



The Economics of Ecosystems & Biodiversity

TEEB AGRI-FOOD ASIA SYMPOSIUM 2021

Presented By

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1. BACKGROUND



Hill Area :53.4%

Plain:46.6%

Forest area: 53.3%

Population: 101.17 lakh

Sex ratio: 963F/1000M

Literacy Rate: 79.63%

Temp max & min:-3.4° C & 40.8° C

Actual and Avg rainfall (mm):1555 & 1631

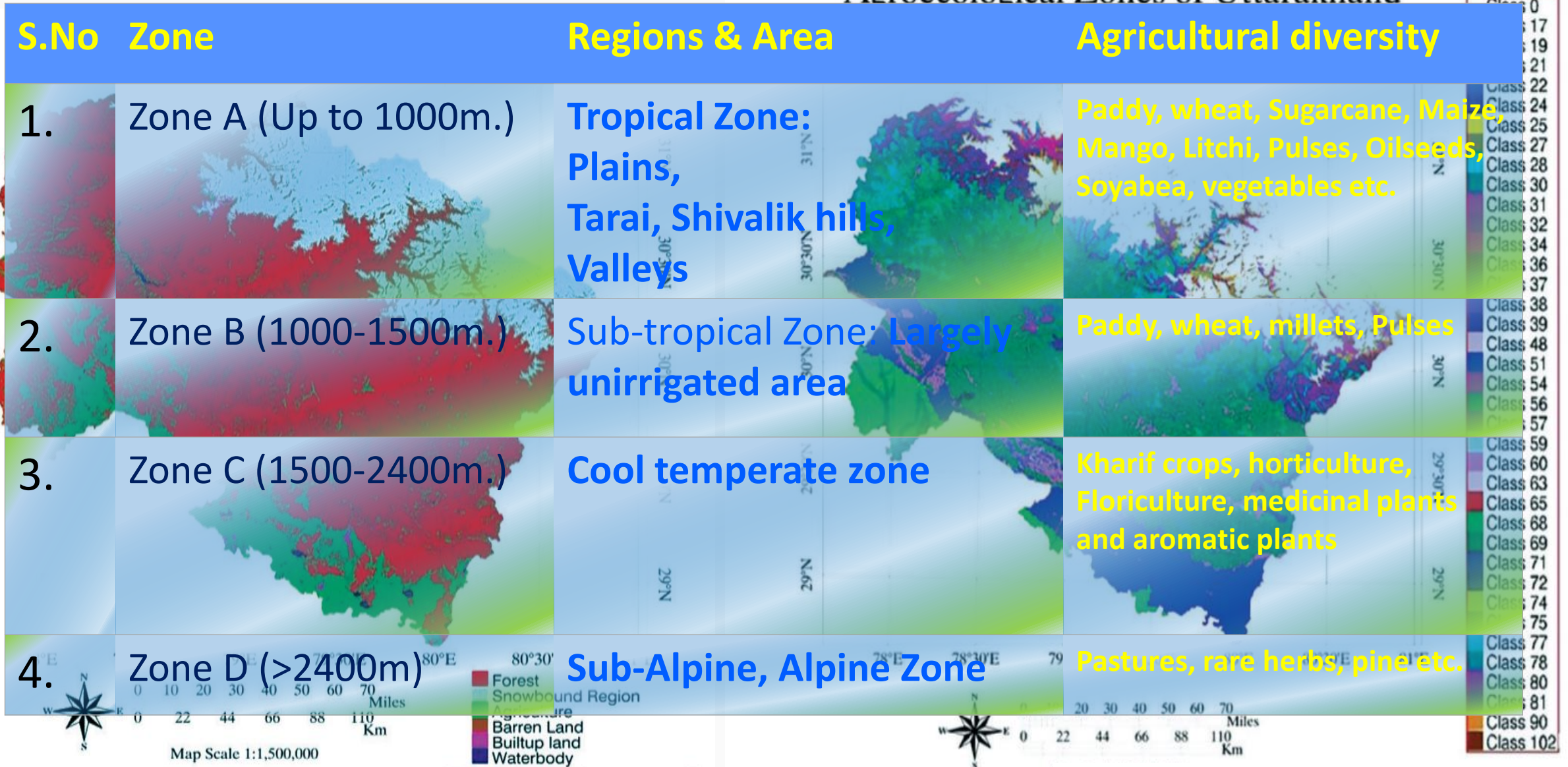
Culturable wasteland: 31,7885 ha

Net sown area: 69,0568 ha

**Uttarakhand produces nearly 6 lakh ton
of fruit, both temperate as well tropical
and about 4 lakh ton of vegetables,
most of them qualify as organic**

