

# Sustainable Land and Integrated Watershed Management in BHUTAN

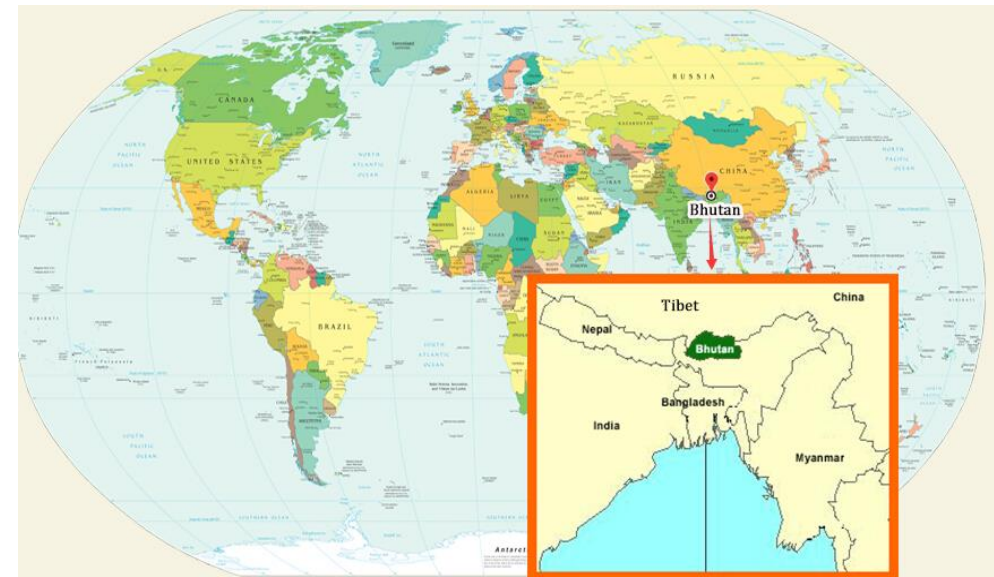


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( on behalf of LDCs)

# Country Profile & Background

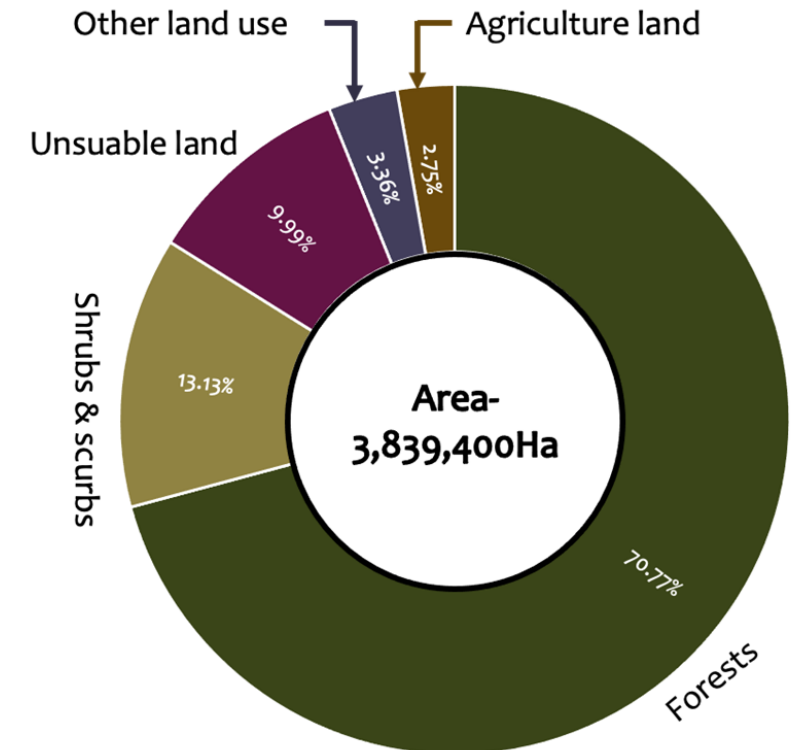
## Profile

Area:	38,394 sq.km
Population:	748,931
GDP:	USD 2,475 Mil
Altitude:	97-7570 masl
Geography:	Landlocked ( India- East, South & West; China-North)



