



Food and Agriculture Organization  
of the United Nations

# Leveraging Opportunities for Investment in Agrifood Systems in Bhutan



**Hand-in-Hand**  
Initiative

Investment Forum | Rome, Italy | 17-19 October 2022



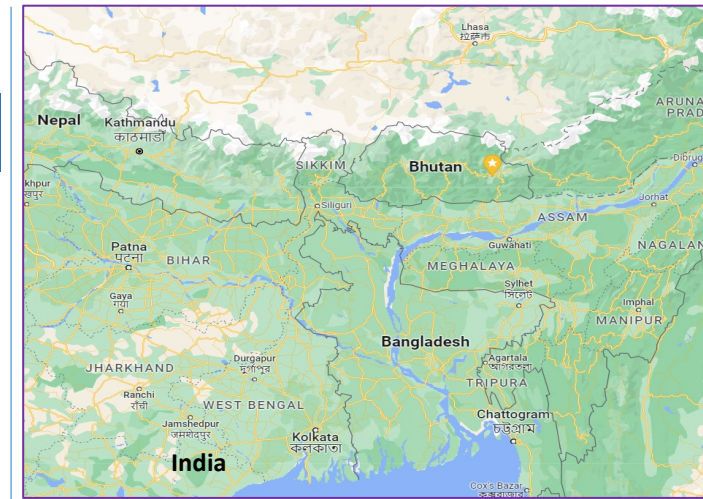
**BHUTAN**



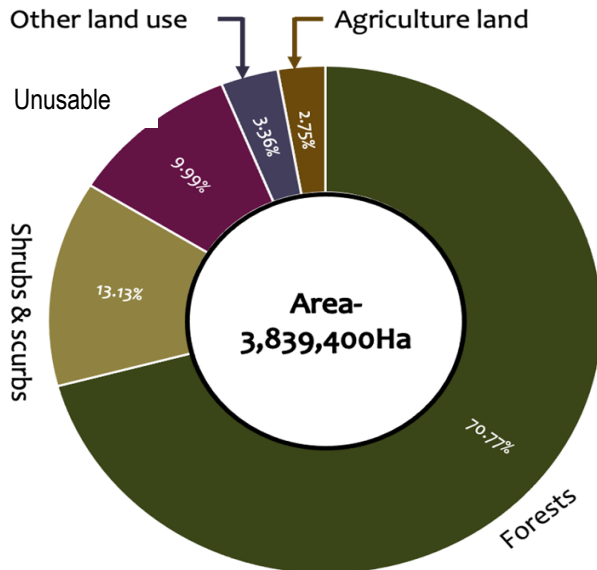
# Overview of Bhutan and Agrifood System

## BHUTAN

<b>Land area</b>	38 394 Km <sup>2</sup>	<b>Population</b>	763 249
<b>GDP (USD Mil)</b>	2 540 (2021)	<b>GDP per capita ( USD)</b>	3 359 (2021)
<b>Poverty rate</b>	8.21% (National); 11.94% (Rural)	<b>Unemployment rate</b>	4.8% (overall); 20.9% (youth)
<b>Economy</b>	Agriculture, Hydropower, Industry, Tourism		
<b>Climatic condition</b>	Humid and subtropical (southern plains and foothills), temperate (inner Himalayan valleys of the central regions), and cold (in the north)		
<b>Special features</b>	Gross National Happiness Values; Pristine Environment; Rich Biodiversity; Natural Farming; Carbon Negative		



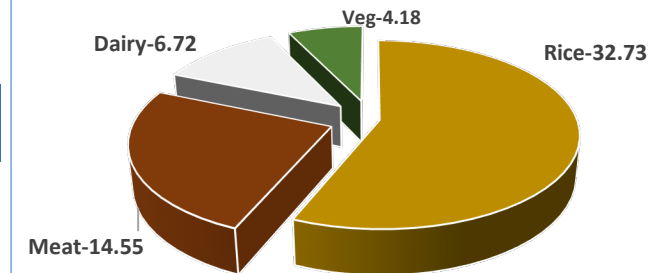
## AGRICULTURE



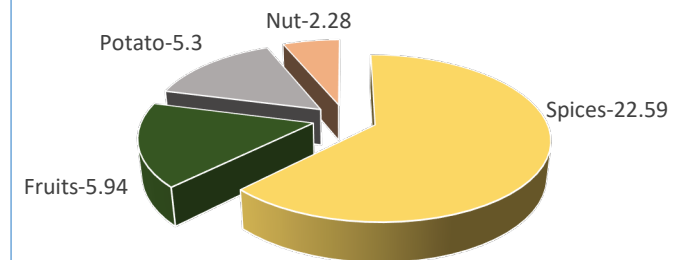
Land Cover and Land Use

- Agriculture Sector: Agriculture, Livestock and Forestry
- GDP Share: 19.19% (2021)
- Direct Employment: 49.2% (2021)
- Transforming subsistence farming to semi-commercial/commercial
- Increasing organic/climate smart production practices
- Focussing investment on high-value low-volume commodities for high-end export markets
- Implementing HiHi, OCOP and digitalization in agrifood system
- 57.8% of employed women are vital players in the food & nutrition security landscape
- Self Sufficiency: rice-46%, vegetables-84%, fruits-115%; eggs-100%, meat-36%, dairy-93%

## Major Agri-imports (USD Mil)



## Major Agri-export (USD Mil)

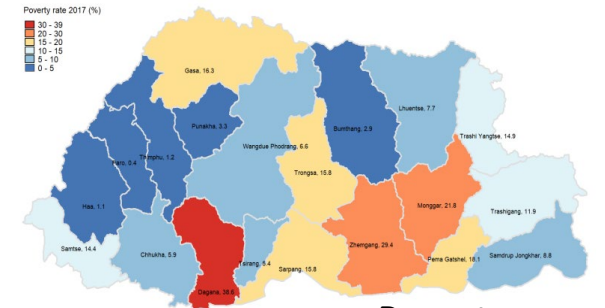


Agrifood trade balance: -91.18 Mil USD (2021)

# Objectives and Priorities

***“Transforming agri-food system in Bhutan from a deficit to a food and resource surplus nation, significantly contributing to socio economic impacts by creating employment, income and business opportunities”***

- **Investing on opportunities** that will increase productivity, competitiveness, bring economic growth; as well as increase income and alleviate poverty
- **Significantly contribute to Bhutan’s economy** through increase in internal commerce, value chain building, ramping up of exports, adoption of technology, and harnessing of big data
- **Increase provision of meaningful, dignified and well remunerated employment** ensuring conducive work and business environment and shifting to high value commodities from traditional system
- **Proactively mitigate carbon** emissions and continue to ensure the persistence of nature, biodiversity and ecosystem services



Source: Calculated based on consumption data from the BLSS 2017. **Poverty map**

## Key Targets

- increase **improved agriculture** by 50%, of which 50% (22,457 Ha) under **complete organic** by 2050; and **reduce synthetic fertilizer** by 50% by 2030
- undertake structural reforms from **subsistence agrarian** (self sufficiency) to **high-value low-volume** products for export markets
- increase **cereal sufficiency** by 100% (except rice by 70%) by 2040
- increase area under **perennial crops** (32,917 to 66 016Ha) by 2050
- enhance dairy product sufficiency by 98% by 2040, and increase improved dairy cattle breed by >25000 by 2050
- **GHG mitigation** from agri-sector by at least up to 710 ktCO<sub>2</sub>e by 2030 and 3563 ktCO<sub>2</sub>e by 2050

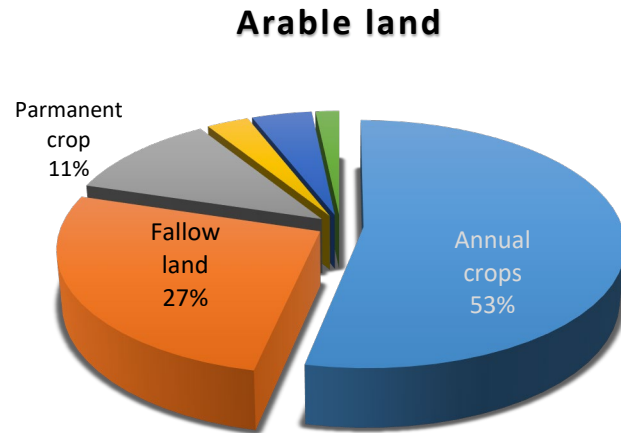


**Priority Commodities for Export**



# Enabling Investment Opportunity in Agriculture Sector

## 1. Land availability



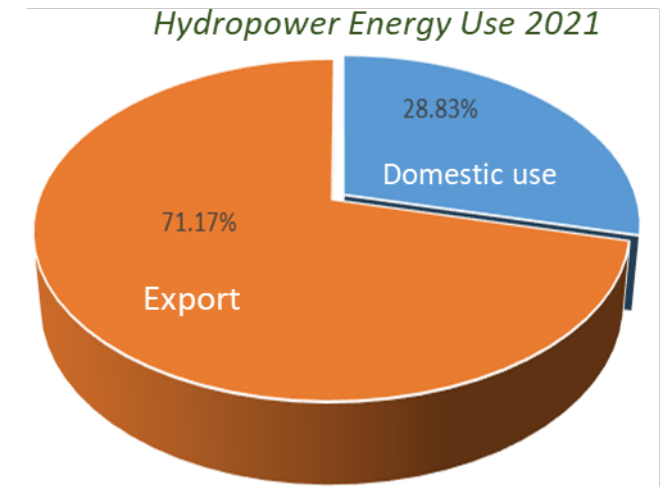
land holdings + access to state land on lease

## 2. Abundance & easy access to water



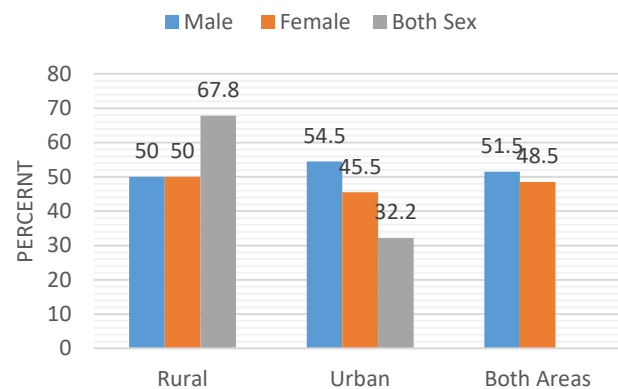
Per Capita fresh water: 94 500m<sup>3</sup>

## 3. Access to cheap and green renewable energy



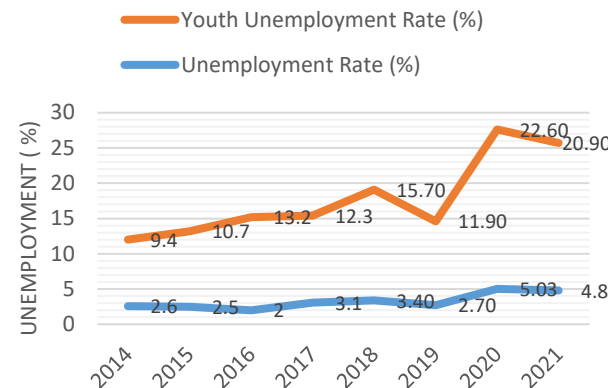
Solar and wind energy is being further explored

