience					
		Carbon Sequestration	Reduced Emissions	Diversification	Soil and Water Conservation	Knowledge & Capacity	Social Resilience	Ecological Resilience	Economic Resilience	Health & Nutrition Resilience	Traditional Knowledge	Reflective Learning
Development of Functional Pack House, On farm collection and storage unit	Reduced post-harvest loss, improved market linkage	N	N	Y	N	Y	Y	N	Y	N	N	Y
Cold Storage Units	Minimized spoilage, stable pricing	N	N	N	N	Y	Y	N	Y	N	N	Y
Establishment of a multi-layer integrated farming system emphasizing backyard poultry, integration of diverse crops and plants for nutritional benefits, supplementary feed production, and comprehensive livestock care to enhance productivity.	Closed-loop nutrient systems, improved food and income diversity	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Construction of low-cost goat shelter for enhancing goat rearing practices by ensuring access to green fodder and supplementary feed to improve productivity.	Disease control, improved productivity	N	Y	N	N	Y	Y	N	Y	Y	Y	Y
Strengthening vaccination services and animal healthcare through Community Animal health workers.	Lower mortality, animal productivity improvement	N	N	N	N	Y	Y	N	Y	N	Y	Y
Back yard Duck rearing	Diversified income, local protein source	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y
Setting up a pipe-based diversion irrigation system, emphasizing micro-irrigation by harnessing natural water sources such as streams, rivers, springs, and water harvesting structures and Promotion of solar-powered community-based irrigation infrastructure.	Improved irrigation efficiency, reduced energy dependency	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y

Intervention	Output	Mitigation		Adaptation			Resilience					
		Carbon Sequestration	Reduced Emissions	Diversification	Soil and Water Conservation	Knowledge & Capacity	Social Resilience	Ecological Resilience	Economic Resilience	Health & Nutrition Resilience	Traditional Knowledge	Reflective Learning
Integrated watershed Development	Soil and water conservation, ecosystem restoration	Y	Y	N	Y	Y	Y	Y	Y	N	Y	Y
Construction of Farm ponds	Water storage, improved irrigation reliability	N	Y	N	Y	Y	Y	Y	Y	N	Y	Y
Construction of Water Harvesting Structure	Rainwater capture, recharge enhancement	N	Y	N	Y	Y	Y	Y	Y	N	Y	Y
Construction of Micro-River lift Projects (Solar / Electric)	Reliable irrigation for smallholders	N	Y	N	Y	Y	Y	Y	Y	N	Y	Y
Establishment of hybrid primary processing infrastructure powered by both electricity and solar energy, aimed at providing services such as cleaning, grading, etc and other value addition for crops and commodities.	Value addition, reduced post-harvest loss	N	Y	N	N	Y	Y	Y	Y	N	N	Y
Research and development of small-scale farm machinery suitable for all land types, with modifications/ alteration tailored to local needs, and linkage with potential entrepreneurs for promotion and deployment.	Improved productivity, reduced drudgery	N	Y	N	N	Y	Y	N	Y	Y	Y	Y
Provision of a revolving fund to FPOs and entrepreneurs to support business activities within the landscape, including packaging, branding, and marketing of products	Access to finance, entrepreneurship support	N	N	N	N	Y	Y	N	Y	N	Y	Y

Intervention	Output	Mitigation		Adaptation			Resilience					
		Carbon Sequestration	Reduced Emissions	Diversification	Soil and Water Conservation	Knowledge & Capacity	Social Resilience	Ecological Resilience	Economic Resilience	Health & Nutrition Resilience	Traditional Knowledge	Reflective Learning
Entrepreneurship Development	Job creation, youth engagement, rural enterprise	N	N	Y	N	Y	Y	N	Y	N	Y	Y

Table 7.2 – Potential Climate Outcomes of Interventions

7.3. Increasing Incomes

Income estimates have many facets. For example, the production of commodities within the landscape, such as vegetables, will lead to a reduction in imports from outside the landscape. On the other hand, the sale of commodities produced within the landscape and sold outside it will lead to increased income. Increased production and/or productivity does not necessarily lead to increased incomes. **Table 7.3** provides income potential for select interventions in the landscape.

S. No.	Crop/Commodity Name	Output/Yield Unit	Resource base unit	Current Output/Yield	Current Resource Base	Average State Output/Yield	Average National Output/Yield	New Output/Yield Post-Intervention	Resource base (under intervention)	Resource base (under original practice)	Total quantity of commodity available for sale (current)	Total quantity of commodity available for sale (post-intervention)	Percentage change in quantity of commodity sold
1	Black Gram	Kg/Ha (annual)	Ha	685	348	553	610	822	400	0	143028	197280	37.93
2	White Rajma	Kg/Ha	Ha	700	100	589	892	840	400	0	42000	201600	380
3	Black Horse Gram	Kg/Ha (annual)	Ha	350	119	550	904	455	400	0	21990	109200	336.97
4	Niger	Kg/Ha (annual)	Ha	412	218	484	1340	535	400	0	53890	128400	138.26
5	Turmeric	Kg/Ha (annual) – 2 years	Ha	2300	265	NA	NA	2990	400	0	365700	717600	96.23
6	Cashew	Kg/Ha	Ha	80	450	NA	NA	104	100	350	28800	-	-
7	Mango	Kg/Ha	Ha	450	1100	NA	NA	540	100	1000	396000	-	-
8	High Value Vegetables	Kg/Ha	Ha	930	20	NA	NA	1100	200	0	14880	176000	1082.8

Table 7.3 – Assessment of Crop Productivity, Resource Base, and Sales Potential Under Proposed Interventions

7.4. Enhanced Biodiversity

As given in Chapter 5, section 5.1, the agrobiodiversity plan will be worked upon by Technical Experts in the implementation phase. Some of the identified interventions, which will have a positive impact on the biodiversity are listed below:

A. Agriculture-Based Interventions

1. **Promotion of crop intensification (Little Millet, Black Gram, White Rajma, Black Horse Gram, Niger, etc.) through intercropping/polycropping:**
   - Increases on-farm crop diversity and supports beneficial insects, pollinators, and soil microbes.
   - Enhances resilience by integrating multiple species in a single system.

