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Building Resilient Commercial Smallholder Agriculture

(BRECSA)

Concept Note on Permaculture

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IFAD
Investing in rural people

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ROYAL GOVERNMENT OF BHUTAN

MINISTRY OF AGRICULTURE AND LIVESTOCK

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BUILDING RESILIENT COMMERCIAL SMALLHOLDER AGRICULTURE (BRECSA)

Concept Note on Permaculture

September, 2025

Project Management Unit

Gelephu, Sarpang

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Concept Note on Permaculture

1. Background

The Ministry of Agriculture and Livestock (MoAL) under the Royal Government of Bhutan (RGoB) is implementing *Building Resilient Commercial Smallholder Agriculture* (BRECSA) project financed by Global Agriculture and Food Security (GAFSP) of USD 13 million grants. The project is co-financed by International Fund for Agriculture Development (IFAD) of loan of USD 8.934 million. IFAD is the Supervising entity for the investment while WFP is the supervising entity for Technical Assistance. BRECSA will be implemented in four Dzongkhags of Sarpang, Trongsa, Tsirang, and Zhemgang comprising of 37 Gewogs and 539 villages.

The project aspires to catalyze a 30% increase in resilient commercial agricultural production and improve food and nutrition security in the 4 target Dzongkhags by 2030. The developmental objective of the project is to transforms smallholder agriculture into inclusive and resilient agri-food systems that are increasingly profitable and food and nutrition secure. BRECSA will adopt several measures to enhance farming resilience and upscaling production through multi-pronged approaches while drawing inspirations from the lesson learnt by the on-going IFAD funded CARLEP, projects and also from the GAFSP funded Food Security and Agriculture Productivity project. These includes, emphasis on community empowerment and gender inclusion, mainstreaming youth, women and vulnerable groups into to the project scope, nutrition sensitive interventions, market-led value chain development, and most importantly by integrating principles of agro-ecological productions for a holistic and sustainable food system transformation.

While BRECSA will primarily focus on small-scale, semi, and commercial farming however it does not differentiate between organic and conventional methods. The project will focus on current farming practices, whether organic or conventional in nature. However, understanding the far-reaching benefits of sustainable production through emphasis on the principles of agro-ecology, the project will promote few permacultures farm models in the targeted districts. Similar permaculture program implemented by CARLEP project also indicated an optimistic result such as reduced climate risk vulnerability, reduced cost and revitalization of fallow land. Hence, promoting these model permaculture farms, BRECSA aims to advocate for the multi-dimensional advantages of permaculture in diversifying income generation and achieving long-term sustainability.

In conclusion, recognizing the potential of permaculture as a sustainable food production approach, the BRECSA project has decided to promote few permaculture farms in its landscape districts. BRECSA project was also partly Inspired by the promising results of similar model farms established by the CARLEP project in the east. Therefore, this document titled “Concept note on permaculture” seeks to provide project stakeholders, particularly the key implementers, with a better understanding of permaculture's basic concepts and design principles to facilitate effective field implementation.

2. Introduction

Permaculture, as defined by Bill Mollison and David Holmgren, is a holistic design system that mimics natural ecosystems to produce abundant food, fiber, and energy for local communities. It emphasizes sustainability, interconnectedness, and human well-being. Permaculture seeks to avoid the problems associated with conventional agriculture, such as soil degradation, biodiversity loss, and reliance on external inputs. By focusing on optimizing interactions between plants and soil, permaculture aims to maximize both ecosystem health and the benefits it provides.

Bhutan a country known for its commitment to environmental conservation, presents a unique case study for permaculture implementation. Its agricultural sector, primarily focused on subsistence farming, with average landholding just 1.4 hectares, aligns well with the principles of permaculture approach to farming. Most Bhutanese farmers employ sustainable practices that integrate various agricultural methods to ensure food security. This includes growing a diverse crop, raising livestocks, and collection of various forest products to meet their household needs (Chhogyel et al., 2018). These practices often involve traditional farming methods with minimal or no use of synthetic fertilizers and pesticides. For instance, Kobayshi et al. (2015) reported that farmers use leaf litter from the nearby jungles as bedding material for cattle, creating a natural fertilizer through decomposition. Hence, to large extent agriculture production in Bhutan can be considered as an organic since the farmers either lack necessary financial means or have limited access to pesticides and synthetic fertilizers.

