The ten-year Haa Organic Farming Support Initiative (HOFSI) in Bhutan has had a significant impact on the lives of farmers in the Haa Valley. By providing poly tunnels, compost pits, vegetable seeds, electric fencing and training, the initiative enabled farmers to use and share knowledge and practices within the community, improving their livelihoods and promoting greater independence for women.

The project also promoted responsible farming by raising awareness of efficient resource use and crop diversification. It has laid a strong foundation for organic vegetable production and serves as an example of environmentally sustainable agriculture in action, ensuring that farmers in Haa are well prepared for future challenges.

HOFSI REPORT 2013 - 2023

HOFSI REPORT

2013-2023

Table of contents

Executive summary

The Haa Organic Farming Support Initiative (HOFSI) was a transformative ten-year project, funded by Dr. Rudolf Josef Knünz. The initiative was strategically designed and implemented in five gewogs of Haa Dzongkhag: Bji, Kathso, Uesu, Samar, and Sombaykha, with the overall objective of enhancing the livelihoods of the participating farmers through the promotion of sustainable vegetable cultivation.

The overall objective of the project was to "promote and support vegetable production as a strategic means to reduce poverty and improve the living standards of vegetable farmers". Through targeted support, the project aimed to economically empower farmers economically and improve their economic well-being.

The total project cost of Nu. 27,6 million was exclusively funded by Dr. Rudolf Josef Knünz, a philanthropist with a strong commitment to improving the livelihoods of financially weak farmers. His exclusive and generous funding commitment ensured that the project had the necessary resources to implement its strategies without relying on other sources of funding. It was crucial to the realization of HOFSI's objectives.

In terms of implementation modalities, the Project Management Unit (PMU) spearheaded the execution of field activities, demonstrating a hands-on approach to ensure effective implementation. The Dzongkhag Agriculture Sector and the Gewog Extension Offices of each gewog played an integral role in providing support, guidance, and expertise throughout the project's lifecycle. The Bhutan Development Bank Limited (BDBL) was the main implementing partner overseeing the organization and repayment of the loans by the participating farmers.

The project involved supplying and financing 87 poly tunnels equipped with drip irrigation systems, HDP pipes for water conveyance, construction of compost pits, supply of vegetable seeds, and installation of 19 km of electric fences. In addition, the project undertook extensive training and counselling of the farmers in the villages to support them with expert advice.

In November 2023 a project evaluation was conducted in Haa to assess the impact of the project on farmers. The results were highly positive financially, as most of the farmers who took credit for poly tunnel from BDBL successfully repaid them and were earning good income from vegetable production and sales. However, the electric fencing was less effective due to issues with voltage and wiring.

Nonetheless, most farmers requested continued assistance in the planning of their farming and quality seed supply. Hence, Dr. Rudolf graciously consented to support the farmers and committed a fund of Nu. 3 million. Because of the government requirement, the fund is now provided to the Society of Community Development, which implements activities in the field with close collaboration with Dasho Dzongda and the District Agriculture Office.

The impact of the project on the promotion of sustainable vegetable production is indeed noteworthy, marked by a shift in farming practice and the adoption of commercially viable approaches by most farmers in Haa. The initiative has spurred a significant transformation in the agriculture landscape of Haa, particularly in the cultivation of tomatoes and carrots. These positive changes not only improved the economic prospects of farmers but also aligned with the principles of sustainable agriculture by optimizing resource use and crop diversification.

The Haa Organic Farming Support Initiative (HOFSI) was kindly supported by Dr. Rudolf Josef Knünz. The donor contributed Nu. 27.6 million (~ 300.000 €) for the implementation of the project activities and was implemented by a Project Management Unit (PMU) located at Paro. The project was launched on the first of August 2013. The Bhutan Development Bank Limited (BDBL) was the main implementing partner and was responsible for arranging and reimbursement of loans from the participating farmers.

The initiation of this project can be attributed to the personal interest and initiative taken by His Excellency Late Lyonpo Chenkhab Dorji. His vision was to enhance commercial vegetable production in Haa. Upon the completion of his tenure as a minister under the Royal Government of Bhutan, back in 1995, Lyonpo identified scarcity of locally grown fresh vegetables in Haa leading to heavy reliance on imported vegetables from India and other nearby districts of Bhutan.

Recognizing the untapped potential for organic vegetable cultivation in Haa, given the limited use of chemical fertilizers and pesticides by local farmers, Lyonpo envisioned a solution. In addition, the unique climatic conditions of the Haa Valley provided an opportunity to produce vegetables when neighbouring districts were close to exhaustion. In his quest to help and motivate the farmers of Haa, Lyonpo Chenkhab Dorji engaged in discussions with his friend Rudolf Josef Knünz. Dr. Knünz agreed to provide funds for this initiative, aligning with Lyonpo's commitment to empowering and motivating the farmers of Haa.

Organic agriculture in Bhutan

Organic agriculture was officially launched in Bhutan in 2003, with the National Framework for Organic Farming introduced in 2007, and the National Organic Program (NOP) established in 2008. In 2010, Bhutan declared its goal to become a fully organic country by 2020. This shift towards organic agriculture was driven by concerns over the negative impacts of conventional farming observed globally and the desire to protect Bhutan's fragile environment. Organic farming was seen as a sustainable agricultural model, offering numerous social and environmental benefits, especially for resource-poor rural communities.

Since its inception, the NOP has developed various frameworks and guidance materials to support organic agriculture. Key documents include the Strategic Action Plan for Organic Agriculture Development (2011), the Master Plan for Organic Sector Development (2012), and the National Organic Standard of Bhutan. Additional guidelines, such as the Bhutan Organic Certification System, protocols for the import and distribution of organic pesticides and fertilizers (2015), and a national logo for marketing organic products, were also established. These documents collectively address all aspects of transitioning to organic agriculture.

The NOP initially promoted organic farming with select crops in specific areas, with plans to scale up this approach nationwide over time. The Master Plan for Organic Sector Development (2012) assessed the current status of organic farming in Bhutan and identified key focus areas, serving as a roadmap for stakeholders to advance organic farming. The Bhutan Organic Standard was created to unify the understanding of organic production, processing, labelling, and marketing of agricultural, livestock, and forest products, ensuring credible quality assurance and traceability. This standard formed the basis for the use of the Bhutan Organic Mark by Bhutanese producers.

Going organic in Bhutan was seen as beneficial for several reasons

01 Organic practices are environmentally friendly and reduce reliance on agrochemicals.

02 Organic farming leads to long-term sustainability.

03 Organic farming is well-suited for resource-poor rural communities in Bhutan.

04 Organic agriculture aligns with traditional Bhutanese agricultural practices.

The Pioneer
Dr. Rudolf Josef Knünz

In the late 1980s, Rudolf Knünz, a business economist with an adventurous spirit, travelled to Bhutan to work for his father's company, which specialized in the supply of winches for the forestry industry. Arriving in Bhutan aboard a small and somewhat precarious Donier plane, Rudolf faced the uncertainty of whether he would be granted a visa. Little did he know that this trip would mark the beginning of a long association with the Himalayan country.

While working with the forestry department, he crossed paths with Lyonpo Chenkhab Dorji, then a forest officer, and began a friendship that would lay the foundation for a shared vision.

After years of association, Lyonpo Chenkhab Dorji shared an idea of how to improve the livelihoods of farmers in his home valley Haa. This vision led to Rudolf being introduced to field specialist and farmer Karma Penjore and Jambay Dorji, the founder of Bhutan Alpine Seed. With the invaluable support of Regina Geisler-Knünz and Anna Wieser, they set about establishing the HOFSI project.

Drawing on Rudolf's entrepreneurial thinking, economic insights and global experience, HOFSI aimed to empower farmers through micro credits. Understanding that sometimes monumental change comes from turning seemingly small screws, the HOFSI team brought their expertise to the fore, believing that these micro-level interventions could bring about substantial and positive changes in the lives of the people of Haa.

2.1 | Project context

Dr. Rudolf Josef Knünz had funded a vegetable production project titled “Haa Organic Farming Support Initiative” (HOFSI) in the Haa District of Bhutan. Haa Dzongkhag is administratively divided into six gewogs namely, Bji, Uesu, Katsho, Samar, Sombaykha, and Gakiling. Unlike typical projects funded by international donor agencies and managed by government entities, this project stands out as it was implemented through a Project Management Unit (PMU), consisting of field specialist and farmer Karma Penjore and Jambay Dorji, with the Bhutan Development Bank Limited (BDBL) as the implementing partner. The project was operational in the six gewogs except Gakiling.

Due to its high-altitude, Haa faces challenges in cultivatable agricultural land constituing only around 2% of the total dzongkhag area. The region is further constrained by the prolonged winter and short summer seasons. Farmers depend mainly on dry land cultivation of cereals such as wheat, vegetables, and potatoes. Livestock is an important economic activity in the local economy. The initiative aimed to address these challenges by supporting organic farming in Haa, improving vegetable production, and providing an alternative source of income for the local community.

2.2 | Objectives of the project

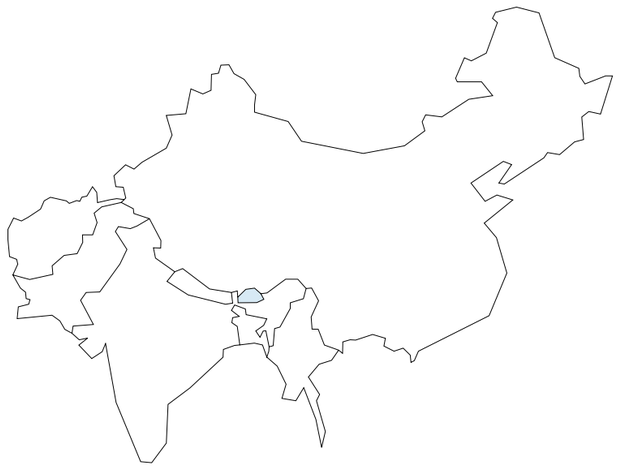
The primary objective of this project was to improve the livelihood of farming households in Haa by increasing their incomes by giving them the opportunity to optimize their productivity in vegetable production. The project used a multi-faceted approach to achieve this goal by supporting resources such as poly houses, drip irrigation, fencing, seeds, and intensive training and monitoring of the farmers. These interventions were designed to empower farming households in Haa, not only improve their immediate economic conditions but also contribute to the sustainable development of the broader rural economy.

2.3 | Time frame and implementing modalities

The project was initially planned for a three-year duration, with the BDBL playing a central role as the main implementing partner. A small PMU was established in Paro, to oversee the project operations on behalf of the donor. The PMU was tasked with executing the activities in the field while BDBL was responsible for lending and recollecting repayments. Under this arrangement, BDBL provided loans to the beneficiaries without requiring any collateral and at a fixed interest rate of 10%. The interest collected was used to cover the operational costs incurred by BDBL in administering the loan. The loans were designed to be repaid over a period of five years. As the borrowers repaid their loans, the funds were returned to the project account. These returned funds were then used to finance subsequent project activities and additional farmers, creating a revolving fund mechanism. This approach not only facilitated ongoing support to the farmers but also contributed to the sustainability and continuity of the project. The project was managed by a board of members, with the late His Excellency Lyonpo Chenkhab Dorji serving as the chairman, and the CEO of BDBL, the donor, and the project coordinator as the sitting members.