## 4. Economically active population



Labour force participation rate: 64-69% (2019-2021)

## 5. Opportunity to engage youths



Youth literacy rate: 93.09%

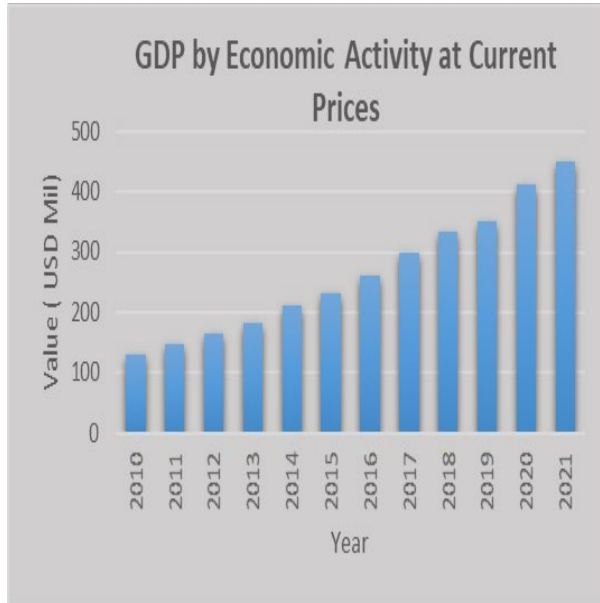
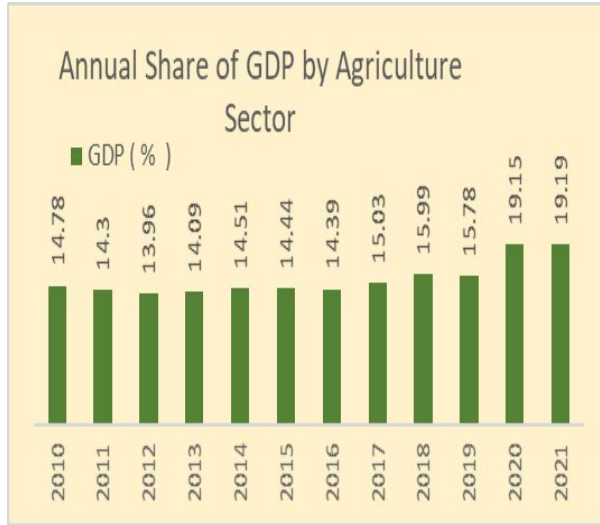
## 6. Suitable agro-climatic condition

- **Favourable biophysical and diverse agro-ecological conditions** allowing multiple crops/livestock/biodiversity growth and expansion
- **Future climate change** – becoming more suitable for agriculture expansion
- **Increasing awareness and adoption** of climate smart technologies and advanced production system

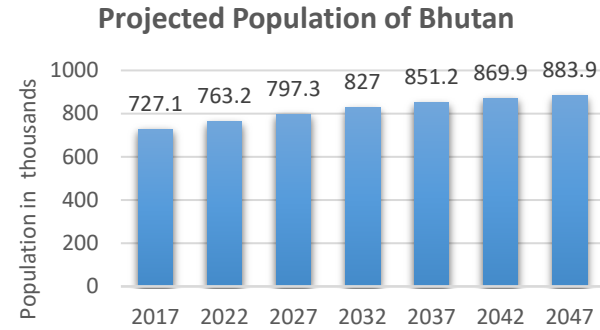
# Enabling Investment Opportunity in Agriculture Sector

Economic Growth & Market Expansion

## 1. Positive growth value



## 2. Increasing food demand (growing population and rapid urbanisation)



Urban pop. growth rate projected at 56.8% by 2047; and increase in tourists arrival

## 3. Growing access to domestic market



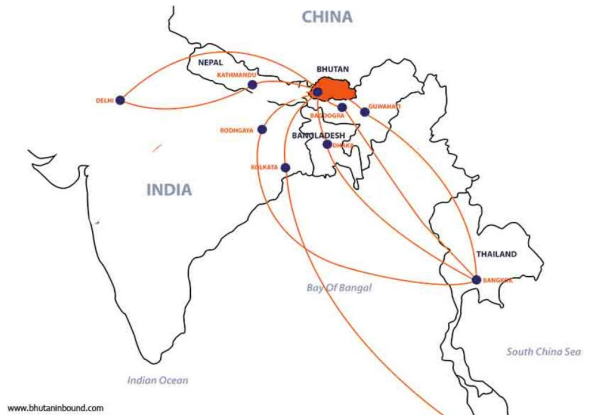
- reliable national highways and rural access
- access to Indian highways
- potential to access waterways connecting India and Bangladesh
- warehouse in border towns

## 4. Growing access to export market

India  
Bangladesh  
Singapore  
Thailand



- Upgrading one domestic airport to international airport
- Introducing cargo flight
- Increasing frequency



-outbound flights are normally with half-filled cargo space

Bangkok, Thailand	Singapore	Kathmandu, Nepal
(Daily) 2 flights	(Twice Weekly) 2 flights	(Daily) 2 flights
Kolkata, India	Delhi, India	Dhaka, Bangladesh
(Daily) 2 flights	(5 Times Weekly) 2 flights	(Thrice Weekly)

# Enabling Policies to Accelerate Agri-business

*“Sustainable policies and programmes supporting agrifood system growth, expansion and trade”*

**Bhutan is geo-politically stable** with sound Foreign Policy, strong and enabling National Laws and Security

- member to 39 UN agencies, 39 Regional Organisations
- diplomatic relations with 56 Nations

- **Opportunity for renewed active participation in agriculture trade-** Established Bilateral trades, SAFTA-8 countries, BIMSTEC-7 members states, and reaching out to 89 other countries, and current PTA/FTA under progress with Thailand

- Easy access to natural resources, energy, pristine environment, land access & land lease policy, ICT infrastructures

- **Innovative Finance:** blended finance and impact investment; example-Mountain Hazelnut Venture (8000 Ha) & wine grapes

- **Economic Development Policy and FDI Policy** enabling agricultural-based business with **tax-holiday (10 years)**, prevailing system of tariff free for agri-exports, tax exemption for inputs
- **Air freight** providing 50% subsidy for agricultural products for exports
- Indicated for import tax exemptions in potential export countries (for example- Thailand)

- Strategies (RNR strategies, LEDS), Standards (BSB, Organic), programmes, guidelines, actions plans ( biosecurity & food safety)

**Strong and Vibrant Governance Structure**

- **Ministry/National agency**
- **Central/ Regional Institutes**
  - **Local Government**



# Policies for Stronger Trade and Business Promotion

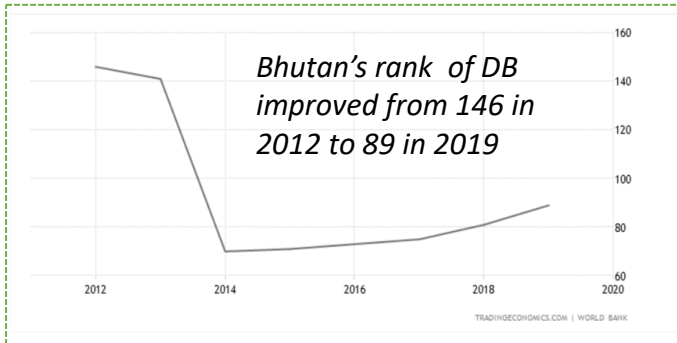
❑ **Export promotion and market reach through “Brand Bhutan” approach**, capitalizing on the Unique Selling Point (USP) packaging all attributes -pristine environment, rich cultural diversity, the GNH philosophy, political stability and others

- **Organic Produce** -BAFRA(ISO1765); IFOAM standards; member of CertAll (ASEAN CB), BAFRA accreditation by NACCB & NPOP (under process); ongoing dialogue with APEDA; member of Codex Alimentarius
- Instituting legal framework for **“Brand Bhutan”**
- **Adopting Special Agriculture Products (SAP) strategies and initiate** GI/GIES (special focus on pristine mountain environmental condition)

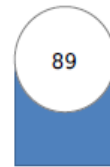
“Made In” and  
“Grown In”  
Bhutan



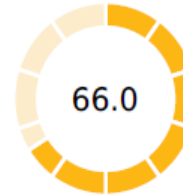
## ❑ Ease of Doing Business



DB RANK

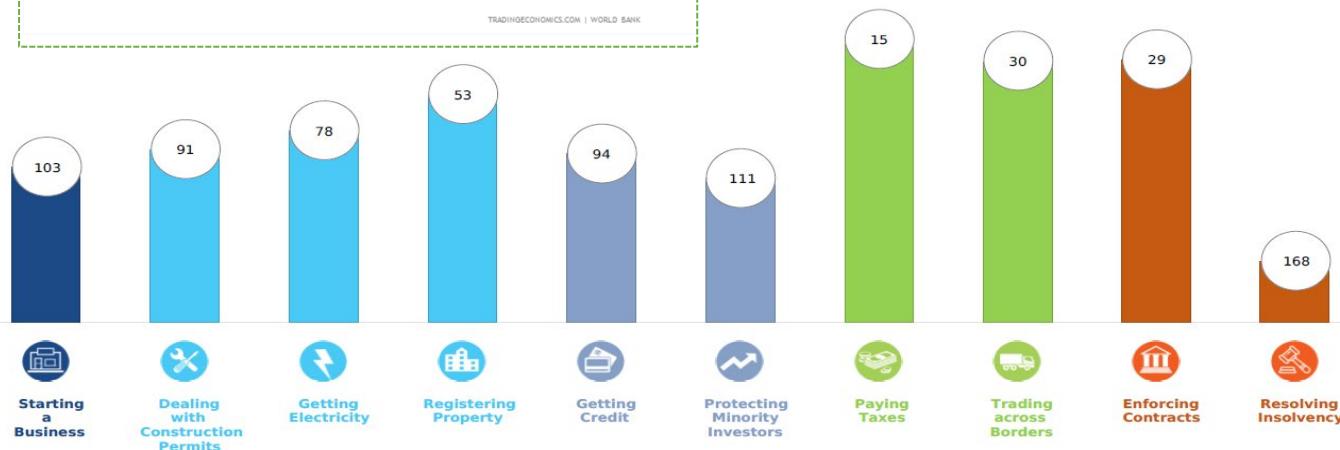


DB SCORE



### Critical reforms undertaken to improve ease of doing business

- **Single Window Corporate Registry System**- electronic incorporation of companies and online filing of statutory documents post-registration
- **Facilitation of Exports**: consolidate shipments to allow more scale for export destinations; and improve firm capacity to test and certify products for key foreign markets
- **FDI Policy 19**-allows foreign investments in both the manufacturing and services, more relaxed investment size