1. **Promotion of Green Gram and Bengal Gram in rice fallows:**
   - Introduces new crops into mono-cropped areas, improving biodiversity in rice-dominated landscapes.
   - Enriches soil microbial diversity through nitrogen-fixing pulses.

2. **Promotion of Breeder Models for indigenous and traditional landraces:**
   - Conserves and regenerates agrobiodiversity by multiplying local seed varieties adapted to the micro-ecosystem.
   - Reduces genetic erosion and preserves traditional seed systems.

3. **Setting up Bio-Manure Centres (bio-fertilisers and bio-pesticides):**
   - Reduces chemical dependency, allowing natural soil biodiversity (microbes, earthworms, fungi) to flourish.
   - Promotes organic soil regeneration and healthier agroecosystems.

B. Agroforestry Interventions

5. **Nursery Development for Quality Planting Material (QPM):**
   - Diversifies species composition through the inclusion of native forest and fruit tree species.
   - Conserves local germplasm and promotes restoration of degraded areas.

6. **Promotion of Agroforestry through Silvicultural and Boundary Models:**
   - Integrates trees, crops, and sometimes livestock, enhancing structural and functional diversity.
   - Provides habitats for birds, pollinators, and soil fauna, while stabilizing ecological cycles.

C. Horticulture Interventions

7. **Organic Vegetable Cultivation in Clusters:**
   - Encourages habitat for beneficial insects and pollinators by avoiding pesticide use.
   - Promotes crop rotation and diversification, restoring soil life and microbial diversity.

8. **Development of Fruit Orchards (Cashew, Mango, Banana, Pomegranate, Pineapple):**

- Expands perennial vegetation cover, creating microhabitats and improving ecological connectivity.
- Supports pollinators and beneficial fauna throughout the year.

9. **Promotion of Floriculture Cultivation:**
    - Directly enhances floral diversity and pollinator populations.
    - Encourages diversification of the farming system with nectar-rich species.

D. Animal Husbandry Interventions

10. **Multi-layer integrated farming systems (poultry, fodder, legumes, vegetables, orchards):**
    - Promotes circular nutrient flows and interdependence between species.
    - Reduces waste and enriches ecosystem services through organic manure cycling.

E. Natural Resource Management Interventions

11. **Integrated Watershed Development and Water Harvesting Structures:**
    - Regenerates native vegetation and aquatic biodiversity.
    - Prevents soil erosion and supports ecological restoration in degraded catchments.
12. **Promotion of Solar-Based Irrigation and Micro-Irrigation:**
    - Reduces groundwater stress and maintains ecological balance in water bodies.
    - Promotes efficient water use that sustains vegetation and biodiversity in the long term.

F. Cross-Cutting & Support Interventions

13. **Research and Development of small-scale machinery suited to local ecosystems:**
    - Minimizes habitat disturbance by promoting low-impact tools.
    - Encourages context-specific adaptation that supports agroecological diversity.
14. **Entrepreneurship and FPO strengthening in biodiversity-based products:**
    - Incentivizes conservation of traditional varieties (millets, pulses, medicinal plants) through market demand.
    - Strengthens biodiversity-linked livelihoods and conservation economies.

7.5. Improving the Quality of Natural Resources

The following interventions are designed to enhance the natural resources, specifically land, water, forests, and commons.

S No.	Intervention	Land	Water	Forest	Commons	Description of Resource Impact
1	Crop intensification with intercropping/polycropping (Little Millet, Black Gram, Niger, etc.)	✅			✅	Improves soil fertility, prevents erosion, and enhances productivity on common farmlands.

S No.	Intervention	Land	Water	Forest	Commons	Description of Resource Impact
2	Green Gram & Bengal Gram in rice fallows	✅				Promotes soil regeneration and nutrient cycling in underutilised fallow lands.
3	Turmeric intensification with polycropping	✅				Builds soil organic matter and strengthens root-soil interactions.
4	Breeder models for indigenous and suitable landraces	✅				Strengthens genetic diversity and land productivity through resilient varieties.
5	Bio-manure & Bio-pesticide Centres	✅				Improves soil organic carbon and reduces chemical degradation.
6	Nursery development for Quality Planting Materials (QPM)	✅		✅	✅	Promotes afforestation and soil improvement through tree and horticultural species.
7	Agroforestry on marginal uplands, medium lands, and wastelands	✅	✅	✅	✅	Restores degraded lands, improves infiltration, supports forest cover, and enhances community commons.
8	Agroforestry on agricultural boundaries	✅	✅	✅	✅	Increases tree cover, soil moisture, and ecological connectivity.
9	Organic vegetable cultivation in cluster mode	✅	✅			Improves soil structure, water retention, and reduces pollution.
10	Orchard development (Cashew, Mango, Banana, Pomegranate, Pineapple)	✅	✅	✅		Promotes perennial vegetation, improves soil stability, and enhances microclimate regulation.
11	PMKSY scheme (micro-irrigation)		✅			Improves irrigation efficiency, water use, and groundwater recharge.
12	Integrated watershed development	✅	✅	✅	✅	Strengthens soil conservation, surface and groundwater recharge, and landscape restoration.
13	Farm ponds construction	✅	✅		✅	Enables rainwater harvesting, supports irrigation, and improves local water tables.
14	Water harvesting structures	✅	✅		✅	Reduces runoff and improves water availability for multiple uses.
15	Micro-river lift projects (solar/electric)		✅		✅	Enhances water accessibility and equitable distribution among farmers.
16	Solar-based irrigation systems		✅			Provides reliable and sustainable irrigation without over-extracting groundwater.
17	Multi-layer integrated backyard farming systems	✅	✅			Promotes circular nutrient flows and reduces waste through efficient land use.
18	Goat shelters and fodder tree planting	✅		✅	✅	Improves fodder availability, reduces grazing pressure on forests, and restores commons.
19	Integrated animal health and vaccination systems				✅	Protects livestock productivity and reduces stress on natural grazing commons.
20	Diversion-based irrigation systems (pipe-based)		✅			Reduces erosion, ensures efficient water delivery, and supports multi-crop systems.