Land Use Pattern in Uttarakhand

Agroecological Zones of Uttarakhand



Importance of the state for India from food and agriculture perspective

Participation of women in agriculture accounts 70% as cultivators and agri-labors



Climate resilient farming practices such as “Baranaja” Grains, lentils, vegetables, and root vegetables are sown in alley cropping pattern



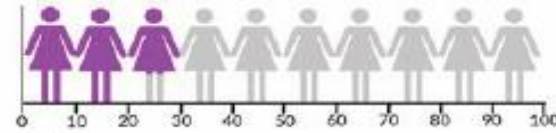
Chia and Quinoa farming is gaining new interest among farmers as a part of new farming strategies

Forest provides a huge source for timber, organic waste for farmers as subsidiary occupation

Uttarakhand Today - Indicators

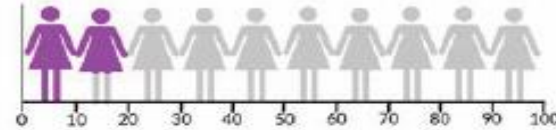
ECONOMIC

Women Work Participation



26.8%

Share of Women in Non-Agricultural Sector



16.8%

Per Capita Income 1,77,356

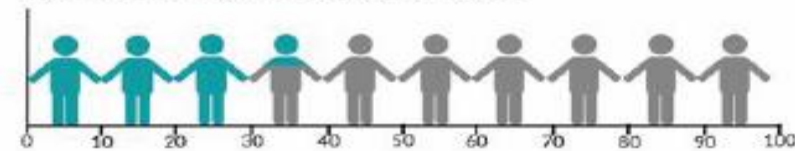




Uttarakhand Today - Indicators

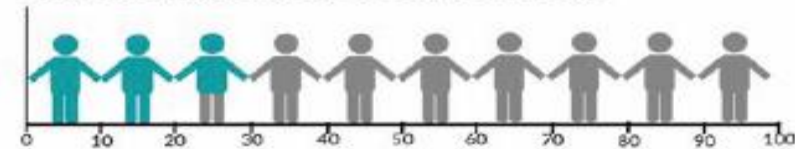
SOCIAL

Stunted Children Under 5 Years



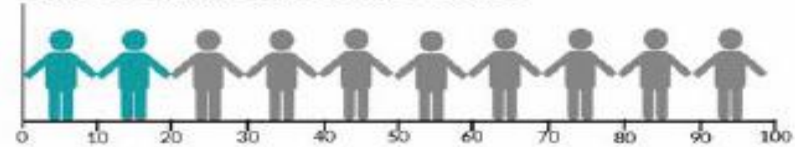
33.5%

Underweight Children Under 5 Years



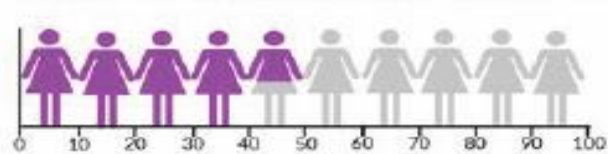
26.6%

Wasted Children Under 5 Years



19.5%

Anaemia among Women of Reproductive Age (15-49 years)



45.2%

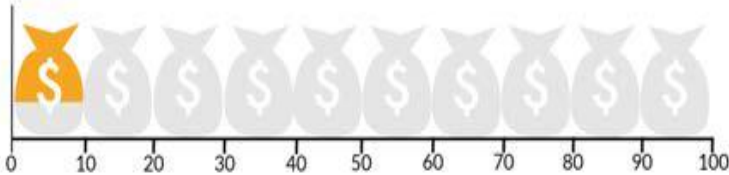
Anaemia among Children (6-59 months)