# Social Safeguard and Environmental Sustainability

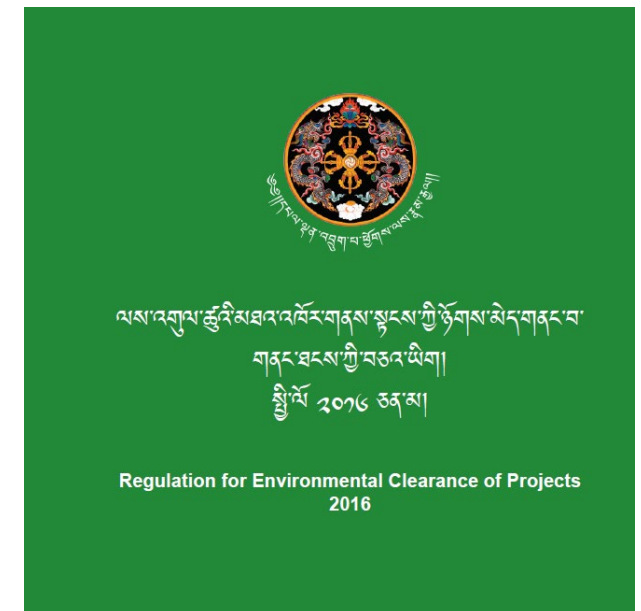
- ❑ Bhutan is always known for **pristine environment**, reinforced by “**The Constitution of the Kingdom of Bhutan**” to maintain minimum of **60% of total land under forests cover for perpetuity**
- ❑ Any projects or developments are well integrated and complied to social and environmental safeguard frameworks
- ❑ Social and Environmental assessment are prerequisite part of any projects /investment proposals

## Social Safeguard

- minimal social displacement
- focus on improving the livelihood of the vulnerable groups
- create employment, income and business opportunities
- inclusive participation in decision making process
- provision for incentives and subsidies
- women’s empowerment & fundamental rights
- welfare and social safety net

## Environmental Safeguard

- integrated in sustaining livelihood, health of soils, ecological processes and biodiversity conservation
- abide by environmental policies & laws, and adopt environmental friendly practices
- reduce emission both at farm level and downstream ( postharvest/transportation)
- resource use optimisation- natural resources (land, water and energy)
- environmental risk mitigation measures
- reduce postharvest losses and food wastes





# Overview of the Investment Proposal

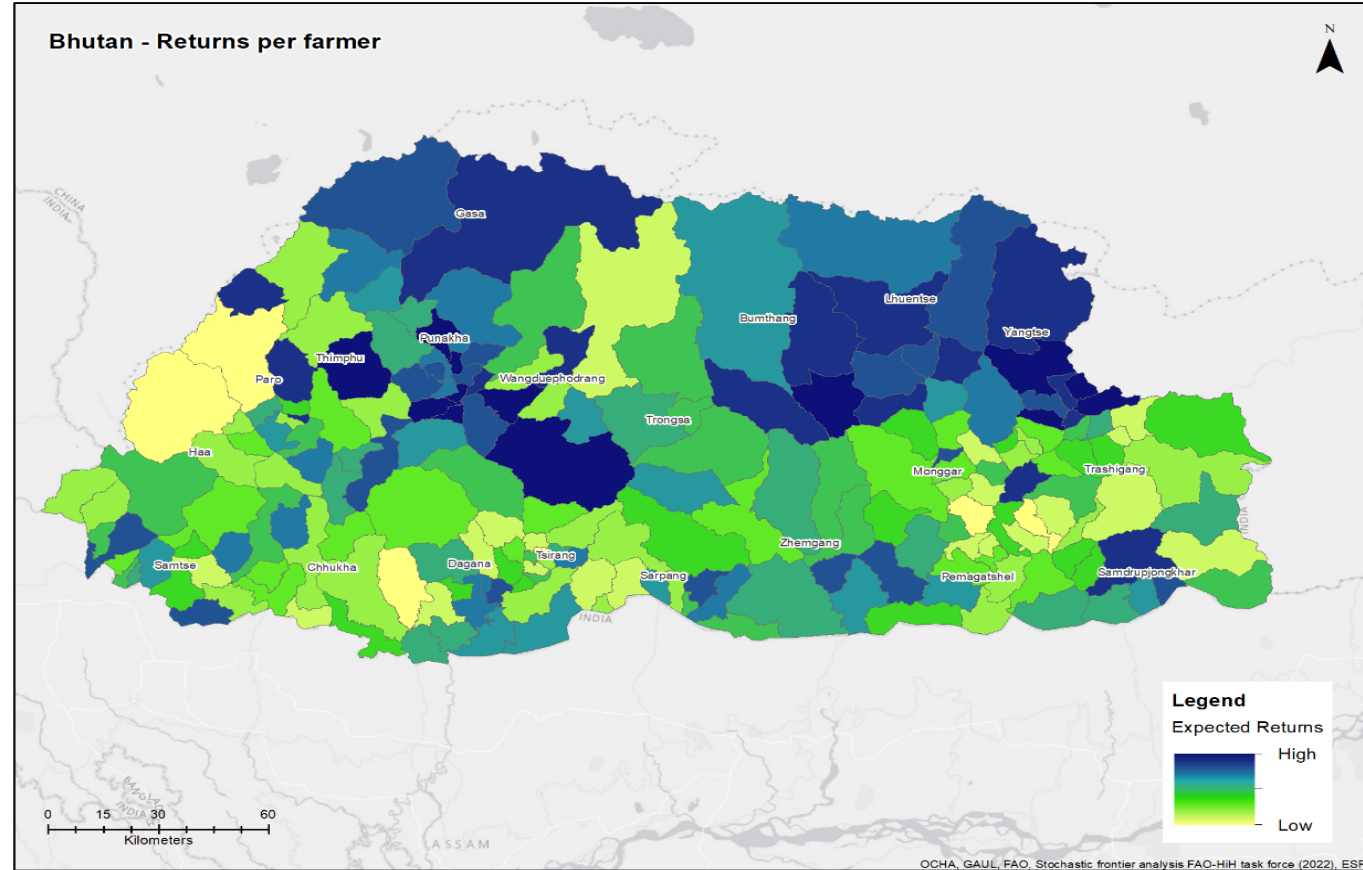
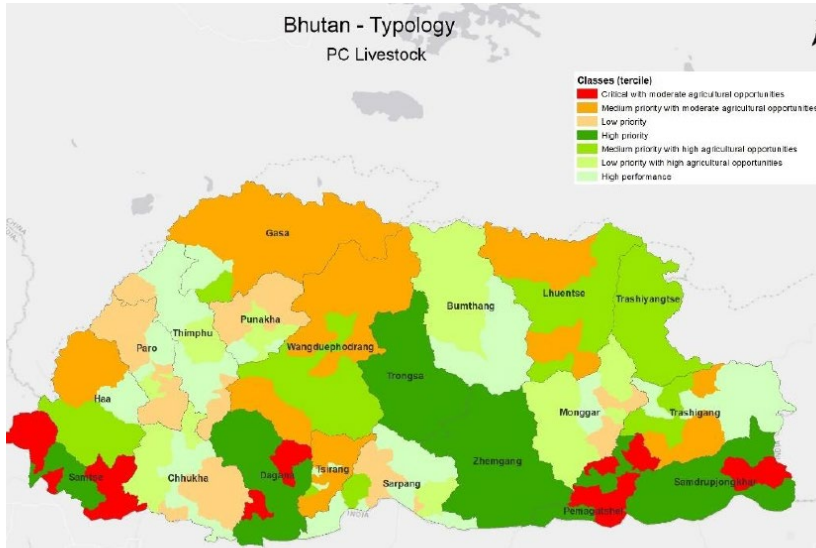
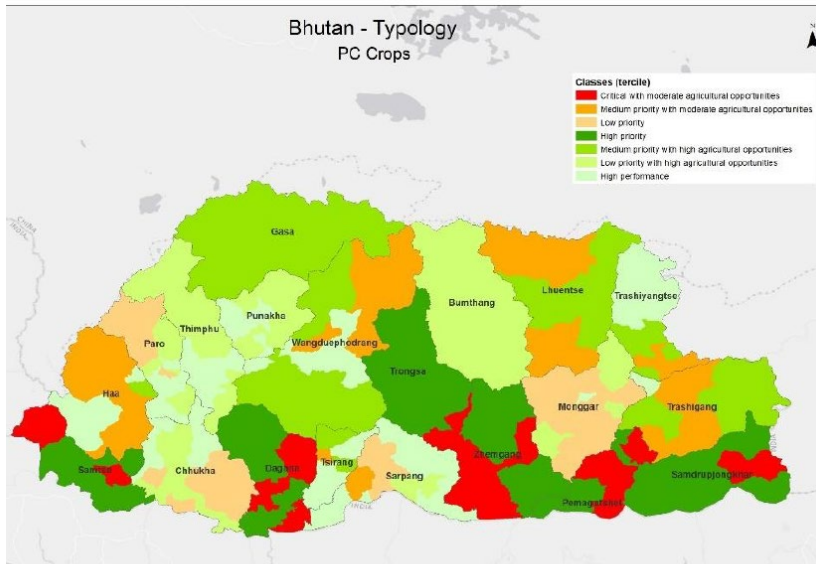
## Priority Value Chain

1. Organic Asparagus production
2. Organic Strawberry production
3. Asparagus and Strawberry centralised packhouse
4. Quinoa production
5. Quinoa processing and packhouse
6. Black Pepper production

## Rational/Objectives

1. Invest on High-value, Low-volume commodities
2. Build volume to meet demand in the export market
3. Attract youths into agricultural enterprise and business
  - making agriculture more attractive, creating conducive agri-business environment
  - provide “*fit-for-purpose*” business model
4. Co-benefits
  - enhance climate resilience
  - improve social values, gender inclusive and enhanced engagement
  - emission reduction/carbon sequestration

# Potential Returns to the Farmer



Source: FAO-HiH analysis team

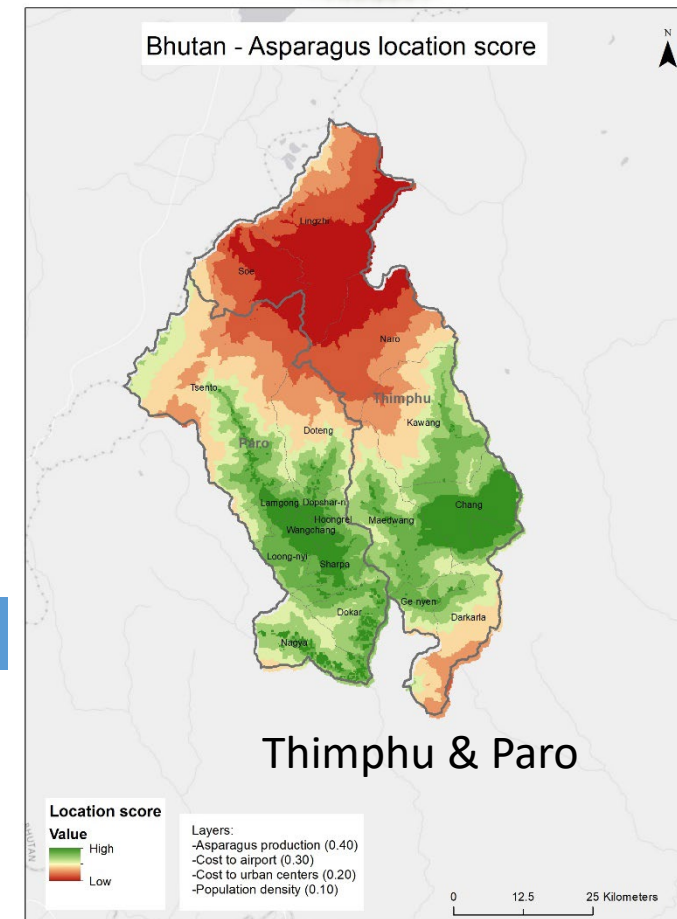
- Significant unexploited potential in agriculture not only for investors but also for the farmers
- Investments and interventions are socially inclusive with high returns to the farmers
  - Valorizing the potential with well targeted investments signifies higher farm incomes and lower poverty