S No.	Intervention	Land	Water	Forest	Commons	Description of Resource Impact
21	Entrepreneurship in local processing, machinery, and input supply	✅			✅	Reduces wastage, improves input efficiency, and adds value to natural resource use.
22	Revolving fund for FPOs and entrepreneurs				✅	Enables local reinvestment in natural resource management and sustainable enterprises.

Table 7.4 – Proposed Interventions to Strengthen Natural Resources

The following interventions are intended to rebuild or repair prior work done in the landscape related to the management of natural resources.

- **Integrated Watershed Development** – revitalizes existing watershed structures, strengthens soil and water conservation measures, and restores degraded catchments for improved water recharge.
- **Construction and Renovation of Farm Ponds** – repairs or deepens existing ponds to enhance water storage capacity and ensure year-round availability for irrigation and livestock.
- **Construction and Rehabilitation of Water Harvesting Structures** – rebuilds earlier check dams, percolation tanks, and contour bunds that may have degraded over time, improving surface and groundwater recharge.
- **Pipe-based Diversion Irrigation Systems** – upgrades or replaces traditional open channel systems with buried pipelines to reduce seepage losses and improve efficiency of existing irrigation infrastructure.
- **Micro-River Lift Projects (Solar/Electric)** – modernizes or restores earlier lift irrigation systems by integrating solar power and micro-irrigation technologies for sustainable operation.
- **Promotion of PMKSY Scheme** – converges with ongoing government irrigation programs to repair, expand, and operationalize partially functional assets created under earlier schemes.
- **Agroforestry Promotion in Marginal and Cultivable Fallows** – reclaims degraded or underutilized lands, improving soil stability and restoring vegetative cover on previously treated or abandoned plots.
- **Integrated Solar-Based Irrigation Infrastructure** – upgrades existing electric-based systems in remote or low-voltage areas, ensuring reliability and continuity of irrigation services.

The following interventions are aimed at the demand-side management of natural resources, primarily water.

- **Promotion of Micro-Irrigation Systems** (under diversion and solar irrigation projects) – enhances water use efficiency by delivering water directly to the root zone, minimizing evaporation and seepage losses.
- **Pipe-based Diversion Irrigation Systems** – replace traditional open channels with closed pipelines, reducing water losses and ensuring equitable distribution among users.
- **Promotion of Solar-Powered Community-Based Irrigation Infrastructure – Encourages** regulated water use through community-managed systems that optimize energy and water consumption.
- **Integrated Watershed Development** – supports soil and moisture conservation, contour bunding, and groundwater recharge, thereby improving water availability while promoting efficient use at the field level.

- **Construction of Farm Ponds and Water Harvesting Structures** – enables localized water storage, promoting controlled, need-based irrigation rather than over-extraction from shared sources.
- **Crop Diversification and Intensification Models** – promote less water-intensive crops, such as millets, pulses, and oilseeds, during Rabi and off-season cultivation, thereby reducing overall irrigation demand.
- **Promotion of Agroforestry and Horticulture in Uplands** – stabilizes slopes and reduces runoff, thereby conserving soil moisture and improving in-situ water retention, which in turn lowers irrigation needs downstream.

7.6. Enhancing Food and Nutrition Security

The dietary assessment of Chitrakonda reveals an overall favourable nutritional profile, with dietary diversity and consumption of healthy food groups significantly higher than national averages. However, imbalances in food group consumption, low dairy intake, and rising consumption of unhealthy foods present emerging challenges that need attention. Following are some of the key observations:

- **High Dietary Diversity:** A remarkable 82% of respondents achieved a Minimum Dietary Diversity (MDD) score of 5 or above, compared to just 33% of rural women nationally. The mean dietary diversity score (5.8) also surpasses the national average of 4.6, indicating better access to a variety of foods.
- **Gender Parity:** Both men (84%) and women (81%) reported similar MDD scores, suggesting equitable access to diverse diets within households — a positive gender outcome.
- **High Intake of Protective Foods:** Nearly 98% of households consumed at least one fruit or vegetable in the past 24 hours, far exceeding the national figure of 78%. Similarly, 63% of households consumed all five essential food groups (cereals, pulses, vegetables, fruits, animal-source foods), compared to 28% nationally.
- **Protein-Rich Diets:** Consumption of meat, poultry, and fish was notably higher (77%) than the national average (28%), reflecting good access to and cultural acceptance of animal-source protein.
- **Local Food Production:** Most households grow or collect staples such as rice, millets, and local pulses, showing strong reliance on local agro-biodiversity and traditional food systems.

Some of the key challenges are:

- **Rising Intake of Unhealthy Foods:** A growing concern is the high consumption of sugary foods (65%) and fried snacks (40%), nearly double the national rural averages. This trend suggests nutrition transition towards calorie-dense, nutrient-poor foods.
- **Limited Household Production of Animal-Source Foods:** Only 13% produce eggs, 29% chicken, and 48% mutton, indicating partial dependence on markets and possible exposure to supply disruptions.
- **Dependence on Markets for Perishables:** Despite high consumption, self-production of vegetables and pulses is low (15% and 34%, respectively), making households vulnerable to price and supply fluctuations. Seasonality also limits consistent availability.
- **Timing of Data Collection:** As the data were collected during July–August 2025, some findings—especially on vegetable availability and self-production—may not fully represent year-round patterns.

The goal of this project is to ensure local availability of all food groups, preferably grown locally. Efforts will also be made to revive traditional cooking and consumption practices, which are expected

to lead to enhanced bioavailability of nutrients in the food. This will be accomplished through the intervention of nutrition education.

7.7. Ensuring Well-Being of Women Farmers, Small and Marginal Farmers

Efforts will be made to enrol women as members and directors in various community-based organisations (CBOs), such as cooperatives and Farmer Producer Companies (FPCs). The accompanying report on policy changes at the landscape level will outline further measures.

