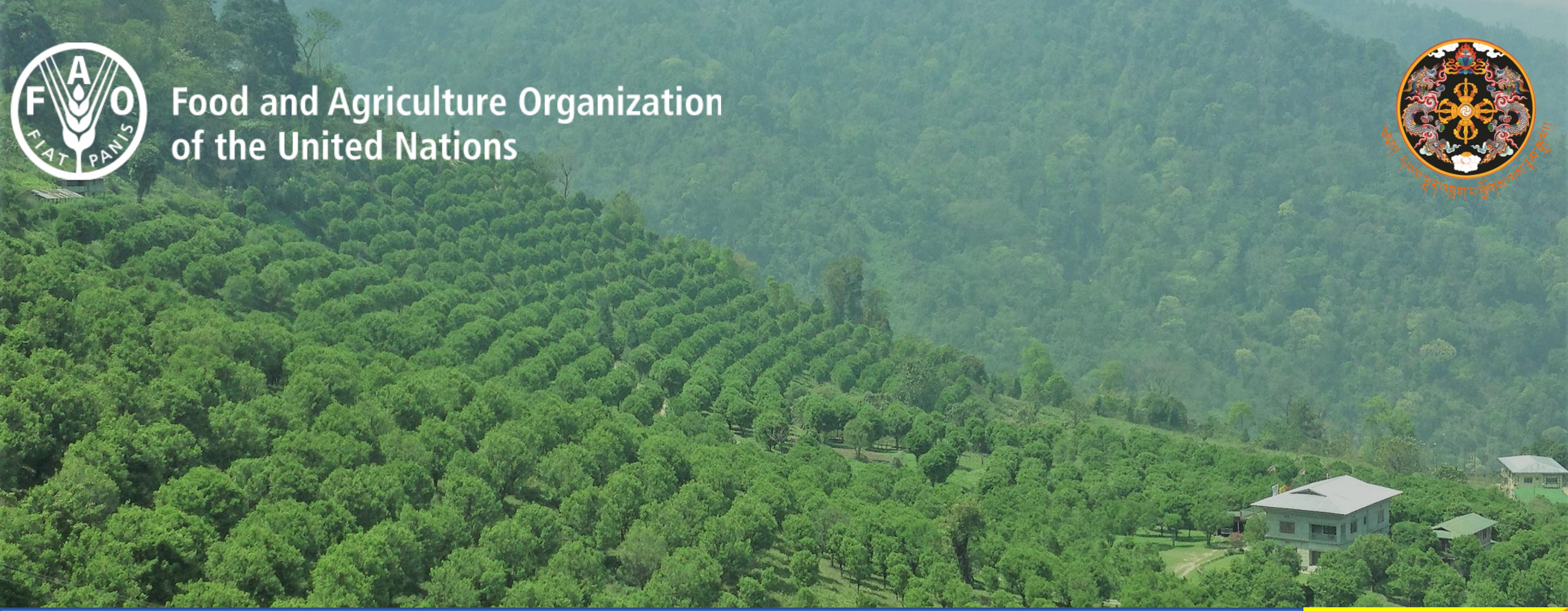


Food and Agriculture Organization of the United Nations

Leveraging Opportunities for Investment in Agrifood Systems in Bhutan

Hand-in-Hand Initiative

BHUTAN

Hand-in-Hand Investment Forum|Rome-Italy|15-17 October 2024

Overview of Bhutan and Agrifood Systems

Hand-in-Hand Initiative

Bhutan

• **Land area**	38 394 Km^2	• **Population**	777 224
• **GDP (USD Mil)**	2 898	• **GDP per capita (USD)**	3 833
• **Poverty rate (WB/2022)**	12.4% (Rural 17.5%)	• **Unemployment rate**	4.1 %, Youth (22.9%)

Main Source of Economy
- Agriculture, Services, Industry

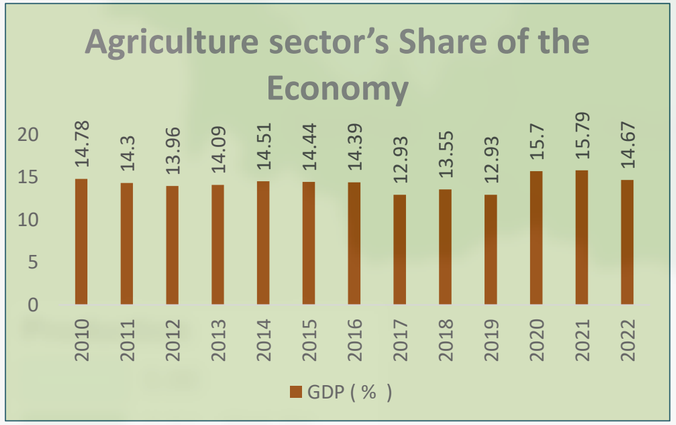
Special features
- Gross National Happiness (GNH), Environmental Champion, Carbon Negative, Rich Biodiversity

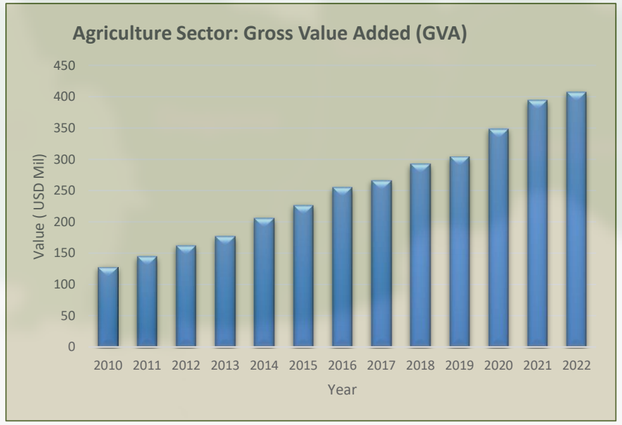
Agrifood Systems and National Scenario

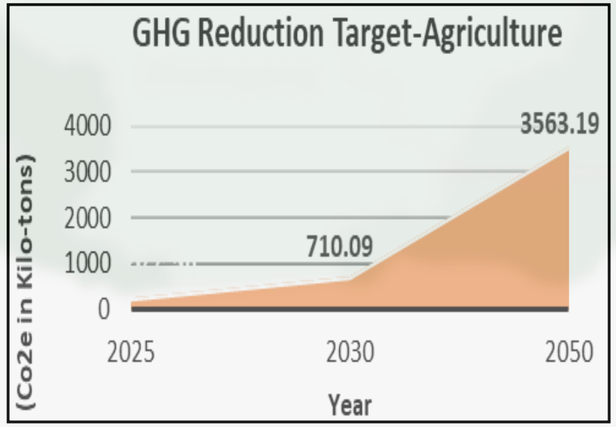
"Contribution to GDP: 14.67%; and provides Employment: 43%"

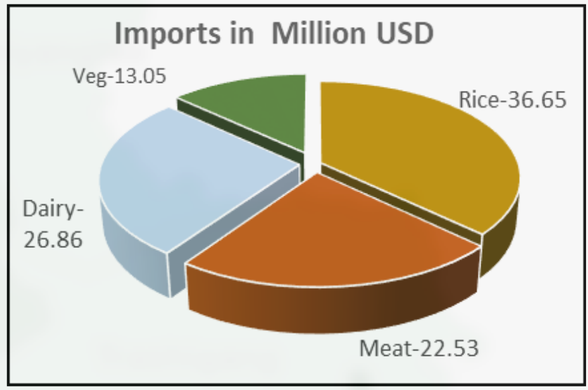
✓ **Transforming agrifood systems from a deficit to a food and resource surplus nation**