# 1. Expand Organic Asparagus in Open-field Condition

## Opportunity & Reach

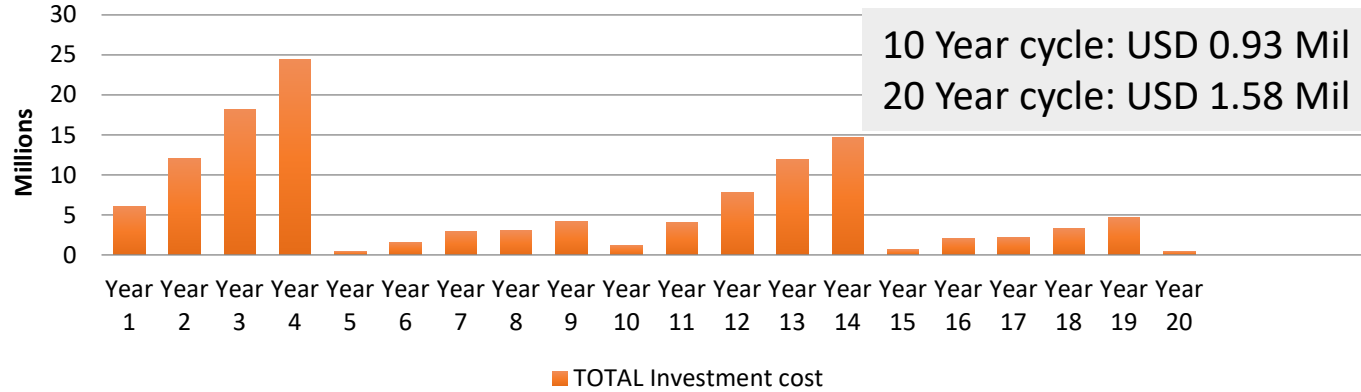
<b>Location</b>	Thimphu and Paro district ( <i>targeting high potential areas closer to airport</i> )
<b>Production target</b>	1000 acres (2000 Households): 50% under rainfed and 50% under irrigated cultivation; Volume-900MT/year
<b>Production scope</b>	suitable agro-climatic condition; availability of land (including land for rotation), water, labour, organic inputs; easy to grow-production experiences, low incidence of pests and diseases; expansion potential (>10000 acres)
<b>Post-harvest mtg.</b>	producers will be linked to central packhouse with cold store facilities and will be facilitated with reefer trucks for transportation by packhouse
<b>Targeted market</b>	Singapore, Thailand, Bangladesh-through aggregation centre/packhouse
<b>Food safety/standards</b>	strictly implement Bhutan Organic Standards and SPS measure prescribed by export market; monitoring by BAFRA (National Authority for quality control)
<b>Impacts</b>	increase income-USD1797/hh, employment (108 500 man-days/season, 206 direct/full time) & spillover employment, carbon sequestration: 324tCO <sub>2</sub> e <sub>q</sub>



## Key Risks Mitigation Measure

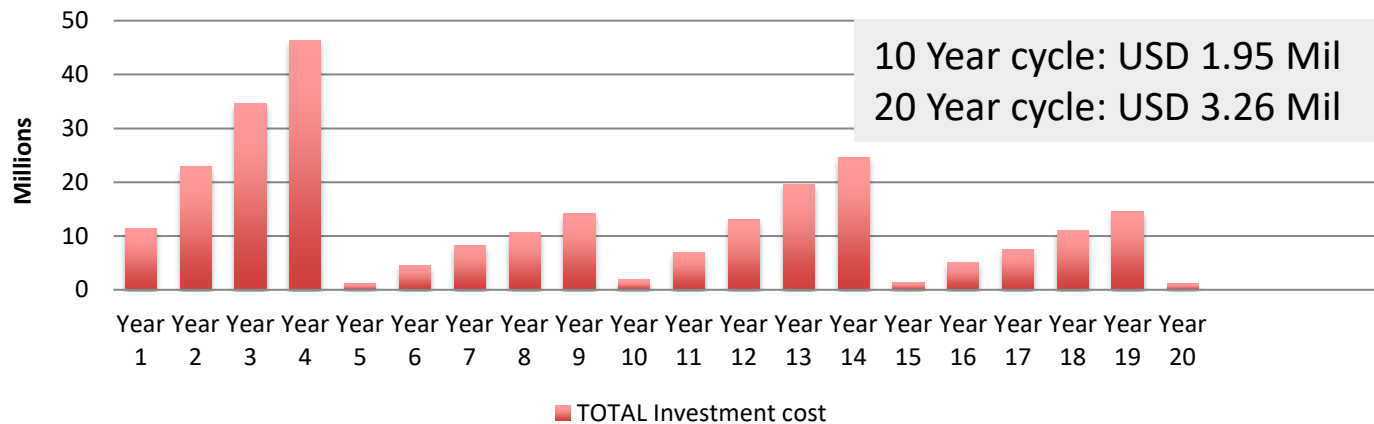
- to reduce market risk, market negotiations are in progress and exploring additional markets
- for the production sustainability and quality, introduction of advanced and climate-smart technologies (including high yielding and climate resilient varieties) are explored and adopted
- complementary investments for testing/certification will be needed: capacity building and accreditation of BAFRA is on-going, and consulting export market requirements for compliance

## Asparagus rainfed: Investment per year (in Nu millions)



FNPV@10%: USD600 425    FNPV@8%: USD937 915    IRR: 15.50%

## Asparagus irrigated: Investment per year (in Nu millions)



FNPV@10%: USD1 801 198    FNPV@8%: USD2 456 553    IRR: 20.65%

## Asparagus: Investment needs





# 2. Introduce Organic Strawberry in Protected Conditions

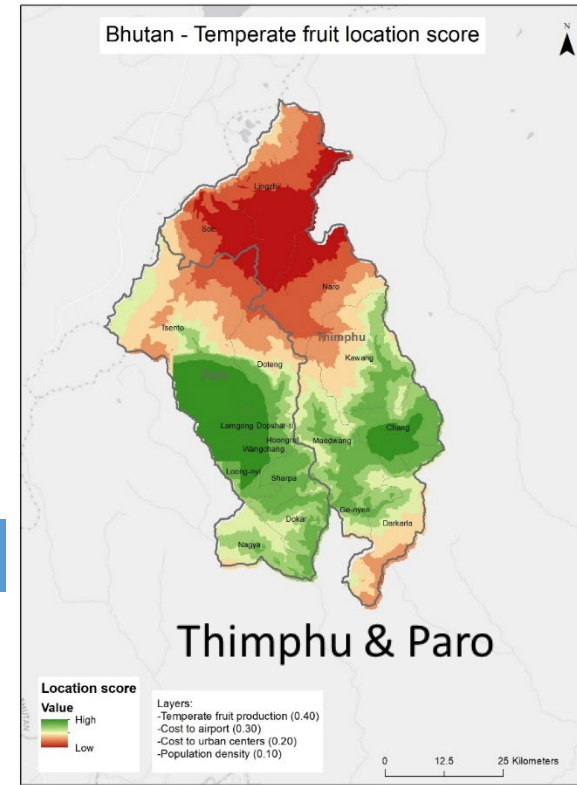
## Opportunity & Reach

<b>Location</b>	Thimphu and Paro (potential areas closer to airport and local market)
<b>Production target</b>	500 greenhouses (equiv. to 37 acres), 500 beneficiaries; 360MT/year
<b>Production scope</b>	semi-automated greenhouse for yield increase, minimizing pests incidence, and for extended production. suitable under open condition in temperate/cold regions. availability of land, labour, water, organic inputs, etc. and scope to increase area
<b>Post-harvest mtg.</b>	linking producers with central packhouse with cold store, and will be facilitated transportation using reefer trucks to packhouse/cold store by packhouse operator
<b>Target market</b>	Singapore, Thailand, Bangladesh (through aggregation centre/packhouse) & local market (including agro and milk processing industry)
<b>Food safety/standards</b>	strictly implement Bhutan Organic Standards and SPS measure prescribed by export market; monitoring and quality control by BAFRA
<b>Impacts</b>	increase income-USD1215/hh; employment for youth and women group (31800 man-days/season, 130 direct/full time) & spillover employment, emission reduction-24tCO2eq



## Key Risks Mitigation Measure

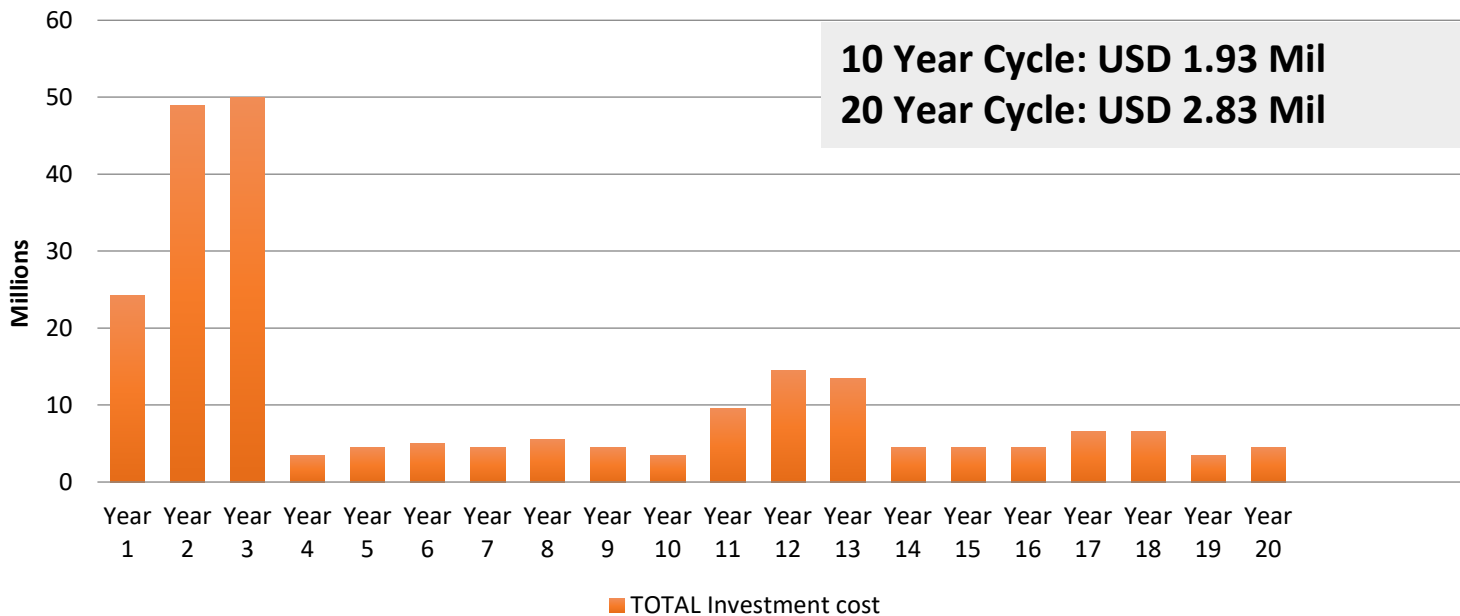
- to reduce market risk, market negotiations are in progress and exploring additional markets
- highly perishable commodity: production will focus proximity to cold storage facilities and airport to reduce risk; nonetheless, production remains viable even with 40 percent production losses
- complementary investments for testing/certification will be needed: capacity building and accreditation of BAFRA is on-going, and is consulting export market requirements for compliance