In most interventions, initial grants, in-kind support, and demonstration units will be made available to small and marginal farmers, as well as landless labourers.

7.8. Sustainable Development Goals

Table 7.5 illustrates the output of different interventions and their connection to the Sustainable Development Goals.

Note: 'Y' has been stated to indicate that the SDG would be impacted, and 'N' has been stated in case of no direct impact

Domain/Sector-wise Interventions	SDG 1 No Poverty	SDG 2 Zero Hunger	SDG 3 Good Health and Well-being	SDG 4 Quality Education	SDG 5 Gender Equality	SDG 6 Clean Water and Sanitation	SDG 7 Affordable and Clean Energy	SDG 8 Decent Work and Economic Growth	SDG 12 Responsible Consumption and Production	SDG 13 Climate Action	SDG 14 Life Under Water	SDG 15 Life on Land	SDG 16 Peace, Justice & Strong Institutions	SDG 17 Partnership for the Goals
Agriculture														
Promotion of crop intensification focusing on Little Millet, Black Gram, White Rajma, Black Horse Gram, and Niger, with an emphasis on intercropping or polycropping approaches	Y	Y	Y	N	N	N	N	Y	Y	Y	N	Y	N	N
Promotion of Green Gram and Bengal Gram and other suitable crops in rice fallow areas during the Rabi season, to enhance overall cropping intensity.	Y	Y	Y	N	N	N	N	Y	Y	Y	N	Y	N	N
Intensification of Turmeric with polycropping models.	Y	Y	N	N	N	N	N	Y	Y	N	N	Y	N	N
Promotion of Breeder models aimed at conservation, Production and multiplication of indigenous and suitable landraces aiming to establish a supply chain of seed distribution to farmers, with a focus on enhancing nutrition, productivity, and other key traits.	Y	Y	Y	Y	Y	N	N	Y	Y	Y	N	Y	N	N
Organic Certification through Participatory Guarantee System (PGS)	N	N	Y	N	N	N	N	Y	Y	N	N	Y	Y	Y
Setting up a Bio-Manure Centre under an entrepreneurship model, with a focus on producing bio-fertilizers and bio-pesticides.	Y	N	N	Y	Y	N	N	Y	Y	Y	N	Y	N	N
Agroforestry														
Nursery Development for the production of Quality planting Materials (QPM) through Local institutions and Entrepreneurs.	Y	N	N	Y	Y	N	N	Y	N	Y	N	Y	N	N
Promotion of agroforestry through silvicultural models and others in marginal uplands, medium lands, cultivable fallows, and wastelands.	N	N	N	N	N	N	N	Y	Y	Y	N	Y	N	N

Note: 'Y' has been stated to indicate that the SDG would be impacted, and 'N' has been stated in case of no direct impact														
	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 8	SDG 12	SDG 13	SDG 14	SDG 15	SDG 16	SDG 17
Domain/Sector-wise Interventions	No Poverty	Zero Hunger	Good Health and Well-being	Quality Education	Gender Equality	Clean Water and Sanitation	Affordable and Clean Energy	Decent Work and Economic Growth	Responsible Consumption and Production	Climate Action	Life Under Water	Life on Land	Peace, Justice & Strong Institutions	Partnership for the Goals
Promotion of Agroforestry in agricultural field and boundaries.	Y	N	N	N	N	Y	N	Y	Y	Y	N	Y	N	N
Horticulture														
Promotion of Organic Vegetable cultivation in cluster mode in Rabi season.	Y	Y	Y	Y	N	N	N	Y	Y	Y	N	Y	N	N
Development of Cashew Orchard	Y	N	N	N	N	N	N	Y	Y	Y	N	Y	N	N
Development of Mango Orchard	Y	Y	Y	N	N	N	N	Y	Y	N	N	Y	N	N
Development of Banana Orchard	Y	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	N
Development of Pomegranate Orchard	Y	Y	Y	N	N	N	N	Y	Y	Y	N	Y	N	N
Pineapple cultivation	Y	Y	Y	N	N	N	N	Y	Y	N	N	N	N	N
Promotion of PMKSY Scheme	Y	N	N	N	Y	Y	N	Y	Y	N	N	Y	N	N
Promotion of Floriculture Cultivation	Y	N	N	N	N	N	N	Y	Y	Y	N	Y	N	N
Development of Functional Pack House, On farm collection and storage unit	Y	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	N
Cold Storage Units	Y	Y	Y	Y	Y	N	N	Y	N	N	N	N	N	N
Animal husbandry														
Establishment of a multi-layer integrated farming system emphasizing backyard poultry, integration of diverse crops and plants for nutritional benefits, supplementary feed production, and comprehensive livestock care to enhance productivity.	Y	Y	Y	N	N	N	N	Y	Y	Y	N	Y	N	N

Note: 'Y' has been stated to indicate that the SDG would be impacted, and 'N' has been stated in case of no direct impact

Domain/Sector-wise Interventions	SDG 1 No Poverty	SDG 2 Zero Hunger	SDG 3 Good Health and Well-being	SDG 4 Quality Education	SDG 5 Gender Equality	SDG 6 Clean Water and Sanitation	SDG 7 Affordable and Clean Energy	SDG 8 Decent Work and Economic Growth	SDG 12 Responsible Consumption and Production	SDG 13 Climate Action	SDG 14 Life Under Water	SDG 15 Life on Land	SDG 16 Peace, Justice & Strong Institutions	SDG 17 Partnership for the Goals
Construction of low-cost goat shelter for enhancing goat rearing practices by ensuring access to green fodder and supplementary feed to improve productivity.	Y	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	N
Strengthening vaccination services and animal healthcare through Community Animal health workers.	Y	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	N
Back yard Duck rearing	Y	Y	Y	N	N	N	N	Y	Y	Y	N	N	N	N
Natural Resource Management														
Setting up a pipe-based diversion irrigation system, emphasizing micro-irrigation by harnessing natural water sources such as streams, rivers, springs, and water harvesting structures and Promotion of solar-powered community-based irrigation infrastructure.	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	Y		N
Integrated watershed Development	N	N	Y	Y	N	Y	N	Y		Y	N		Y	Y
Construction of Farm ponds	Y	N	Y	N	N	Y	N	Y	N	Y	N	Y		N
Construction of Water Harvesting Structure	Y	Y	Y	Y	N	Y	N	Y	N	Y	N	Y	N	N
Construction of Micro-River lift Projects (Solar / Electric)	Y	Y	Y		N	Y	Y	Y	N	Y	N	Y	N	N
Others														
Establishment of hybrid primary processing infrastructure powered by both electricity and solar energy, aimed at providing services such as cleaning, grading, etc and other value addition for crops and commodities.	Y	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N