59.8%

VISION 2030

GSDP Growth 2016-17



7%

Per Capita Income
2016-17



Rs 1,60,795

Flower Production
(Hectares)



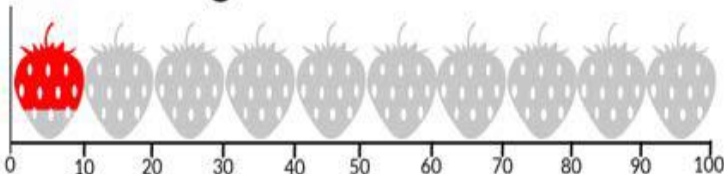
1400 Hectares

Aromatic Plants
Production(Hectares)



625 Hectares

Fruits & Vegetables Processed



7.5%

GSDP Growth



7.1%

Per Capita Income



Rs 2,87,980

Flower Production
(Hectares)



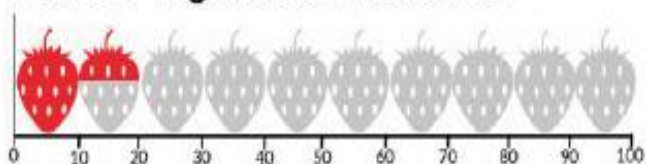
5000 Hectares

Aromatic Plants
Production(Hectares)



16900 Hectares

Fruits & Vegetables Processed



15%

SCOPE OF WORK (1) Benefits of Organic Farming in Uttarakhand

Agriculture

- Enhanced productivity in long run
- Increased water retention
- Reduced tillage
- Maximum utilization of resources
- Lower input cost
- Reduces migration from state with available employment opportunities

Consumers

- Chemical free agricultural produce promotes health and nutrition

Ecosystem

- Sustainable utilization of natural resources
- Minimises the residual impact on environment
- Minimal usage of fossil-fuel

Government

- Reduces subsidy expenditure on fertilizer etc.
- Increased revenues from the development of Agro-processing and marketing of organic products
- Increase foreign exports
- Boost economy and revenue with a multiplier effect through increase in agriculture investment
- Reduced expenditure with lesser private sector investment



Organic farming SWOT analysis in Uttarakhand

Strengths

- Abundant traditional manuring practices
- Large forest cover provides resources
- Minimal use of chemical inputs
- Agro-climatic diversity provides suitable seed production
- Lower input cost
- Organic certification easy due to conserved lands

Opportunities

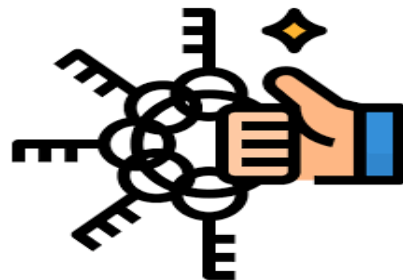
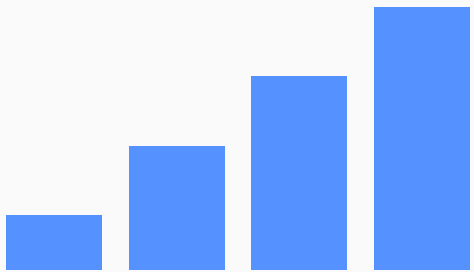
- Rising demand for organically grown food
- Huge potential to market and process horticultural crops, medicinal plants and herbs & traditional cereals
- Capitalise on Uttarakhand's pure and pristine environment by building strong equity of U.K produce