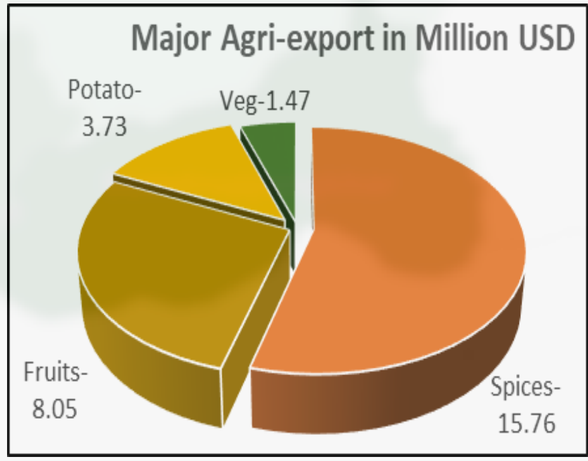
- **Investing on opportunities that will;**
  - increase competitiveness, economic growth, and alleviate poverty
  - increase provision of meaningful and well remunerated employment
  - proactively mitigate carbon emissions and preserve biodiversity and ecosystem services











Agrifood Trade Balance: -254 Mil USD (2023)

Initiatives and Progress since Hand-in-Hand Investment Forum 2023

Hand-in-Hand Initiative

Resources mobilized

- **Global Environmental Facility: USD 10.6 million**
- **FAO Technical Cooperation Programme and Flexible Voluntary Contribution: USD 0.89 million**

Total: USD 11.49 million

Investment/trade under Negotiation/Pipeline (after BATIF)

Investment:

1. Thailand company for organic inputs (under Bhutan brand)
2. Japanese company for hybrid seeds production
3. Bangladesh company for diverse organic produces (potatoes, turmeric, cardamom, and ginger, fish, quinoa, asparagus, and other cereals, poultry and feed)
4. Singaporean company for organic produces (diverse varieties)

Trade:

1. Bangladesh company –import of seed potato and ginger
2. Cottage and Small Industry (CSI) sector to establish market in Europe and US, and regional market

Trade and Investment Forum

- Graced by the Hon'ble Prime Minister of Bhutan
- 250 participants, 40 exhibitors, 20 food exhibitions
  - 22 foreign private companies, 7 Institutes, 5 Development partners, 67 domestic companies + SOEs and Government Officials
- 8 Technical Plenary + 6 panels/dialogues organised
- 53 Business to Business meeting + 4 B2G meeting organised
- 6 new agriproducts launched +Quinoa and potato recipe/exhibition organised
- 2-day field visits for investors/traders

Bhutan Agrifood Trade and Investment Forum (BATIF 2024)

- At BATIF 2024, government announced 100 percent equity FDI in the agriculture sector, allowing for full foreign ownership
- Road Map: BATIF to be held every two years

Trade and market linkages established-through other forums

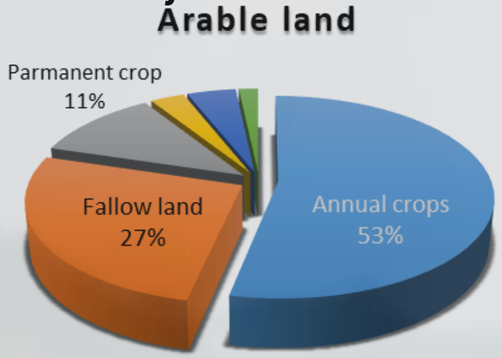
Outcomes	Event/forum
• 5 B2B linkages established with Singaporean companies (trial marketing on-going) • Trading of Asparagus, Broccoli, Cauliflower, Garlic, Ginger are operational with one Singaporean company	Government delegation and private sector participation at Agrifood Tech Expo Asia, in Singapore, Oct/Nov-2023
• State Trading Corporation Ltd. (STCBL) opened a Bhutan Outlet in Dhaka, Bangladesh, in February 2024 • Particle board trading with Bangladesh has been established • An additional forum in Dhaka has been organized to further strengthen collaboration and market linkages	Bhutan Trade and Investment Fair 2023, organised in Dhaka, Bangladesh by Bhutan Embassy, Agriculture Ministry, Trade Department Bhutan Trade and Investment Fair 2024 at Dhaka, Bangladesh (2nd Edition)

Enabling Environment for Investment in Agrifood Sector

Hand-in-Hand Initiative

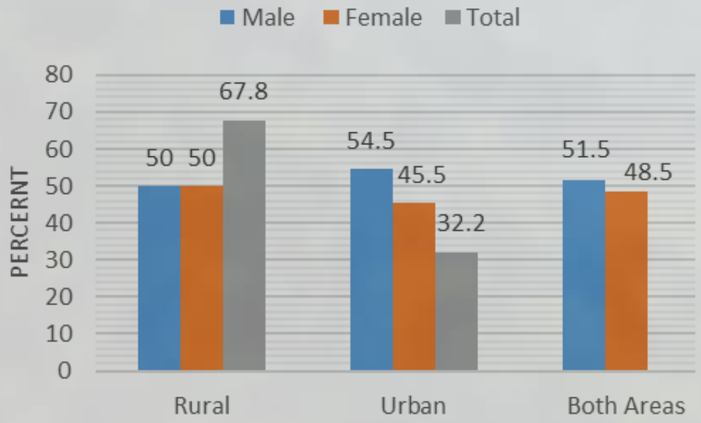
Availability and Access to Resources

1. Availability of land to investors



land holdings + fallow land + state land lease

2. Economically active population

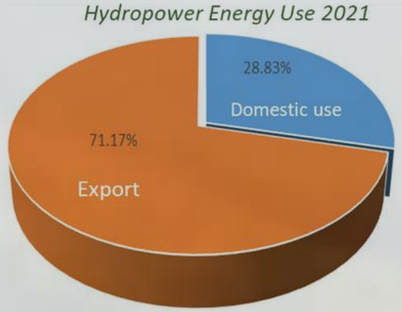


- *labour force participation rate: 64%*
- *youth unemployment: 22.9%*
- *literacy-70.2% (overall), 97.70% (youth)*
- *rich experience in agriculture farming*

3. Abundance of quality water

Per Capita fresh water: 94 500m^3

4. Access to clean, green and price competitive renewable energy



Solar and wind energy being explored and 6 hydropower to be commissioned

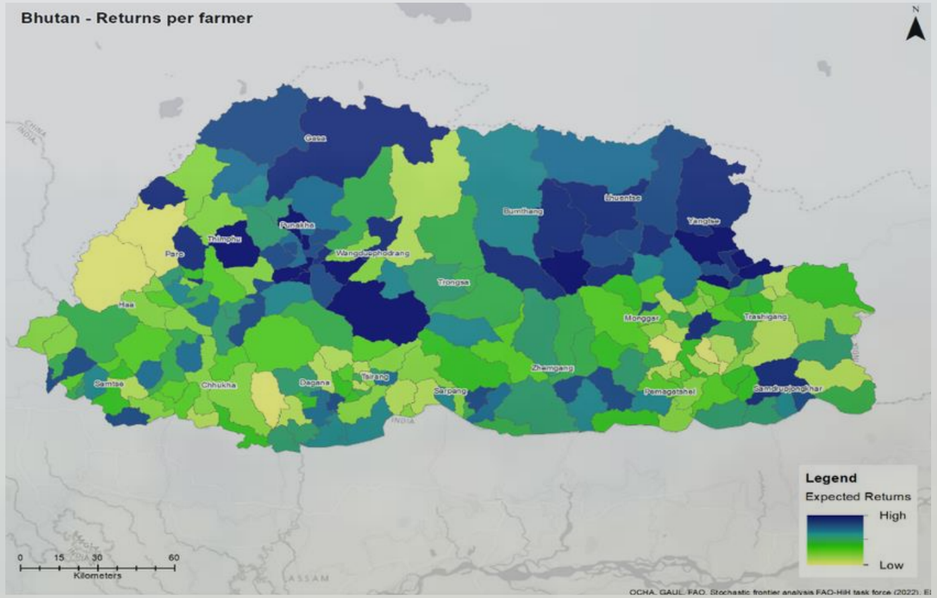
5. Access to Finance & Credits

- *government finance for common infrastructure (roads, irrigation, storage)*
- *Gov. invests about USD 100-200 mil/FYP*
- *start-up fund + collateral free loans +projects*