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

# Strawberry: Investment needs

Strawberry protected: Investment per year (in Nu millions)



**FNPV@10%: USD4 866 112**     
 **FNPV@8%: USD5 893 107**     
 **IRR: 53.48%**





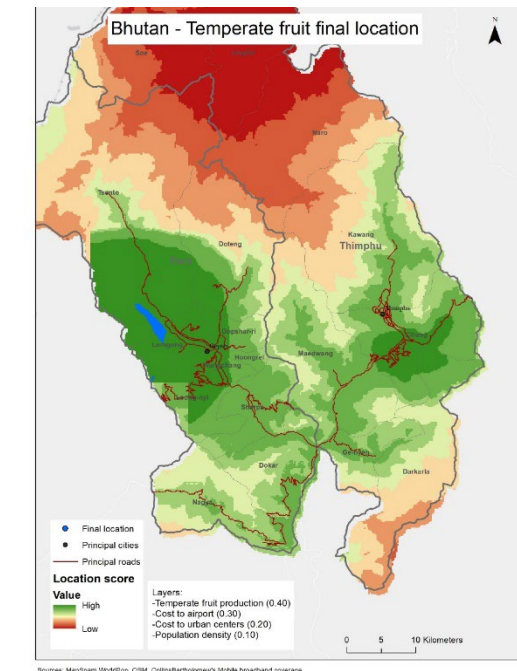
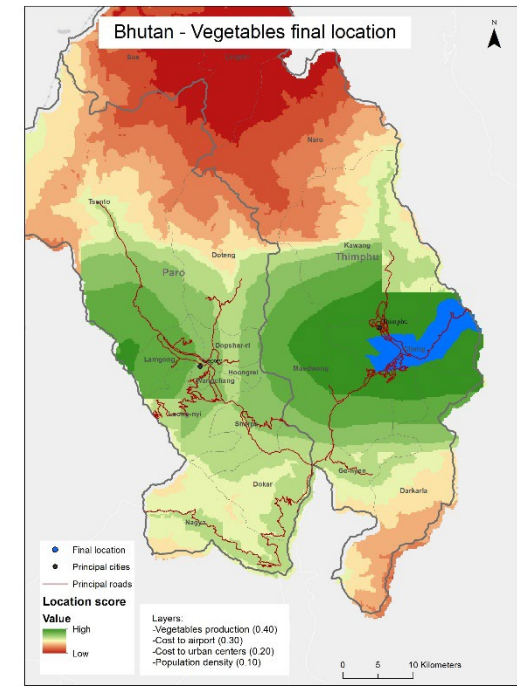
# 3. Central Packhouse for Asparagus & Strawberry

## Opportunity & Reach

<b>Location</b>	Thimphu and Paro, 1 central packhouse for each location
<b>Target capacity</b>	5-10 MT of produce each day and a cold storage capacity of 25 MT (compartments of 15 MT and 10MT); and 2 sets of reefer trucks for each facility
<b>Importance/scope</b>	reduce post-harvest losses and ensuring quality standards (washing, grading, food testing, certification, packing, labelling) especially for export markets; temporary storage right after field/before transportation to export market
<b>Target market</b>	Singapore, Thailand, Bangladesh & local market (including agro and milk processing industry); adopt BRAND BHUTAN for export market
<b>Food safety/standards</b>	strictly follow Organic Standards for processing, handling, storage including the use of packaging materials and labeling; monitoring by BAFRA
<b>Impact</b>	enhanced private sector engagement, income and employment opportunity for youth and women group including spillover employment, reduce carbon foot print (shorter transportation and use of green energy for processing)

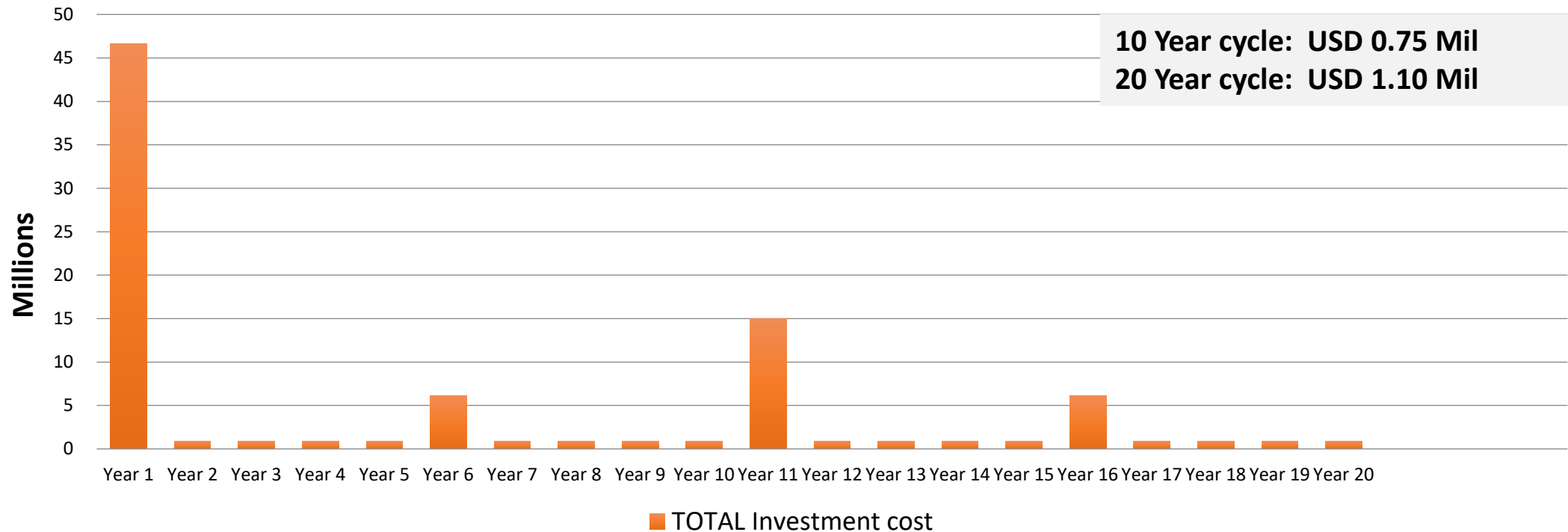
## Key Risks Mitigation Measure

- facility could accommodate other commodities in addition to targeted crops during lean season, thereby reducing the risk of financial viability
- facility operators will be fully trained on operation and maintenance at the beginning of the establishment to avoid any associated risks
- Standard Operating Procedures will be put in place to ensure that equipment is used for purpose and maintenance schedule being followed



# Central Packhouse for Asparagus and Strawberry: Investment needs

Aggregation centre: Investment per year (in Nu millions)



*FNPV@10%: USD 2 833 560*

*FNPV@8%: USD3 623 351*

*IRR: 30.04%*



# 4. Expand Quinoa Production

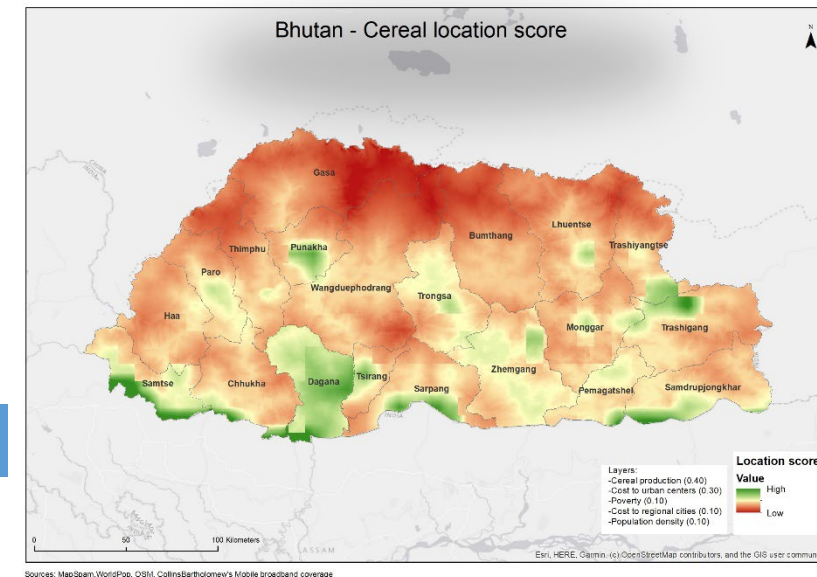
## Opportunity & Reach

<b>Location</b>	East region-6 districts; West central & south- 6 districts (green spots in map)
<b>Production target</b>	4000 acres (4000 Households): 70% under rainfed and 30% under irrigated cultivation; Volume-2360T/year
<b>Production scope</b>	suitable agro-climatic condition; availability of land, water, labour; easy to produce-less incidence of pests and disease, adaptive under marginal land; grow after maize and potato harvests and grow as intercrop, and possible to expand area (> 30 000 acres), adopt high yield. Var. for better returns
<b>Post-harvest mtg.</b>	producers will be linked to processing facility, which will also provide pick-up services; produces will be processed/packed/stored/marketed by processing centre
<b>Target market</b>	Japan and Bangladesh and local market (through processing centre)
<b>Food safety/standard</b>	strictly follow Bhutan's GAP Standards, monitoring by extension experts and BAFRA, follow SPS measures recommended by export market; adopt GI
<b>Impacts</b>	income increase: USD 172/hh, food & nutrition security, employment (221 800 man-days/season, 893 direct/full time), rural livelihood, reduce emissions : 30600tCO2eq

