Leveraging Opportunities for Investment in Agrifood Systems in Bhutan

Hand-in-Hand Initiative

Investment Forum | Rome, Italy | 17-19 October 2022
Overview of Bhutan and Agrifood System

**BHUTAN**

<table>
<thead>
<tr>
<th>Category</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land area</td>
<td>38,394 Km²</td>
</tr>
<tr>
<td>Population</td>
<td>763,249</td>
</tr>
<tr>
<td>GDP (USD Mil)</td>
<td>2,540 (2021)</td>
</tr>
<tr>
<td>GDP per capita</td>
<td>3,359 (2021)</td>
</tr>
<tr>
<td>Poverty rate</td>
<td>8.21% (National); 11.94% (Rural)</td>
</tr>
<tr>
<td>Unemployment rate</td>
<td>4.8% (overall); 20.9% (youth)</td>
</tr>
</tbody>
</table>

**Economy**

Agriculture, Hydropower, Industry, Tourism

**Climatic condition**

Humid and subtropical (southern plains and foothills), temperate (inner Himalayan valleys of the central regions), and cold (in the north)

**Special features**

Gross National Happiness Values; Pristine Environment; Rich Biodiversity; Natural Farming; Carbon Negative

**AGRICULTURE**

- 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)**

- Dairy: 6.72
- Meat: 14.55
- Veg: 4.18
- Rice: 32.73
- Spices: 22.59
- Fruits: 5.94
- Nut: 2.28
- Potato: 5.3

**Major Agri-export (USD Mil)**

- Spices: 22.59
- Fruits: 5.94
- Nut: 2.28

**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

### 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 ktCO2e by 2030 and 3563 ktCO2e by 2050
Enabling Investment Opportunity in Agriculture Sector

1. Land availability
   - Arable land
     - Annual crops 53%
     - Fallow land 27%
     - Permanent crop 11%
   - Land holdings + access to state land on lease

2. Abundance & easy access to water
   - Per Capita fresh water: 94,500 m³

3. Access to cheap and green renewable energy
   - Hydropower Energy Use 2021
     - Domestic use: 28.83%
     - Export: 71.17%

4. Economically active population
   - Male
   - Female
   - Both Sex
   - Labour force participation rate: 64-69% (2019-2021)

5. Opportunity to engage youths
   - Youth literacy rate: 93.09%
   - Youth Unemployment Rate (%)

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

1. Positive growth value

- Annual Share of GDP by Agriculture Sector
- GDP (%)

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

- Projected Population of Bhutan

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

3. Growing access to domestic market

- Economic Growth & Market Expansion
- Positive growth value
- • 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

- Growing access to export market
- • Upgrading one domestic airport to international airport
- • Introducing cargo flight
- • Increasing frequency

- Outbound flights are normally with half-filled cargo space

<table>
<thead>
<tr>
<th>Bangkok, Thailand</th>
<th>Singapore</th>
<th>Kathmandu, Nepal</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Daily) 2 flights</td>
<td>(Twice Weekly) 2 flights</td>
<td>(Daily) 2 flights</td>
</tr>
<tr>
<td>Kolkata, India</td>
<td>Delhi, India</td>
<td>Dhaka, Bangladesh</td>
</tr>
<tr>
<td>(Daily) 2 flights</td>
<td>(5 Times Weekly) 2 flights</td>
<td>(Thrice Weekly)</td>
</tr>
</tbody>
</table>
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 NABCB & 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)

- 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

Critical reforms undertaken to improve ease of doing business:

- Bhutan’s rank of DB improved from 146 in 2012 to 89 in 2019
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

- 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

Source: FAO-HiH analysis team

Stochastic frontier analysis FAO-HiH task force (2022)
1. Expand Organic Asparagus in Open-field Condition

**Opportunity & Reach**

- **Location**: Thimphu and Paro district (targeting high potential areas closer to airport)
- **Production target**: 1000 acres (2000 Households): 50% under rainfed and 50% under irrigated cultivation; Volume-900MT/year
- **Production scope**: 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)
- **Post-harvest mtg.**: producers will be linked to central packhouse with cold store facilities and will be facilitated with reefer trucks for transportation by packhouse
- **Targeted market**: Singapore, Thailand, Bangladesh-through aggregation centre/packhouse
- **Food safety/standards**: strictly implement Bhutan Organic Standards and SPS measure prescribed by export market; monitoring by BAFRA (National Authority for quality control)
- **Impacts**: increase income-USD1797/hh, employment (108 500 man-days/season, 206 direct/full time) & spillover employment, carbon sequestration: 324tCO2eq