6. Suitable Agro-Ecological Conditions

- favourable and diverse agro-ecological conditions
- projected positive impact of climate change
- increase in technical capacity of farmers

7. High Potential Returns



Source: FAO-HiH analysis team

- **Significant unexploited potential** in agriculture not only for investors but also for the farmers
- Investments and interventions are socially inclusive with **high returns to the farmers**
  - Valorizing the potential with well targeted investments signifies **higher farm incomes and lower poverty**

In Bhutan, agriculture and food are the lifeline – Weaving Sustenance, Culture, and Prosperity Together

Enabling Environment for Investment and Trade in Agrifood Sector

Hand-in-Hand Initiative

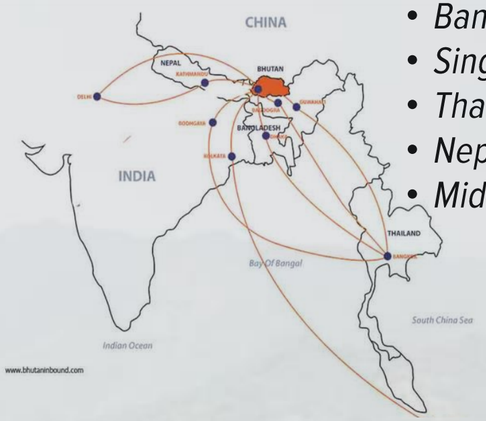
Economic Growth & Market Expansion

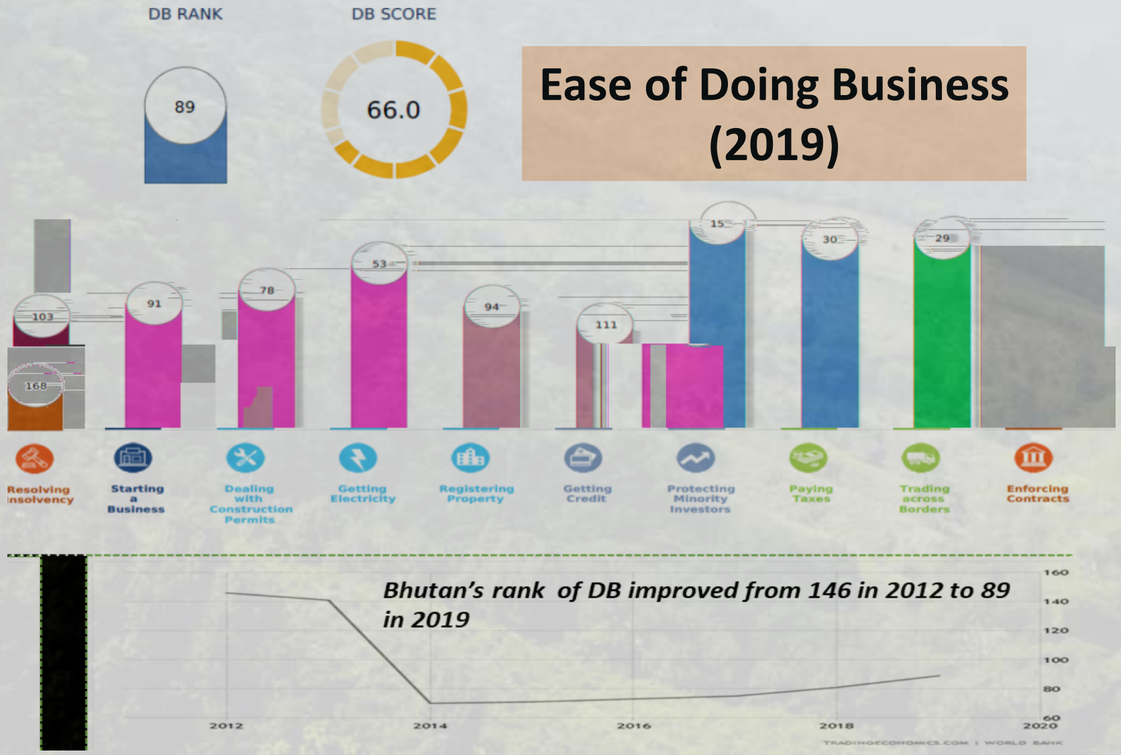
1. **Agrifood Sector- Priority Sector**
   - ❖ **Significant contribution to GDP**
     - *14.67% of GDP*
     - *Gross value added- annual growth rate of 10% (2010-2022)*
   - ❖ More than 60% of population are directly engaged agriculture sector

2. **Increase in food demand and market access**
   - Projected population: 883,000 by 2047
   - Urban population: 56.8% by 2047
   - Annual tourist arrival targeted- 300 000
   - Gelephu Mindfulness City + Local+ Schools/Institutions
   - Free Trade Agreement (FTA) with India
   - Preferential Trade Agreement (PTA) with Bangladesh + PTA with Thailand & Nepal are in advanced Negotiation
   - South Asia Free Trade Area (SAFTA)

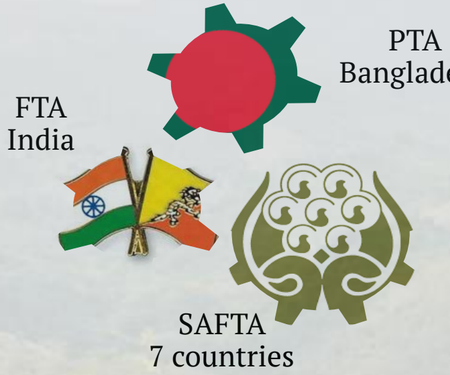
3. Increase in Logistics

- *India*
- *Bangladesh*
- *Singapore*
- *Thailand*
- *Nepal*
- *Middle East*





Ease of Doing Business (2019)



- Well-connected national roads and sub-ways
- Upgrading domestic airport to international airport
- Mega dry ports in entry and exit points
- Establishing railway link to India
- Exploring waterways, and access to seaports

Critical reforms to improve ease of doing business

- **Revised FDI Policy 2019,** allowing 100% foreign equity in agrifood sector
- **Single Window Corporate Registry System**
- **Facilitation of Exports:** *consolidated shipments, improved firm capacity to test and certify products*

"Bhutan positioning itself at 30th in Trading Across Border in 2020 out of 183 economies"

Bhutan marks a significant milestone in its economic development with LDC graduation in 2023

Enabling Policies for Investment in Agrifood Sector

Hand-in-Hand Initiative

"Holistic and responsible approach to sustainable and inclusive development"

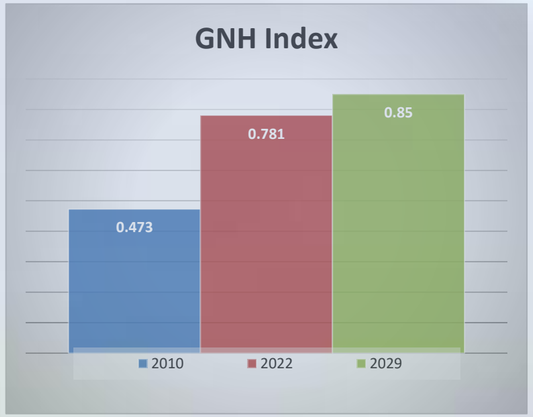
Peace & Happiness (19th out of 163 as per 2022 Global Index)

Gross National Happiness (GNH)

Low Level of Crime and Corruption
4th in Asia) – (Best in South Asia)

HIGH INCOME GNH ECONOMY

- Sustainable and Equitable Socio-economic Development
- Preservation and Promotion of Culture
- Conservation of Environment
- Good Governance