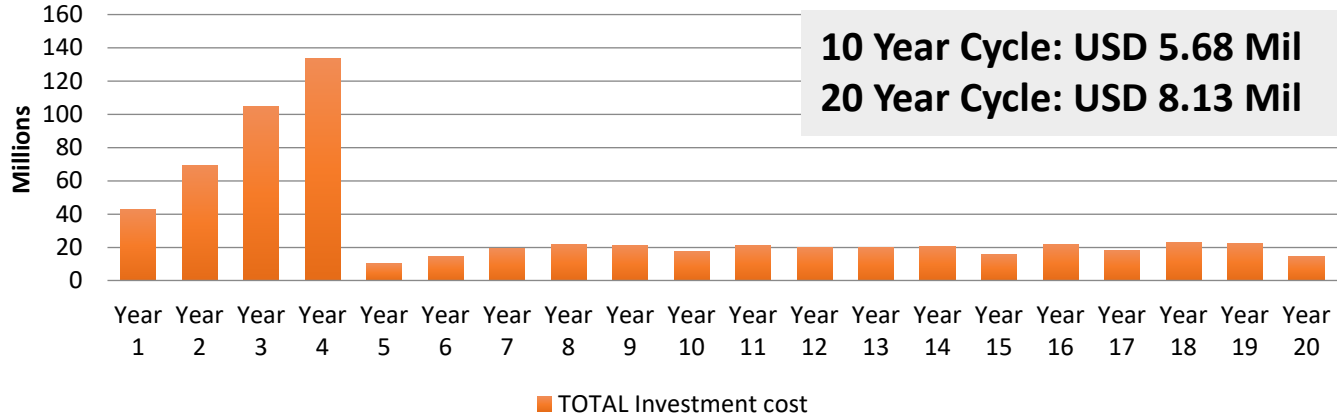


## Key Risks Mitigation Measure

- complementary investments for testing/certification will be needed: capacity building and accreditation of BAFRA is on-going, and is consulting export market requirements for compliance and standardization; samples sent to potential export markets
- exploring additional markets

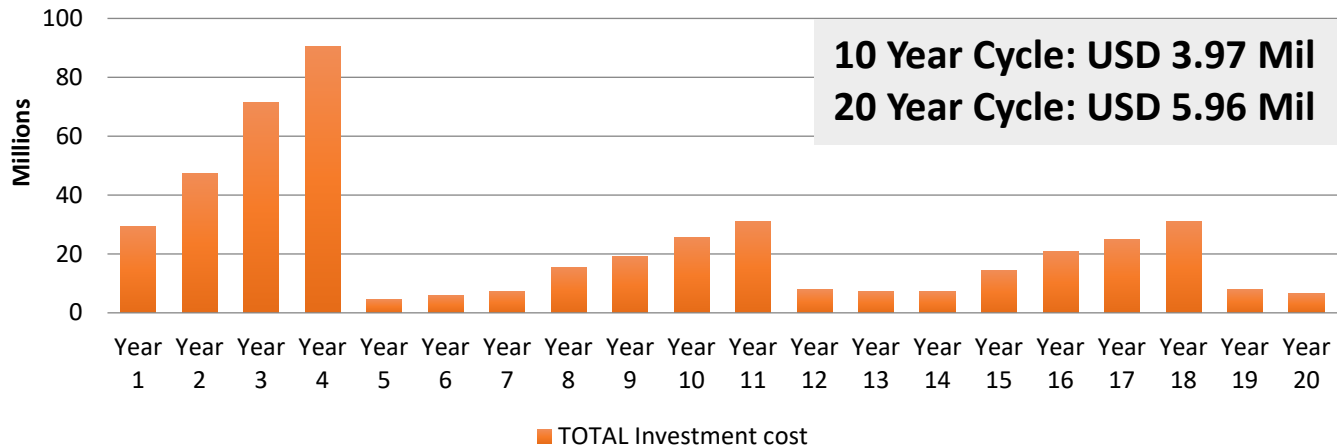


## Quinoa, rain-fed: Investment per year (in Nu millions)



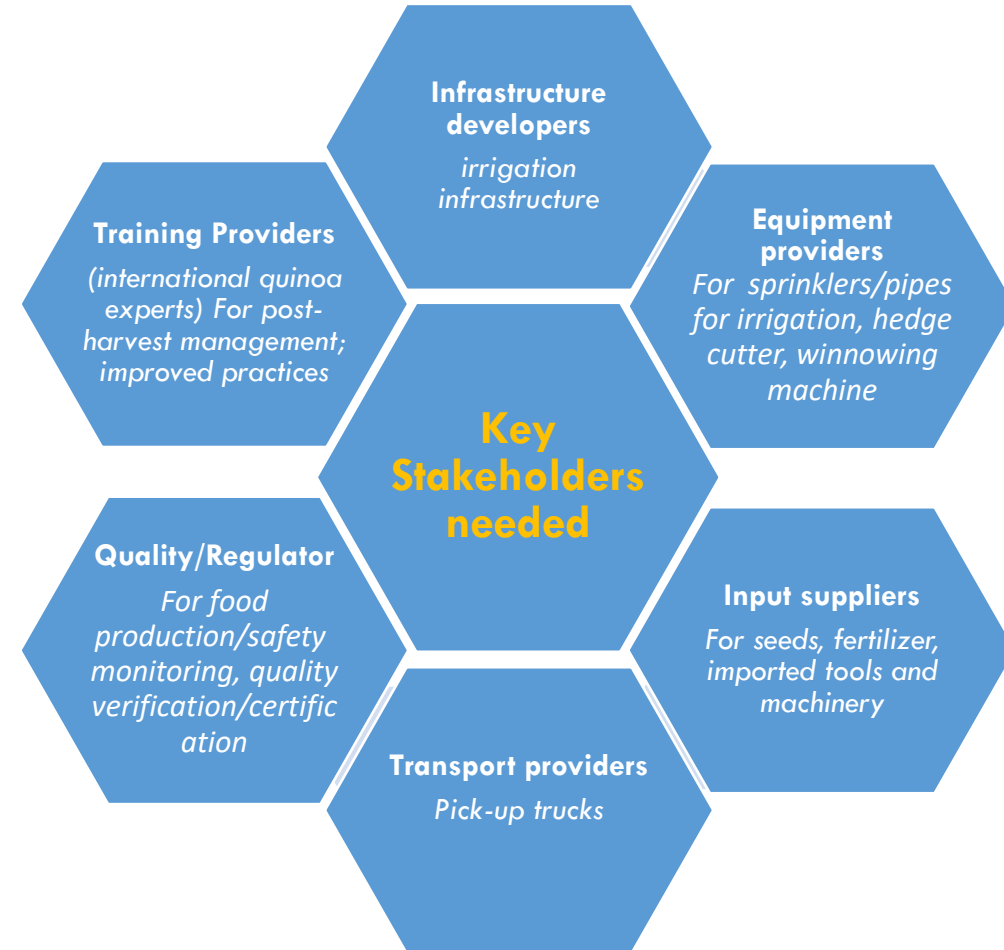
**FNPV@10%: USD2 276 581    FNPV@8%: USD3 130 994    IRR: 20.05%**

## Quinoa, irrigated: Investment per year (in Nu millions)



**FNPV@10%:USD2 764 086    FNPV@8%: USD3 510 762    IRR: 29.41%**

# Quinoa Investment needs



# 5. Processing Centre for Quinoa (Post-harvest management)

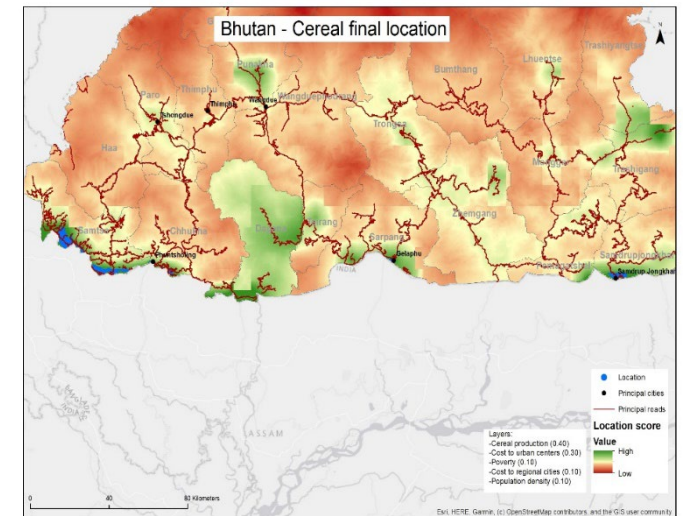
## Opportunity & Reach

<b>Location</b>	Phuntsholing ( <i>upgrading existing facility and new estb. in Nganglam</i> )
<b>Capacity</b>	Existing facility- 4MT/day; New facility-8MT/day (atleast for 9 months)
<b>Importance/scope</b>	critical for reducing post-harvest losses and ensuring quality standards (washing, drying, grading, testing, packing, certification, labeling) especially for export markets; and for temporary storage
<b>Target market</b>	Japan, Bangladesh, and local market ( 30%), marketing under GI for Bhutan
<b>Food safety/standards</b>	strictly follow the food safety standards of Bhutan and quality required by the market, and build in-house capacity for food testing and quality mgt.
<b>Impact</b>	enhanced engagement of private sectors, employment for youth and women group, national economy; reduce emission (use of green energy for processing)



## Key Risks Mitigation Measure

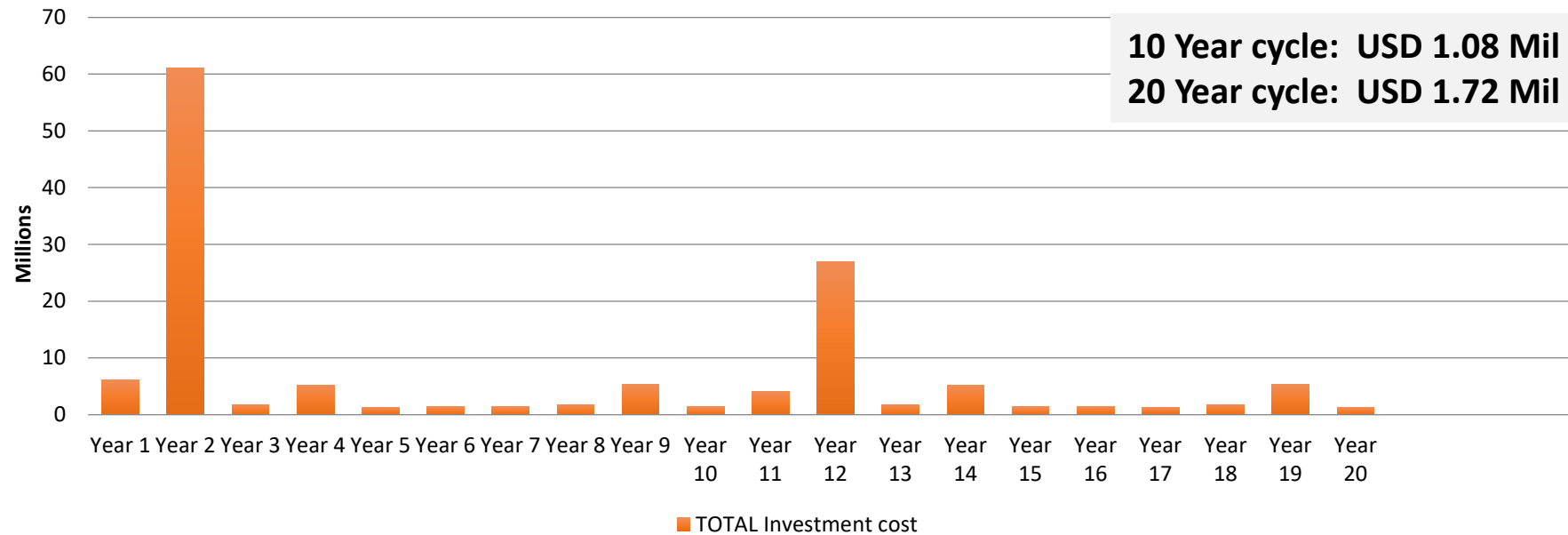
- facility could accommodate other commodities in addition to targeted commodities and will be used for similar purpose reducing the risk of financial viability
- facility operators will be fully trained on operation and maintenance at the beginning of the establishment to avoid any associated risks
- Standard Operating Procedures will be put in place to ensure prescribed operation procedures are followed including maintenance of equipment