Due to of some changes in the project activities and the efficient use of the funds, the initially agreed budget for the three-year period allowed for an extension of the project duration from three to five years. Consequently, at the November 2014 board meeting, the board approved the extension of the project activities for a period of two additional years resulting in the overall project duration being extended to ten years.

Map of Haa District



2.4 | Project area and map

The project was initially implemented in Bji, Katsho, Uesu and Samar Gewogs. However, in 2017, the project activities extended to include Sombaykha Gewog. The gewogs and specific villages where project activities were implemented are listed in Annexure 1.

Agriculture in Haa is predominantly small-scale dry land farming, typically on plots of land less than two acres in size. Traditionally the main crops cultivated in the region include wheat, barley, buckwheat, potatoes and turnips. Over the last two decades, there has been a steady increase in vegetable farming. Potatoes and vegetables in particular, play a crucial role as the main source of livelihood for the majority of farmers in the district.

The range of vegetables cultivated includes cabbage, cauliflower, green pea, radish, beans and greens. Recognizing the importance of vegetable farming in sustaining the local economy and livelihoods of the farmers, the project focussed on improving both the production and marketing aspects of vegetable cultivation. In addition, the project was closely aligned with the government's policy to increase domestic vegetable production and reduce dependence on imports. Through these efforts, the project sought to enhance vegetable production practices and income generation to contribute to the overall economic well-being of farming communities in Haa.

The aims and objectives of the project were achieved through the following:

01

Improved access to resources: By enabling improved access to resources such as poly houses, drip irrigation, vegetable seeds, and crop protection against wild animals and pests, the project directly promoted improved vegetable production and increased the volume of vegetable trades within the valley.

02

Farmer capacity development: The main activities under this component included farmer's training, exposure visits, demonstrations, field days, and constant monitoring and advisory support provided by the technical expert.

03

Linking farmers to the market: through subsidy on transportation, formation of marketing groups, and capacity development of the groups.

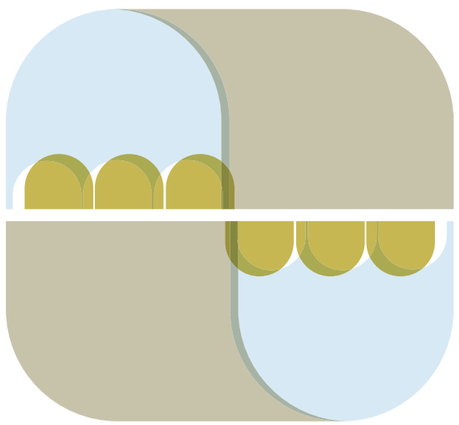
3.1 | Supply of poly houses

The average elevation of Haa is 2,700 meters above sea level and it experiences severe winters for about six months and mild summers with heavy rainfall. This climatic pattern allows for a relatively short window of about six months for vegetable cultivation. Given these conditions, the use of poly tunnels is particularly advantageous.

A poly tunnel (or poly house) is a single piece of plastic stretched over curved iron supports and anchored to the ground. The more common structure consists of galvanized steel tubes for the framework, supplied in kit form for self-assembly. It helps to protect vegetables from strong wind, dust, and heavy rain and helps to increase the indoor temperature in cold places. It enables the extension of the growing season, allowing the cultivation to start in early spring and continue through the winter, which in Haa is until the end of October. Excessive rainfall significantly restricts the variety of vegetables suitable for cultivation in open fields. Poly houses, on the other hand, offer a protected environment conducive to the production of higher-quality crops. A poly tunnel house typically measures 20 meters by 5 meters, amounting to an area of 100 square meters. Of this, 20 square meters are dedicated to the footpath between the beds, leaving 80 square meters for vegetable cultivation.

It was planned to supply 100 poly tunnels within the first two years of the project at an estimated cost of Nu. 100,000.00 for each set (refer to Table 1). As planned 40 poly tunnels were distributed at 60% subsidy in the first year. However, in the second year, only 23 farmers agreed to take the poly house out of the initially planned 60. Subsequently, 18 poly tunnels were then supplied to interested farmers in 2017, and an additional, five poly tunnels were supplied in 2018. As of March 2019, the project had successfully distributed a total of 87 poly tunnels (Annexure 2) to farmers in Haa Dzongkhag (refer to Table 1).

This left a budget surplus equivalent to 14 sets of poly tunnels and inline drip irrigation systems which was used for other purposes such as replacing damaged sheets and other poly tunnel house accessories.



Gewog	No. Of units	Total Cost	Total Subsidy (60%)	Total Credit (40%)	Cost per farmer	Year of distribution
Kathso	6	652,158.00	391,294.80	260,863.20	43,477.00	
Samar	8	869,544.00	521,726.40	347,817.60	43,477.00	
Uesu	10	1,086,930.00	652,158.00	434,772.00	43,477.00	**2014**
Bji	16	1,739,088.00	1,043,452.80	695,635.20	43,477.00	
	40	**4,347,720.00**	**2,608,632.00**	**1,739,088.00**		
Kathso	7	760,851.00	456,510.60	304,340.40	43,477.00	
Samar	5	543,465.00	326,079.00	217,386.00	43,477.00	
Uesu	5	543,465.00	326,079.00	217,386.00	43,477.00	**2015**
Bji	7	760,851.00	456,510.60	304,340.40	43,477.00	
	24	**2,608,632.00**	**1,565,179.20**	**1,043,452.80**		
Kathso	3	303,900.00	182,340.00	121,560.00	40,520.00	
Uesu	2	202,600.00	121,560.00	81,040.00	40,520.00	
Samar	4	405,200.00	243,120.00	162,080.00	40,520.00	**2017**
Sombaykha	9	911,700.00	547,020.00	364,680.00	40,520.00	
	18	**1,823,400.00**	**1,094,040.00**	**729,360.00**		
Bji	1	94,800.00	56,880.00	37,920.00	37,920.00	
Uesu	2	189,600.00	113,760.00	75,840.00	37,920.00	
Sombaykha	2	189,600.00	113,760.00	75,840.00	37,920.00	**2018**
	5	**474,000.00**	**284,400.00**	**189,600.00**		

Table 1: Expenditure details of poly tunnels and inline drip.

While poly tunnels can be used to grow variety of vegetables, the ones distributed through the project were mainly used to grow tomatoes. This recommendation stemmed from the fact that, tomatoes unlike other vegetables such as cabbage, cauliflower, or broccoli, tomatoes can be harvested continuously over a period of three to four months, ensuring consistent supply for the market and income for the farmers. Other reasons for cultivating tomatoes in poly tunnels include

- Produces better quality tomato crops
- Higher productivity
- Poly tunnels provide protection from insects and diseases

A significant benefit of using a poly tunnel is the remarkably high productivity and return per unit area. For example, a farmer cultivating one acre (4047 square meters) of potatoes generates an annual income ranging from Nu. 60,000.00 to Nu. 70,000.00. Surprisingly, farmers cultivating tomatoes in a poly house achieve a comparable income despite the substantial difference in area.

Success Story

Ms. Kinley Bidha from Bangayna Village of Uesu Gewog is one of the farmers who received poly house from the project. With a small plot of land beside her homestead, Kinley began her journey into the world of tomatoes in 2015. The project offered her a poly tunnel at a 60% subsidy, seeds, training on tomato cultivation and mentoring sessions with the project technical expert. She learned a lot about soil nutrition, pest and disease management and how to manage and grow tomato plants professionally (refer to photographic report Fig.1). Having cultivated tomatoes with success over the past six years, Kinley proudly exclaims that she has "graduated" to highlight her mastery in tomato cultivation. "Through the earnings generated from growing tomatoes, I managed to repay the poly house loan within a year. Subsequently, in the second year and beyond, the income derived from tomato cultivation enabled me to contribute to my daughter's education, cover grocery expenses, and recharge my mobile voucher. I am no longer reliant on my husband for pocket money or recharging my mobile". The success of Kinley and her fellow women tomato farmers symbolizes the broader success of the project. Kinley now has four poly houses in which she grows tomatoes.

In the end, it wasn't just about growing tomatoes; it was about sowing the seeds of women's empowerment and sustainable living. Kinley transferred the knowledge to cultivate her land but also cultivated a sense of confidence and accomplishment over the past years.

3.2 | Supply of inline drip irrigation system

Haa is situated at a very high altitude, with only about 2% of the total dzongkhag area suitable for cultivation. The predominant land-holding type is dry land which accounts for 74% and is primarily used for growing cereals such as wheat, barley, buckwheat, and vegetables. Most of the open-field crops in the region rely solely on natural precipitation and do not have irrigation facilities to support crop cultivation. This heavy dependency on natural rainfall poses several challenges leading to unpredictable crop production and occasional crop failures. Traditionally, there have been no established practices of irrigating crops in Haa leading to underdeveloped irrigation structures. Therefore, a major challenge faced by many farmers in Haa is the absence of irrigation channels to bring water to the farm. While this represents the general irrigation situation in the district, it is particularly crucial for poly tunnels, where a reliable irrigation system is essential due to the inaccessibility of rainwater caused by plastic sheeting. As a result, all the water requirement of vegetables in a poly tunnel has to be met through artificial irrigation. Recognizing this, it was deemed essential to provide support to farmers with irrigation facilities to boost vegetable production in the region. The project therefore supported the poly tunnel farmers with an inline drip irrigation system and High-Density Polyethylene (HDP) pipes for conveying water from the source to the farm (refer to Annexure 3).

The support for HDP pipes has proven to be beneficial to farmers by facilitating the transportation of irrigation water to their farms. At the same time, the implementation of an inline drip system has played a very significant role in efficiently applying water to the tomatoes and other vegetables in the poly tunnels. Water management in a poly house presents unique challenges. Usually sprinkling water directly on the plants in a poly house is not encouraged due to the potential outbreak of foliar diseases on vegetables. Therefore, water must be applied at ground level. Typically, most farmers use hose pipes for irrigating vegetables in poly houses. However, manoeuvring hose pipes between rows of vegetables is a cumbersome task that can result in damage to the plants. Similarly, irrigating crops in a poly house during the daytime is challenging as the temperature inside the poly houses could be quite high. The use of an inline drip irrigation system in a poly house significantly addressed these issues.

3.3 | Supply of poly house sheets

The first batch of poly houses was distributed in 2014. Over time, many of them showed signs of weathering and accidental damages. To help those interested farmers, the PMU provided 80% of the cost of replacing the plastic sheets. In 2019, the PMU initiated the replacement process by ordering 40 poly house sheets. The cost per sheet was Nu. 12,850.00, of which 20% of this amount which was collected from the farmer at the time of distribution. Similarly, the PMU procured another 20 numbers of sheets and supplied them to the farmers in 2020 (refer to Annexure 4).