Pristine Environment *(maintain a minimum of 60% of the land under forest cover)* and Vibrant Culture

Economic Development Policy 2016

- Corporate Income Tax holiday for 10 years
- Tariff-free export, tax rebate on agricultural inputs

FDI Policy

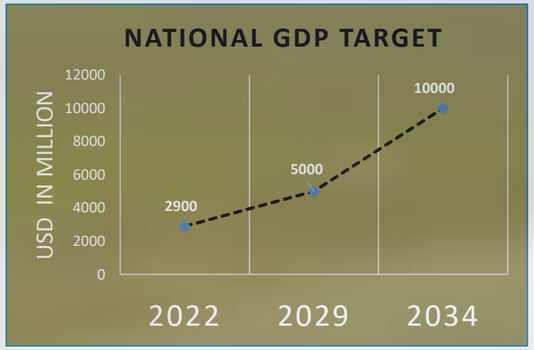
- 100% foreign ownership allowed in the agrifood sector
  - *Secured, fair, and transparent land tenure systems for long-term leases for foreign investors*
- Innovative finance options: blended finance and impact investment
  - 113 FDIs for US$ 589 million (9 in the agrifood sector, e.g., Mountain Hazelnut, Sersang Kabong Food Pvt. Ltd, Crawfish Himalayan Ltd.)

Investment Allowance

- 5% of the total investment + USD 0.18 million
- Sustainable Development Fee (SDF) waiver for investors

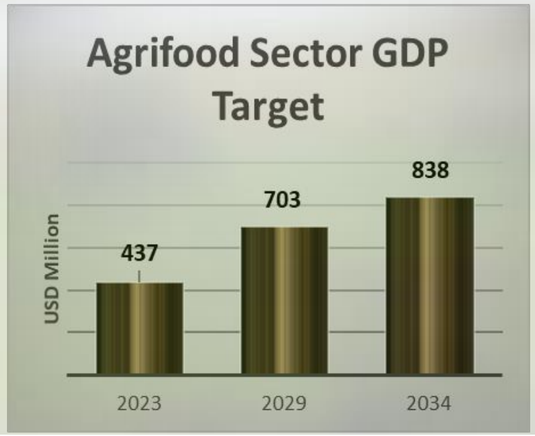
Joined Global Initiatives

- Hand-in-Hand Initiative (HiHi)
- One Country One Priority Product (OCOP)



Supporting Strategies

- Agrifood Systems Strategy 2030
- Low Emission Development Strategy for Food Security 2022
- Branding, Certification, and Standardization (Brand Bhutan, Organic Products. Good Agricultural Practices)
- Introducing Geographical Indications (GI), Geographical Indications Environment & Sustainability (GIES)



National Gender Equality Policy 2020

BHUTAN ORGANIC

Made in BHUTAN

Grown in BHUTAN

Bhutan Happiness is a place

BHUTAN Believe

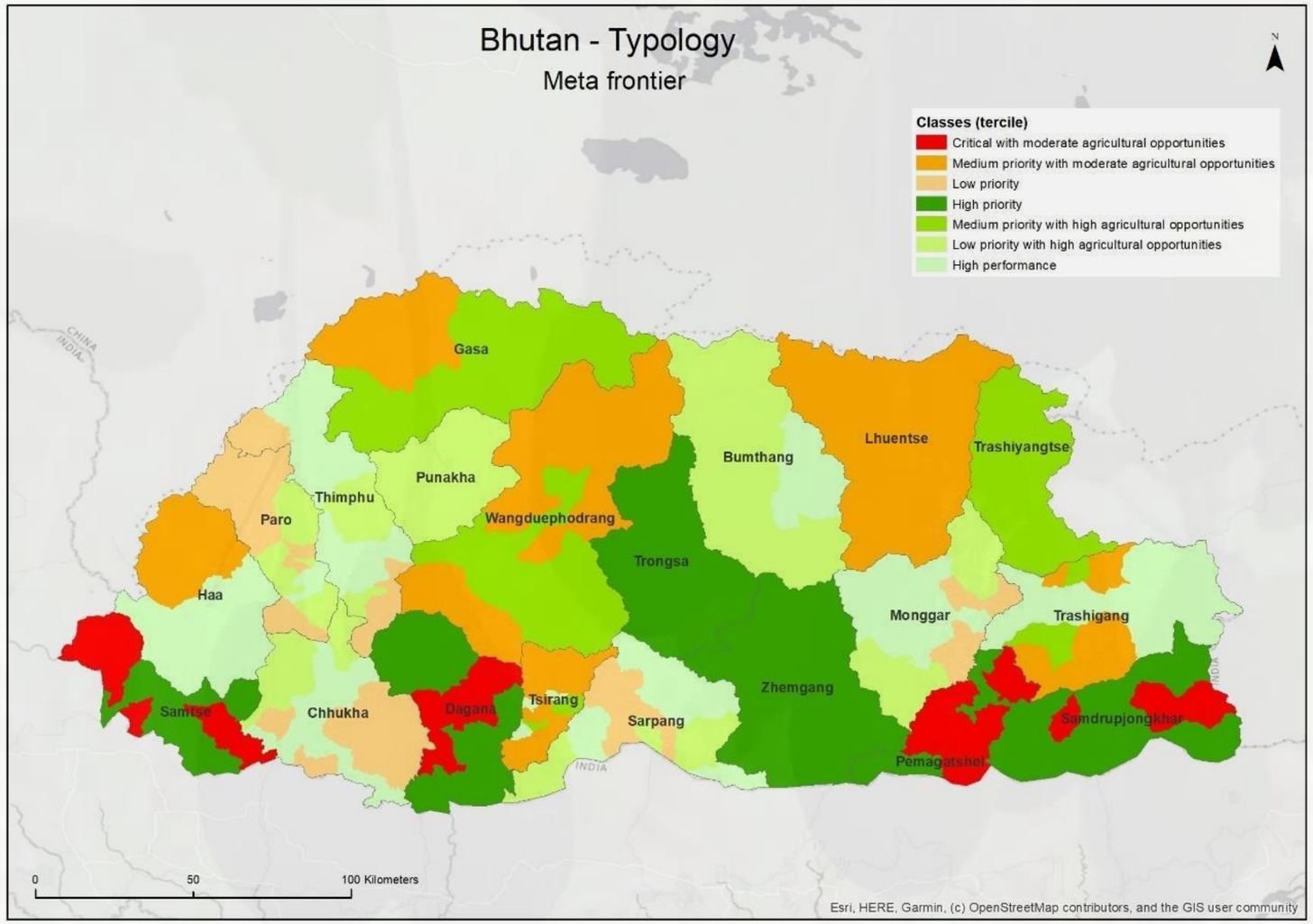
GAP Bhutan Good Agricultural Practices

GI BHUTAN GEOGRAPHICAL INDICATION

Investment Priorities based on Agricultural Typologies

Hand-in-Hand Initiative

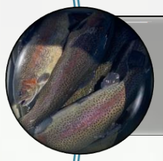
Agricultural Typologies- Targeted Locations and Commodities for Investment



Priority Value Chains


Citrus Mandarin


Coffee


Rainbow Trout


Black Pepper


Quinoa

Source: Stochastic frontier analysis, FAO-HiH task force (2022)

High Priority Districts	Zhemgzang, Trongsa, Samdrupjongkhar, Samtse, Dagana, Trashiyangtse, Wangduephodrang