Weakness

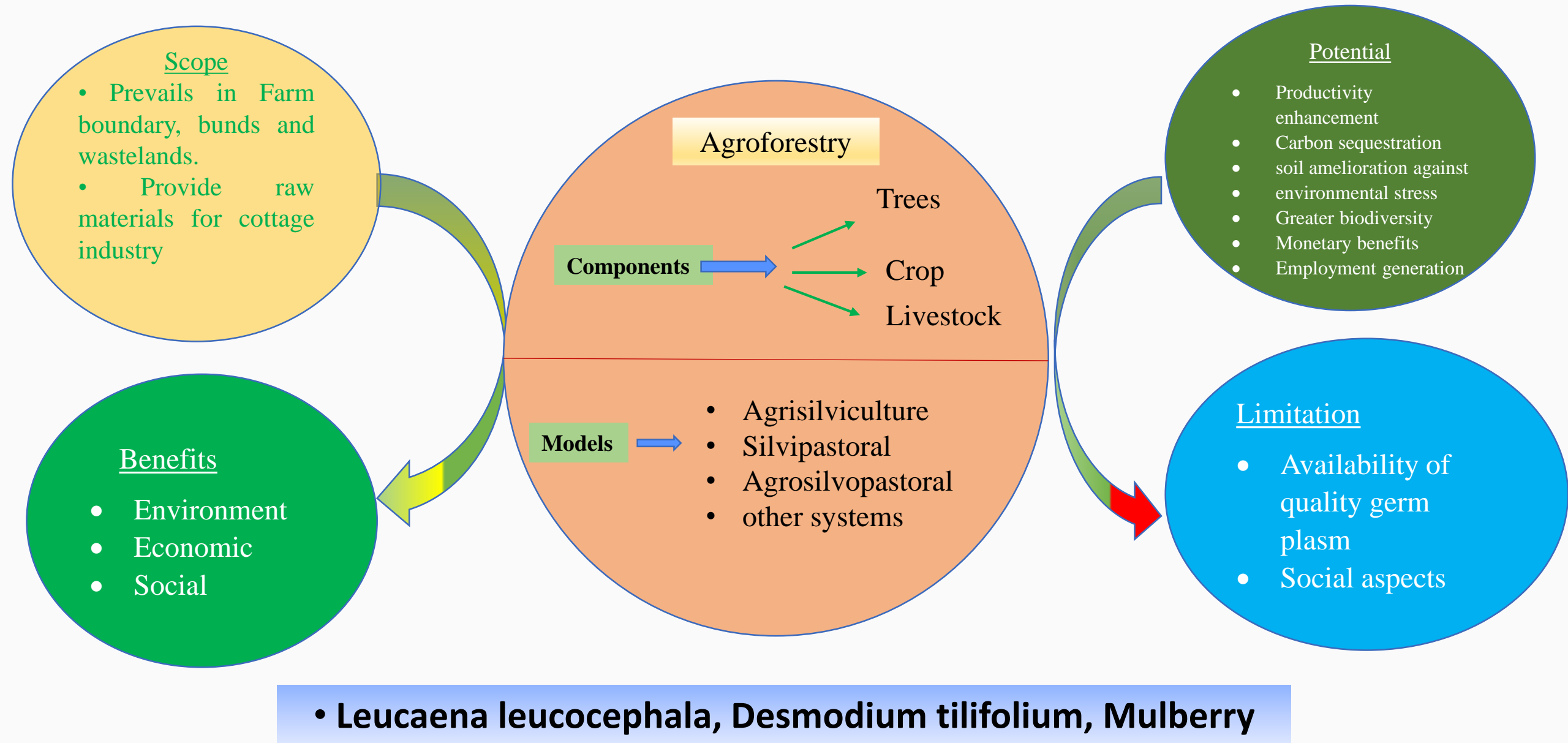
- Lesser awareness about organic markets
- Lower productivity as modern packages of practices are not available to farmers
- Inadequate market set up
- Negligible post-harvest infrastructure
- Few entrepreneurs participation from private sector

Threats

- Stringent quality standards for organic certification
- Infrastructural crunch
- Competition in global market
- Poor disease management
- Natural calamities every now then
- Impact of climate change on agriculture



Agroforestry for Uttarakhand & India



Why Agroforestry is not getting momentum in Uttarakhand

Weak Practical aspect and knowledge of agroforestry among farmers

Lack of R&D in field of agroforestry/tree sciences

Complex process of buyback arrangements through partnership between farmers and Industries