3.4 | Farmer's capacity development

A crucial aspect of the project was to increase the capacity of the farmers to independently sustain vegetable production on their own after the end of the project. To achieve this, the project aimed to empower farmers with the knowledge and skills necessary to address the challenges related to vegetable production (refer to Table 2). Collaborating with key entities such as the Horticulture Division of the Department of Agriculture (DOA), the National Organic Program (NOP), the National Plant Protection Centre (NPPC), the National Post Harvest Centre (NPHC), the Department of Agricultural Marketing and Cooperatives (DAMC), and the National Soil Services Centre (NSSC), the project conducted comprehensive training sessions.

These training sessions covered various aspects of vegetable production, pest management, organic farming practices, and sustainable soil fertility management. By providing insight into the intricacies of vegetable cultivation and offering solutions to common problems, the project sought to equip farmers with the tools needed for long-term success in vegetable farming.

Recognizing the importance of the entire vegetable value chain, the project also organized additional training sessions focussing on marketing strategies and post-harvest technology specific to vegetables. This holistic approach aimed to ensure that farmers not only cultivate vegetables effectively but also have the knowledge and skills to successfully market their produce and effectively manage the post-harvest phase.

Individually, the project's technical advisor conducted specialized training for selected farmers, focussing on various aspects of vegetable cultivation. The training covered topics such as tomato cultivation, techniques for pruning tomatoes, the preparation of trellis for tomatoes, carrot cultivation, the setup of poly houses, asparagus cultivation and composting methods. These training sessions aimed to provide farmers with specific skills and knowledge related to these agricultural practices.

To reinforce the effectiveness of the training, the project implemented continuous field monitoring and mentoring. This ongoing support was designed to ensure that the trained farmers not only acquired the necessary skills but also were also applied them correctly in their agricultural activities. The monitoring and mentoring process served the dual purpose of validating the practical application of the skills learnt and correcting any mistakes or challenges faced by the farmers in real-world farming scenarios.

In essence, the project sought to create a comprehensive learning environment, that combined theoretical knowledge with practical application and continuous support to enhance the farmers' expertise and success in the specified vegetable cultivation practices.

Sl. No	Topic of training	No. of farmers	Year	Collaborators
1	1. Sustainable soil fertility management 2. Vegetable production 3. Organic farming 4. Organic plant protection	38	April 2014	NSSC, NOP, DOA, Gewog Extension
2	1. Post harvest handling of vegetables 2. Group marketing	40	June 2014	DAMC & NPHC
3	Training of trainers on electric fencing	16	Sept. 2014	RNR-RDC Yusipang
4	Pitching poly houses	18	Feb. 2015	Extension officer Samar Gewog and PMU
5	Workshop on production planning for extension officers	8	Feb. 2015	NOP, NPPC and PMU
6	Pitching poly houses	7	March 2015	PMU
7	1. Organic agriculture 2. Soil fertility management 3. Tomato cultivation	18	May 2015	NOP, NSSC & PMU
8	Study tour/ training for gewog extension officers	7	June 2015	Institute of Himalayan Environmental Research and Education (INHERE) INDIA
9	Composting and vermiculture	17	July 2015	PMU and Extension officers of Uesu and Samar
10	Field day	55	Aug. 2015	PMU and District agriculture office
11	Training on electric fencing	24	Jan. 2016	NPPC & PMU
12	Study visits for project officials	2	March 2016	Department of Horticulture, Sikkim, and Government of India.
13	Nursery management	47	May 2016	PMU and Extension officer of Uesu
14	Preparation of trellis for tomato	18	April 2017	PMU
15	Tomato pruning	26	June 2017	PMU
16	Farmers exposure visit	33	April 2019	PMU and DAO
17	Tomato production	45	April 2019	PMU
18	Composting	21	Aug. 2019	PMU
19	1. Organic pest management 2. Plant nutrient management	44	July 2020	ARDC Yusipang & PMU
20	Exposure visits for farmers from MOV to Bangayna tomato growers	18	October 2020	PMU

Table 2: List of trainings and other farmers capacity development activities undertaken by PMU.

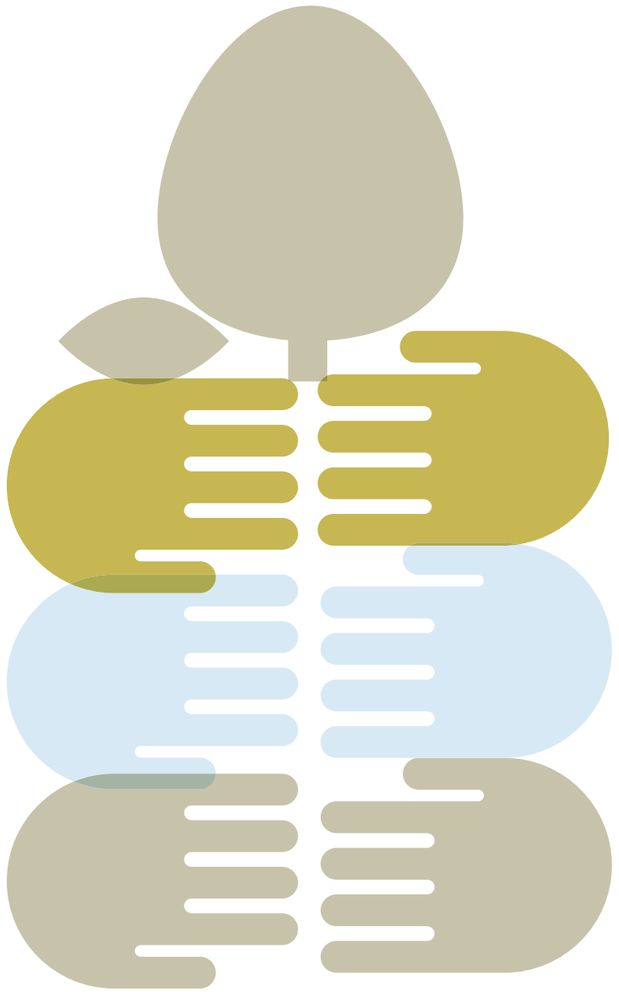
3.5 | Capacity development of extension officers

The Gewog Extension Officers played a pivotal role in ensuring the seamless execution of project activities. Their involvement was crucial in facilitating the smooth implementation of project activities. The PMU collaborated very closely with these Extension Officers to effectively engage the local community and coordinate essential field activities. One key responsibility was community mobilisation, where the Extension Officers worked along the PMU to rally the community members and garner their active participation in project activities. Additionally, the Extension Officers were instrumental in organizing meetings with farmers, information sharing, providing advisory services and conducting farmers' training.

Beyond these roles, the Extension Officers also played a vital part in monitoring field activities. Their presence in the field enabled real-time monitoring of field activities and ensuring that field activities aligned with the intended goals of the project and necessary adjustments in activities could be made to enhance efficiency. However, the majority of the Extension Officers lacked sufficient exposure to organic farming, leading to hesitancy in providing advisory services on this subject to the farmers. Consequently, the project took the initiative to address this knowledge gap by supporting a study tour and a training program at the Institute of Himalayan Environmental Research and Education (INHERE), in Almora, Uttrakhand India in June 2015. The primary aim of the visit to INHERE was to expose the Extension Officers to relevant organic farming methodologies, processes, and innovations in organic farming (refer to photographic report Fig. 2) developed by the institute. The tour also intended to facilitate interaction with practicing farmers, allowing the extension officers to gain insights into the challenges faced by these organic farmers and the solutions they employ. Another objective of the tour was to explore organic processes; methodologies and innovations that could be adapted and implemented in the specific context of Haa Dzongkhag.

The project also organized a Training of Trainers (ToT) specifically focussed on electric fencing (refer to photographic report Fig. 3). This was seen as a very important exercise to build the capacity of both Extension Officers and farmers in view of the planned upcoming electric fencing activity under Haa Dzongkhag. The objective was to establish a core group of Extension Officers and farmers with the skills to install and maintain electric fences, thereby reducing the dzongkhag's dependence on external organizations for future electric fencing activities. The six-day hands-on training was a conducted in collaboration with the Renewable Natural Resources Research Development Centre (RNR-RDC), Yusipang. Four farmers from Talung Village and 14 staff members from the Renewable Natural Resources sector in Haa Dzongkhag participated in the training.

The training consisted of several key components related to the installation of electric fencing. These components included area calculation and material estimation using Gobal Positioning System (GPS), preparation of insulators, preparation of fence corridors, fixing of a fence post, fixing the electrical line, fixing the solar panel and energizers (refer to photographic report Fig. 4), development of bylaws for the beneficiaries and development of terms of responsibilities.



3.6 | Electric fencing

While the project focussed on the production aspects of vegetables, protecting crops from both wild and domestic animals held equal importance. Haa farmers, like many others in Bhutan, regularly faced the reality of wildlife causing damage to their crops. Farmers in Haa were deeply affected by this issue, which not only threatened their livelihoods but also had a negative impact on their social and psychological well-being. Recognizing the gravity of the situation, protecting crops from wild animals emerged as a crucial aspect of promoting and improving vegetable production in Haa. Consequently, the project took steps to address this issue by installing electric fences in three villages of Talung, Yangthang, and Wangcha (refer to Table 3 and photographic report Fig. 5).

An electric fence is a barrier that uses non harmful electric shock to keep animals (domestic and wild) away from fields and crops. When the animal touches the fence, it receives a painful electric shock creating an unpleasant experience. This serves as an effective deterrent discouraging the animal from approaching or touching the fence again.

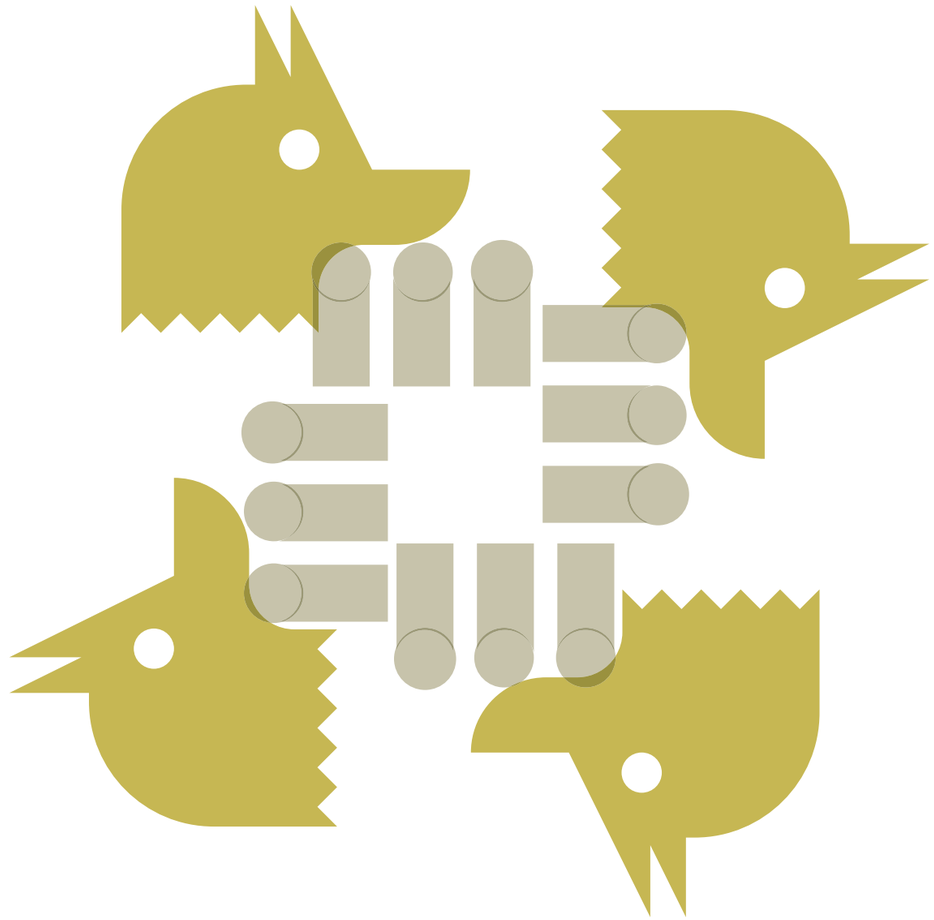
The electric fences installed in the three villages were slightly different from other electric fences installed elsewhere in Bhutan. Iron clamps set in concrete were used as a foundation for securing the wooden post (refer to photographic report Fig. 6 & 7). This innovative approach was adopted to prolong the life of the fence post and easy replacement of the damaged post. Although the incorporation of iron clamps set in concrete provided a more durable and long-lasting support structure for the wooden post, contributing to the overall longevity and effectiveness of the electric fence, the modification had resulted in an increase in costs of the fencing.