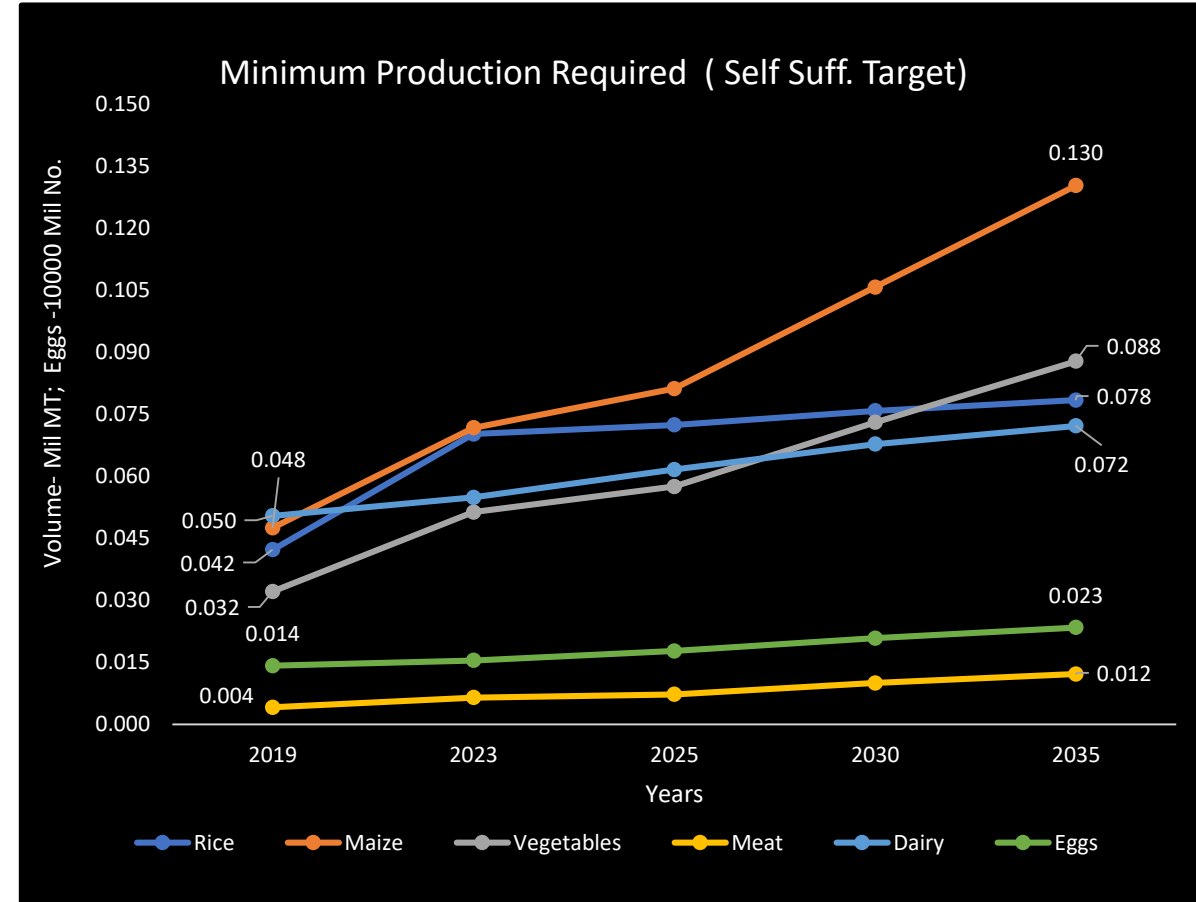