**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: Investment needs

**Infrastructure developers**
For aggregation unit, cold storage

**Equipment providers**
For drip irrigation, aggregation unit, cold storage

**Training Providers**
(international horticulture experts)
post-harvest management; improved practices

**Quality/Regulator**
For food safety monitoring, quality verification/certification

**Input suppliers**
For seedlings, imported tools, bio-fertilizer, and machinery

**Transport providers**
For refrigerated trucks, air freight, pickup trucks

**Key stakeholders needed**

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

- **10 Year cycle:** USD 0.93 Mil
- **20 Year cycle:** USD 1.58 Mil

**FNPV@10%:** USD 600,425  **FNPV@8%:** USD 937,915  **IRR:** 15.50%

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

- **10 Year cycle:** USD 1.95 Mil
- **20 Year cycle:** USD 3.26 Mil

**FNPV@10%:** USD 1,801,198  **FNPV@8%:** USD 2,456,553  **IRR:** 20.65%
2. Introduce Organic Strawberry in Protected Conditions

**Opportunity & Reach**

**Location**
Thimphu and Paro (potential areas closer to airport and local market)

**Production target**
500 greenhouses (equiv. to 37 acres), 500 beneficiaries; 360MT/year

**Production scope**
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

**Post-harvest mgmt.**
linking producers with central packhouse with cold store, and will be facilitated transportation using reefer trucks to packhouse/cold store by packhouse operator

**Target market**
Singapore, Thailand, Bangladesh (through aggregation centre/packhouse) & local market (including agro and milk processing industry)

**Food safety/standards**
strictly implement Bhutan Organic Standards and SPS measure prescribed by export market; monitoring and quality control by BAFRA

**Impacts**
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
Key stakeholders needed

Infrastructure developers
For greenhouse, aggregation unit, irrigation infrastructure

Equipment providers
For drip irrigation, aggregation unit, cold storage

Training Providers
(international horticulture experts)
For post-harvest management, improved practices

Quality/Regulator
For food production/safety monitoring, quality/certification

Input suppliers
For seedlings, bio-fertilizer, imported tools and machinery

Transport providers
For refrigerated trucks, air freight, pickup trucks

Strawberry: Investment needs

Strawberry protected: Investment per year (in Nu millions)

10 Year Cycle: USD 1.93 Mil
20 Year Cycle: USD 2.83 Mil

FNPV@10%: USD 4 866 112  FNPV@8%: USD 5 893 107  IRR: 53.48%
3. Central Packhouse for Asparagus & Strawberry

**Opportunity & Reach**

**Location**
Thimphu and Paro, 1 central packhouse for each location

**Target capacity**
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

**Importance/scope**
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

**Target market**
Singapore, Thailand, Bangladesh & local market (including agro and milk processing industry); adopt BRAND BHUTAN for export market

**Food safety/standards**
strictly follow Organic Standards for processing, handling, storage including the use of packaging materials and labeling; monitoring by BAFRA

**Impact**
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)

- **10 Year cycle:** USD 0.75 Mil
- **20 Year cycle:** USD 1.10 Mil

**FNPV@10%:** USD 2 833 560  
**FNPV@8%:** USD 3 623 351  
**IRR:** 30.04%
4. Expand Quinoa Production

**Opportunity & Reach**

**Location**
East region-6 districts; West central & south- 6 districts *(green spots in map)*

**Production target**
4000 acres (4000 Households): 70% under rainfed and 30% under irrigated cultivation; Volume-2360T/year

**Production scope**
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

**Post-harvest mtg.**
producers will be linked to processing facility, which will also provide pick-up services; produces will be processed/packed/stored/marketed by processing centre

**Target market**
Japan and Bangladesh and local market (through processing centre)

**Food safety/standard**
strictly follow Bhutan’s GAP Standards, monitoring by extension experts and BAFRA, follow SPS measures recommended by export market; adopt GI

**Impacts**
income increase: USD 172/hh, food & nutrition security, employment (221 800 man-days/season, 893 direct/full time), rural livelihood, reduce emissions : 30600tCO2eq

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**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 investment needs

**Stakeholders needed**
- **Infrastructure developers**
  - irrigation infrastructure
- **Equipment providers**
  - For sprinklers/pipes for irrigation, hedge cutter, winnowing machine
- **Input suppliers**
  - For seeds, fertilizer, imported tools and machinery
- **Transport providers**
  - Pick-up trucks
- **Quality/Regulator**
  - For food production/safety monitoring, quality verification/certification
- **Training Providers**
  - (international quinoa experts) For post-harvest management; improved practices