Note: 'Y' has been stated to indicate that the SDG would be impacted, and 'N' has been stated in case of no direct impact														
	SDG 1	SDG 2	SDG 3	SDG 4	SDG 5	SDG 6	SDG 7	SDG 8	SDG 12	SDG 13	SDG 14	SDG 15	SDG 16	SDG 17
Domain/Sector-wise Interventions	No Poverty	Zero Hunger	Good Health and Well-being	Quality Education	Gender Equality	Clean Water and Sanitation	Affordable and Clean Energy	Decent Work and Economic Growth	Responsible Consumption and Production	Climate Action	Life Under Water	Life on Land	Peace, Justice & Strong Institutions	Partnership for the Goals
Research and development of small-scale farm machinery suitable for all land types, with modifications/ alteration tailored to local needs, and linkage with potential entrepreneurs for promotion and deployment.	N	N	Y	Y	Y	N	Y	Y	Y	N	N	N	N	N
Provision of a revolving fund to FPOs and entrepreneurs to support business activities within the landscape, including packaging, branding, and marketing of products	Y	N	Y	Y	Y	N	N	Y	N	N	N	N	Y	N
Entrepreneurship Development	Y	N	N	Y	Y	N	N	Y	N	N	N	N	N	N
Operation Farmer Field School, including running cost for 3 years	N	Y	Y	Y	Y	N	N	N	Y	Y	N	Y	Y	N
One day, Capacity Building Training Programs for Community Resource Persons, Extension functionaries, PRI etc.	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N
One day, capacity building programs for farmers and lead farmers	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N
Two-day capacity building programs for farmers and lead farmers.	N	N	Y	Y	Y	N	N	Y	N	N	N	N	N	N

Table 7.5 – Interventions and the Sustainable Development Goals

Annexures

Annexure 1- Numbers of Farm Families, Social-class-wise and Holding Size

Land Holding Size	ST	SC	Other	Total
Marginal (<1.0 ha.)	3,701	433	691	4,825
Small (1.2 ha.)	1,948	228	364	2,540
Semi-Medium (2-4 ha.)	1,482	173	277	1,932
Medium (4-10ha.)	104	12	19	135
Large (>10ha.)	0	0	0	0
Total Farm Family	**7,235**	**846**	**1,351**	**9,432**

Annexure 2 - Crop-wise Use of Seeds for Different Crops

Cropping Season	Crops	Government	Own/ Indigenous
Kharif	Paddy	✅	
Kharif	Maize	✅	✅
Kharif	Ragi/ Little Millet		✅
Kharif	Arhar	✅	✅
Kharif	Green Gram	✅	✅
Kharif	Black Gram	✅	✅
Kharif	Cow Pea		✅
Kharif	Black Horse Gram		✅
Kharif	Ground nut	✅	
Kharif	Sesamum		✅
Kharif	Niger	✅	✅
Kharif	Chilly		✅
Kharif	Turmeric		✅
Kharif	Other Vegetables		✅

Source: District Agriculture Strategy Booklet & Community Interaction

Annexure 3 - Crop-wise Growing Seasons and Varieties

Cropping Season	Crops	Early/ Late	% of HH	Transplanting Month
Kharif	Paddy	Early	70%	June/July
Kharif	Maize	Early	100%	June/July
Kharif	Ragi/ Little Millet	Late	80%	August/ September
Kharif	Arhar	Early	20%	June/July
Kharif	Green Gram	Late	30%	November/ December
Kharif	Black Gram	Late	80%	September/ October
Kharif	Cow Pea	Early	70%	July

Annexure 4 - Forest Species and their Use

FOREST SPECIES AND USES											
S. No.	Name of the species	Timber	Firewood	Foodery	Fruit	Medicines	Oil	Agriculture Equipment	Spices	Department Priority	People Priority
1	Sala	✅	✅	✅				✅		✅	
2	Bija/ Piasala	✅	✅	✅						✅	
3	Pahadi Sissoo/ Balisissoo	✅	✅							✅	
4	Saguan	✅	✅							✅	
5	Asan	✅	✅							✅	
6	Arjun	✅	✅							✅	
7	Dhaura	✅	✅	✅				✅		✅	
8	Phasi	✅	✅							✅	
9	Mundi	✅	✅							✅	
10	Haluda/ Kuramo	✅	✅							✅	
11	Sidha	✅	✅							✅	
12	Korada	✅	✅							✅	
13	Kasi	✅	✅							✅	
14	Bandhan	✅	✅					✅		✅	
15	Bara Bakulia	✅	✅							✅	

FOREST SPECIES AND USES											
S. No.	Name of the species	Timber	Firewood	Foodery	Fruit	Medicines	Oil	Agriculture Equipment	Spices	Department Priority	People Priority
16	Gambhari	✅	✅							✅	
17	Dhala Siris	✅	✅							✅	
18	Kala Siris'	✅	✅							✅	
19	Amba				✅					✅	✅
20	Ambada				✅					✅	✅
21	Panas				✅					✅	✅
22	Tentuli				✅					✅	✅
23	Jamu				✅					✅	✅
24	Barkoli				✅					✅	✅
25	Rama Pholo				✅					✅	✅
26	Ata				✅					✅	✅
27	Ou (Elephant apple)				✅					✅	✅
28	Nimba		✅			✅				✅	
29	Bala		✅			✅				✅	
30	Aonla		✅			✅				✅	
31	Harida		✅			✅				✅	
32	Bahada		✅			✅				✅	