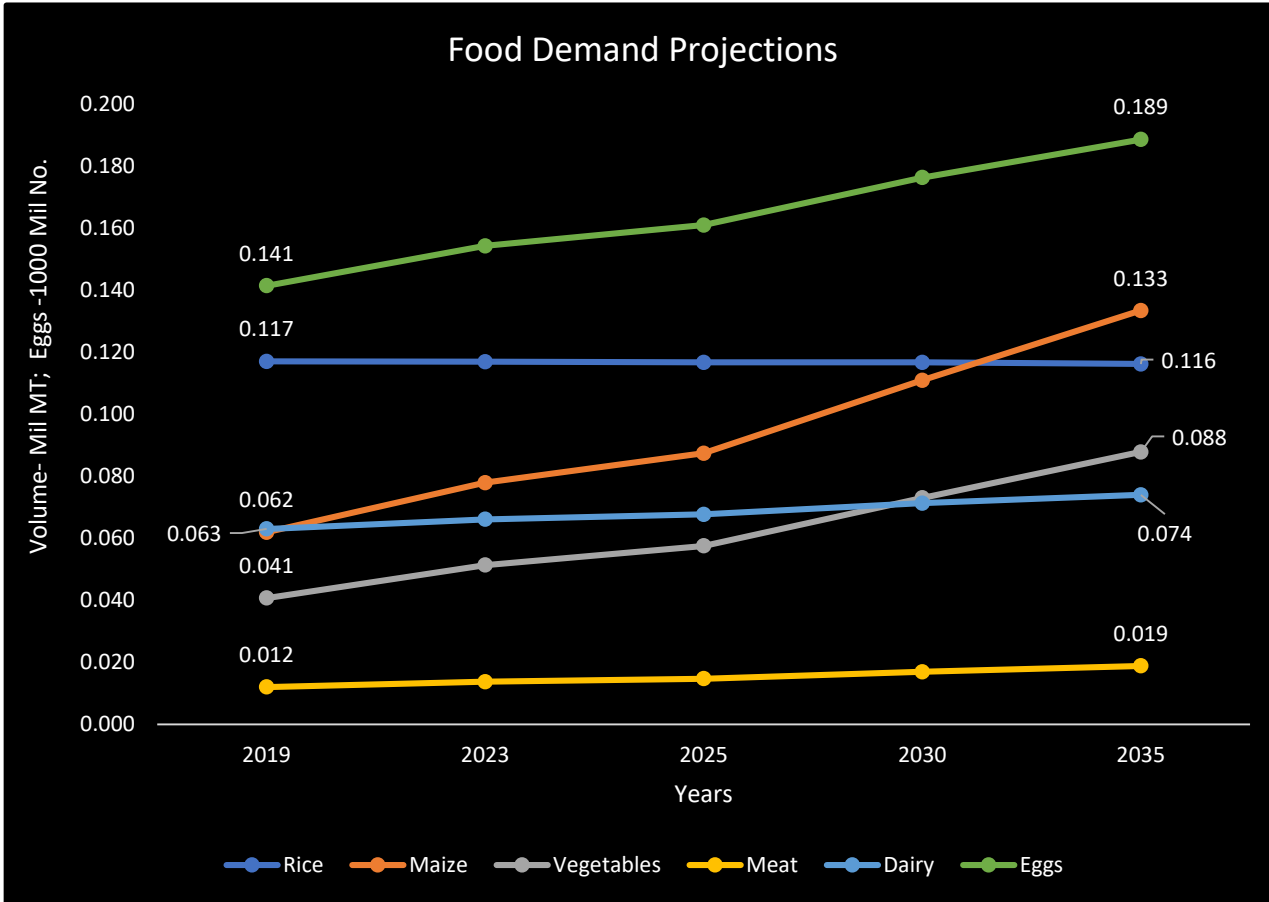
## Land Use and Food Security