However, Bhutan's agricultural practices have undergone significant transformations in recent decades (Dendup, 2018). The shift from traditional, village-based production to a market-oriented approach has led to the adoption of modern farming techniques. While these transformations have brought certain benefits, they also raise concerns about long-term sustainability. For instance, Kobayashi et al. (2015) corroborated on the agricultural transformation evidenced by shifting towards market-oriented entrepreneurial farming, emphasizing on year-round cultivation and use of improved seeds, fertilizers, and other inputs. Further, Dendup (2018) also reported that growing urban population has led to a surge in demand for high-value agricultural products such as cereals, vegetables, and livestock products. This increased demand has encouraged farmers to adopt more entrepreneurial farming practices, including semi-commercial and commercial-scale operations.

With population expected to increase exponentially over the years, the demand for the agriculture and livestock products will correspondingly expand. For that matter, government also formulated ambitious “Vision 2020” strategy in 2006, envisioning to transform Bhutan into a first 100% organic country in the world. In contrast, even today, this dream remains far-fetched. For example, in an article reported in Kuensel (2020); Despite efforts to transition to organic agriculture, Bhutan's progress has been limited due to factors such as inadequate infrastructure, insufficient support, and limited market awareness. Balancing food security with organic ideals has proven challenging, especially considering the country's reliance on imports.

While these conventional farming practices may temporarily alleviate certain challenges, they raise concerns about long-term sustainability, particularly given its adverse impact on environment and the bio-diversity. For instance, National Organic Framework for Organic Farming in Bhutan (2006) has identified such impacts; including loss of bio-diversity, soil degradation, loss of income, environmental pollution, health issues, and disruption of rural institutions and farming systems.

Given the imminent threat of climate change and the negative consequences of conventional farming, there is a pressing need for alternative agricultural practices that ensure long-term food sustainability while minimizing environmental impacts. In response, permaculture offers a promising solution towards sustainable agriculture. Krebs (2018) suggests that permaculture's emphasis on holistic agroecosystem design makes it a more viable option compared to other sustainable practices, including agroforestry, organic farming, and conservation agriculture.

3. Objectives

- Provide clear and concise overview of the principles of permaculture farming, its benefits, challenges and implementation strategies.
- Advocate and educate stakeholders on the permaculture principles and encourage participation.
- Provide overview on the project objectives, target beneficiaries, methodology and expected outcomes.
- Create platform for the stakeholders to provide inputs and feedbacks towards development of comprehensive strategy document.

4. Methodology

4.1 Permaculture Principles

There are three ethical principles and twelve design principles of permaculture which were developed by co-originator, David Holmgren. These principles were developed as a result of comprehensive analysis of ecology, pre-industrial, and sustainable societies, and design thinking. Together, these principles help to create a complex design system, which mimic natural eco-system to create a sustainable ecosystem.

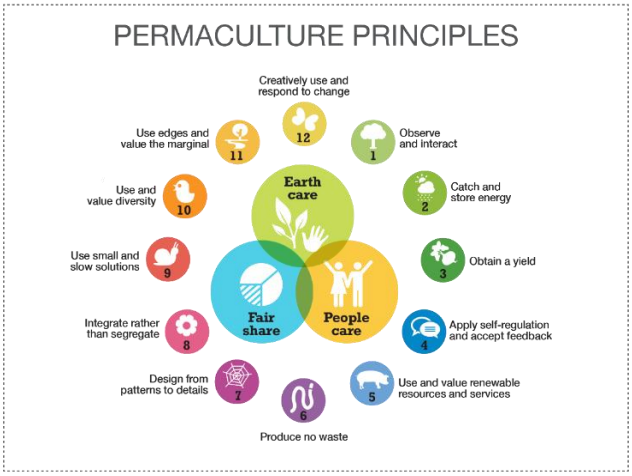


Fig: Permaculture Principles

Ethical Principles:

1. **Care for the Earth:** This principle emphasizes the importance of respecting and nurturing the natural world.
2. **Care for People:** It promotes the well-being of all people, both now and in the future.
3. **Fair Share:** This principle encourages a just and equitable distribution of resources.

