



Climate Smart Agriculture (CSA) for Sustainable Agriculture Production in Bhutan

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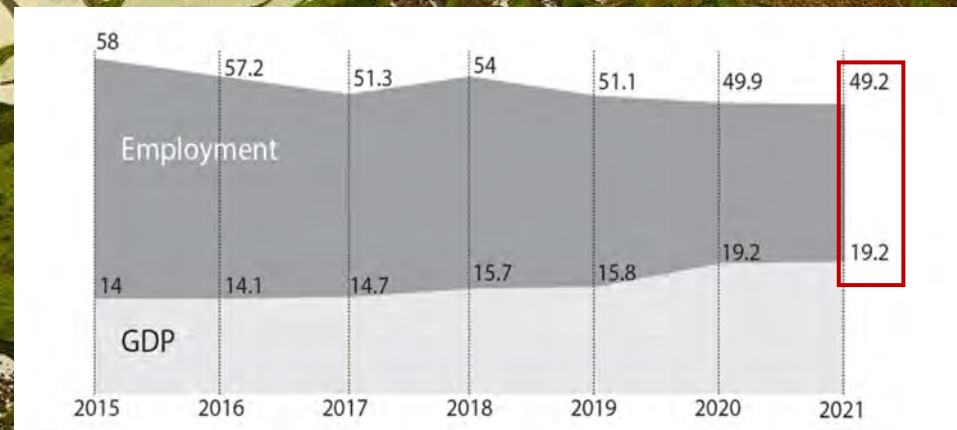


Outline

- 01. Over-view of Bhutanese Agriculture**
- 02. Agro-ecological zone/Climate of Bhutan**
- 03. Impacts of Climate change on agriculture**
- 04. CSA practices in Bhutan**
- 05. Constraints & Challenges**
- 06. Opportunities in CSA**

Overview of Bhutanese Agriculture

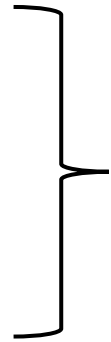
- **Agriculture - primary source** of livelihood for majority of the Bhutanese population (**57%**) (Chhogyel & Kumar, 2018)
- Total arable land **2.93%** (FAO 2021)
- Agriculture contribution to Gross Domestic Product (GDP) :
19.2% (Kuensel 2023)
- **49.2 %** of the total labour force



(Source: Kuensel² 2023)

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**Rice, Maize, Wheat,
Buckwheat, Potato,
Chillies, Vegetables**



Major crops



AEZ & Seasons of Bhutan

Agro-ecological zones	Altitude Range
Wet Subtropical	100-600
Humid Subtropical	600-1,200
Dry Subtropical	1200-1,800
Warm Temperate	1,800-2,600
Cool Temperate	2,600-3,600
Alpine	3,600-7,500
Total	

Source: RNR Statistics 2015, MoAF, Bhutan.

Seasons

Spring: March-May

Summer: June-August

Autumn: September-November

Winter: December-February



**“AGRICULTURE SECTOR IN BHUTAN IS EXPERIENCING
THE IMPACTS OF CLIMATE CHANGE”**



**Increasing
temperature**

**Change in
precipitation
patterns**

**Flash
floods/Erosion**

**Heat and
drought**

**Impacts of
climate
change on
agriculture
in Bhutan**

**Wind and hail
storms**

**Pest and disease
outbreak**

Contd....

Table 6 Evidences of climate change impacts being felt in Bhutan

Extreme weather events	Year	Remarks
Glacial lake outburst (GLOF) flash flood	1994	Damaged 965 acre of agricultural land
Rice blast epidemic	1996	80-90% crop loss in high altitudes
High-intensity monsoon rain, nationwide	2004	Damaged 39 irrigation channels
Northern corn blight	2007	> 50% crop loss in high altitudes
Unusual windstorm	2008	Damaged maize crops of 320 hhs in Eastern Bhutan
Cyclone Aila/flash flood	2009	> 100 acre land washed away
Flash flood and landslides	2010	Affected 809 acre of land, damaged irrigation channels
Hailstorm in Punakha	2012	30–40% rice crop damaged
High-intensity rain/windstorm	2013	> 100 acre maize crop damaged, erosion and damaged irrigation structures
Hailstorm/flash flood	2015	> 100 acre rice crop damaged
High-intensity rain	2016	> 100 acre rice crop damaged

(Chhogyel & Kumar, 2018)

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Flash flood



Windstrom

Contd....



Pest and disease outbreak

Contd....



Heat stress and drought

Approach used for CSA

Climate Smart Villages (CSV)-Cluster of household or community selected based on their vulnerability where interventions were carried out to enhance resilience to climate change

12 CSV initiated in eastern Bhutan



Major CSA Technologies Identified in BHUTAN

SL.No	CSA Technology	Smartness
1	Protected cultivation	Weather
2	Upland Paddy	Weather
3	Spring Paddy	Weather
4	Heat tolerant maize	Weather
5	Quinoa	Weather
6	Heat tolerant vegetables	Weather
7	Drip irrigation	Water
8	Mulching	Water/Nutrient
9	Ultra high density fruit plantation in Mango and Apple	Weather/Nutrient

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10	Sustainable land management	Carbon
11	Integrated pest management	Weather/Water
12	Bio pesticide	Carbon
13	Smart electric fencing	Carbon/Knowledge
14	Sunken greenhouse	Weather
15	Hydroponics	Water/Nutrient
16	Rangzhin Bupmen (Biopesticide)	Nutrient
17	Rangzhin luechu 1 (biofertilizer)	Nutrient
18	Vermicomposting	Nutrient
19	Composting	Nutrient
20	Aeroponics	Weather/Water

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21	Tissure culture	Weather/Water
22	Low cost plastic lined water harvesting pond	Water
23	Rice bran Bokashi	Nutrient
24	Bhutan Agriculture Microbial solution	Nutrient
25	Intercropping	Nutrient
26	Rain shelter for vegetable cultivation	Knowledge/Weather
27	Crop rotation	Nutrient/Knowledge
28	Acreanut based multi-tier cropping system	Weather/Nutrient

Adopted CSA technologies

1. Protected Cultivation

Enables cultivation of high value, short duration crops under protected condition and enhances year-round production.



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2. Upland paddy (Drought tolerant)

5 Varieties released

Altitude range 1800-3000
masl

Yield: 1900kg/ac



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3. Spring paddy

Altitude range: 650-
1100 masl

Feb-July



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4. Quinoa

Altitude range 650-3000 masl

High region (May-Oct)

Mid & Low area (Aug-Dec)



5. Heat tolerant vegetables

Heat tolerant cabbage (Bengal king & Asha) and cauliflower (White express 50 & Pragati) can be produced during peak summer.

Enhance vegetable production in heat prone areas



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6. Heat tolerant maize

Heat prone zones

Yield potential: 1800-
2000kgs/ac



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7. Bokashi

Fermented organic fertilizer

Improve soil fertility,
integrated disease control,
utilization of organic waste



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7. Composting

Improve soil fertility,
utilization of organic waste



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8. Drip Irrigation

Promoted in commercial farms



Constraints & Challenges

- ❑ Lack of awareness and education
- ❑ lack access to credit or financial resources
- ❑ Climate Variability and Risk
- ❑ Limited research on CSA technologies
- ❑ Behavioural and Cultural Factors

Opportunities

- Improved productivity and increase resilience
- Sustainable resource management
- Economic opportunities
- Environmental benefits
- Investment support from outside
- Community engagement and empowerment

Conclusion

- The adoption of CSV practices in Bhutan holds key to ensuring Sustainable Agriculture Production.



THANK YOU