- At least 60% of the total area to be maintained under forest cover - by The Constitution.
  - Currently 70.77% under forests cover ( carbon sink-9.42 MtCO<sub>2</sub>e)
- Arable area- 105,682.43 ha (2.75%).
- Population directly depending on agriculture-51%.
- Food import dependency (64% rice, 23% maize, 21% veg.).
- Landscape-mostly steep and high mountains, V-shaped valleys and high peaks.



# Food Demand Projections

# Self Sufficiency Target



Total National Demand

Total Domestic Production Required to meet the Self Sufficiency Target

# Food Security Strategy

**SDG: Towards goals 1, 2, 3, 5, 10 & 13**

## **Development Philosophy**

**Gross National Happiness:** good governance, sustainable socio-economic development, cultural preservation, and environmental conservation

## **Agriculture Sector Goal**

Inclusive and sustainable development for ensuring food self-sufficiency and economic self reliance

NKRA 5: Healthy Ecosystem Enhanced

NKRA 8: Food, and Nutrition Ensured

## **Objective**

- Enhance food and nutrition security
- Enhance sustainable management and utilization of Natural resources

## **Implementation Approaches and Strategies (Total 11 strategies)**

- Land development and fallow land reversion
- Irrigation and water management



# Introduction: Food Security

- Largely grown under rain-fed condition.
- Only 18% under assured irrigation
- 98% access to food
- Diverse crop production
- Low input use



# Guiding Question 1

*What are your countries' national experiences with sustainable land and water management, including integrated watershed management strategies, to ensure food security? What opportunities and challenges does your country face in planning and implementation for sustainable land and water management?*



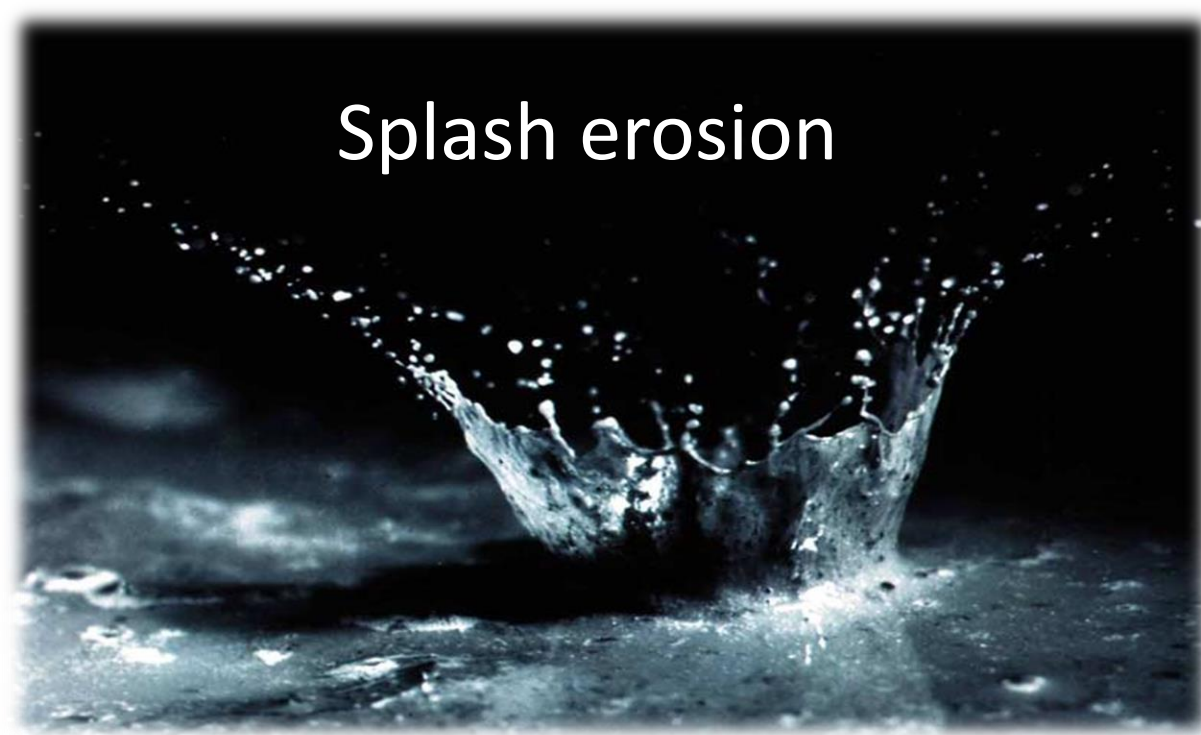
# Opportunities and Challenges- with land and water

- Very fragile ecosystem- vulnerable to climate change
- 70% of the agriculture land located on steep slopes
  - 31% of the cultivated land on >50% slope
- Vulnerable to annual soil loss- 29 T/Ha (landslide/erosion)
- The CLEWS-model shows that, to meet the food demand in future will need to increase cultivated area by another 47%.
- **Drying up of water sources** : glacial retreat, receding snowline, drying up of lakes, ponds & springs and deterioration of water qualities.
- Degradation of watersheds-losing to development.
- Erratic and untimely monsoon for agriculture production.
- Low irrigation technology efficiency–water seepage and evaporation rates are very high resulting with conveyance efficiency of only 30 to 40 %.
- Irrigated land in the country is less than 18 % of the total land and mostly under rain-fed condition