Investment Case-1: Expansion of Citrus Mandarin Production & Processing

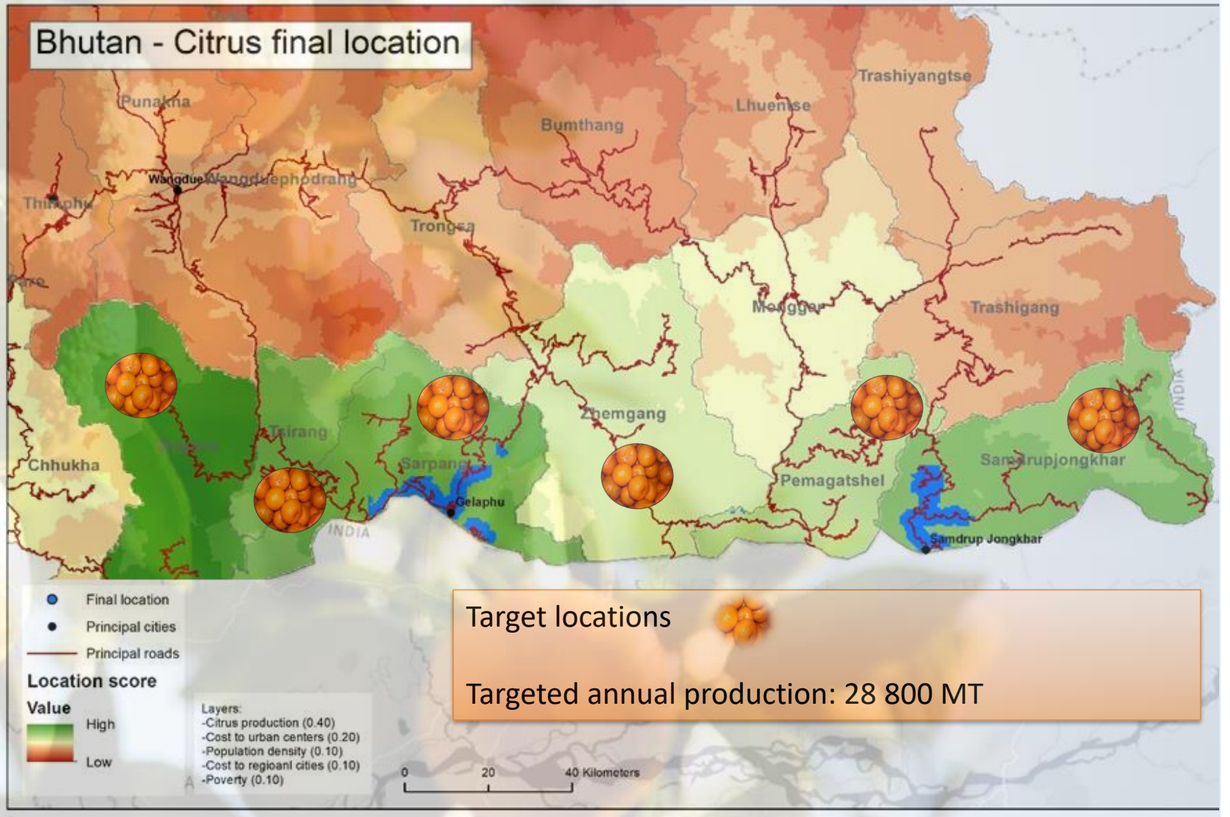
Hand-in-Hand Initiative

Opportunity & Reach

- RICH production experience: currently 23 817 growers in 16 districts, producing about 18 000 MT, annually
- CLIMATE CHANGE projects increase in area by 70-120% & production by 100%
- DIVERSE and highly adaptive Varieties
- Availability of land

- High demand in Bangladesh, Bhutan exports 95% of mandarin to Bangladesh
  - *Imports in Bangladesh >260,000 MT; imports citrus worth USD155Mill (OEC 2022)*
  - CIF-Bhutan Mandarin at B/desh: US$0.75 to 1.5/kg, Retail price: US$2 to 5/kg, able to fetch comparatively better price
    - Unique flavour and high quality produce- produced under clean and green environment
    - Seasonal advantage over citrus supplies from other countries
  - Shorter distance-Bhutan is comparatively closer to Bangladesh

Key Bottlenecks	Key Investment
1. Low productivity 2. High on-farm losses	❑ **Expanding Climate Smart Citrus Production under 5000 acres of fallow land** ○ 800 000 improved varieties of planting materials adaptive under diverse agro-climatic conditions ○ Climate smart Irrigation: Drip Material + Storage tank (5000L), 5000 sets ○ Capacity building on climate smart production practices: 5000 farmers, 50 staff ○ Community based chain link fencing to protect from crop damage by wild animals ○ Equipment-spraying machines and grass cutter: 500 sets
3. High postharvest losses 4. Limited value addition and unexploited market opportunities	❑ **Three Primary Processing Facilities and Equipment to facilitate export markets** • Three packhouse of capacity - 100 MT/day/plant + three warehouse of capacity -200MT • Processing line- 4 lines/packhouse, (3MT/hr processing facility)+ 3 pulping unit for export rejects



Investment Case-1: Expansion of Citrus Mandarin Production & Processing

Hand-in-Hand Initiative

Investment and returns (20 years)

Intervention	Investment	FNPV @ 8%	IRR
Production	20.51 Mil USD	18.91 Mil USD	15.79%
Processing	1.99 Mil USD	2.23 Mil USD	33.57%

	Social	Environmental
Impact	• Direct benefits: 5000 farmers • Indirect benefits: 20,000 People • Direct employment generation (person-days /year): 212 085	• GHG emission: ***-54 815 tCO2e*** • Water use increase at processing: 197 147 liters/year • Improve Land stability

Key Risk Mitigation Measures

Climate/Weather risk	○ **Enhance Agro-met Decision Support System** for timely weather advisory services ○ **Produce based on crop suitability assessment** with long-term projection ○ **Capacity building on integrated climate-smart production practices** including: Integrate nutrient, water; and canopy management ○ **Use of varieties, including rootstocks, tolerant to drought** ○ **Various protection/insurance systems:** Weather Index-based Insurance (WIBI), Price protection, Warehouse receipts
Pests and diseases outbreak	○ **Use disease-free certified planting materials** from certified nurseries only ○ **Adopt disease-tolerant varieties, including the use of rootstocks** ○ **Improve pest surveillance and field monitoring systems**, including pest forecasting with contingency plans ○ **Train extensions and farmers on Integrated Pest and Disease Management**
Market	○ Diversify the market ○ Increase processing and product diversification facilities

Investment Case-2: Expansion of Organic Coffee Production

Hand-in-Hand Initiative

Opportunity & Reach

- **Proven highly suitable (Arabica varieties)** in the Southern Foothills
- **Low input and labour intensive**, currently produced by approximately 200 farmers
- **High potential for production expansion** with available fallow land and integration into agroforestry systems
- **High domestic demand** with an annual import of 46 MT, valued at USD 0.20 mil.
- Can be **competitive in the export market** in Japan, Singapore, and Europe, through:
  - **Organic** and branded as **Brand Bhutan**
  - **Geographical Indication (GI/GIES)** - Uniquely produced in a clean and green environment.