4.1.1 Observe and Interact:

This principle emphasizes the importance of understanding the natural systems in place before implementing any changes. By observing the land, climate, and local ecology, we can design systems that work harmoniously with nature. For example, a permaculture designer might study the natural water flow patterns on a site to create a swale system that captures and distributes water efficiently. Likewise, by carefully observing the local ecosystem, designer can identify beneficial insects to mitigate pests, attract pollinators, or attract natural predators to control insects by observing predator-prey relationship.

4.1.2 Catch and Store Energy:

This principle involves capturing and storing energy in various forms, such as solar energy, rainwater, and organic matter. For example, a solar panel system can be used to generate electricity, while a compost bin can capture and store organic matter for use as fertilizer. Similarly, rain water harvesting ponds, vermicompost pits, and biogas energy to convert waste to energy, installing windmills if the place is windy are few examples how to catch and store energy.

Fig: Representative picture

4.1.3 Obtain a Yield:

This principle focuses on producing useful outputs from the system, such as food, fuel, or fiber. For example, a permaculture garden can produce a variety of vegetables and fruits, while a small-scale livestock operation can provide meat, eggs, and milk.

Fig: Representative picture

4.1.4 Self-Regulate:

This principle aims to create systems that are self-sustaining and can regulate themselves without human intervention. For example, a well-designed permaculture ecosystem can maintain its own nutrient balance and pest control.

4.1.5 Use and Value Diversity:

This principle recognizes the importance of biodiversity in creating resilient and productive systems. For example, a permaculture garden can include a variety of plant species to attract beneficial insects and reduce the risk of crop failure.

4.1.6 Integrate Rather Than Separate:

This principle emphasizes the benefits of integrating different elements of the system to create synergies. For example, livestock manure can be composted and used as as a fertilizer creating a closed-loop system. Likewise, companion planting, mixed cropping, integrating apiculture to enhance income and pollination of plants are some of the practices that creates diversity and symbiotic relationship in the permaculture farm.

4.1.7 Design from Pattern to Element:

This principle suggests that by understanding the underlying patterns in nature, we can design systems that are more resilient and sustainable. For example, the pattern of a forest ecosystem can be used to inform the design of a permaculture forest garden. Similarly, designing water harvesting and filtration system in the farm by mimicking natural water cycle.

4.1.8 Do Not Waste: Minimizing Waste and Maximizing Resource Efficiency

The principle emphasizes the importance of minimizing waste and maximizing resource efficiency. This involves designing systems that reduce the number of materials and energy that are discarded or lost. For example, repair and reuse of materials, maintaining minimalist life, seed saving, food processing like pickling, bottling etc.

4.1.9 Use Edge and Value the Marginal: Harnessing the Benefits of Boundaries

The principle of permaculture recognizes the importance of the edges between different ecosystems. These areas, often referred to as "ecotones," are characterized by high levels of biodiversity, productivity, and ecological complexity. It will also help reduce pest pressure in the field. Examples edge effects include; forest-field edges, pond-marsh edges, and hedge rows.

4.1.10 Relocate Species: Introducing Beneficial Organisms

This principle suggests that introducing carefully selected species to a system can enhance its resilience and productivity. This can involve reintroducing native species that have been lost or declining, or introducing beneficial species from other regions that are well-suited to the local environment. For example, pollinator gardens to attract bees, Leguminous plants to fix nitrogen in the soil, introducing predators like ladybugs to control pest. However, introducing non-negative species may become invasive and have adverse effect, hence due caution should be taken for it.

4.1.11 Use Nature as a Model: Learning from Natural Ecosystems

This principle emphasizes the importance of observing and learning from natural ecosystems to inform sustainable design. By studying the patterns, processes, and relationships found in nature, we can develop more resilient and productive systems.

4.1.12 Accept Responsibility for the Future: Taking Action for Sustainability

This principle recognizes that our actions today have a profound impact on the world we leave for future generations. It encourages us to take a long-term perspective and make choices that promote sustainability and well-being. It includes, approach such as community engagement, advocacy programs, ethical consumption, and intergeneration equity.

4.2 Implementation Strategies

In each Dzongkhag, four dynamic farmers (Lead Farmers) already practicing some level of diversified farming will be identified. Altogether, 16 permaculture farms will be developed in the four target districts. Similarly, young women and men and other farmers interested in adopting agroecological farming who reside relatively close to the Lead Farmer will also be identified. A service provider will be recruited by the project to help train the selected farmers and youth about permaculture farming methodologies and develop a fully operational permaculture farm. The network of permaculture farms and Hubs will be linked to form a community of practice (COP) and connected via an online app for remote supervision and intermittent support from the service provider for a period of 2 years.