Village	Total cost (Nu)	Number of beneficiaries	Total area (Ac)	Project contribution (60%)(Nu)	Total farmers contribution 40%) (Nu)	Total length of fence (Km)
Talung	913,430.00	87	218.553	548,058.00	365,372.00	9
Yangthang	703,103.00	52	158.74	421,861.80	281,241.20	6
Wangcha	455,581.30	25	80.039	273,348.75	182,232.50	4
Total	2,058,724.00	164	457.332	1,235,234.55	823,489.70	19

Table 3: Details of Talung, Yangthang and Wangcha electric fence.

Benefits of the fence

The fence was exceptionally effective in keeping both, wild and domestic animals away from the crops and allowing the community to harvest a good crop of wheat and barley in 2015 (refer to photographic report Fig. 8 & 9).

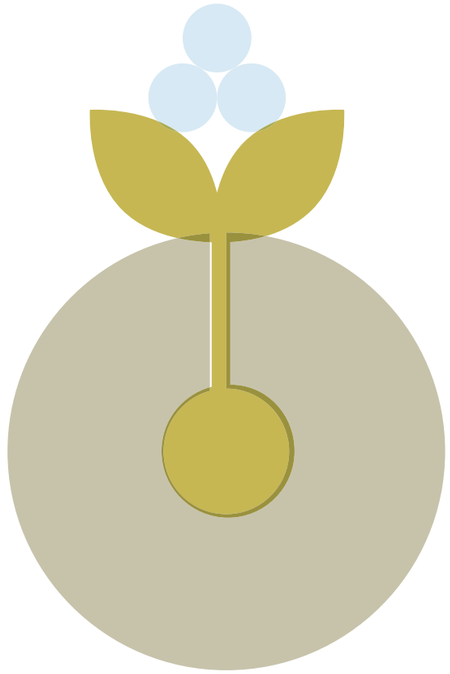


3.7 | Supply of seeds

The seed is undeniably one of the most critical inputs in vegetable production as it plays a key role in shaping a farmer's ability to produce quality vegetables. The choice of seed has a direct impact on the overall success of the farming operation. It is not only about obtaining any seed but ensuring the right seed at the right time. The appropriateness of the seed variety to the specific growing conditions, climate, and market demand holds significant importance. The project supported the poly house and open field farmers with a diverse range of vegetable seeds. By addressing the specific seed needs of farmers, the project contributed a meaningful impact on vegetable production, ultimately promoting the production of high-quality vegetables in both poly houses and open fields.

By supporting a wide range of vegetable seeds over eight years as detailed in Table 5, the project was able to motivate and encourage farmers to take up vegetable production to improve their livelihood. Over time, this support has led to a shift where the production and sale of vegetables have become a major source of income for all the farmers in Haa.

Historically potatoes have been predominant cash crop for the farmers in the region, followed by cabbage. However, the recurrent incidence of blight diseases affecting potatoes and club root diseases affecting cabbage and other allied crops, made cultivation of these crops increasingly difficult. As a result, the project actively promoted the cultivation of alternative crops such as carrots, beetroot, and onions (refer to photographic report Fig. 10). The climatic conditions of Haa are highly favourable for the cultivation of onions and carrots. Among various vegetables, the cultivation of carrots is widely adopted by a majority of farmers and is a very popular crop among the farmers of Uesu, Katsho, and Bji Gewogs. Two crops of carrots can be harvested in one year and when properly graded carrots fetches a very good price. Production data from 2019 is used to illustrate the significance of vegetable production for income generation as presented in Table 4. Analysis of the data shows that carrots and tomatoes are particularly advantageous in terms of seed investment and subsequent income.



Sl. No	Vegetable	No of Packets	Rate	Total seed cost (Nu)	Total Production (Kg)	Sales value (Nu)
1	Carrots	3,993	35.00	139,755.00	51,599.00	1,216,630.00
2	Beetroot	302	25.00	7,550.00	3,531.00	73,310.00
3	Beans	421	20.00	8,420.00	1,798.00	32,425.00
4	Radish (SPTN)	228	30.00	6,840.00	6,270.00	54,240.00
5	Mustard green	31	25.00	775.00	2,242.00	9,740.00
6	Pea	189	200.00	40,000.00	4,993.00	47,570.00
7	Broccoli	39	485.00	18,915.00	255.00	13,750.00
8	Onion	48	25.00	1,200.00		
9	Cabbage	339	220.00	74,580.00	36,993.00	460,317.00
10	Cauliflower	139	350.00	48,650.00	660.00	9,980.00
11	Chili	18	20.00	360.00		
12	Spinach	31	20.00	620.00	254.00	3,930.00
13	Brinjal (Eggplant)	10	20.00	200.00		
14	Tomato	87	170.00	14,790.00	14,333.00	644,127.00
15	Radish (Minowasi)	88	20.00	1,760.00	6,270.00	54,240.00
16	Japanese green	10	20.00	200.00		
				363,840.00	**129,198.00**	**2,620,259.00**

Table 4: Vegetable production in 2019.

	2016		2017		2018		2019		2020		2021		2022		2023	
Crop	**Pkt.**	**Cost**	**Pkt.**	**Cost**	**Pkt.**	**Cost**	**Pkt.**	**Cost**	**Pkt.**	**Cost**	**Pkt.**	**Cost**	**Pkt.**	**Cost**	**Pkt.**	**Cost**
Cabbage	619	660.00	592	82,880.00			339	74,580.00	378	85,800.00	135	33,750.00				
Cauliflower	105	15,750.00	99	14,850.00			139	48,650.00	6	2,100.00					2	720.00
Carrot	1046	31,380.00			1540	53,900.00	3993	139,755.00	11407	386,645.00	15965	558,775.00	5297	116,534.00	3000	210,000.00
Radish	1097	329,10.00			830	24,900.00	316	8,600.00	1335	40,050.00			86	1,720.00		
Sweet Pea	157	23,602.50			1278	25,560.00	200 kg	40,000.00	561.5 kg	112,300.00			126	31,500.00		
Broccoli	28	840.00					39	18,915.00	9	1,296.00	5	2,400.00				
Beans	48.23	7,234.50			840	16,800.00	421	8,420.00	240	4,800.00					40 kg	20,000.00
Tomato	40	12,000.00	60	24,000.00	80	32,000.00	87	14,790.00	85	14,150.00	208	66,560.00	70	11,900.00	81	218.70
Mustard Green					333	8,325.00	31	775.00	194	4,850.00			24	600.00	10	250.00
Coriander					478	9,560.00							17	340.00		
Cucumber					152	3,800.00										
Beetroot					302	7,750.00	302	7,550.00	3285	86,615.00	40	1,200.00				
Spinach					229	55.00	31	620.00	22	550						
Brinjal					15	300.00	10	200.00								
Chili					84	1,680.00	18	360.00			10	3,100.00				
Onion					72	1,800.00	48	1,200.00	283	8,250.00	228	11,400.00				
Asparagus					6000	30,000.00										
Beans (Local)									13.5	10,350.00						
Mustard													530			
Japanese green							10	200.00								
		210,377.00		**121,730.00**		**187,550.00**		**363,840.00**		**549,345.00**		**674,785.00**		**203,694.00**		**252,840.00**

Table 5: Total seeds supported by PMU (2016-2023).

3.7.1 | Distribution of potato seeds

In addition to the vegetable seeds, the project also supported some farmers with potato seeds on two occasions. The first was to support the Talung community, a decision approved by the project Board. The objective of the activity was to encourage farmers to produce field crops and vegetables on fallow lands, particularly after the installation of an electric fence around their village. In terms of financial support, the project covered 60% of the cost of potato seeds while the farmers had to pay the remaining 40%. A total of 3,950 kg of potato seeds was procured at a cost of Nu. 86,900.00, of which the project contributed Nu. 52,140.00 and the farmers contributed
Nu. 34,760.00.

The second occasion was in 2018 when the project supplied potato seeds to 164 farmers (refer to Table 6). Following a severe outbreak of late blights in 2016, the National Plant Protection Centre (NPPC) recommended a change of potato seed lot for the affected farmers. The project's approval to support this seed lot was granted by the Board in 2016. However, due to the unavailability of potato seeds from the National Seed Centre (NSC), the activity could not be implemented in 2017. Subsequently, the activity was implemented in January 2018 after receiving the Board's approval in 2017. The PMU subsidized 50% of the total cost of potato seeds while the remaining 50% was borne by the farmers themselves. In monetary terms, the PMU support amounted to Nu. 193,725.00.

Sl. No.	Gewog	Total Numbers of farmers
1	Samar	18
2	Uesu	48
3	Katsho	32
4	Bji	66
	TOTAL	164

Table 6 : Gewog wise list of farmers supplied with potato seeds.

The expected reduction in blight incidence due to the replacement of stock seed could not be validated. Despite the purchase of potato seeds from the National Seed Centre, blight incidence was detected in the majority of the potato fields and potato crop performance did not show any improvement compared to previous years. It appears that there is a degeneration of potato seed quality even at the seed producers' farms. The other main challenge was the lack of rainfall during the tuber enlargement stage of the potato plant, leading to an overall low potato yield throughout the whole valley during the year.

3.7.2 | Distribution of Asparagus seedlings

The climate of the Haa Valley is suitable for asparagus cultivation and there is a good local market with some seasonal advantage over other asparagus-growing areas of Bhutan. Despite these advantages, there was a lack of awareness among the farmers about the possibility of growing asparagus in Haa. To address this and to encourage interested farmers, the project provided support by distributing asparagus saplings in 2017 and 2018. In addition, farmers were provided with demonstration and guidance during the planting (refer to photographic report Fig. 11 & 12). Nine farmers from Bji Gewog and two farmers from Kathso Gewog were supplied with asparagus seedlings (Var.: *Mary Washington*) procured from Punakha. The details of seedling distribution are as given in Table 7.