Key Bottlenecks

1. Low productivity
2. low production volume
3. Lack of irrigation systems
4. Limited technical knowledge on improved climate smart coffee production

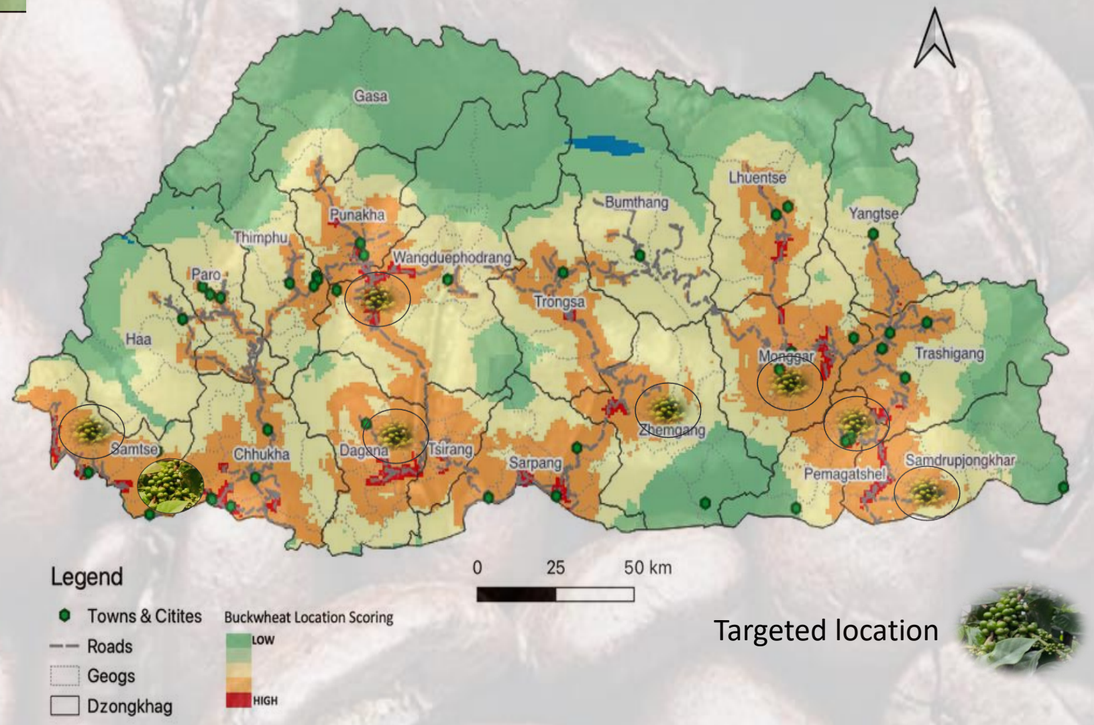
5. Lack of primary processing, poor value addition, and unexploited market

Key Investment

- ❑ **Expand climate smart production of Arabica Coffee** over 1500 acres of fallow land
  - **Use improved planting materials** -1.005 million
  - **Partial irrigation systems** for 1500 acres
  - **Capacity building and trainings for farmers** (6000) and extensions (40)
  - **Machinery/equipment**-spray, grass cutter,
  - Community based fencing for crop protection

- ❑ High efficient processing plant for primary processing
  - **Processing Facility** (with storage facilities and office)
  - Washing Tank/Container
  - Drying Yard
  - **Machineries** (4 units each): Pulping, Dehusking, Sieving/Vibrator, Polishing, Grading, Packaging
  - Water Storage Tanks with Tank Stand (3000 lit)
  - Other Equipment: Crates, Diesel Generator, Weighing Scale
  - Vehicles (4 numbers)

Location Scoring for Investment Zones - Coffee



Targeted location

Production target: 3 940 MT/Year

Investment Case-2: Expansion of Organic Coffee Production & Processing

Hand-in-Hand Initiative

Investment and returns (20 years)

Intervention	Investment	FNPV @ 8%	IRR
Production	11.91 Mil USD	10.80 Mil USD	25.43%
Processing	0.55 Mil USD	2.01 Mil USD	38.11%

	Social	Environmental
Impact	• Direct beneficiaries: 6000 farmers • Indirect beneficiaries: 24,000 People • Direct employment generation (person-days/year): 70 446	• GHG emission: -68 460 t CO2e • Improve biodiversity • Improve Land stability

Key Risk Mitigation Measures

Climate/Weather risk	○ **Enhance Agro-met Decision Support System** for timely advisory services ○ **Build capacity of extensions and farmers** on climate smart production practices ○ Produce based on crop-climate suitability assessment with long-term projection ○ Various protection/insurance systems initiated; Weather Index-based Insurance (WIBI), **price protection/ and warehouse receipts**
Pests and disease outbreaks	○ Improve pest surveillance and field monitoring systems, and advisory services ○ Train extensions and farmers on Integrated Pests/Disease Management
Market	• Diversify both domestic and international market • Enhance storage facilities

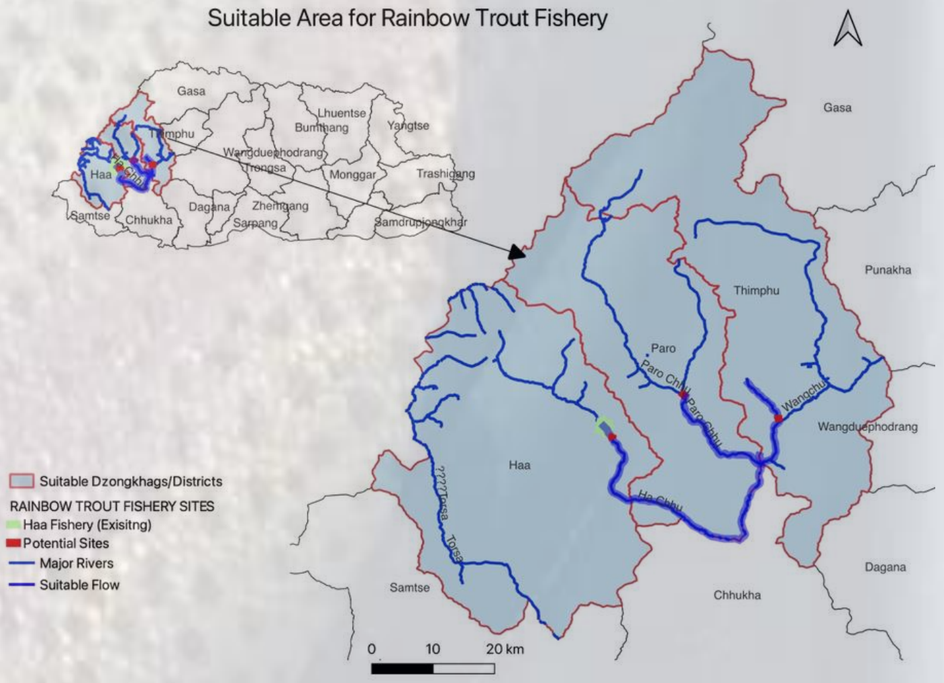
Investment Case-3: Increase Rainbow Trout Production & Processing

Hand-in-Hand Initiative

Opportunity & Reach

- **Current Production:** Approximately 15 metric tons per year
- **Potential for Expansion:** Ideal conditions for increasing production with an abundance of fresh water
- **High Demand in Singapore Market:**
  - Singapore's imports of fresh or chilled trout were valued at US$62 million for 844 tons (WITS, 2021), with an average price of US$73/kg
  - Bhutan can offer CIF prices between US$13-20/kg in the Singapore market
- **Import Substitution:** Bhutan imports fish worth nearly USD 6 million annually
  - **Increasing Demand:** Growing interest from high-end hotels and rising tourist arrivals

Key Bottlenecks	Key Investment
1. Low productivity and volume	❑ **Environmental-Friendly Cold Water Running Conditions** (13 commercial farms): • **Construction of raceways** to provide optimal water flow • **Fencing, water supply, and electrification** • **Setting up storage** for feed and administrative offices • **Equipment:** Crates, nets, weighing balances, and other essential tools • **Fingerlings and feed** for initial establishment
2. Unexploited market, and value addition	❑ **Processing and Value Addition Facility (600-700 kg/day) for Export:** • **Construction of a facility** for processing and packaging trout with reliable energy supplies • **Storage, processing, and packaging equipment** • **Quality control materials** to ensure products meet export standards • **Machinery:** Forklifts, pallet jacks for material handling • **Cleaning, water treatment, and waste management facilities** to ensure proper disposal and recycling systems



Production target: 72 MT/year

Location: Haa, Paro, Chukha

Investment Case-3: Increase Rainbow Trout Production & Processing

Hand-in-Hand Initiative

Investment and Returns (20 years)

Intervention	Investment	FNPV @ 8%	IRR
Production	1.25 Mil USD	0.39 Mil USD	14.22%
Processing	0.46 Mil USD	0.34 Mil USD	21.75%