Meanwhile, it is important to understand the core principles of permaculture for smooth and successful implementation of permaculture activities. The design and layout of farms must be kept within the scope of permaculture principles to achieve a close-loop and self-sustaining system. Hence, a proper planning and strategy must precede implementation actions. These includes:

4.2.1 Land Assessment and Planning

Soil Analysis: Determine soil health, texture, fertility, and nutrient content to select the most suitable plant for planting. For technical assistance National Soil Service Center (NSSC) should be consulted.

Climate Assessment: Understand local rainfall patterns, temperature variations, rainfall, humidity, wind patterns, and growing seasons. This will help in identifying the best crop species and strategize climate resilient practices.

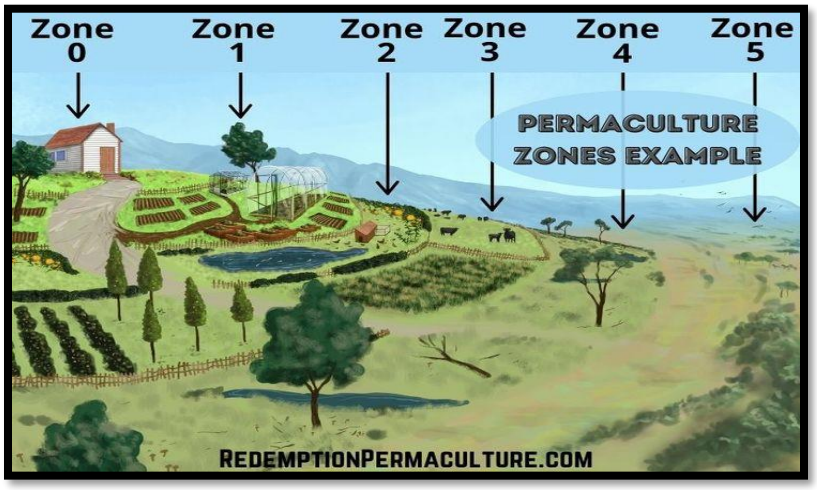
Topographic Survey: Map the land's slopes, elevation, watercourses, and microclimates. It will help in overall land design and layout, control soil erosion, and water management.

Existing vegetation: Identify native species and their ecological roles. This will help in making informed decisions about plant selections, preserve biodiversity, and removing of non-native invasive species,

Community Needs: Assess local food preferences, market potential, and social needs like job creation, and income generation.

4.2.2 Design and Layout

1. **Zone Planning:** The identified land should be divided into zones based on accessibility and use frequency.



Zone 0: This is your home or dwelling. It's the most accessible are and frequently used zone, so plants that are used daily, such as herbs and vegetable should be located here. This zone should be available to process, preserve, value add or package the yields obtained from the farm. Structures such as green house, shed house, compost pit etc. are located in this zone.

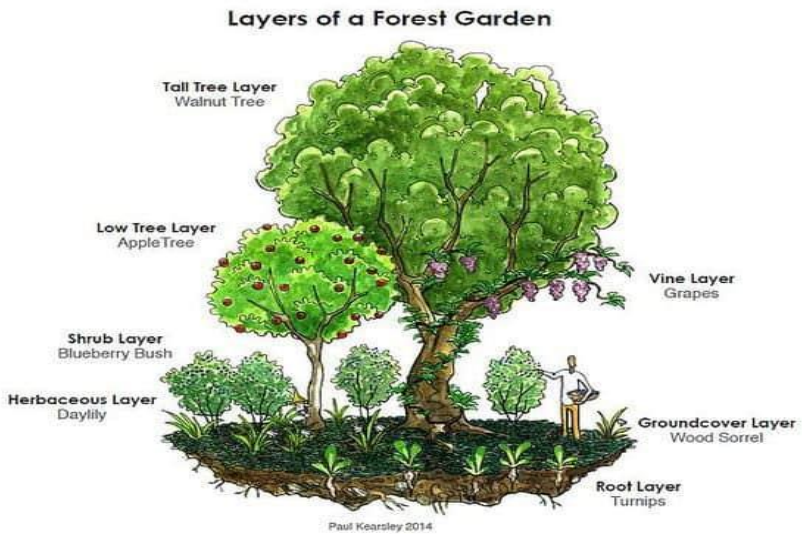
Zone 1: This zone is also easily accessible but moderately used. This zone is ideal for plants that require frequent visits for harvesting, pruning, or maintenance. Fruit trees, berry bushes, vegetable garden, Vine crops, ornamental plants.