# Processing Centre for Quinoa: Investment needs

Quinoa Processing: Investment per year (in Nu millions)



*FNPV@10%: USD 1 721 032*

*FNPV@8%: USD2 135 500*

*IRR: 44.78%*

# 6. Introduce and Promote Black Pepper Production

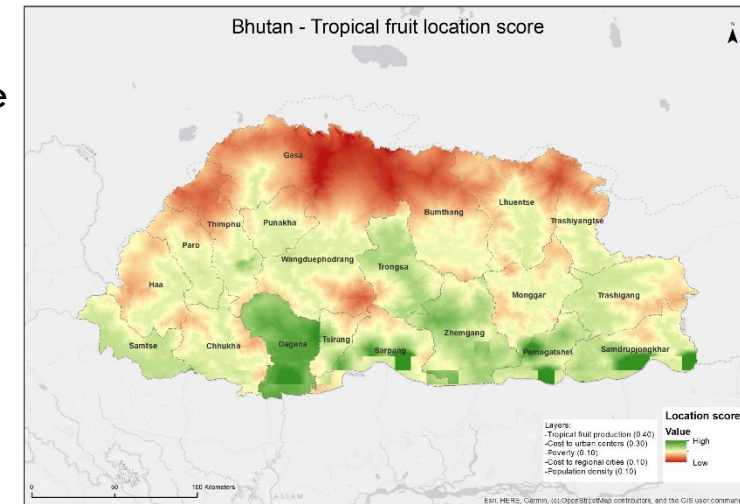
## Opportunity & Reach

<b>Location</b>	5 districts in South/central (Samtse, Chukha, Sarpang, Samdrupjongkhar, Dagana)
<b>Production target</b>	3000 acres (3000 Households); Volume-4320MT/year (raw/dried)
<b>Production scope</b>	suitable agro-climatic condition; availability of land, water, labour; most easy to grow- grow along with arecanut (require no additional land), increase production in all arecanut growing areas (>10000 acres in future)
<b>Post-harvest mtg.</b>	comparatively easy to manage (sun drying at household level); producers will be linked to private aggregators/traders exporting to India
<b>Target market</b>	India (border towns-directly or through aggregators)
<b>Food safety/standard</b>	follow standard production practices (minimal use of synthetic inputs), meet the quality required in the market
<b>Impacts</b>	increase private sector engagement (production/marketing), income increase- USD2364/hh, employment for youth and women group (190 350 man-days/season, 900 direct/full time), carbon sequestration-70 360CO2eq



## Key Risks Mitigation Measure

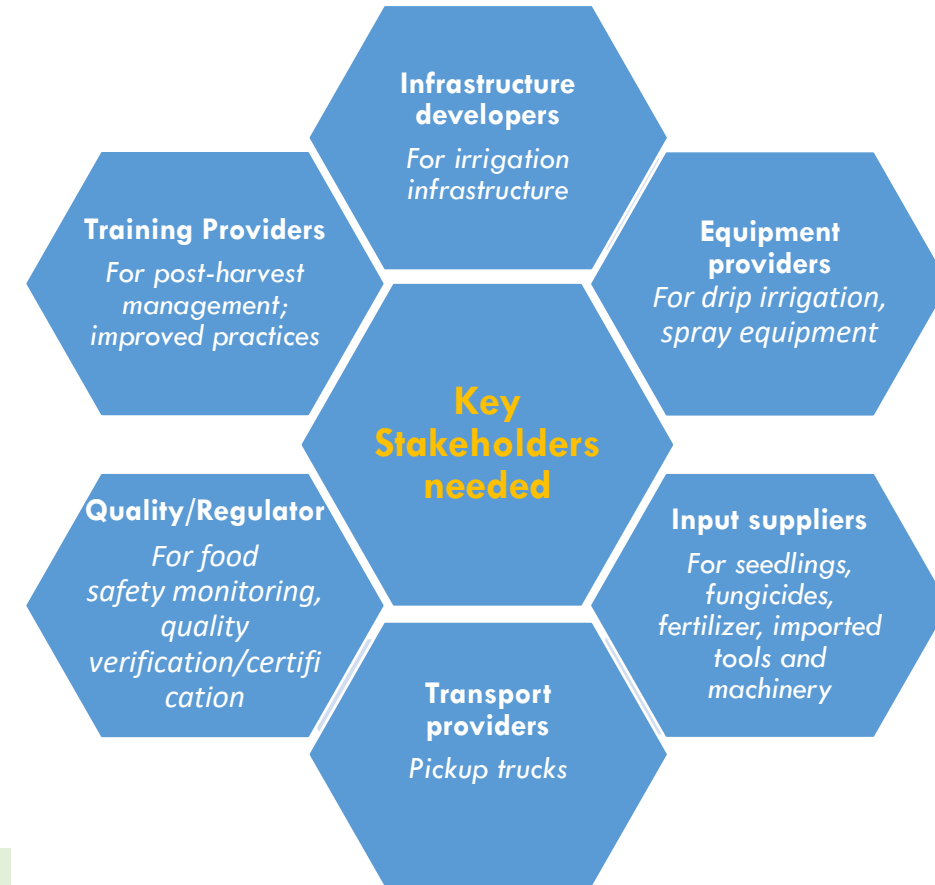
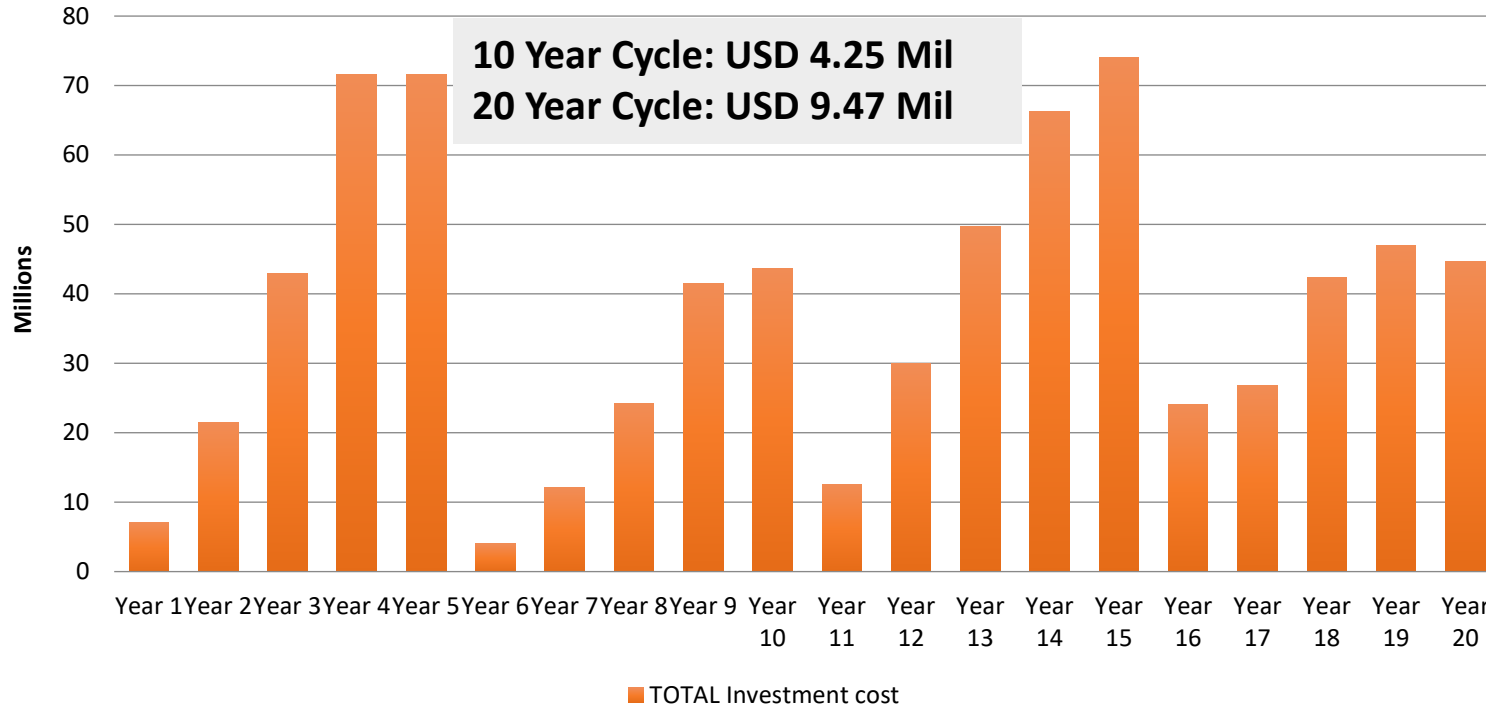
- Planting materials for initial establishments: agriculture sector has already started accessing planting materials, screening and multiplication of planting materials
- complementary investments for testing/certification will be needed: capacity building and accreditation of BAFRA is on-going, and is consulting export market requirements for compliance and standardization