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

- **10 Year Cycle:** USD 5.68 Mil
- **20 Year Cycle:** USD 8.13 Mil

**FNPV@10%:** USD 2,765,581  
**FNPV@8%:** USD 1,309,994  
**IRR:** 20.05%

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

- **10 Year Cycle:** USD 3.97 Mil
- **20 Year Cycle:** USD 5.96 Mil

**FNPV@10%:** USD 2,764,086  
**FNPV@8%:** USD 3,510,762  
**IRR:** 29.41%
## 5. Processing Centre for Quinoa (Post-harvest management)

### Opportunity & Reach

<table>
<thead>
<tr>
<th><strong>Location</strong></th>
<th>Phuntsholing (upgrading existing facility and new estb. in Nganglam)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity</strong></td>
<td>Existing facility- 4MT/day; New facility-8MT/day (atleast for 9 months)</td>
</tr>
</tbody>
</table>

### Importance/scope
- 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

### Target market
- Japan, Bangladesh, and local market (30%), marketing under GI for Bhutan

### Food safety/standards
- 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.

### Impact
- 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)

10 Year cycle: USD 1.08 Mil
20 Year cycle: USD 1.72 Mil

FNPV@10%: USD 1 721 032
FNPV@8%: USD2 135 500
IRR: 44.78%
6. Introduce and Promote Black Pepper Production

**Opportunity & Reach**

<table>
<thead>
<tr>
<th>Location</th>
<th>5 districts in South/central (Samtse, Chukha, Sarpang, Samdrupjongkhar, Dagana)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production target</td>
<td>3000 acres (3000 Households); Volume-4320MT/year (raw/dried)</td>
</tr>
<tr>
<td>Production scope</td>
<td>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 (&gt;10000 acres in future)</td>
</tr>
<tr>
<td>Post-harvest mtg.</td>
<td>comparatively easy to manage (sun drying at household level); producers will be linked to private aggregators/traders exporting to India</td>
</tr>
<tr>
<td>Target market</td>
<td>India (border towns-directly or through aggregators)</td>
</tr>
<tr>
<td>Food safety/standard</td>
<td>follow standard production practices (minimal use of synthetic inputs), meet the quality required in the market</td>
</tr>
<tr>
<td>Impacts</td>
<td>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</td>
</tr>
</tbody>
</table>

**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: Investment needs

**Key Stakeholders needed**

- **Infrastructure developers**
  - For irrigation infrastructure
- **Equipment providers**
  - For drip irrigation, spray equipment
- **Quality/Regulator**
  - For food safety monitoring, quality verification/certification
- **Transport providers**
  - Pickup trucks
- **Input suppliers**
  - For seedlings, fungicides, fertilizer, imported tools and machinery
- **Training Providers**
  - For post-harvest management, improved practices

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

- **10 Year Cycle:** USD 4.25 Mil
- **20 Year Cycle:** USD 9.47 Mil

**Financials**

- **FNPV@10%:** USD 48,595,529
- **FNPV@8%:** USD 63,699,424
- **IRR:** 32.75%
### Return to investments: Internal rate of return and financial net present value

<table>
<thead>
<tr>
<th></th>
<th>Asparagus (Rained) 500 acres, 1000 beneficiaries</th>
<th>Asparagus (Irrigated) 500 acres, 1000 beneficiaries</th>
<th>Strawberry (Protected) 500 greenhouses, 500 beneficiaries</th>
<th>Centralized Packhouse (2 facilities)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FNPV@10%</strong></td>
<td>312,329</td>
<td>1,075,258</td>
<td>3,002,484</td>
<td>1,425,501</td>
</tr>
<tr>
<td><strong>FNPV@8%</strong></td>
<td>500,470</td>
<td>1,418,186</td>
<td>3,440,283</td>
<td>1,752,310</td>
</tr>
<tr>
<td><strong>IRR</strong></td>
<td>14.19%</td>
<td>19.38%</td>
<td>52.44%</td>
<td>26.93%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Quinoa (rain-fed) 2800 acres, 2800 beneficiaries</th>
<th>Quinoa (Irrigated) 1200 acres, 1200 beneficiaries</th>
<th>Quinoa Processing (2 facilities)</th>
<th>Black pepper (raw) 3000 acres, 3000 beneficiaries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FNPV@10%</strong></td>
<td>635,483</td>
<td>1,300,432</td>
<td>944,540</td>
<td>7,965,450</td>
</tr>
<tr>
<td><strong>FNPV@8%</strong></td>
<td>970,663</td>
<td>1,589,910</td>
<td>1,109,629</td>
<td>10,340,517</td>
</tr>
<tr>
<td><strong>IRR</strong></td>
<td>14.91%</td>
<td>25.88%</td>
<td>42.60%</td>
<td>21.68%</td>
</tr>
</tbody>
</table>