FOREST SPECIES AND USES											
S. No.	Name of the species	Timber	Firewood	Foodery	Fruit	Medicines	Oil	Agriculture Equipment	Spices	Department Priority	People Priority
33	Sunari		✅			✅				✅	
34	Chandan		✅			✅				✅	
35	Raktachandan		✅			✅				✅	
36	Gongasiulei		✅			✅				✅	
37	Banabhalia		✅			✅				✅	
38	Khaira		✅			✅				✅	
39	Palas		✅			✅				✅	
40	Simili		✅			✅				✅	
41	Kachila		✅			✅				✅	
42	Baulo		✅			✅				✅	
43	Ritha		✅			✅				✅	
44	Ganduli		✅			✅				✅	
45	Phanaphana		✅			✅				✅	
46	Ashoka		✅			✅				✅	
47	Mahula		✅			✅	✅			✅	✅
48	Kusum		✅				✅			✅	✅
49	Karanja		✅				✅			✅	✅
50	Kirchi (Khakada)		✅				✅			✅	✅

FOREST SPECIES AND USES											
S. No.	Name of the species	Timber	Firewood	Foodery	Fruit	Medicines	Oil	Agriculture Equipment	Spices	Department Priority	People Priority
51	Champa		✅							✅	
52	Krushna Chuda		✅							✅	
53	Bishnu Chuda		✅							✅	
54	Radha Chuda		✅							✅	
55	Mysore queen		✅							✅	
56	Kanchana		✅							✅	
57	Borada/ Kailari		✅							✅	
58	Kadamba		✅							✅	
59	Nagaswar		✅							✅	
60	Bara		✅							✅	
61	Aswastha		✅							✅	
62	Dimiri		✅							✅	
63	Podei		✅				✅	✅		✅	
64	Jori		✅				✅	✅		✅	
65	Baidimiri		✅							✅	
66	Rubber Plant		✅							✅	
67	Baunsa (Bamboo)		✅							✅	
68	Tal		✅							✅	

FOREST SPECIES AND USES											
S. No.	Name of the species	Timber	Firewood	Foodery	Fruit	Medicines	Oil	Agriculture Equipment	Spices	Department Priority	People Priority
69	**Salap**		✅							✅	✅
70	**Gua**		✅							✅	
71	**Bhrusanga/ Mirsinga**		✅						✅	✅	
72	**Dalchini**		✅						✅	✅	
73	**Teja patra**		✅						✅	✅	
74	**Karpura**		✅						✅	✅	
75	**Labanga**		✅						✅	✅	
76	**Alicha**		✅						✅	✅	
77	**Golmaricha**		✅						✅	✅	

Source: Interaction with Forest Department and community of the landscape.

Annexure 5 - Haats and Major Items Traded

Chitrakonda Haats and Major Items Traded									
S. No.	Haats	Distance from Chitrakonda in Km	Household Goods	Crops	Vegetable	Fruits	NTFP	Poultry	Sheep/ Goat
1	Chitrakonda	0	✅	✅	✅	✅	✅	✅	
2	Jantapai	30	✅	✅	✅	✅	✅	✅	
3	Gajalmamudi	62	✅	✅	✅	✅	✅	✅	
4	Darlabeda	50	✅	✅	✅	✅	✅	✅	
5	Panasput	65	✅	✅	✅	✅	✅	✅	
6	Muchimput	100	✅	✅	✅	✅	✅	✅	✅
7	Rudakata	92	✅	✅	✅	✅	✅	✅	✅
8	Lachimipur	85	✅	✅	✅	✅	✅	✅	
9	Ghatakonda	14	✅	✅	✅	✅	✅	✅	
10	Katnipadar	58	✅	✅	✅	✅	✅	✅	
11	Petal	32	✅	✅	✅	✅	✅	✅	
12	Bhusput	90	✅	✅	✅	✅	✅	✅	✅

Annexure 6 - Sources of Irrigation and Coverage

S. No.	Irrigation Programs/ Sources	Area in Ha
1	Minor Irrigation Program	30
2	Lift Irrigation Program (OAIC, OLIC)	1728
3	Borewells	8
4	Dug wells	15
5	Other Sources	40
	Total	**1821**

Source: District Agriculture Strategy Booklet

Annexure 7 - Production and Consumption of Different Crops

S. No.	Season	Crops	Area In Ha	Yield in Qntl/ Ha	Production (In Quintal)	Consumption (In Quintal)	Surplus (In Quintal)
1	Kharif	HYV Paddy	2,742	36.62	100,412	40,165	60,247
2	Kharif	Local Paddy	1,401	24.58	34,437	13,775	20,662
3	Kharif	HYV Maize	1,180	32.10	37,878	15,151	22,727
4	Kharif	Local Maize	202	25.48	5,147	2,059	3,088
5	Kharif	Ragi	1,350	8.21	11,084	4,433	6,650
6	Kharif	Little Millet	962	6.00	5,772	2,309	3,463
7	Kharif	Arhar	239	4.50	1,076	430	645
8	Kharif	Green Gram	216	5.70	1,231	492	739
9	Kharif	Black Gram	348	4.84	1,684	674	1,011
10	Kharif	Cow Pea	65	7.05	458	183	275
11	Kharif	Black Horse Gram	119	3.50	417	167	250
12	Kharif	Rajma	100	12.50	1,250	500	750
13	Kharif	Ground nut	80	10.55	844	338	506
14	Kharif	Sesamum	689	4.30	2,963	1,185	1,778
15	Kharif	Niger	218	4.10	894	358	536
16	Kharif	Ginger	85	36.67	3,117	1,247	1,870
17	Kharif	Turmeric	265	22.92	6,074	2,430	3,644
18	Kharif	Other Vegetables	1,092	102.64	112,083	44,833	67,250
19	Rabi	Sweet Potato	85	95.70	8,135	3,254	4,881
20	Rabi	Potato	88	115.83	10,193	4,077	6,116
21	Rabi	Onion	30	122.33	3,670	1,468	2,202
22	Rabi	Other Vegetables	120	169.75	20,370	8,148	12,222