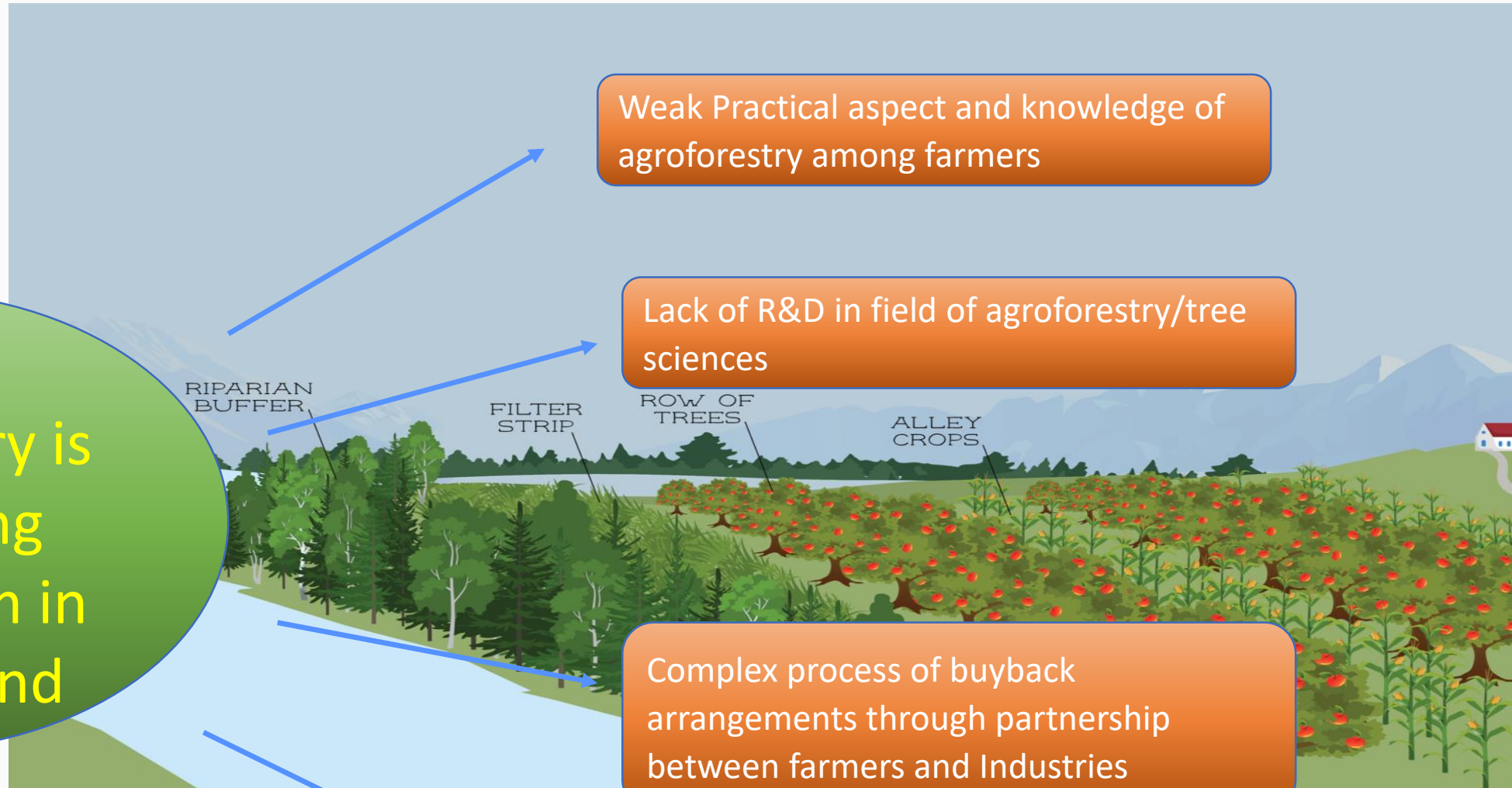
Easy forest accessibility for grazing, fuelwood and Non-Timber Forest Produce collection