Zone 2: Located a bit further away from the home, Zone 2 is suitable for plants that require moderate effort to reach, such as larger fruit trees or perennial vegetables. Structures like compost pit, cattle yard, pigsty, and poultry coop, bee hives, etc. are located in this zone. Aligning with the no waste ideology, all the surplus or yield obtained from the farm can be fed to the livestock while their waste can be used as compost in vice-versa.

Zone 3: This zone is also called as a farming zone, it is more remote and can be used for plants that require minimal maintenance, like self-seeding annuals or wild edibles, orchards, guilds, bamboos, and windbreaks. Forest gardens which include planting diverse trees, shrubs, vines and ground covers can be made in this zone.

Zone 4: The most distant zone, Zone 4 is often left undisturbed as a natural area for wildlife and ecosystem preservation. These includes forest wetlands, meadows, and wild life habitat. This zone is essential for overall health and sustainability of a permaculture system.

Guild Planting: Group plants that benefit each other, mimicking natural ecosystems. This include plants that provide shade, fix nitrogen, pest control, or other beneficial interactions.



Water Harvesting: Implement rainwater harvesting systems like swales, ponds, and cisterns. Emphasis must be given for efficient use of water, like drip irrigation, sprinklers to avoid wastage.

Mulching: Use organic materials to retain moisture, suppress weeds, and improve soil health. Generally, should be applied at depth of 5-10cm; avoid applying directly against the stem as it can promote rot.

Perennial Crops: Prioritize long-lived plants for sustained yields and reduced maintenance. Fruit crops, agro-forestry trees like neem, agar, sandalwood, shrubs like mulberry, raspberry, blue berry etc. should be planted for additional income and sustenance.

4.2.3 Training and Capacity Building

One of the core principles of permaculture is social integration, which involves equipping farmers and community members with required skills and knowledge for permaculture and sharing the benefits from the farm. The capacity building strategies include:

- **Workshops and trainings**
  BRECSA, project will facilitate community-based trainings of the farmers with technical assistance from the relevant Agriculture and livestock centers. Practical trainings will be provided to the farmers while experts will be invited for outreach programs.
- **Field trips and demonstration**
  Project will organize field trips for the lead permaculture farmers both within the country and in the neighboring states.
- **Certification program**
  Certificate will be provided to recognize individuals who excel in permaculture farm practices while opportunities would be created for continuous learning and professional development.
- **Mentorship and Coaching**
  A service provider will be recruited by the project to help train the selected farmers and youth about permaculture farming methodologies and develop a fully operational permaculture farm.

5. Expected Outcomes

Key positive impacts of permaculture would be:

5.1 Environmental Benefits:

- Improved soil health with increase in organic matter and nutrient content.
- Reduced soil erosion due to rich plant bio-diversity including grasses and cover crops
- Efficient water usage due to techniques of water conservation, rain water harvest and recharge ground water.
- Protect bio-diversity, by creating habitats for wildlife, birds and insects, conservation of native plant species.
- Climate change adaptation and enhance resilience through emphasis on organic approach, careful selection of plants and livestock species, and efficient water management system

5.2 Economic Benefits:

- Permaculture practices often lead to increase in the overall production while reduction in the external inputs like fertilizers, pesticides. Hence, reduction of operational cost has a huge economic benefit.
- Income diversification through integration of diverse plants and livestock species. In addition, extra income can be generated through processing and value addition techniques like making pickle, jams, honey, handicrafts etc.
- Organically produced products with good branding can have better access to market both domestically and internationally.
- It can create jobs and opportunities stimulating local economies and help in community empowerment.

5.3 Social Benefits:

- Improved food security through production of local organic local products and reducing imports.
- Community empowerment through participation, trainings and capacity development and social cohesion through permaculture practices.
- Help preservation of traditional knowledge of agriculture, conserve native plant and animal species
- Improve overall health and wellbeing by increasing access to nutritious organic food

6. Budget

Total Project Cost: The ballpark figure for establishment of permaculture farm is ascertained as below.