Source: District Agriculture Strategy Booklet/ Odisha Agriculture Statistic 2019-20

Annexure 8 - Community Institutions Promoted by Various Departments

S. No.	Nodal Department	Institution formed	Responsibility for Operations
1	Agriculture Department	Women Self Help Groups (WSHGs)	CRPs / Krushaka Sathi
2	Agriculture Department	Farmer Producer Organizations	
3	Odisha Livelihood Mission/ Misson Sakti Department	Block Level WHG Federation	Krushi Mitra/ Prani Mitra/ Bank Mitra/ MBKs / Udyog Mitra
4	Odisha Livelihood Mission/ Misson Sakti Department	Producer Company (PCs)/ Producer Group (PGs)	
5	Odisha Livelihood Mission/ Misson Sakti Department	WSHGs - Running Enterprises/ Processing Units.	
6	Integrated tribal development Agency	Janjati Jivika Parishad	Janjivika Sathi
7	Integrated tribal development Agency	Village Development Committee (VDC)	Community resource persons
8	Integrated tribal development Agency	Van Dhan Bikash Karjyakrama (VDBK Groups)	
9	Forest Department	Forest Protection committee	Community
10	Fishery Department	Fishery Producer Groups	Community

Annexure 9 - Scientific Names of Crops

S. No.	Crops	Scientific Name	Family
1	Paddy	Oryza sativa	Poaceae
2	Maize	*Zea mays*	Poaceae
3	Finger Millet	*Eleusine coracana*	Poaceae
4	Little Millet	*Panicum sumatrense*	Poaceae
5	Sorghum	*Sorghum bicolor*	Poaceae
6	Arhar/ Redgram	*Cajanus cajan*	Fabaceae
7	Green Gram	*Vigna radiata*	Fabaceae
8	Black Gram	*Vigna mungo*	Fabaceae
9	Cow Pea	*Vigna unguiculata*	Fabaceae
10	Black Horse Gram	*Macrotyloma uniflorum*	Fabaceae
11	Ground nut	*Arachis hypogaea*	Fabaceae
12	Rajma (Buta semi)	*Phaseolus vulgaris*	Fabaceae
13	Sesamum	*Sesamum indicum*	Pedaliaceae
14	Niger	*Guizotia abyssinica*	Asteraceae
15	Castor	*Ricinus communis*	Euphorbiaceae
16	Tumeric	Curcuma Longa	Zingiberaceae
17	Ginger	Zingiber officinae	Zingiberaceae

Annexure 10 - Scientific Names of Plants

S. No.	Trees/ Fruit Bearing Plant/ Local Name	Scientific Name/ Botanical Name	Family
	Timber Species		
1	Sala	Shirea robusta	Depterocarpaceae
2	Bija/ Piasala	Ptrerocarpus marsuplum	Fabaceae
3	Pahadi Sissoo/	Dalbergia Latifolia	Fabaceae
4	Balisissoo	Dalbergia Sisso	Fabaceae
5	Saguan	Tectona Grandis	Verbenaceae
6	Asan	Terminalia tomentosa	Combreataceae
7	Arjun	Terminalia arjuna	Combreataceae
8	Dhaura	Anogeisissus Latifolia	Combreataceae
9	Phasi	Anogeisissus acuminata	Combreataceae
10	Mundi	Mitragyna Parvifolia	Rubiaceae
11	Haluda/ Kuramo	Adina Parvifolia	Rubiaceae
12	Sidha	Lagerstoemia Praviflora	Lytheraceae
13	Korada	Clesistanthus Collinus	Euphorbiaceae
14	Kasi	Bridellia Retusa	Euphorbiaceae
15	Bandhan	Ougeinia oojeinensis	Fabaceae
16	Bara Bakulia	Dalberigia paniculata	Fabaceae
17	Gambhari	Gmelina arboria	Verbenaceae
18	Dhala Siris	Albizzia Lebeck	leguminaceae
19	Kala Siris'	Albizzia Lebeck	Mimosaceae
	Fruit Bearing Species		
20	Amba	Mangifera Indica	Anacardiaceae
21	Ambada	Spondias mangifera	Anacardiaceae
22	Panas	Artocarpus Heterophyllus	Moraceae
23	Tentuli	Tamarindus indica	Caesalpinaceae
24	Jamu	Syzygium cumini	Myrtaceae
25	Barkoli	Zizyphus jujuba	Rhamnaceae
26	Rama Pholo	Anona retelucta	Annonaceae
27	Ata	Anona squamosa	Annonaceae
28	Ou (Elephant apple)	Dillenia idica	Dilleniaceae
	Medicinal Plant		
29	Nimba	Azradoiirachta Indica	Meliaceae
30	Bala	Aegle marmelos	Rutaceae
31	Aonla	Emblica officinalis	Euphorbiaceae
32	Harida	Terminalia Chebula	Combretaceae
33	Bahada	Terminalia belerica	Combretaceae
34	Sunari	Cassia Fistula	Caesalpinaceaae
35	Chandan	Santalum Album	Santalaceae
36	Raktachandan	pterocarpus santalinus	Fabaceae
37	Gongasiulei	Nyctantus arbortraistis	Oleaceae
38	Banabhalia	Semicarpus anacardium	Anacarrdiaceae
39	Khaira	Acacia Catecha	Mimosaceae
40	Palas	Butea monosperma	Fabaceae
41	Simili	Bombax Ceiba	Bombacaceae
42	Kachila	Strychnons nuxvomica	Strychanceae