Sl. No	Name	Village	Gewog	Qty.
1	1. Ms. Tshering Lham	Yangthang	Bji	1000.00
2	2. Ms. Dawa Lham	-Do-	-Do-	300.00
3	Ms. Yangchen	-Do-	-Do-	1,000.00
4	Ms. Jagami Gaki	-Do-	-Do-	500.00
5	Ms. Gakim	-Do-	-Do-	300.00
6	Ms. Gaki	-Do-	-Do-	500.00
7	3. Ms. Chimi Om	-Do-	-Do-	300.00
8	Ms. Tshewang Lham	Talung	-Do-	1,000.00
9	Ms. Tshering Yangchen	Wangcha	Katsho	1,000.00
10	Ms. Kiba	Ingo	Katsho	6,000.00
11	Ms. Tshering Om	Talung	Bji	1,000.00

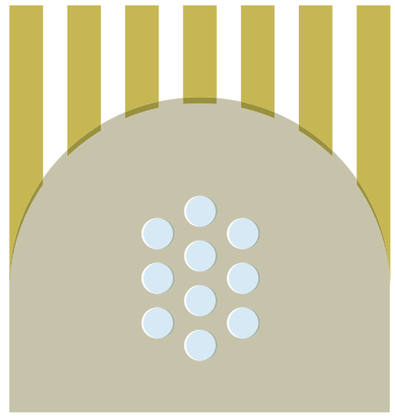
Table 7: List of farmers who received asparagus seedlings.

3.8 | Compost sheds

Compost and farm yard manure plays a very important role in farming and is a rich source of organic matter and nutrients for the crops. Traditionally farmers in Bhutan have been using the heap method (refer to photographic report Fig. 13) for preparing manure. Heap method of composting has many fundamental drawbacks as the manures are exposed to natural elements such as rain and sunshine leading to issues such as nutrient leaching, nutrient volatilization, and incomplete decomposition. Moreover, the heap method raises hygiene concerns due to infestation by house flies and every so often, the manure gets scattered around the homestead by animals creating more health and hygiene issues around the homestead.

To address these challenges and to promote the adoption of proper composting practices, five pilot sheds were constructed in 2018 in the villages of Talung, Wangcha, Bangayna, and Balamna. The construction of these sheds (refer to photographic report Fig. 14) in the pilot phase was fully subsidized, with the PMU providing essential materials like cement, CGI sheets and covering the cost of items such as sand, stone aggregates, and labour charges. Five farmers from Uesu, Kathso, Samar and Bji Gewogs received 100% subsidy during the pilot phase.

In the subsequent years, farmers were made to contribute 20% of the cost of construction. By 2020, 52 composting sheds (Annexure 5) were constructed across the valley enabling farmers to produce sufficient quantities of compost for their agricultural needs. Along with the cattle dung and waste, farmers were encouraged to use weeds and bushes growing around their homestead to increase the bulk of manure and as well as to keep their surroundings clean.



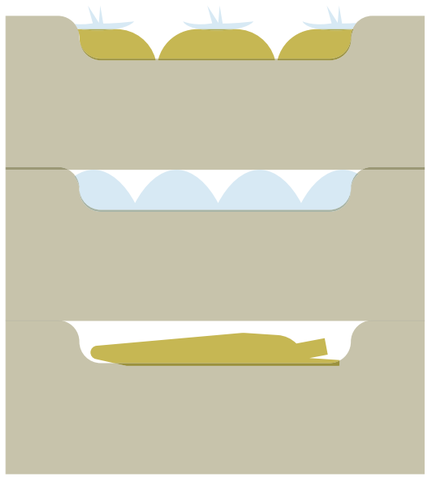
3.9 | Marketing vegetables

The upper four gewogs of Haa do not have any wetlands (paddy fields) and as a consequence, the local farmers in these gewogs rely solely on dry land cultivation of cereals (Wheat, barley, buckwheat), potatoes and vegetables on dry lands. To address the agricultural needs of farmers and to enhance their livelihoods through vegetable cultivation, the project supported farmers with vegetable seeds, training, and constant backup advisory support. The outcome was a noticeable increase in overall vegetable production and recognition of the importance of creating opportunities for farmers to sell their produce to ensure economic viability and sustainability of the farming community.

The majority of the farmers involved in the project are marginal and subsistence farmers. Due to the nature of their farming operations, individual farmers faced challenges in producing large enough quantities of vegetables to benefit from economies of scale. This was also a challenge in attracting sufficient traders to do business. The lack of volumes also impeded the development of other allied marketing structures and processes that are essential to manage the flow of produce from farms to markets. To facilitate the growth of a more effective vegetable marketing system, a coordinated efforts was needed to establish structures and processes that could handle increased quantities of products and link farmers to the market.

While collaborative marketing in the form of producer groups and cooperatives can be a mechanism to link these small-scale producers to the downstream market once they have consolidated their produce, our experience in group formation for electric fences revealed a lack of trust among farmers. Trust is a crucial factor in the formation and development of cooperative marketing. Therefore, on a pilot scale, clusters or small groups of farmers were organized and guided to engage in the market. The main objective of this pilot initiative was to engage farmers in open-field vegetable production and market participation. The farmers received assistance in the form of seeds, packaging materials, and 50% of the transportation cost. A total of 166 farmers from Bji, Kathso, Esu and Samar Gewogs participated in the program. The participants collectively produced and marketed 163.68 metric tons of vegetables.

A comparable initiative was also undertaken to support the production and marketing of vegetables in villages surrounded with electric fences. The project supported a group of women from Wangcha Village in 2017. The group was supported with seeds, the construction of a compost shed, vegetable collection trays, and a weighing scale for the group's collective use. By providing these resources, the project aimed to empower the women's group in Wangcha Village, not only by supporting their agricultural activities but also by facilitating the marketing aspect.



As a part of a parallel initiative to promote collective marketing, in March of 2019 the project in partnership with Dzongkhag Agriculture Sector established two marketing groups under Samar Gewog and Uesu Gewog through several rounds of consultative meetings. Through these meetings, the following key objectives were realized.

01

A suitable name for the group was recognized

02

Key office bearers for the group (chairman, secretary and treasurer) were elected

03

Potential crops and necessary seed quantity for each participating farmer were determined

The following are the details of the two marketing groups that were formed.

01

Meri Phunsum Sanam Tshongdrel Tshogpa
Chairman: Mr. Gem Dorji
Secretary: Mr. Lhab Dorji
Treasurer: Ms. Pema Thungzom
Number of members: 46
Gewog: Uesu

02

Samar Chuethun Tshogpa
Chairman: Mr. Hodo
Secretary: Ms. Sonam Dema
Treasurer: Ms. Tshering Pem
Number of members: 23
Gewog: Samar

With the formation of two marketing groups, The Dzongkhag Agriculture Sector of Haa, the Department of Agriculture Marketing and Cooperatives (DAMC) and the PMU supported the group members to undertake marketing of tomatoes. The groups launched the sale of tomatoes from Haa at the Thimphu Centenary Farmers Market in August 2019 (refer to photographic report Fig. 15). DAMC supported the transportation costs while Dzongkhag Agriculture Sector supported the daily allowance of Nu. 300 per day for the participating members. As the daily allowance for the participants was negligible, the PMU supported the accommodation for the participating farmers. The PMU also supported the two marketing groups by providing vegetable collection trays and weighing scales. The launch took place on the 7th of July,2019. The marketing group also interacted with the media, retailers and BAFRA officials (refer to photographic report Fig. 16) at the Thimphu Centenary Market to develop linkages for future trade opportunities. A total of 975 kg of tomatoes were sold during the launch.

3.10 | Collaboration with other organizations

3.10.1 | Initiation of cultivation of medicinal and aromatic plants

HOFSI in cooperation with Ennovent attempted to see the possibility of initiating the cultivation of medicinal and aromatic Plants (MAPs) in Haa as some farmers from Upper Haa had already cultivated MAPs in the past. The practice slowly stopped, as the growers could not find a reliable market to sell their products. In addition to production, the value chain was missing in the past intervention by the government. A draft proposal was submitted by the PMU to Ennovent Bhutan for further development and undertake the necessary market analysis. As first step three MAPs were identified namely, *Paris polyphylla* (Satuawa), *Aconitum* (Tsendu) and *Pseudoginseng*.

3.10.2 | Collaboration with the International Centre for Integrated Mountain Development (ICIMOD)

The first interactions between the International Centre for Integrated Mountain Development (ICIMOD), Nepal started with an informal discussion with Dr. Tashi Dorji (Chief Livelihood Theme) and Dr Nand Kishor (Chief Resilient Mountain System) in October 2019 in Paro. As a first joint activity, the PMU, ICIMOD and the National Organic Program (NOP) prepared a collaborative village plan for Longpa Nobgang Model Organic Village.

Longpa Nobgang is a village under Samar Gewog and was adopted as a Model Organic Village (MOV) by the National Organic Program (NOP) in 2017. However, without a comprehensive development plan and the necessary monitoring and backup support to the community, the village did not make much progress in achieving its objectives and developmental goals. In addition, there was also a lack of budget for implementing most of the planned activities which also contributed significantly to the lack of progress and achievement of the village development plan. Therefore, NOP made an effort to revitalize the Model Organic Village plan. This activity was supported by ICIMOD through Resilient Mountain Solutions (RMS). RMS conducted several training sessions on organic agriculture for the farmers of Longpa Nobgang Village. The PMU collaborated with RMS and the National Centre for Organic Agriculture (NCOA) to provide technical expertise during the implementation of the village plan. The PMU also supported vegetable seeds and compost sheds for the farmers of the MOV.

Consequently, ICIMOD invited the PMU to attend a partner's workshop for RMS from 28th to 31st January 2020 at Kathmandu Nepal. The

main aim of the workshop was to reflect on the progress and achievements of the initiative till date and develop a prospective work plan for 2020. The workshop was focused on key areas such as knowledge generation, up scaling solutions, communication, gender, monitoring and evaluation, and institutional capacity development.

3.11 | Capacity development of project staff

3.11.1 | Study visit to Sikkim

As the project was on organic vegetable production, it was extremely difficult to manage pests and disease on the vegetables without using inorganic chemicals. As there were no suppliers of organic substitutes in Bhutan, the project coordinator and the field specialist after due approval from the donor made a three-day visit to Sikkim as the state was declared as an organic state of India. The main objective of the visit was to explore the possibilities of importing organic fungicides and insecticides. The team found that there were numerous organic preparations available in Sikkim that were being used by the farmers. As the Indian states of Sikkim and Bhutan share similar kind of agroecological and climatic condition these products could be beneficial if allowed to be imported into the country.