Splash erosion



Surface erosion



Rill erosion



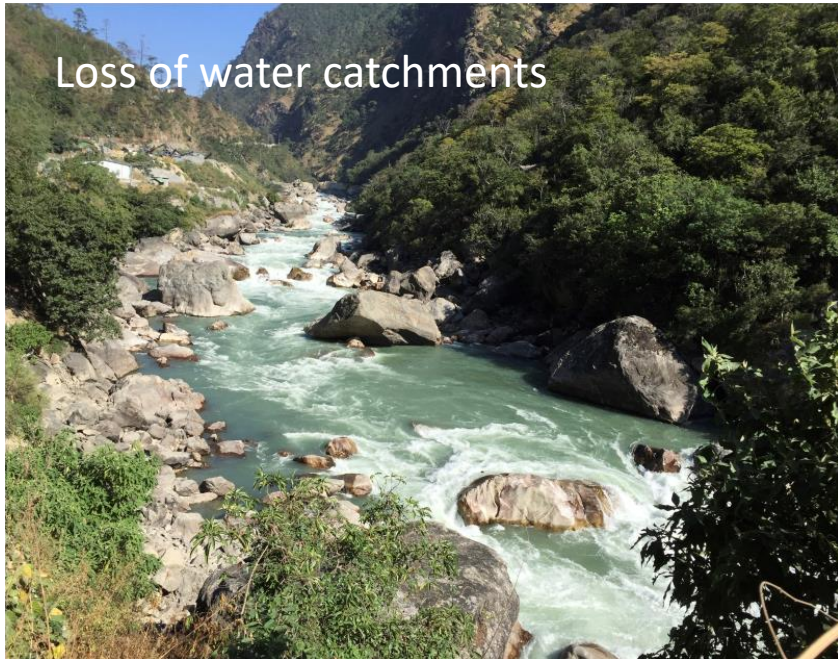




Receding snowline



Glacial retreat



Loss of water catchments



Drying up of spring sources

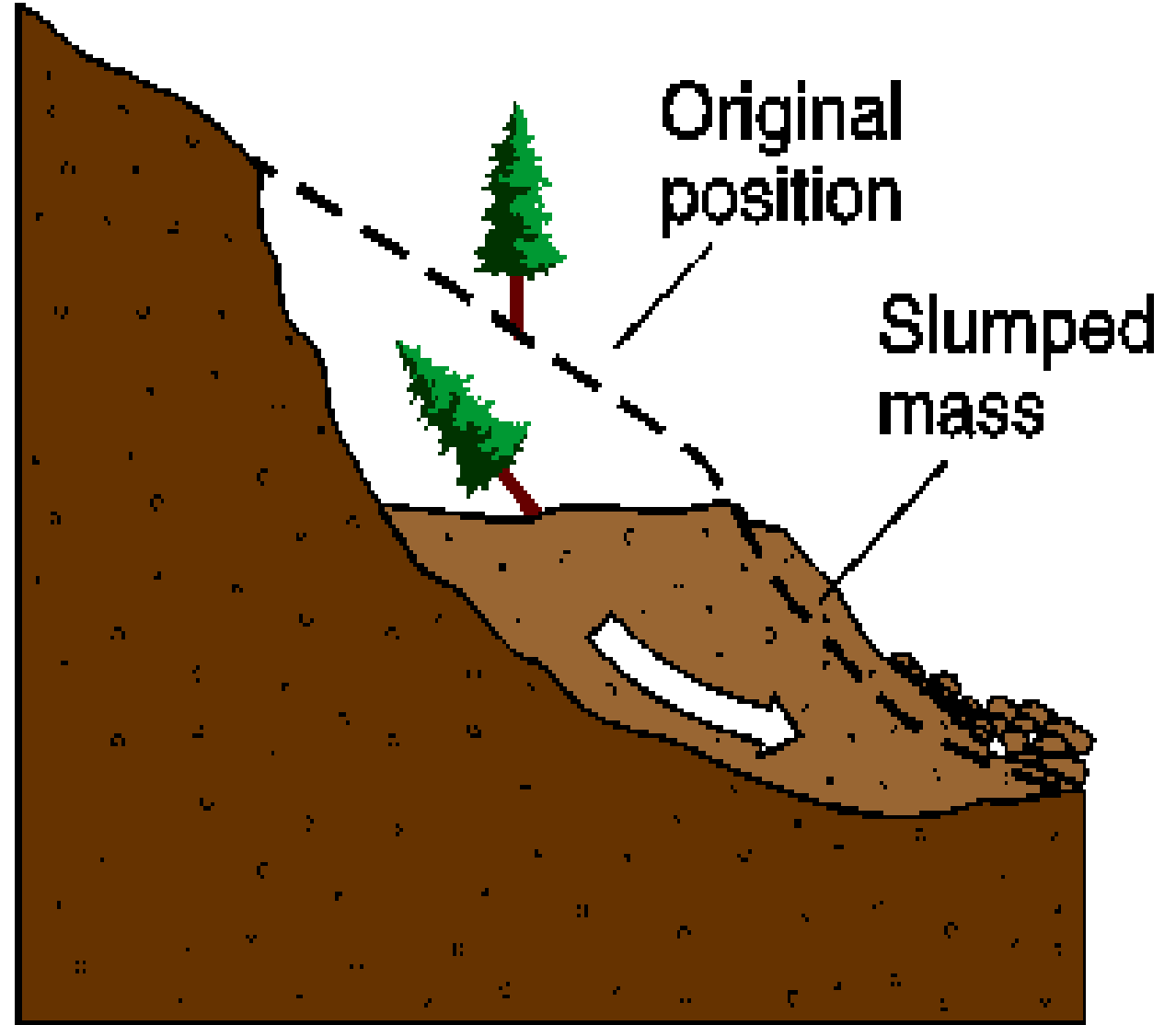


# Gully erosion





# Mass movement





# Sustainable Land Management Practices

- Land development and sustainable management-
  - About 7746 acres brought under SLM
    - Increase to 12000 acres by 2030
    - reduce soil erosion and nutrient loss, improve crop productivity, increase soil carbon stock.
    - Reduce farm drudgery, revive fallow land, increase production.
- Low Emission Development Strategy (LEDS) for food Security:
  - i. Improved agricultural Practices
  - ii. Switch from synthetic to organic fertilizers
  - iii. Increase biomass through increasing perennial crop production
  - iv. Maintain production management synergies
- Protection of watersheds and forest cover.





# Terrace consolidation- paddy production



-ease cultivation practices- enable use of farm machineries, increase nutrient and water use efficiency



# Dry land terracing & stone bunding



-reduce soil erosion & nutrient loss; and ease of cultivation practices, land stabilisation



# Grass hedgerows and brush layering



- Soil stabilisation
- Integrate fodder plantation for livestock