Sl.No	Agriculture component	Area(5 acres)	Esimated cost (nu)	Total (nu)	Remarks
1	Bush clearing	5 acres	300000	300000	if green field may incur more cost but on established farm cost will be lower
2	Land development, terracing, road connectivity	5 acres	500000	500000	if green field may incur more cost but on established farm cost will be lower
3	Fruit trees, agroforesty tree sapling, vegetable seeds	5 acres	100000	100000	if green field may incur more cost but on established farm cost will be lower
4	Labour cost for plantation and overal design development	5 acres	350000	350000	if green field may incur more cost but on established farm cost will be lower
5	Rain water harvest pond,	small scale	250000	250000	Low cost
6	Green house, shed house,	small scale	250000	250000	Prefabricated
7	Miscelleaneous		100000	100000	Manure, mulch, other inputs such as tools
	Livestock component				
1	Compost shed	small scale	300000	300000	As per the government cost sharing mechanism
2	Pigsty, including piglet procurement	small scale	350000	350000	As per the government cost sharing mechanism
3	Cattle shed, procurement of cattle breed	small scale	400000	400000	As per the government cost sharing mechanism
4	Poultry coop, layer procurement	small scale	300000	300000	As per the government cost sharing mechanism
5	Fishery pond	small scale	250000	250000	As per the government cost sharing mechanism
6	Barn for goat and sheep	small scale	300000	300000	As per the government cost sharing mechanism
7	Apiculture	small scale	250000	250000	As per the government cost sharing mechanism
`	**Total estimated cost for permaculture establishmen in 5 acre of land**			**2,150,000.00**	
	Training and capacity building including study tour		1,500,000.00	**1,500,000.00**	

Table 1: Estimated cost of establishment

Funding Sources:

- All the funding will be borne by BRECSA project in conforming to the existing government financial norm including cost sharing guidelines.

7. Sustainability Plan

To ensure long term sustainability of the permaculture farms and contribute towards food security, environmental restoration, economic sustainability, community engagement, and enhance overall agriculture resilience, it is imperative to have a robust and continued monitoring and evaluation(M&E) strategies. Some of the components for the M&E framework include:

- **Key Performance Indicators (KPIs):**
  Identify specific metrics to measure the project's progress toward its goals, such as food production yields, soil health indicators, economic returns, and community engagement levels.
- **Data Collection Methods:**
  Determine how data will be collected, including surveys, interviews, field observations, and record keeping.
- **Monitoring Frequency:**
  Establish a schedule for data collection and analysis, ensuring that the monitoring process is timely and relevant. For instance, Dzongkhags and Sonam Jabchorpas could take this lead responsibility.

- **Evaluation Methods:**
  Select appropriate evaluation methods, such as baseline assessments, periodic reviews, and impact assessments, to assess the project's effectiveness.
- **Stakeholder Involvement:**
  Involve relevant stakeholders, including community members, farmers, researchers, and district officials, in the M&E process to ensure that the evaluation is comprehensive and responsive to local needs.

Specific to a Permaculture Farm:

- **Soil Health:** Monitor soil health indicators such as organic matter content, nutrient levels, and soil structure.
- **Biodiversity:** Track changes in plant and animal diversity on the farm.
- **Water Quality:** Assess water quality in nearby streams or rivers to evaluate the farm's impact on the local watershed.
- **Community Engagement:** Measure the level of community participation in farm activities and educational programs.
- **Economic Viability:** Monitor the farm's financial performance, including income, expenses, and profitability.

8. Conclusion

This concept note outlines a comprehensive plan for implementing permaculture farms in Bhutan as part of the BRECSA project. By applying permaculture principles, the project aims to promote sustainable agriculture, enhance food security, and improve the livelihoods of local communities in the four target districts. As mentioned, the project will identify few interested farmers who fulfill the criteria developed and assist them in training, designing and establishment of a model permaculture farm. Considering the tremendous benefit of the permaculture principles to the overarching food security and agriculture sustainability of the nation, the project is optimistic that this model farms would go a long way in inspiring other farmers to take up similar venture. This would guarantee long term viability of the agriculture and livestock farming in the country. The project also looks forward to continued support and collaboration from all the stakeholders, particularly the dzongkhag officials in taking forward this plan.

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