	Social	Environmental
Impact	• Direct Beneficiary: 13 farmers • Indirect Beneficiary: 52 people • Direct employment generation (person-days/year): 12 816	• GHG emission: ***780 tCO2e*** • 978 liters of water use/per year at the processing level

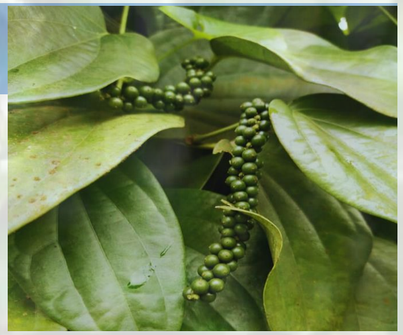
Key Risk Mitigation Measures

Climate/Weather risk	○ Regular monitoring and alternate sourcing of water supplies ○ **Price protection/insurance schemes, and warehouse receipts - in collaboration with RICBL, BIL and RSEBL**
Pests and diseases outbreaks	○ **Ensure the use of disease-free certified fingerlings** sourced from certified suppliers ○ **Enhance pest surveillance and field monitoring systems**, including advisory services ○ **Train extension workers and farmers on aquatic/fishery health management**
Market failure	○ **Enhance cold storage systems and processing facilities** ○ **Diversify market opportunities**

Investment Case-4: Promote Black Pepper Production

Hand-in-Hand Initiative

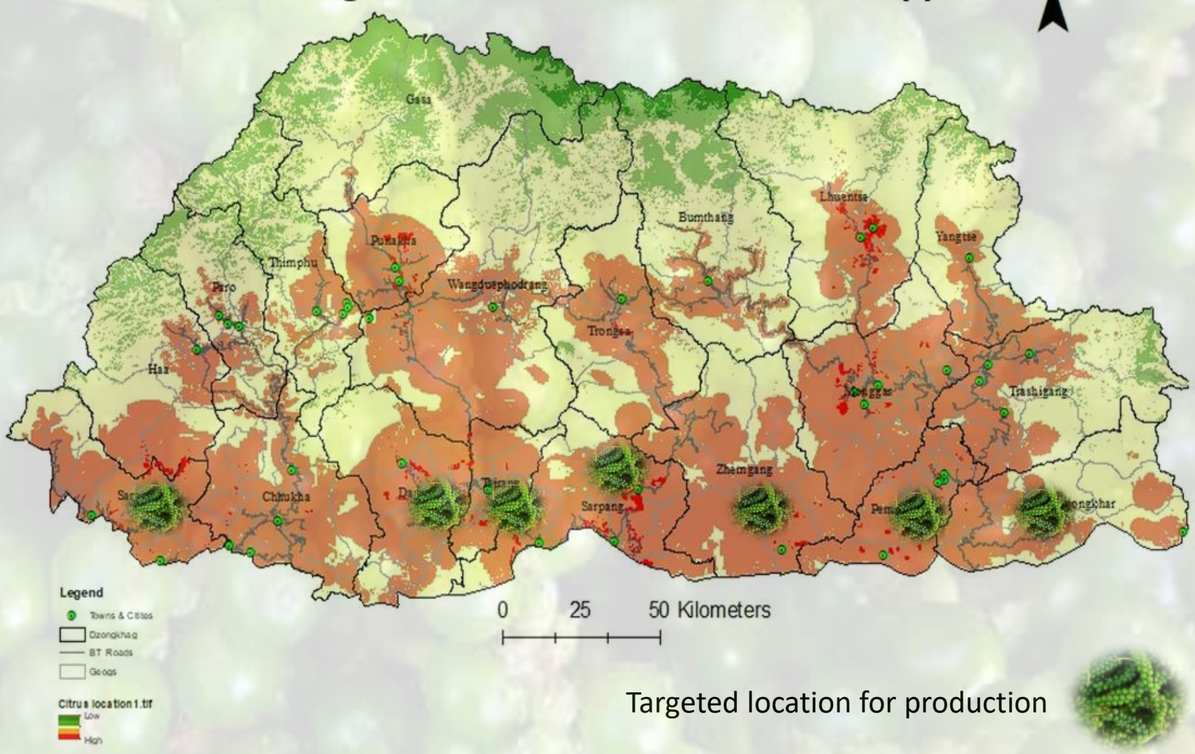
Opportunity & Reach



- **Highly suitable and economically viable**, easy to grow and sustain returns over 30+ years
- **Can be easily integrated with arecanut** plantations, required for no additional land
- **High quality and competitive** in the border towns of India, with potential to supply at < US$5/kg, compared to the usual price range of US$6-8/kg
- Opportunity in overseas' market
  - **Unique value** - grown in a clean and green environment, and GAP/organic production

Key Bottlenecks	Key Investment
• Low productivity and small scale/volume	**Climate-smart production system** across 3000 acres as an understory crop with arecanut plantations: • **Supply of improved and certified saplings** - 1.44 million saplings • **Irrigation systems** covering 3000 acres • **Harvesting equipment** (tools/ladders) - 3000 sets • **Capacity building** every 3 years for farmers and every 5 years for staff (3000 farmers and 50 extension workers) • **Green net fencing** for early-stage protection (5 nets per household)
• Unexploited market to leverage high income opportunity	• **Conventional drying and packing materials** - 3000 units

Location Scoring for Investment Zones – Black Pepper



Targeted location for production

Annual Production Targeted Target: 4320MT

Investment Case-4: Promote Black Pepper Production

Hand-in-Hand Initiative

Investment and returns (20 years)

Intervention	Investment	FNPV @ 8%	IRR
Production	5.56 Mil USD	37.89 Mil USD	28.79%

	Social	Environmental
Impact	• Direct Benefits: 3000 farmers • Indirect Benefits: 12 000 People • Direct employment generation (person-days/year): 190 350	• GHG emission: ***-68 640tCO2e*** • Improve biodiversity

Key Risk Mitigation Measures

Climate/Weather risk	◦ **Enhance Agro-met Decision Support System** for timely advisory services ◦ **Build capacity of extensions and farmers on climate smart production practices** ◦ Produce based crop-climate suitability assessment and long-term projections ◦ **Various protection/insurance systems initiated**; Weather Index-based Insurance (WIBI), price protection/ and warehouse receipts
Pests and disease outbreaks	◦ Improve pest surveillance and field monitoring systems, and advisory services ◦ Train extensions and farmers on Integrated Pests/Disease Management
Market	• Diversify both domestic and international market • Enhance storage facilities and introduce processing and value addition