- Habitat for beneficial insects- predators, pollinator, forage for bees, etc.
- Catch debris , armour and reinforce land stability.



# Construction of check-dams



- Prevent landslides and gully formation; reduces the water overflow speed during heavy rains



# Low Emission Development Strategy – *for food Security*



## i. Improved agricultural Practices

- Enhancing National Organic Programme (2007); and currently implemented as a National Organic Flagship programme ( Organic Blue Print 2019).
  - Community Based Integrated Landscape Management (12 commodities)
  - Highly integrated to sustain the health of soil, ecological process, biodiversity and nutrient cycle.
  - Integration of traditional production practices (indigenous knowledge and skills- minimum tillage, traditional seeds, mixed cropping & farming, cover crops ) *with* new production practices (water use, climate resilient crop var., and efficient nutrient management, precision farming).
    - Formalising GAP policy and implementation process & practices.
- Targeting 50% ( 22,457 ha) of the total area under organic by 2050; (Currently about 4000 ha only).
  - reduce GHG emission (KtCO<sub>2</sub>e) by 133.90 in 2030 & 953.23 in 2050.
  - assuring long-term biologically-based soil fertility and increase SOC stocks (current status-0.5 to 315.3 ton/ha; stores 0.4 Gt Carbon on 30 cm depth).