RIPARIAN BUFFER

FILTER STRIP

ROW OF TREES

ALLEY CROPS



Potential for the project to contribute

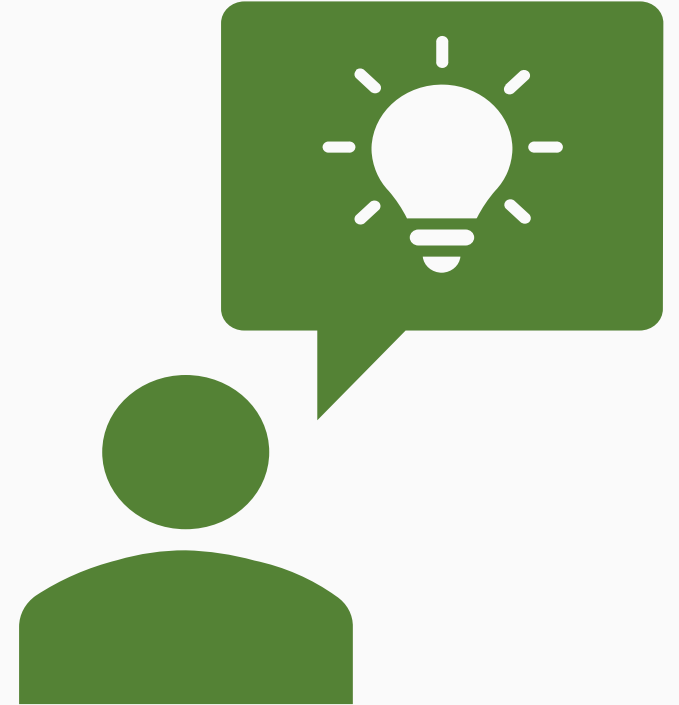
Identifying drivers of change

Technology development for farmers using traditional and innovative methods

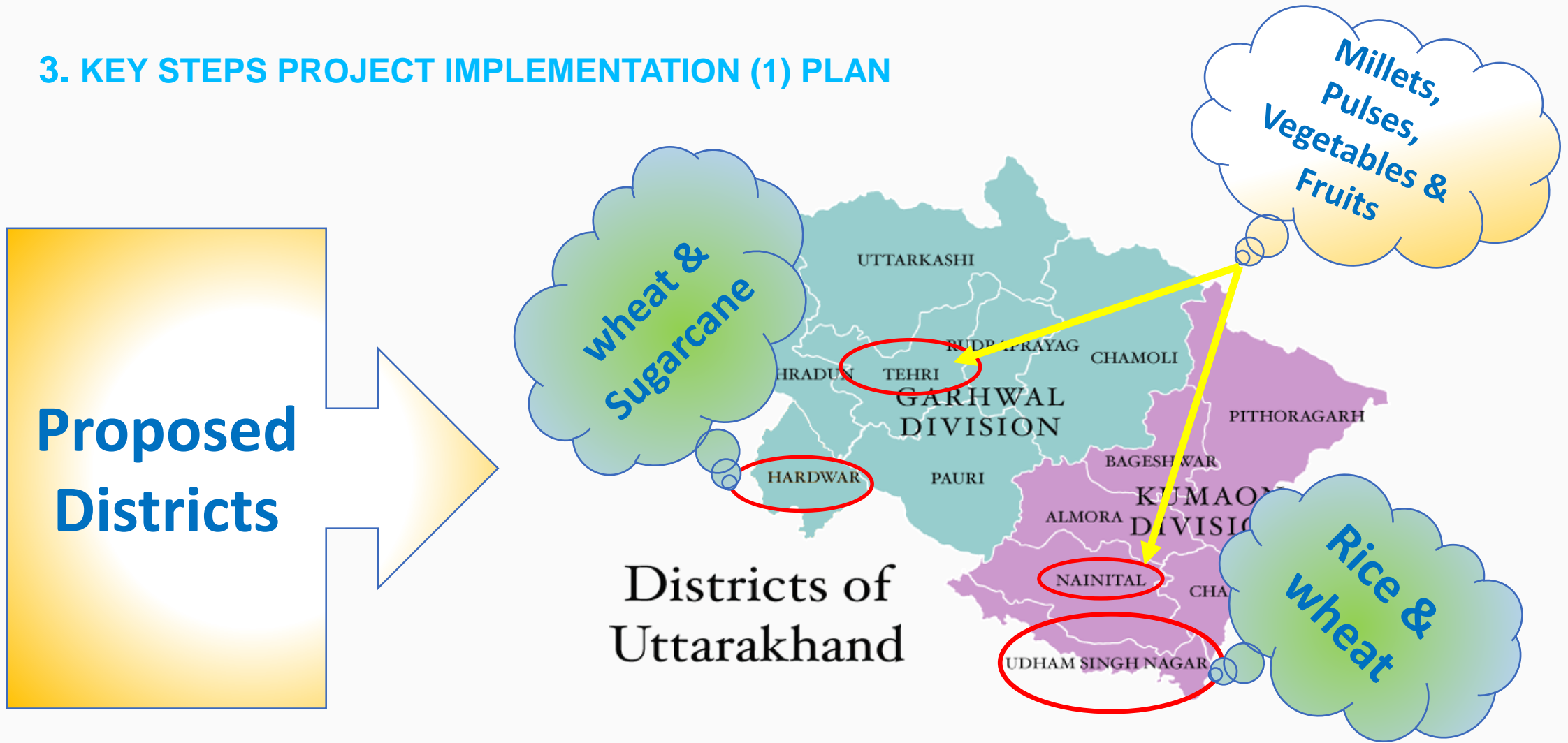
Implementation of soil ecosystem conservation through agroforestry intervention with new farming models