3.11.2 | Trip to Austria

Dr. Rudolf supported an eight-day trip to Austria for the project coordinator and the field specialist form 19th to 26th May, 2019. The main purpose of the visit was transfer knowledge from Austrian benchmark companies and small-scale farmers in the agricultural business. It was a comprehensive visit comprising of visits to farmers cooperatives (LGV-Frischgemüse), organic farmers (ADAMAH BioHoF), asparagus farmers, a biodynamic farm, chili farmers, small scale farmers and herbs and spices companies (e.g. Sonnentor). All of these organizations had their unique and motivating features some of which could be adapted to Bhutanese farming situations. Activities such as farmers marketing groups require high initial investment and motivation with unwavering support from each member and such a development in Bhutan can only be expected when the capacity of Bhutanese farmers has improved both in terms of education and financial resources. Most of the field activities of growing crops are done by larger machines as the Austrian farmers have much larger land holdings compared to a Bhutanese farmer. Some of the farming activities were computerized whereby real-time field data is collected by computers and necessary action are taken by the computer system. Farm mechanization is a major bottle neck in Bhutanese farming due to small land holding and topography. Farm machinery and simple hand tools used by Austrian small-scale farmers can be easily adopted in Bhutanese farms. These machines and tools include mini-power tiller, seed drills and simple hand tools such as oscillating hoes. In addition to these simple machines and tools there is great scope for introducing seeds of some specialty crops such as strawberries and all-male hybrid asparagus. These crops could be easily integrated into the current farming practices in Bhutan.

HOFSI aimed to improve the welfare of farmers and provide a high standard of living for the next generation in the Haa region of Bhutan. The project targeted mainly women farmers and aimed to improve agricultural production, productivity and profitability to increase household incomes of rural farmers in the Haa region.

The evaluation aims to assess the impact of the project at three different levels

01

Quantitative analysis of vegetable production and marketing

02

Evaluation of household and community changes

03

Embedding the project in the broader context of national, regional and transnational agricultural development strategies.

Interviews were conducted to gain meaningful insights into the impact of the project on individuals and the area. The interview design aimed to elicit both expected outcomes and possible unanticipated consequences.

4.1 | Study design and project phases

As stated in the Terms of Reference of the project (Annexure 6), the evaluation of the interviews is an essential part of the project as it gives a clear insight into the impact of the project. Initially, two to three interviews (before, during and after the project) were planned to ensure the optimal course of this study.

First phase: For organisational reasons, the first phase of the study was conducted in April 2014, after the poly houses had been built. However, the project was still at an early stage and the interviews provided clear insights into the current living situation of the participating farmers and the status quo of the project.

Second phase: Due to the COVID 19 pandemic, the interviews for the second phase of the study were conducted in early November 2023. Questions specifically designed to assess the situation before and after the project for the individual farmer were used to show the overall impact of the project.

The results of the first and second phase interviews allowed a detailed comparison of the situation at the beginning and end of the project. This was done through case studies, where the same families were interviewed in both phases, and through questions in the second phase interviews that included comparison options focussing on before and after the project.

4.2 | Outline of interview questions

In 2014, a general overview of lifestyles and expectations of the project was assessed through open-ended questions.

The questionnaire of the second phase interviews consisted of open questions, decision questions, rankings and attitudinal statements (e.g. Likert Scale). The aim was to capture quantitatively and qualitatively the overall impact and effects of the project on individuals and the area, and to compare the lives of farmers before, in 2012, and after the project period, in 2023. It was also intended to provide meaningful insights into demographic, social and economic changes during the project phase.

4.3 | Interview modalities

During the stay in the Haa Valley, oral interviews were conducted with families participating in the HOFSI project. In addition, in the first phase, families were visited to inspect the poly house without conducting interviews. The oral interviews were conducted with one or two members of a household, sometimes as group interviews with people from different households, focusing on the person who does most of the work related to the project. The duration of the interviews varied from 20 minutes to over an hour. The interviews were conducted outside the farm in the fields, next to the poly houses or in the farmhouses.

The first phase of interviews took place between 11th and 14th of April 2014 and the second phase between 4th and 5th November 2023 with farmers participating in the project in the Haa Valley. Participating farmers were informed well in advance by the project field assistants. The interviews in April 2014 were conducted at the farmer's home, while the interviews in 2023 were conducted on site individually, but also in groups.

A total of 20 interviews were conducted in 2014 and 15 in 2023. Participating households were randomly selected. A total of four of the households were visited in both the first and second phases, allowing a direct comparison of how the situation has changed over the years (see section 4.4.10 Case studies).

The interviews in the first phase were conducted by Regina Geisler-Knünz and translated by field specialist Karma Penjore, while the interviews in 2023 were conducted by Anna Wieser and translated by Tashi Dorji for a more neutral environment. In both cases the questions and answers were translated from English into Dzonghka and vice versa.

4.4 | Results

4.4.1 | General information on interviewed farmers

In 2014, open-ended questions were asked about general lifestyle and expectations. Results from four families in 2014 are compared with interviews with the same families in 2023 in section 4.4.10 Case studies in detail.

In 2023, a total of 15 households were interviewed in the three Gewogs of Uesu, Samar and Katsho, living in the villages of Kibri, Bangayna, Nubgang, Balamna, Shari, Engo, Bali and Wangcha. The respondents were on average 44 years old and lived in households between two and ten people, with an average of six people. The 82 people in the interviewed households were divided into 46 women and 36 men and ranged in age from one to 80 years. Nine of the 15 households had at least one person living outside the country, predominantly in Australia, who are on average 28 years old. In total, 14 of the 82 living in the household are living in Australia and one person in Canada. From the 15 people, nine are women.

4.4.2 | Poly houses

Of the 15 households interviewed, eight farmers received their poly houses from the HOFSI project, which were constructed between 2013 and 2018. All HOFSI poly houses were in use at the time of the interviews. Nevertheless, this question was answered by eleven farmers who have a poly tunnel, as Karma Penjore has assisted the farmers even if the poly house was not received through the project.

In total, eleven farmers reported working less than two hours a day in the poly house. The main problems faced by the farmers in relation to the poly tunnel were snowfall and subsequent damage to the plastic sheeting or frost damage to the plants.

Eleven farmers strongly agreed or agreed that there was an advantage to growing vegetables in a poly house. Eleven of them strongly agreed or agreed that the poly house had positively improved their income generation. Ten of the 15 farmers strongly agreed or agreed that they had received all the necessary support from the project to manage the crops indoor. All farmers who received a loan through HOFSI strongly agreed or agreed that the subsidy and loan they received from the Bhutanese Development Bank was beneficial and that it was easy for them to repay the loan in the expected time.

"The best thing about poly houses is that we are no longer dependent on the season and can harvest and earn all year round."

(Tshering Yangchen)

4.4.3 | Capacity development and training

Farmers received information on HOFSI related issues at gewog meetings or through direct field meetings with field specialist Karma Penjore. Most of the households, eleven in number, reported attending meetings related to development programs and the project about once a month and discussing agricultural issues with neighbours on a spontaneous basis.

All the farmers attended training sessions on vegetable cultivation and composting. Seven of the farmers received training in electric fencing. The ways in which they have benefited from attending such trainings include gaining agricultural and personal confidence, learning new skills, communicating with other farmers, learning how to compost, learning how to maintain their equipment and, as a result, generating more income.

4.4.4 | Electric fencing

In total, eleven of the 15 farmers lived in areas with electric fences. Twelve of the farmers interviewed reported problems with wildlife damaging crops in 2023, mostly due to wild boar. Fencing is an effective method of minimizing the risk of wildlife damage, but farmers also keep night watch, light fires or need a lot of luck to avoid being affected.

Of the eleven farmers living in areas covered by electric fencing, only one household was interviewed in a village where the HOFSI project interacted with a fence. Ten other households had fencing installed by the government. The farmer interviewed lives in Wangcha Village in Katsho Gewog. The fence was constructed in 2015. The community elected three people as leaders for the overall management and preservation of the fence. There are a total of 24 households in the village, of which 22 are actively involved in the installation and maintenance of the fence. Two households were removed because they did not cooperate. The remaining households share the workload and profits equally, and the community has established some bylaws for the fence.

At the time of the interviews in 2023, the fence wasn't working properly and, according to the farmer interviewed, had lost its effectiveness almost two years ago, even though the project had supported its maintenance and increased the electricity supply. Nevertheless, the wildlife situation is better than it was before the fence, although farmers sometimes must spend the night in sheds in the field. The effect of the fencing was found to be very helpful for growing vegetables in the open field. Another side-effect of the fence, which had an impact on the overall social structure of the village, was that it helped with livestock issues. Before the fence, cattle used to go into each other's fields to eat the crops.

4.4.5 | Seeds

Fourteen of the 15 households surveyed reported having received seed from the HOFSI project. Ten of the farmers interviewed ranked the importance of seeds first among other inputs (e.g. training, technical advice, nutrients, crop protection), three farmers ranked it second and two farmers ranked it third. In 2023, all farmers reported receiving seeds from HOFSI and all reported buying seeds additionally by themselves. In 2012, only seven farmers bought their own seed. Interest in government seeds, which are free, decreased from 13 farmers in 2012 to nine farmers in 2023.

"Grow together, harvest together."

(Thinley Wangmo)

4.4.6 | Compost sheds and organic farming

Thirteen out of the 15 households reported having installed a compost shed from the HOFSI project between 2016 and 2020. The number of farmers using farmyard manure on the farm increased from ten in 2012 to 15 in 2023. Thirteen of the farmers reported using compost in 2023, compared to none before 2012. The use of chemical fertilizers decreased from 15 farmers in 2012 to ten in 2023.

In contrast to 2012, 12 farmers made their own compost in 2023. Twelve of the farmers also have problems with pests. The use of organic pesticides increases slightly from three farmers in 2012 to five farmers in 2023, while the number of farmers using chemical pesticides decreases from ten in 2012 to eight in 2023.

Thirteen out of 15 farmers confirmed that they had received training (including demonstrations) on different methods of composting and soil fertility management. Twelve out of 15 farmers are aware of improved manure and compost preparation methods. Thirteen out of 15 participants use animal dung, bedding and weeds to prepare good quality compost for later application to the field. Eight of them are aware of the inherent drawbacks of traditional composting methods and ten of them reported that they had received sufficient support from the Gewog Extension Officers and HOFSI on manure application.

„Compost fertiliser is better than artificial fertiliser, it has improved my crop yield and helped me save on fertiliser costs.“

(Tshering Choden)

4.4.7 | Marketing

An interesting aspect in this section was that selling directly at the market decreased from twelve farmers in 2012 to seven farmers in 2023. On the other hand, selling through traders increased from two farmers in 2012 to 12 farmers in 2023.

There was also an increase in the amount of effort put into marketing strategies (see section 3.8) to sell the products. While in 2012 four farmers stated to spend less than two days on marketing the product, in 2023 it was seven. Four farmers even reported spending a month on marketing and four reported spending more than a month on marketing in 2023. Before 2012, this investment in marketing strategies had not been made.

Eleven of the 15 farmers agreed or strongly agreed that they were satisfied with the marketing setup they had during the interviews.

„Self-consumption is a new thing for us now. We used to have to buy a lot of vegetables from the market!“

(Tsen Du)

4.4.8 | Vegetable production

The total area used by farmers for agricultural crops varied between 0.6 and 5 acres, with an average of 2.54 acres. On average, 75.67% of this area was used for vegetable production.

In 2012, all 15 farmers grew one to four types of vegetables. In 2023, only six farmers grow one to four types, six farmers grow five to ten types and three farmers grow more than eleven types of vegetables.

In 2012, a total of seven different types of vegetables were mentioned. In 2023, however, thirteen types of vegetables were mentioned (see Fig. 17). Tomatoes and carrots are new crops in 2023 for twelve of the 15 farmers and were not grown before 2012.