**NPV in USD (1USD=80BTN)**
Asparagus and Strawberry

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

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

**Airport**
- Deliver to airport using reefer vans

**Local market**
- Processing centre collects from aggregation centre

**Export market**
- collection, processing, cleaning, grading, packaging, labelling, certification, marketing

**Quinoa**

**Production**
- production using certified seeds
- field monitoring for production standards

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

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

**Deliver to identified wholesalers**
<table>
<thead>
<tr>
<th>Country/Market</th>
<th>Market identification</th>
<th>Commodity/advantages</th>
</tr>
</thead>
</table>
| Singapore     | One company has committed to facilitate Bhutan for agri-exports                        | - for any commodities produced in Bhutan  
- possible to facilitate warehouse and outlets for Bhutan’s produces in Singapore; could facilitate beyond Singapore market  
- not restricted for production regimes (organic/inorganic) |
|               | One firm has committed to support selective marketing of produces                       | - dedicated to work with the Kingdom of Bhutan towards sustainable agriculture-to produce vegetable and fruits  
- selected commodity either through business-business or on goodwill between two countries |
<table>
<thead>
<tr>
<th>INTERVENTIONS</th>
<th>ENVIRONMENTAL</th>
<th>SOCIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>20-year period</strong></td>
<td><strong>GHG emission at farm:</strong> <strong>-3518 tCO2e/year</strong></td>
<td>• Net Income: 2364USD per farmer</td>
</tr>
<tr>
<td></td>
<td>• GHG emission downstream emissions (transportation &amp; packaging): +86tCO2e/year</td>
<td>• 900 additional full-time equivalent jobs will be created at the farm level</td>
</tr>
<tr>
<td>Black Pepper</td>
<td>• Food loss: 56t/year</td>
<td></td>
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<tr>
<td></td>
<td><strong>GHG emission at farm:</strong> <strong>-1,530 tCO2e/year</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• GHG emission at downstream(transportation, refrigeration, packaging): +286tCO2e/year</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• GHG emission from estb. of processing infra.: +1,959 tCO2e</td>
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<tr>
<td></td>
<td>• Food lost: 101 tonnes as <em>post-harvest loss</em> on farm and 125 tonnes as <em>de-husking loss</em> at processing</td>
<td></td>
</tr>
<tr>
<td>Quinoa</td>
<td>Net income</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Irrigated farms:</strong> 267 USD per farmer</td>
<td>• 893 additional full-time jobs (15 at the processing level)</td>
</tr>
<tr>
<td></td>
<td><strong>Rainfed farms:</strong> 77 USD per farmer</td>
<td>• 250 full-time jobs for women</td>
</tr>
<tr>
<td></td>
<td>• 893 additional full-time jobs (15 at the processing level)</td>
<td></td>
</tr>
<tr>
<td>Asparagus &amp;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Strawberry</td>
<td><strong>GHG emissions at the farm level:</strong> <strong>-17tCO2e/year</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• GHG emission at downstream (transportation, refrigeration, packaging): +41tCO2e/year</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• GHG emission at packhouse development: +87tCO2e</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Food loss: 90 tons/year</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Net income</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Asparagus:</strong> 1797 USD per farmer</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Strawberry:</strong> 1215 USD per farmer</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 336 additional full-time jobs will be created at the farm level</td>
<td></td>
</tr>
</tbody>
</table>