Generation of the data on Crop provisioning, Carbon Sequestration, Soil retention, water quality

Impact evaluation of Organic farming and Agroforestry on the Ecosystems services



3. KEY STEPS PROJECT IMPLEMENTATION (1) PLAN



Organic agriculture + Agro-forestry

Ecosystem services

Provisioning Services

- Compost preparation
- Water Harvesting
- Agro-forestry
- Microbial Bioinoculants

Regulating Services

- Purification of air
- Atmospheric regulation
- Pollination of crops
- Pest control

Supporting Services

- Nutrient cycling
- Soil formation
- Biodiversity maintenance
- C sequestration

Cultural Services

- Educational
- Aesthetic
- Spiritual
- Recreational

Valuation of the changes in ecosystem services in monetary terms

Basmati vs. Paddy Cultivation ¹	Basmati Organic	Paddy Conventional	Paddy Organic	Org. vs. Conv. Paddy (F) ²	Org. Basmati vs. Conv. Paddy (F) ²
Yield (kg ha ⁻¹)	2039	3759	3843	0.03	512.45 ***
Price (INR kg ⁻¹)	27.89	9.86	9.88	2.88	4895.87 ***
Revenue (INR ha ⁻¹)	56,858	37,152	37,879	0.01	215.02 ***
Production cost (INR ha ⁻¹)	6759	12,230	9434	20.11 ***	60.95 ***
Input cost (INR ha ⁻¹)	2628	5297	3918	42.81 ***	58.62 ***
Gross margin (INR ha ⁻¹)	51,047	25,063	28,713	6.10 *	16.60 ***
CV Gross margin ³	0.50	0.40	0.38	0.04	2.28

¹ Average performance over 5 years; financial results in Indian Rupees adjusted by Consumer Price Index (2012 = 100, 1 EUR = 54.7 INR). ² (F) refers to analysis of variance including the effects of years (five-year averages only) and location (village cluster). ³ CV refers to the coefficient of variation, calculated as mean/standard deviation at the farm level. *** and * denote significance at 1% and 10%, respectively.

DOI link: <https://doi.org/10.3390/su10124424>

Transformation of Conventional Basmati farming to Organic farming?

How to encourage Basmati farming taken up considering :

1. Micro-climate
2. Pest Management

Optimistic scenario

- Chances of increasing organic farming in state
- Better livelihood natural, social & Human capital
- Better ecosystem services

Stringent organic
certification
Market
availability
Lack of storage

Pessimistic scenario

STUDY OF SCOPE

Ecosystem service models...

- **InVest**

Biophysical models...

- **Land use and land cover (TerrSet)**
- **Hydrology (SWAT)**
- **Soil Erosion (RUSLE)**
- **Carbon (Daycent)**

Economic valuation (monetary)...

- **Direct market values**
- **Cost-based methods**
- **Revealed or stated preference**



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THANKS

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