Before HOFSI, in 2012, all farmers cultivated once a year. By 2023, this response had diversified, with six farmers saying they grew once a year and nine farmers saying they grew twice a year. Before the intervention of HOFSI, all the farmers grew vegetables in the open field, after participating in the project, the number of farmers growing exclusively in the open field decreased to three. Twelve of the farmers grow indoors in a poly house and outdoors in the open field in 2023. For nine of the farmers, poly house cultivation is more profitable than open field cultivation.

4.4.9 | Change of income and additional aspects

Alongside livestock and dairy production, vegetable production has been and continues to be an important and widespread source of income for farmers in Haa, and this does not appear to have changed significantly over the years of the project. What has changed is the variety of crops as seen in chapter 4.4.8 Vegetable production.

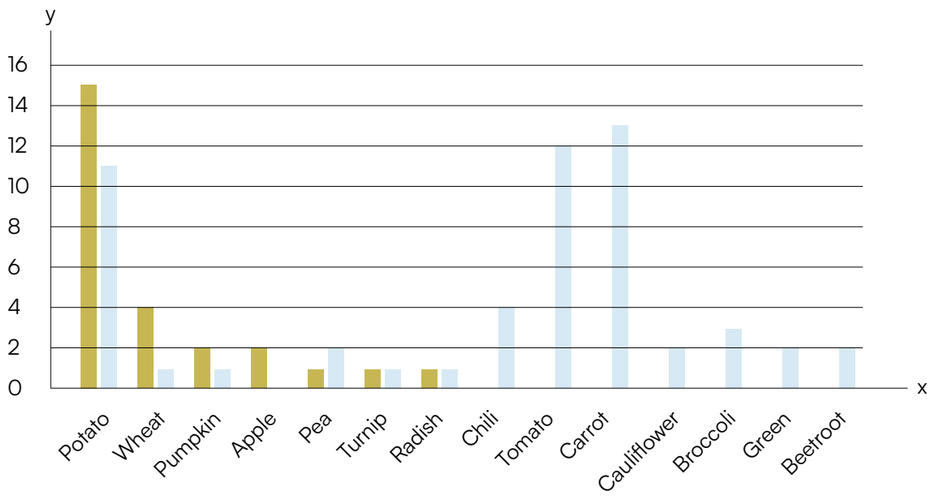
All 15 farmers confirmed that their financial income had increased in recent years because of HOFSI activities. According to the farmers, the reasons for the increase in income, in order of frequency of response, are introduction of new crops, use of compost, reduced expenditure on fertilizer, increased yield, general encouragement and training, and better seeds. Fourteen of the farmers reported spending the income on household items (e.g. clothes, groceries, electronic equipment), eleven on education costs (e.g. fees, books, uniforms), eleven on new agricultural investments (e.g. machinery, animal feed, fertilizer) and four on other things such as donations to religious rituals and pujas. All the farmers who received a loan from the Bhutanese Development Bank for a poly house have been able to repay the loan ahead of schedule.

Fourteen farmers agreed when asked if they saw further potential for increasing their household income. The ideas ranged from concrete marketing ideas, such as drying vegetables to make chips, or planting more and new varieties of crops, to social aspects, such as involving other family members in agricultural work. One farmer shared the vision of acting as a role model for others and came up with the idea of forming a group or cooperative and even working with school drop-outs.

In general, there is great interest from the farmers in receiving further support and advice from the HOFSI project in the form of good quality seeds, training, spare parts for poly houses and help in maintaining and replacing electric fencing. Through the work of the HOFSI project, the farmers have not only been able to generate more income, but also more

vegetables for their own consumption. The new technique of making compost was beneficial as it increased the yield and reduced the cost of fertilizer. The farmers gained confidence and were encouraged to work hard to see their efforts.

However, for most of the farmers, the future of farming remains uncertain, challenging and labour intensive, especially if their children living abroad do not return to work in agriculture.



x Cultivated crops
y Number of mentions

2012
2023

Fig. 17: Number of crops cultivated by participating farmers in year 2012 and 2023.

4.4.10 | Case studies

A total of four families were visited during the two interviews in 2014 and 2023. This allows for case studies with direct comparisons and provides concrete, in-depth knowledge of how the welfare of Haa farming families has increased over a period of almost ten years.

Family 01

Nima, Dago and Hodo Zangmo
Gewog/ Village: Samar/ Shari

Land owned:	5 Acres (100% vegetable production)
Poly Tunnel:	1 (2015)
Compost Pit:	None
Electric Fencing:	Governmental

There are eight children in the family, one of whom lives in Australia. The family all seem to help with the farm work, especially when the children are home during the school holidays. They also have a good relationship with the neighbours and share the work. Agriculture, such as vegetable growing and livestock (butter and cheese), is the family's only source of income.

In 2014, they felt that the poly house could be of good use to them. Before they got the poly house in 2015, they mainly grew potatoes and cabbage, while later they decided to grow tomatoes and chilies after the poly house was installed. In the poly house, it is easier for them to use organic methods, such as cow manure, than in the open field, where they use more chemical fertilizer. Seeds, which they save, buy and receive from HOFSI or the government, play an important role, along with other inputs such as training and crop protection.

They were not afraid of not being able to pay back the loan for the poly house when the project started and finally were able to pay it back before the planned time. In 2014, they said they were aware of marketing opportunities and planned to sell the produce at the Phuntsholing market. In 2023, Nima, the son, confirmed that they were selling their goods directly at the Phuntsholing market and had also tried selling through a cooperative. All in all, they spend about two weeks a year marketing their products, but there seems to be room for improvement. They meet with neighbours individually, spontaneously and without a fixed schedule, to discuss agricultural issues and share information. Whenever possible, they attend gewog meetings and trainings to transfer the knowledge to their own farm. They heard about HOFSI at a gewog meeting and attended various workshops and trainings, such as vegetable gardening, composting and fencing. Through the training they were able to improve their skills, grow new vegetables and make their work, such as growing tomatoes, more profitable.

Overall, the household's financial income has increased in recent years because of HOFSI's activities. With the increased income, they have been able to buy new household items such as mobile phones and pay for education costs. In terms of new agricultural investments, they have been able to buy new tools, fertilizer and hire machinery when needed. They have been able to grow tomatoes, spinach and greens, sell vegetables and keep some for their own use.

They describe the future as a more challenging time for them, but they plan to mitigate this by growing mixed crops. They see the positive aspects of the poly house to help them generate more income and reduce the need to buy vegetables.

Family 02

Ms. Tsendu Wangmo
Gewog/ Village: Samar / Shari

Land owned:	1 Acre (10% dairy, 90% vegetable production)
Poly Tunnel:	1 (2015)
Compost Pit:	None
Electric Fencing:	Governmental

There are three children in the family, one of whom lives in Australia. Additionally, Ms. Tsendu shares household with her husband and her mother. The family's main source of income is agriculture, including vegetable growing and livestock (butter and cheese). Before the project, they also engaged in some labour exchange, such as going into the forest to collect mushrooms for additional income. Although they have a good relationship with their neighbours, there is no division of labour between the farmers.

During the first phase of the interviews in 2014, it was expected that germination in the poly house would be lower than in the open field.

Previously, they had only grown cabbage and potatoes, and vegetables were mainly used for the nursery. In the second phase of the interviews in 2023, they explained that they now also grow tomatoes successfully in the poly house. However, growing potatoes in the open air seems to be more profitable for them. The problems they faced with the poly house were damage from plastic, mainly due to weather conditions.

Regarding organic farming, they stated that they have not tried it yet, but it will be easier for them in the poly house. In general, crop protection is more important to them than seeds and training.

They planned to form a marketing group to take the harvest to the market as a surplus, although the poly house will not be enough to pay back the loan if they sell individually. Higher profits were expected on the local market if sold in a group. In the interviews in 2023, it was stated that they sold the produce through a cooperative as well as through a trader, but their marketing strategies in general could be improved.

In 2014, there were no worries about repaying the loan and no cuts were expected. The expected surplus was to be used for education, kindergarten and household items, and possibly a savings account was to be opened.

They meet with neighbours individually and spontaneously whenever they meet and discuss agricultural issues. They have attended training sessions on growing vegetables and composting and try to attend any training sessions on agricultural topics. For them, the workshops in general have been very helpful, because otherwise they wouldn't be able to grow new crops like tomatoes. Selling tomatoes is very profitable for them.

Overall, the household's financial income has increased in recent years because of HOFSI's activities. With the increased income, they have been able to buy new household items such as mobile phones, food and clothes. Other expenses covered by the increased income include education costs, chemical fertilizer and hired machinery.

The plan for the next few years is to increase the variety of crops, not only tomatoes. The family is very happy with the poly house, as they are growing for sale and for their own consumption these days.

Family 03

Rinchen
Gewog/ Village: Samar/ Balamna

Land owned:	3 Acres (30% for grass production for cows, 70% vegetable production)
Poly Tunnel:	1 (2013)
Compost Pit:	1 (2016/17)
Electric Fencing:	Governmental

There are a total of seven people living in the household of the family interviewed, with two of the five children having completed their studies and currently living in Australia and Canada. Rinchen, his wife and one son participate in agricultural work and share the work equally.

Before participating in the HOFSI project, the family's main income came from dairy farming, selling potatoes and some wheat. In 2023, they live mainly from dairy products, but also sell vegetables such as tomatoes, carrots, chilies and wheat. They also receive remittances from their son who lives in Canada. Overall, the variety of vegetables increased from 1-4 varieties to 5-10 varieties during the project years. While they used to take their potatoes to Phuntsholing, they now have their vegetables picked up directly from the farm by a trader.

For the family, poly house farming is more profitable than open field farming. Regarding organic farming, they say that it is not difficult for them to meet the requirements for organic farming in the because they make their own compost and manure and use cow urine to control weeds. For potatoes they use chemical fertiliser. They do have problems with pests in general, but they do not want to harm the good pests too by adding pesticides and therefore let nature take its course.

For the family, training is the most important thing, along with other inputs such as the poly house and seed quality. They attend the gewog meetings about once a month but discuss most agricultural issues directly with the agricultural officers and the project coordinator, Karma Penjore, when needed.

In 2014, the expectations from the poly house were that it could be used effectively, especially when the weather is not suitable for working outside. In 2023, they will be working in the poly house for about an hour a week, and in the summer for about three hours a week. They have not had any problems with the poly house except for snow damage, where they had to get spare parts and learn how to clear the snow in time.

Financially, they did not see a problem with repaying the loan in 2014 if they worked hard enough. Any surplus money will be used to renovate the house and meet the daily needs of the household. In 2023, the interviews confirmed that it was easy for the family to repay the loan in the foreseeable time and everything was paid back before the planned time. In addition, their financial income has increased by 100% over the last five years as a result of HOFSI's activities. The weekly income increased and more money was available overall. The increased income was used for food and household expenses, as well as for the children's education.

In general, the family is very grateful for the support of the project. In particular, the construction of a compost pit has been beneficial as they no longer need to buy additional fertilizer.