**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

<table>
<thead>
<tr>
<th><strong>Key Investments</strong></th>
<th><strong>Intervention 1</strong></th>
<th><strong>Intervention 2</strong></th>
<th><strong>Intervention 3</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Organic Asparagus</strong> (rainfed/irrigated)</td>
<td><strong>Organic Strawberry</strong></td>
<td><strong>Asparagus &amp; Strawberry Packhouse</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Cost (USD)</strong></td>
<td>US$1.58M/3.26M</td>
<td>US$2.83M</td>
<td>US$1.10M</td>
</tr>
<tr>
<td><strong>IRR (%)</strong></td>
<td>16%/21%</td>
<td>54%</td>
<td>30%</td>
</tr>
<tr>
<td><strong>VPN</strong></td>
<td>US$0.938M/ US$2.457M</td>
<td>US$5.893M</td>
<td>US$3.623M</td>
</tr>
<tr>
<td><strong>Sustainability Benefits</strong></td>
<td><strong>Beneficiaries</strong>: 2000 households</td>
<td><strong>Beneficiaries</strong>: 500 households</td>
<td><strong>Beneficiaries</strong>: 2500 households</td>
</tr>
<tr>
<td>Income increase per capita:</td>
<td>US$1797</td>
<td>US$1215</td>
<td>(as indicated under farm model)</td>
</tr>
<tr>
<td>Emission reduction per capita:</td>
<td>0.162 tCO2eq</td>
<td>0.048tCO2eq</td>
<td>-0.443tCO2eq</td>
</tr>
<tr>
<td><strong>Total Investment</strong></td>
<td>US$34.05M</td>
<td>US$1387</td>
<td>28.33tCO2eq</td>
</tr>
<tr>
<td><strong>Overall Average IRR</strong></td>
<td>31%</td>
<td><strong>Income Increase Per Capita</strong></td>
<td><strong>Emission Reduction Per Capita</strong></td>
</tr>
<tr>
<td><strong>Households</strong></td>
<td>9500</td>
<td>US$34.05M</td>
<td><strong>31%</strong></td>
</tr>
<tr>
<td><strong>Beneficiaries</strong></td>
<td>US$1387</td>
<td><strong>Overall Average IRR</strong></td>
<td><strong>9500 households</strong></td>
</tr>
<tr>
<td><strong>Beneficiaries</strong></td>
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<td><strong>Emission Reduction Per Capita</strong></td>
<td>0.162 tCO2eq</td>
<td>0.048tCO2eq</td>
<td>-0.443tCO2eq</td>
</tr>
</tbody>
</table>

**Note:** NPV@8%, 20-year project cycle, spill over beneficiaries not included
### KEY INVESTMENTS

<table>
<thead>
<tr>
<th>Intervention 4</th>
<th>Quinoa Production (rainfed/irrigated)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost (USD)</strong></td>
<td>US$8.13M/US$5.96M</td>
</tr>
<tr>
<td><strong>IRR (%)</strong></td>
<td>20%/30%</td>
</tr>
<tr>
<td><strong>VPN</strong></td>
<td>US$3.130M/US$3.510M</td>
</tr>
<tr>
<td><strong>Sustainability Benefits</strong></td>
<td>Beneficiaries: 4000 households</td>
</tr>
<tr>
<td></td>
<td>Income increase per capita: US$77/267</td>
</tr>
<tr>
<td></td>
<td>Emission reduction per capita: 7.60tCO2eq</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention 5</th>
<th>Quinoa Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost (USD)</strong></td>
<td>US$1.72M</td>
</tr>
<tr>
<td><strong>IRR (%)</strong></td>
<td>45%</td>
</tr>
<tr>
<td><strong>VPN</strong></td>
<td>US$2.136M</td>
</tr>
<tr>
<td><strong>Sustainability Benefits</strong></td>
<td>Beneficiaries: 4000 household</td>
</tr>
<tr>
<td></td>
<td>Income increase per capita: (as indicated in farm model) US$2364</td>
</tr>
<tr>
<td></td>
<td>Emission reduction per capita: -1.92tCO2eq</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Intervention 6</th>
<th>Black Pepper Production and marketing (raw)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost (USD)</strong></td>
<td>US$9.47M</td>
</tr>
<tr>
<td><strong>IRR (%)</strong></td>
<td>33%</td>
</tr>
<tr>
<td><strong>VPN</strong></td>
<td>US$63.700M</td>
</tr>
<tr>
<td><strong>Sustainability Benefits</strong></td>
<td>Beneficiaries: 3000 households</td>
</tr>
<tr>
<td></td>
<td>Income increase per capita: US$2364</td>
</tr>
<tr>
<td></td>
<td>Emission reduction per capita: 22.88tCO2eq</td>
</tr>
</tbody>
</table>

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

1. Assessment of Climate Risks on Agriculture for National Adaptation Plan Formulation Process in Bhutan 2021
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Contact Points: Yonten Gyamtsho at yontengyamtsho@moaf.gov.bt; Karma Tshering at karmat@moaf.gov.bt