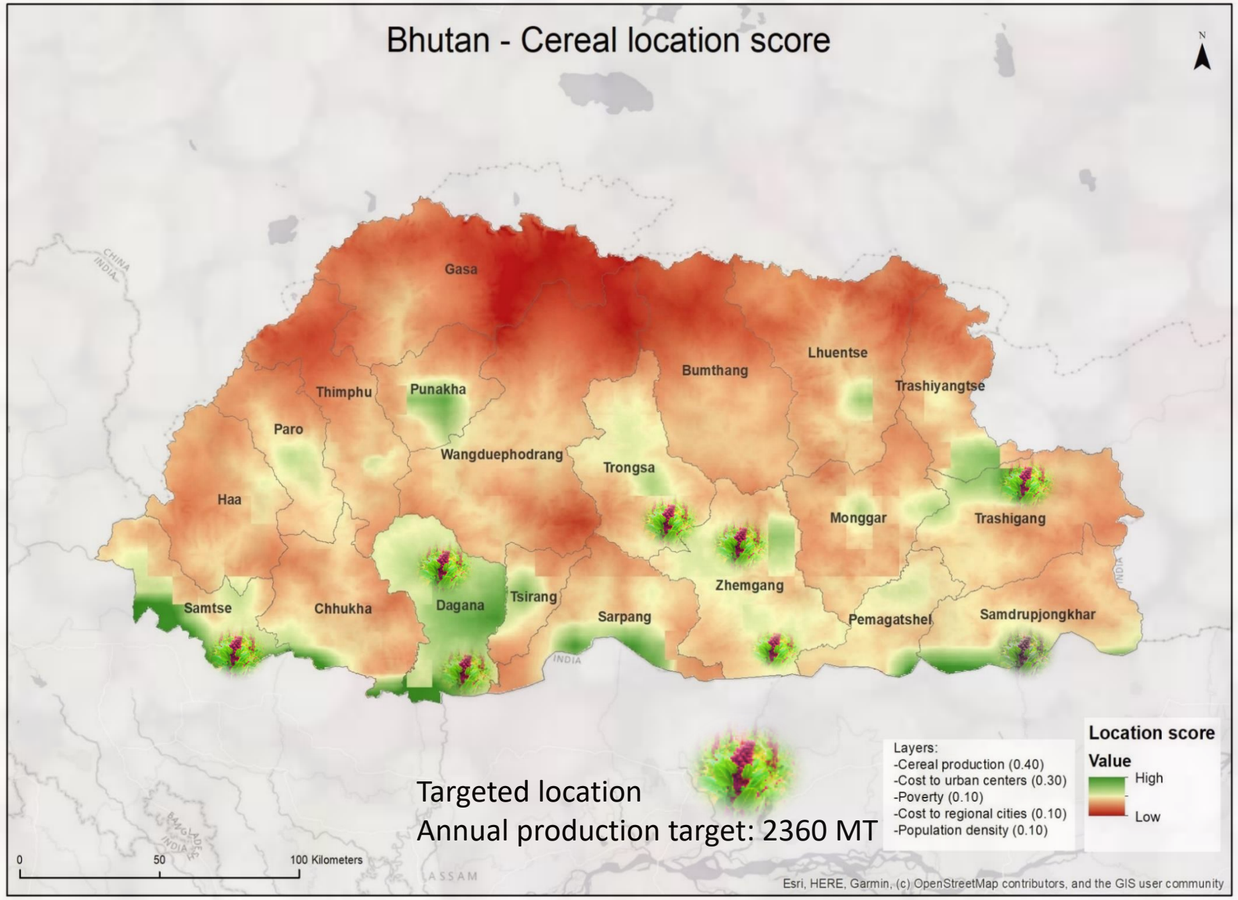
Investment Case-5: Expand Quinoa Production & Processing

Hand-in-Hand Initiative

Opportunity & Reach

- **Quick to generate returns and highly climate resilient:**
  - Adaptive under diverse agro-climatic conditions
  - Varieties *Amarilla Marangani* and *Amarilla Saccaca* are highly suitable
  - Initiated intensive research to explore diverse varieties
- **Suitable for rotational cropping**-maize, potato, and paddy
- **Export Market Opportunities:** High demand in Bangladesh and India, where it is popular as a superfood with significant potential for product diversification
- **Domestic Market Potential:** Targeting schools and hospitals to substitute 5% of rice consumption
- **Competitive Pricing:** Sold at a cheaper price of US$2.7/kg in the local market compared to the imported price of about US$6/kg

Key Bottlenecks	Key Investment
1. Low productivity 2. High on-farm losses 3. Limited value addition and unexploited market opportunities	❑ **Climate-Smart Production under 4000 Acres (4000 Households)** • **Improved Seeds:** Provision of 2 MT of high-yielding, improved quinoa seeds • **Equipment/Machinery:** Harvesting tools and grass cutters. Threshing and winnowing equipment • **Storage and partial Irrigation:**1200 storage tanks (syntax), 2800 sets of sprinklers and pipes • **Training on climate-smart production practices** for 8000 farmers and 50 extension workers • **Chain link fencing** for 4000 acres ❑ **Improvement of Existing Processing Facilities and Development of a New Facility** • **Upgrade the existing facility** to process 4 MT/day • **Renovate the facility building** and replace outdated equipment • **Establish a new quinoa processing facility** with a capacity of 8 MT/day • Install a **fully automated processing** line (2 sets) • Install **quinoa colour sorting and grading machines**



Sources: MapSpam,WorldPop, OSM, CollinsBartholomew's Mobile broadband coverage

Investment Case-5: Expansion of Quinoa Production & Processing

Hand-in-Hand Initiative

Investment and returns (20 years)

Intervention	Investment	FNPV @ 8%	IRR
Production	11 Mil USD	4.75 Mil USD	22.60%
Processing	1.37 Mil USD	1.37 Mil USD	32.87%

Impact	Social	Environmental
	• Direct beneficiaries: 4000 farmers • Indirect beneficiaries:16000 People • Direct employment generation (person-days/year): 226 588	• GHG emissions: ***-22 921 tCO2e,*** *(through adoption of climate smart technologies as compared to conventional farming)* • Water use increases by 32 litres/year at processing

Key Risk Mitigation Measures

Climate/Weather risk	○ Enhance Agro-met Decision Support System for timely advisory services ○ Production based on crop suitability assessment ○ Various protection/insurance systems initiated; Weather Index-based Insurance (WIBI), **price protection/ and warehouse receipts**
Pests & disease outbreaks	○ Improve pest surveillance systems; and provide pest forecast and advisory services ○ Adopt pest and disease resistant/tolerant varieties; engage continuous research & innovation ○ Train extensions and farmers on Integrated Pests/Disease Management
Market	• Diversify both domestic and international market • Enhance storage facilities, processing and product diversification

Bhutan's Investment Plan & Impact Summary

US$54.60M	US$3.60M	US$51M	18013	72052	26%	US$219	0.80 tCO2eq
Total Investment	Committed	Funding GAP	Households Beneficiaries	Indirect Beneficiaries	Overall Average IRR	Income Increase Per Capita	Emission Reduction Per Capita

KEY INVESTMENTS

1

Intervention

Citrus: i) Production ii) Pack house

Cost (USD)

i) US$20.59M ii) 1.99M

IRR (%)

i)15.79% ii) 33.57%

NPV

i) US$18.91M ii) US$2.23M

Sustainability Benefits

Beneficiaries: 5000 households
Indirect Beneficiary: 20 000 People
Emission reduction per capita:
1.17 tCO2eq

2

Intervention

Organic Coffee
i) Production ii) Processing

Cost (USD)

i) US$11.91M ii) US$0.55M

IRR (%)

i) 25.43% ii) 38.11%

NPV

i) US$10.80M ii) US$2.01M

Sustainability Benefits

Beneficiaries: 6000 households
Indirect Beneficiaries: 24000 People
Emission reduction per capita:
0.57 tCO2eq

3

Intervention

Trout: i) Production ii) processing

Cost (USD)

i) US$1.25M ii) US$0.46M

IRR (%)

i) 14.22% ii)21.75%

NPV

i) US$0.39M ii) US$0.34M

Sustainability Benefits

Beneficiaries: 13 farms
Indirect Beneficiaries: 52 People
Emission reduction per capita:
-0.16 tCO2eq

4

Intervention

Black Pepper

Cost (USD)

US$5.56M

IRR (%)

28.79%

NPV

US$37.89M

Sustainability Benefits

Beneficiaries: 3000 households
Indirect Beneficiaries: 12000 People
Emission reduction per capita:
1.18tCO2eq

5

Intervention

Quinoa: i) Production ii) Processing

Cost (USD)

i) US$11M ii) US$1.37

IRR (%)

i) 22.60% ii) 32.87%

NPV

i) US$4.75 M ii) US$1.37M

Sustainability Benefits

Beneficiaries:4000 households
Indirect Beneficiaries: 16000 People
Emission reduction per capita:
0.38tCO2eq

Note: NPV@8%, 20-year cycle, spillover beneficiaries not included, GHG emission per capita included only for farm level