*Black pepper can be grown in arecanut grown areas (sub-tropical/tropical)*

# Black Pepper: Investment needs

**Black pepper, raw: Investment per year (in Nu millions)**



**FNPV@10%: USD48 595 529**

**FNPV@8%: USD63 699 424**

**IRR: 32.75%**



# Return to investments: Internal rate of return and financial net present value

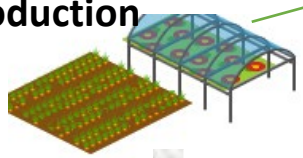
	<i>Asparagus (Rained) 500 acres, 1000 beneficiaries</i>		<i>Asparagus (Irrigated) 500 acres, 1000 beneficiaries</i>		<i>Strawberry (Protected) 500 greenhouses, 500 beneficiaries</i>		<i>Centralized Packhouse (2 facilities)</i>	
	<b>10 years</b>	<b>20 years</b>	<b>10 years</b>	<b>20 years</b>	<b>10 years</b>	<b>20 years</b>	<b>10 years</b>	<b>20 years</b>
<b>FNPV@10%</b>	312,329	600,425	1,075,258	1,801,198	3,002,484	4,866,112	1,425,501	2,833,560
<b>FNPV@8%</b>	500,470	937,915	1,418,186	2,456,553	3,440,283	5,893,107	1,752,310	3,623,351
<b>IRR</b>	14.19%	15.50%	19.38%	20.65%	52.44%	53.48%	26.93%	30.04%
	<i>Quinoa (rain-fed) 2800 acres, 2800 beneficiaries</i>		<i>Quinoa (Irrigated) 1200 acres, 1200 beneficiaries</i>		<i>Quinoa Processing ( 2 facilities )</i>		<i>Black pepper (raw ) 3000 acres, 3000 beneficiaries</i>	
	<b>10 years</b>	<b>20 years</b>	<b>10 years</b>	<b>20 years</b>	<b>10 years</b>	<b>20 years</b>	<b>10 years</b>	<b>20 years</b>
<b>FNPV@10%</b>	635,483	2,276,581	1,300,432	2,764,086	944,540	1,721,032	7,965,450	48,595,529
<b>FNPV@8%</b>	970,663	3,130,994	1,589,910	3,510,762	1,109,629	2,135,500	10,340,517	63,699,424
<b>IRR</b>	14.91%	20.05%	25.88%	29.41%	42.60%	44.78%	21.68%	32.75%

**NPV in USD ( 1USD=80BTN)**

# Supply Chain and Logistics

## Asparagus and Strawberry

### Production

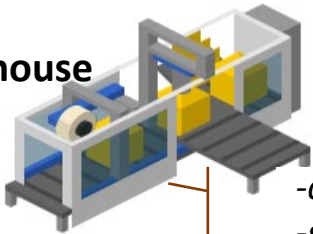


-production using certified organic inputs  
-regular field monitoring by BAFRA and field certification

reefer



### Packhouse



-collection using reefers from field, cleaning  
-sorting/grading, testing, packing, labelling, certification

reefer



### Airport



Deliver to airport using reefer vans

Air freight



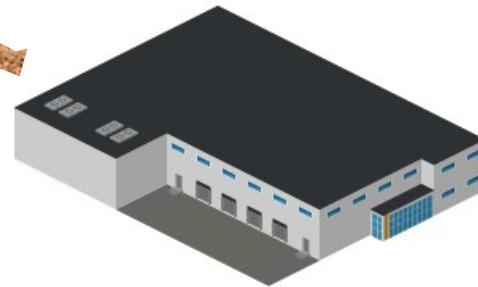
### Local market



reefer



### Export market



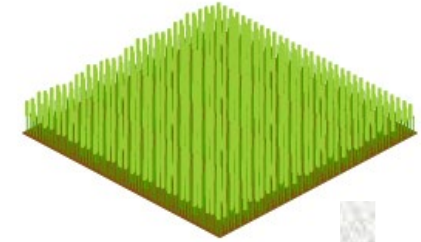
Deliver to identified wholesalers

-production using certified seeds  
-field monitoring for production standards

-farmers deliver to community aggregation point  
-Processing centre collects from aggregation centre

## Quinoa

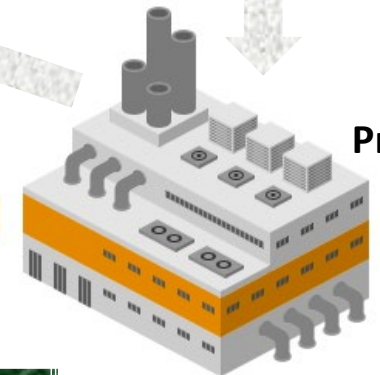
### Production



### Aggregation



### Processing



-collection, processing, cleaning, grading, packaging, labelling, certification, marketing

by road to airport



# Potential Market Analysis and Negotiation

Country/ Market	Market identification	Commodity/advantages
Singapore	One company has committed to facilitate Bhutan for agri-exports	<ul style="list-style-type: none"> <li>- for any commodities produced in Bhutan</li> <li>- possible to facilitate warehouse and outlets for Bhutan's produces in Singapore; could facilitate beyond Singapore market</li> <li>- not restricted for production regimes (organic/inorganic)</li> </ul>
	One firm has committed to support selective marketing of produces	<ul style="list-style-type: none"> <li>- dedicated to work with the Kingdom of Bhutan towards sustainable agriculture-to produce vegetable and fruits                             <ul style="list-style-type: none"> <li>- selected commodity either through business-business or on goodwill between two countries</li> </ul> </li> </ul>
Bangladesh	One company has indicated positively to support export to Bangladesh	<ul style="list-style-type: none"> <li>- committed to facilitate export of Bhutanese produces including water, even beyond Bangladesh</li> </ul>
Japan	"Bhutan Food" connecting to markets in Japan	<ul style="list-style-type: none"> <li>- <i>adzuki bean (committed), buckwheat (committed), and quinoa in pipeline</i></li> </ul>
Thailand	Negotiation with the Government of Thailand	<ul style="list-style-type: none"> <li>- PTA/FTA in process</li> <li>- selected commodities with/without phytosanitary certificate</li> </ul>

**Note: indicated for any volume that Bhutan can produce**



# Environmental, Social & Biodiversity Impact

INTERVENTIONS	IMPACT	
<b>20-year period</b>	<b>ENVIRONMENTAL</b>	<b>SOCIAL</b>
Black Pepper	<ul style="list-style-type: none"> <li>• GHG emission at farm: <b>-3 518 tCO<sub>2</sub>e/year</b></li> <li>• <i>GHG emission</i> downstream emissions ( transportation &amp; packaging): <b>+86tCO<sub>2</sub>e/year</b></li> <li>• Food loss: <b>56t/year</b></li> </ul>	<ul style="list-style-type: none"> <li>• Net Income: 2364USD per farmer</li> <li>• 900 additional full-time equivalent jobs will be created at the farm level</li> </ul>
Quinoa	<ul style="list-style-type: none"> <li>• GHG emissions at farm: <b>-1,530 tCO<sub>2</sub>e/year</b></li> <li>• GHG emission at downstream(transportation, refrigeration, packaging):<b>+286tCO<sub>2</sub>e/year</b></li> <li>• GHG emission from estb. of processing infra.: <b>+1,959 tCO<sub>2</sub>e</b></li> <li>• Food lost: <b>101 tonnes</b> as <b>post-harvest loss</b> on farm and <b>125 tonnes</b> as <b>de-husking loss</b> at processing</li> </ul>	<p><u>Net income</u>  <b>Irrigated farms:</b> 267 USD per farmer  <b>Rainfed farms:</b> 77 USD per farmer</p> <ul style="list-style-type: none"> <li>• 893 additional full-time jobs (15 at the processing level) <ul style="list-style-type: none"> <li>• 250 full-time jobs for women</li> </ul> </li> </ul>
Asparagus & Strawberry	<ul style="list-style-type: none"> <li>• GHG emissions at the farm level : <b>-17tCO<sub>2</sub>e/year</b></li> <li>• GHG emission at downstream (transportation, refrigeration, packaging): <b>+41tCO<sub>2</sub>e/year</b></li> <li>• GHG emission at packhouse development: <b>+87tCO<sub>2</sub>e</b></li> <li>• Food loss: <b>90 tons/year</b></li> </ul>	<p><u>Net income</u>  <b>Asparagus:</b>1797 USD per farmer  <b>Strawberry:</b>1215 USD per farmer</p> <ul style="list-style-type: none"> <li>• <b>336</b> additional full-time jobs will be created at the farm level</li> </ul>

## Biodiversity impact of the whole project

- Mean Species Abundance (MSA) is already very high at 0.90 due to its impeccable forest and ecosystem conservation ( MSA improves)
- Project leads to avoided biodiversity loss in 193 ha
- Added social value of biodiversity of the project is 327,659 USD



# BHUTAN'S INVESTMENT PLAN & IMPACT SUMMARY



Food and Agriculture Organization  
of the United Nations



**US\$34.05M**  
Total Investment

**31%**  
Overall  
Average IRR

**9500**  
**households**  
Beneficiaries

**US\$1387**  
Income Increase  
Per Capita

**28.33tCO<sub>2</sub>eq**  
Emission Reduction  
Per Capita

## KEY INVESTMENTS

### Intervention 1

Organic Asparagus (rainfed/irrigated)

#### Cost (USD)

US\$1.58M/3.26M

#### IRR (%)

16%/21%

#### VPN

US\$0.938M/ US\$2.457M

#### Sustainability Benefits

Beneficiaries: 2000 households

Income increase per capita:  
US\$1797

Emission reduction per capita:  
0.162 tCO<sub>2</sub>eq

### Intervention 2

Organic Strawberry

#### Cost (USD)

US\$2.83M

#### IRR (%)

54%

#### VPN

US\$5.893M

#### Sustainability Benefits

Beneficiaries: 500 households

Income increase per capita:  
US\$1215

Emission reduction per capita:  
0.048tCO<sub>2</sub>eq

### Intervention 3

Asparagus & Strawberry Packhouse

#### Cost (USD)

US\$1.10M

#### IRR (%)

30%

#### VPN

US\$3.623M

#### Sustainability Benefits

Beneficiaries: 2500 households

Income increase per capita:  
*(as indicated under farm model)*

Emission reduction per capita:  
-0.443tCO<sub>2</sub>eq

*note: NPV@8%, 20-year project cycle, spill over beneficiaries not included*

# BHUTAN'S INVESTMENT PLAN & IMPACT SUMMARY



Food and Agriculture Organization  
of the United Nations



**US\$34.05M**  
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**9500**  
**households**  
Beneficiaries

**US\$1387**  
Income Increase  
Per Capita

**28.33tCO<sub>2</sub>eq**  
Emission Reduction  
Per Capita

## KEY INVESTMENTS

### Intervention 4

Quinoa Production  
(rainfed/irrigated)

#### Cost (USD)

US\$8.13M/US\$5.96M

#### IRR (%)

20%/30%

#### VPN

US\$3.130M/US\$3.510M

#### Sustainability Benefits

Beneficiaries: 4000 households

Income increase per capita:  
US\$77/267

Emission reduction per capita:  
7.60tCO<sub>2</sub>eq

### Intervention 5

Quinoa Processing

#### Cost (USD)

US\$1.72M

#### IRR (%)

45%

#### VPN

US\$2.136M

#### Sustainability Benefits

Beneficiaries: 4000 household

Income increase per capita:  
*(as indicated in farm model)*

Emission reduction per capita:  
-1.92tCO<sub>2</sub>eq

### Intervention 6

Black Pepper Production and marketing  
(raw)

#### Cost (USD)

US\$9.47M

#### IRR (%)

33%

#### VPN

US\$63.700M

#### Sustainability Benefits

Beneficiaries: 3000 households

Income increase per capita:  
US\$2364

Emission reduction per capita:  
22.88tCO<sub>2</sub>eq

*note: NPV@8%, 20-year project cycle, spill over beneficiaries not included*



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