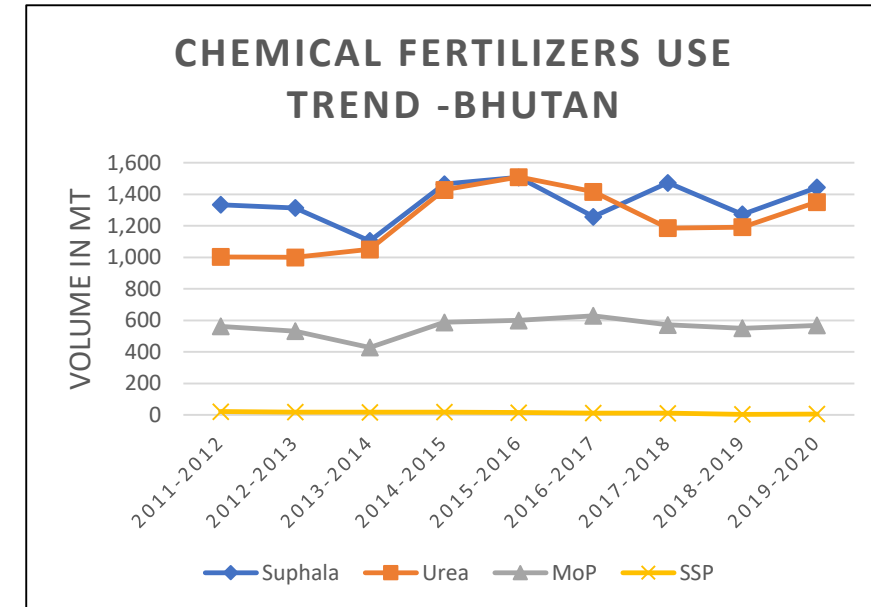


## ii. Switch from synthetic to organic fertilisers

- 37% of the farmers use Agro-chemicals in 19% of their cultivated land.
- Annually, farmers produce about 30,000 MT FYM/composts.
- Farmers experiences soil compaction and low productivity-using Urea.

### Policy Target:

- Organic fertilizer production: 250,000 MT/Year.
- Improve household-based FYM/compost Mgt: 25,000 MT/year.
- Reduce synthetic fertiliser by: 30% (2023 ) and 50% (2030).
- *Switch from Synt. Fertilizer will mitigate GHG emission by 57.30 ktCO<sub>2</sub>e (2050).*
- Use of pesticides with minimal ecological toxicity and gradual replacement with organic products;
  - Safe disposal of obsolete pesticides (completed).
  - Reduce use of synthetic pesticide by 20 % (2023). Current use approx- 500 MT/Year.
  - Initiated use of locally available plant products and safer pesticide use ( WHO Classified-Toxicity Class C &D).
  - Abandoned cover spray and calendar sprays- reduce pest resistance development and residues in the soil.





### iii. Increase biomass through increased perennial crop production and fodder plantation

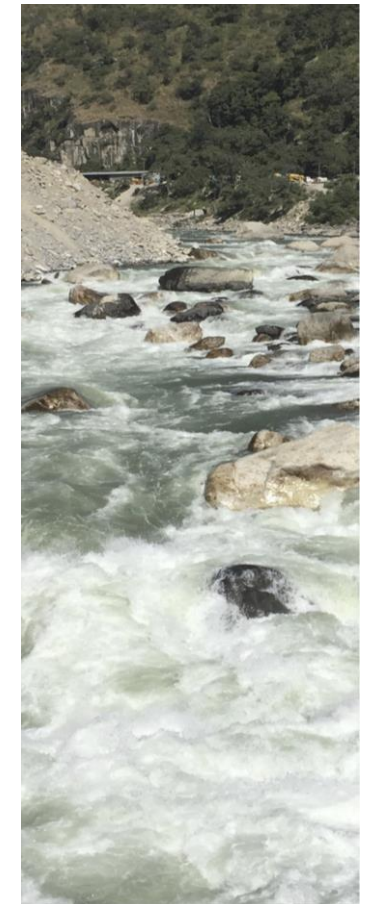
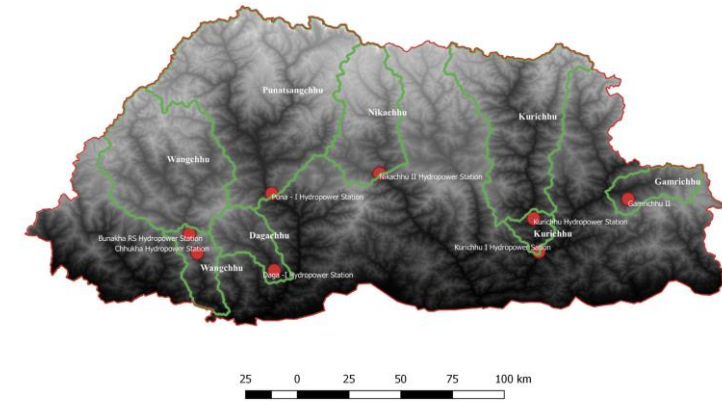
- Increase from 32,917 ha to 69,452 ha by 2050
- Increase carbon sequestration ( KtCO<sub>2</sub>e) by 442.51 in 2030 & 1512.11 in 2050
- The plantation has co-benefits – food production, nutrient security, ground cover, soil conservation-avoiding erosion and landslides; and water conservation-reduce direct seepage and runoff.
- Allows under cropping with legumes and vegetables.
- Agroforestry practices – with plantation of fruit and fodder trees in combination with crops in the landscape.
- Increasing rangeland and fodder plantation
- *Committed under 2<sup>nd</sup> NDC as one of mitigation measures.*