43	Baulo	Mimusops elengii	Sapotaceae
44	Ritha	Sapindus mukorossi	Sapandceae
45	Ganduli	sterculia urens	Steruliaceae
46	Phanaphana	Oroxylum indiclum	-
47	Ashoka	Saraca Asoca	Caesalpinaceae
	Oil Seed Species		
48	Mahula	Madhuca Indica	Sapotaceae
49	Kusum	Schleichera Oleosa	Sapindaceae
50	Karanja	Pongamia Pinnata	Papilionaceae
51	Kirchi (Khakada)	Casearia graveolens	Salicaceae
	Flowing Species		
52	Champa	Michelia champaca	Magnoliaceae
53	Krushna Chuda	Delonix regia	fabaceae
54	Bishnu Chuda	Jacaranda ovlifolia	Bignoniaceae
55	Radha Chuda	Peltraphorum Ferrugeneum	
56	Mysore queen	Spathodea campanulata	
57	Kanchana	Bauhinia racemosa	Caeslpiniaceae
58	Borada/ Kailari	Bauhinia purpurea	
59	Kadamba	Anthocephalus cadamba	Rubiaceae
60	Nagaswar	Mesua ferrea	Guttiferae
	Fiscus Spcies		
61	Bara	Ficus Bengalensis	Moraceae
62	Aswastha	Ficus religiousa	Moraceae
63	Dimiri	Ficus glomerata	Moraceae
64	Podei	Ficus cunia	Moraceae
65	Jori	Ficus retusa	Moraceae
66	Baidimiri	Ficus hererophylla	Moraceae
67	Rubber Plant	Hevea brasiliensis	Moraceae
	Bamoo Species		
68	Baunsa (Bamboo)- (Salia)	Dendracalamus strictus	Gramineae/poaceae
69	Baunsa (Kanta)	Bambusa arundinacia	Gramineae/poaceae
70	Baunsa (Sundar Kani)	Bambuca tulda	Gramineae/poaceae
71	Baunsa (Rakshyasa)	Dendracalamus giganteus	Gramineae/poaceae
72	Baunsa (Topi)	Cepholostachyrm allocilata	Gramineae/poaceae
73	Baunsa (Pani)	oxytenathera abyssinica	Gramineae/poaceae
	Palm Species		
74	Tal	Baressus flabelliferra	Palmaceae
75	Salap	Caryota urens	Palmaceae
76	Gua	Areca catechu	Palmaceae
	Spices		
77	Bhrusanga/ Mirsinga	Murraya coengii	Rutaceae
78	Dalchini	Cinnamomum zeylanicum	-
79	Teja patra	Cinnamomum tamala	-
80	Karpura	Cinnamomum camphora	-
81	Labanga	Syzgium aromaticum	-
82	Alicha	Amomun aromaticum	-
83	Golmaricha	Piper nigrum	-
84	Haldi	Curcuma Longa	Zingiberaceae
85	Ada	Zingiber officinae	Zingiberaceae

	Other species & Fruits		
86	Kendu leaf	Diospyros melanoxylon	Ebenaceae
87	Siali leaf		
88	Jafra		
89	Charkoli		
90	Kantakoli		
91	Jackfruit	Artocarpus heterophyllus	Moraceae
92	Tamarind	Tamarindus Indica	Caesalpinaceae
93	Papaya		
94	Drumstick		
95	Cashew		
96	Mango	Mangifera Indica	Anacardiaceae
97	Guava		
98	Pomogranate		
99	Custard Apple		

Annexure 11 - Breeder Model

The breeder model developed by WASSAN places strong emphasis on collaboration between scientists, Agricultural Universities (AUs), research institutions, and farmers. Its core purpose is the conservation and characterization of traditional crop varieties, while also conducting performance trials within local landscapes. The overarching objective is to identify varieties that are best suited to the local agroecological conditions, focusing on traits such as:

- Higher resistance to pests and diseases,
- Improved productivity,
- Greater stress tolerance, and
- Enhanced nutritional value.

In partnership with ICAR–IIMR, WASSAN is currently engaged in conserving over 150 traditional varieties of millets, pulses, oilseeds, tubers, and other neglected yet nutritionally important crops. Alongside conservation, scientific evaluation trials of millet varieties are undertaken, and maintenance breeding is carried out to ensure the purity of germplasm. A senior plant breeder at WASSAN is responsible for maintaining the genetic purity of the stock, which is then supplied to State Agricultural Universities, ICAR, farmers, Farmer Producer Organizations (FPOs), and Krishi Vigyan Kendras (KVKs) for further multiplication of foundation and certified versions of these traditional varieties. WASSAN continues to invest in breeding and purity maintenance processes to strengthen and stabilize this system.

This breeder model provides a clear pathway for introducing and scaling up locally adapted varieties, supported by rigorous screening and evaluation methods that are responsive to evolving climatic conditions. In many cases, released varieties from other regions tend to underperform in local contexts due to climatic mismatch. To overcome this, the model proposes the establishment of a landscape-based seed system network. Such a network would:

- Assess the performance of indigenous varieties and well-performing landraces across the state,
- Focus on traits of local importance, including taste, cultural relevance, and adaptability,
- Conserve and multiply selected varieties at the farm level, and
- Enable farmers to access larger markets where these traditional varieties can fetch a premium price.

Through this model, WASSAN seeks to bridge the gap between scientific rigor and traditional wisdom, ensuring that crop diversity is not only preserved but also valorized in ways that enhance resilience, nutrition, and income for farming communities.

Consortium for Agroecological Transformations

Cultivating Sustainable Food & Farming Transformations

The Consortium for Agroecological Transformations (CAT) is a national ecosystem orchestrator advancing community-led, regenerative transitions across India's rural landscapes to strengthen both societal and ecological well-being. CAT brings together civil society organisations, technical experts, and farming communities to design and implement landscape-driven agroecological transformation. Its work focuses on generating evidence to inform policy change, enabling blended-finance pathways, and strengthening consumer demand for chemical-free food—advancing resilient, equitable, and sustainable food futures.

More about CAT: www.agroecologyindia.org Consortium for Agroecological Transformations (CAT)