# Integrated Watershed Management

- 71% of the total land under forests cover (by Constitution- 60%)
- Bhutan is endowed with abundant water resources in the form of glaciers, snow, lakes, streams, and rivers (94,500 m<sup>3</sup> per capita water availability + 500-6000 mm rainfall). However, economically water stressed : lack adequate infrastructure for use or management.
- **Watersheds are the mainstay of Bhutan's economy**
  - hydro-powers, drinking and irrigation
  - essential habitats for the rich biodiversity of flora and fauna and enhancing the scenic beauty of the landscapes.
- Watersheds assessed and classified into pristine, normal, degraded or critical watersheds to identify areas where interventions are required.
  - intervention measures are developed using participatory approach involving local communities and all the other relevant stakeholders.
  - intervention measures developed are incorporated in the relevant area-based plans
  - put under regular monitoring – inventory of river basins, springs, wetlands.





# Major Initiatives for Watersheds Mgt..

- Reviving springs- using local as well as scientific hydrological knowledge.
- Initiated targeted up-stream land use management programs through the introduction of Payment for Ecosystem Services (PES) and to undertake sustainable developmental activities with minimum destruction to forest cover.
- Investing in reforestation to avoid reduction of forest cover, increase carbon sequestration, provide habitat for species and genetic resources, as well as to support economic activities.
- ADOPTED Community Based Integrated Watershed Management to undertake work on sustainable water management, land development and improvement of watershed health through collective management of forest and natural resources in order to conserve agro biodiversity within the watershed.
- Wetland management: inventory, monitoring and identification of national and international importance.
- Springshed Management: assess and generate information; identify water recharge areas; design and implement water revival measures.





# Enhancing Water Use Efficiency



*Water Harvesting*



*Drip System*



*Sprinkler Irr.*

- Water harvesting ponds to supply water in water scarce areas ( example: 212 water harvesting ponds, 15 storage tanks during 11 FYP)
- high-efficiency micro irrigation system ( 1995 acres)
- area under the command wetland paddy (40708 acres)
- mulching, cover cropping, terracing... etc.. to conserve water.
- Implementing “Integrated Irrigation Water Management with Watershed Management Plan”.
- Improving the traditional open conveyance system of water supply using advanced technologies.

## Guiding Question 2

*What kind of outcome of the Koronivia Joint Work on Agriculture could contribute to efforts addressing the identified challenges?*



# Contribution from KJWA Outcomes

- Transfer of technology to implement best available technology option for sustainable land, soil nutrient, water and watershed management.
- Build information on soil nutrient including assessment of SOC change to make scientific and data-driven decision for policy interventions.
- Real-time Satellite images with capability to trace changes across time series.
- Address knowledge and technology gaps and implementation issues both through information sharing and capacity building.
- Create access to the global/regional *Food and Climate-based* funds, recognizing the common issues and local contribution to global objectives.
- Enhance transparency in use of agriculture inputs and food production practices-that entails production within low-carbon framework.
- Enhance national capacity to address food security, climate change and building climate resilience.
- Enhance international cooperation and financial investment in sustainable Land and water management technologies.

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THANK YOU!