Family 04

Kiba Choden
Gewog/ Village: Kathso/ Engo

Land owned:	2 acres (100% for vegetable production)
Poly Tunnel:	2 (2013 and 2014)
Compost Pit:	1 (2020)
Electric Fencing:	Governmental

In 2023, four people live on the farm. Before the project, the main source of income was the sale of apples and potatoes and milk production. In 2023, carrots are more profitable than selling milk, followed by potatoes, cabbage, broccoli, cauliflower, beetroot and peas. In summer, chilies and tomatoes can also be profitable. Since the family received a poly house through the project, they are now growing vegetables in the field and under the poly house, which seem to be equally profitable for them. However, it is not easy for them to meet the requirements of organic farming, especially in open field production.

Seed quality seems to be very important to the farmers, more important than training or hard work and personal interest. The HOFSI seeds have shown a high yield and therefore an increase in their income.

Kiba attends monthly meetings and is part of a social media group where agricultural issues are discussed. She has also attended various workshops and trainings on vegetable gardening, composting and electric fencing (by the government).

When asked about any concerns about the project in 2014, Kiba was a bit worried about paying back the loan. However, during the interviews in 2023, she stated that it was easy for her to repay the loan and it was paid before the planned time. The income has increased over the last five years due to the activities of HOFSI, mainly due to the quality of seeds, but also due to the acquisition of farming skills and the encouragement and motivation to work. The extra money is mainly used for religious rituals.

For the future, the family is asking for further support from the project, partly because they are concerned that the poly houses may soon erode due to bad weather conditions such as snow and ice.

4.5 | Discussion

The interviews proved to be an important aspect in assessing the situation of farmers in 2012 and, by comparison, in 2023. They gave a clear picture of the current situation and highlighted crucial aspects that cannot be observed through field visits alone.

The distribution and introduction of poly tunnels by offering loans through BDBL has clearly been a success. When done right, poly tunnel farming is an easy way to increase income by improving vegetable production. Women in particular benefit because the poly tunnels are usually located next to the house, making it convenient to work in the poly house between household chores. In addition, the amount of labour required is relatively low compared to open field production. Another great advantage is the possibility of not being dependent on the growing season and the possibility of growing more than once a year. One of the most important results of the interviews was the fact that the loan for the poly tunnels was repaid very quickly by all participants, which is a good sign of increased income and an appropriate repayment rate. The transfer of the poly houses to the next generation was not observed, a plausible reason being that the duration of the project was too short. Another milestone of the HOFSI project was the introduction of electric fencing in response to farmers' needs. Although HOFSI was not the first to introduce this type of fencing in Bhutan, the way in which new techniques were used to construct the fences was seen as a pilot project that was subsequently copied. Looking back over the years, however, electric fencing has not been the beacon of hope that was expected. On the one hand, it has been a matter of getting the installation, maintenance and wear and tear right, and on the other, it has been a challenge to get farmers with different levels of hardship, such as different levels of exposure to wildlife, to pull together as a community. The introduction of the compost pits and the introduction of a new technology of circular farming in the area was of great benefit to the Haa farmers. Initially, the farmers were quite reluctant to adopt the new model, but from time to time they showed great interest. The impact and success of the compost pits, for example in reducing the use of chemical fertilisers and thus saving money, as well as raising community awareness of organic farming, would not have been seen if the project had not been extended, as new things take time to establish themselves. The importance of and interest in seeds has increased over the course of the project, as farmers are willing to invest their newly earned money in seeds. One misleading information in farmers' minds that emerged from the interviews is the myth of the poor quality of government seeds, which are free. The seeds referred to are of the same origin as those provided by the HOFSI project. The only important difference is the additional training and information on how and when to plant the seeds from the PMU, which the government does not provide. One challenge for farmers after the project ends, apart from the question of where they will get their seeds, will be to overcome this misconception. The expertise and the training by the PMU, especially by Karma Penjore, helped the farmers a lot. On the one hand, it was important for them to get new agricultural input and learn how to prepare their fields and beddings with new techniques for new species of crops but on the other hand, have a contact person which is reliable and trustworthy. The best feedback for the HOFSI team is to see and hear their success stories and how they have gained self-confidence in both agricultural and personal matters. Especially from a gender equality point of view, it is a great achievement to see how the women have gained financial independence from their husbands by running their own small businesses. However, in terms of marketing, there is still some potential to be tapped in order to strengthen the network and make it easier for the farmers to sell their vegetables on the market. What could be observed in the 2023 interviews is the formation of social media chat groups to keep in touch and share agricultural issues, a benefit of the new and easy ways of communicating and networking that have developed rapidly in recent years and will continue to do so in the future.

All of the above has greatly improved productivity in terms of vegetable production and financial profit in Haa. By growing more varieties, some of which have not been grown in the valley before, market prices for individuals are higher as people sell different vegetables at different times. Another positive aspect is that the farmers do not have to spend extra money on buying vegetables as they can grow a lot of them themselves or even export them to other places nearby. All this has helped farmers to increase their income and improve their livelihoods. An important general conclusion that will affect the future of the farms, not only in Haa but throughout Bhutan, is the increasing emigration of young Bhutanese to foreign countries such as Australia. The interviews revealed that farms are passed down from mother to daughter. The lack of young people, especially women, in the country, working abroad and uncertain of their return, will not only be a social problem in terms of family structure, but will also have a major impact on the future of smallholder farming. To address this situation, ways must be found to make life in Bhutan, especially in rural areas such as the Haa Valley, more attractive and profitable for future farmers.

"The good seeds and the knowledge of composting made my work easy. The project has made my hard work worthwhile. I feel very confident that I can help other women farmers in my village through my support and guidance."

(Thinley Bidha)

The HOFSI project has several positive impacts on the farmers. Here are some of them as observed in the life of a farmer.

01

Economic Empowerment:
Participating farmer's engagement in vegetable production and marketing has undoubtedly led to higher income levels contributing to their economic well-being. Vegetable production has enabled farmers to diversify their income and reduced the risk of dependence on single crops such as potatoes. The economic benefits derived from vegetable production and marketing have also played a pivotal role in empowering women economically.

02

Improved livelihoods:
With increased income, farmers also experienced improvement in their overall quality of life. For instance, most of them could use increased income to invest in modern conveniences as washing machines and television set that contribute to a more comfortable and efficient home life.

03

Skill development:
Farmers who participated in the project have acquired skills in cultivation techniques. For example, most of the tomato farmers can prune and train the tomato plant which is crucial in optimizing yield and quality. Likewise, some farmers have developed expertise in installing poly tunnels while others have acquired marketing skills and understand market dynamics. These skills not only improve the efficiency of farming operations but also contributed to the overall resilience of the farming community.

The project contributed to the holistic development of farmers and their communities, promoting economic and social development. In recognition of the importance of the donor's financial contribution and the committed efforts of the project team in contributing to the development of the farmers and their communities in Haa Dzongkhag, the Dzongkhag Administration awarded the PMU with a certificate of appreciation (refer to photographic report Fig. 18)

My name is Karma Penjore and as a technical expert who had the privilege of working on the Haa Organic Farming Support Initiative (HOFSI) project in Bhutan's Haa Valley, I have witnessed first-hand the multifaceted impact that organic vegetable farming can have on local communities. The HOFSI project, aimed at empowering farmers through modern techniques and sustainable vegetable farming practices, has not only transformed farming methods but also significantly improved the socio-economic fabric of the region. Here, I outline the impact of our efforts and highlight critical lessons learned along the way.

One of the primary goals of our organic vegetable farming project was to boost vegetable production by introducing advanced farming techniques. By introducing poly tunnels, improved seeds, and implementing practices such as crop rotation, and drip irrigation, we have observed a substantial increase in vegetable yields. These innovations have collectively led to higher yields and better-quality produce, directly benefiting the farmers involved.

Economically, the HOFSI project has been transformative for farmers of Haa valley. By providing microcredit and financial support in the form of subsidies, the project has enabled farmers to invest in poly tunnels and drip irrigation systems. These investments have proven to be worthwhile, as farmers are now seeing higher returns from their tomato crops, which command good prices in the local markets.

The project has significantly popularized the cultivation of tomatoes and carrots among local farmers. The success of these crops has not only boosted their availability in the local market availability but also inspired many farmers to do marketing in distant markets. Consequently, tomatoes and carrots have become the primary livelihood crops in Haa, contributing to improved income generation.

Education and training have been pivotal to the success of our project. Farmers participated in extensive training sessions covering modern farming techniques, and sustainable practices. This comprehensive education has empowered them to make informed decisions, adopt innovative solutions, and take ownership of their farming practices. The resulting sense of empowerment and increased confidence among the farmers is evident. They have transitioned from being passive recipients of aid to active participants in their development.

One of the key lessons learned is the importance of ongoing education and support. Continuous engagement with farmers, and regular training sessions, have been crucial in ensuring the success of the project.

The HOFSI project stands as a testament to the transformative power of organic farming. By improving soil health, promoting environmental sustainability, enhancing farmer health, and opening up new economic opportunities, the project has had a profound impact on the Haa Valley community. As a technical expert involved in this initiative, I am proud of our achievement and firmly believe that the lessons and successes of the HOFSI project can serve as a model for other regions looking to embrace sustainable agricultural practices. The future of farming lies in such holistic approaches that benefit not only the land but also the people who depend on it.

"I am very grateful to the project for the support and I would like to thank Sir Karma for supporting us without any discrimination. We are able to earn much more than before and help our families."

(Tshering Namgay)

In closing, the HOFSI project has laid a strong foundation for sustainable vegetable farming in the Haa Valley, although the future presents new challenges. A significant issue is the migration of youths to towns and foreign countries leaving primarily the aging parents to manage the farms. This trend threatens the continuation of the tradition of passing down farmhouses to daughters and sons. If these youths do not return to the village, the agricultural workforce will dwindle, jeopardizing the progress we've made. The sustainability of our efforts depends on reversing this trend and ensuring that the younger generation sees a future in farming.

To address the challenge of youth migration and ensure the sustainability of farming in Haa, we must make agriculture as interesting and lucrative as possible for young people. This can be achieved by incorporating advanced agricultural technologies that streamline farming processes and increase productivity. Offering financial incentives, such as subsidies, grants, and access to micro credits, can help young farmers invest in their farms and see immediate economic benefits.

Creating educational programs that showcase the benefits and potential of modern farming can inspire and equip young people with the knowledge and skills they need to succeed. These programs can emphasize the profitability, sustainability, and innovative aspects of agriculture.

Additionally, fostering a vibrant agricultural community with ample opportunities for social engagement and collaboration can make farming more appealing. Building networks where young farmers can share ideas, resources, and experiences will create a supportive environment that encourages them to stay in Haa and continue farming. By investing in these strategies, we can ensure that the next generation sees farming not only as a viable career but as a fulfilling and prosperous way of life. This will help retain and attract young people to the Haa Valley, securing a sustainable future for its agricultural sector.

08 | Note of thanks

As we reach the conclusion of Haa Organic Farming Support Initiative (HOFSI) project in Haa Valley, the project team would like to take a moment to extend our deepest gratitude to everyone who contributed to this remarkable journey.

First and foremost, our heartfelt thanks go to the local farmers whose hard work, dedication, and unwavering commitment to sustainable agriculture have been the cornerstone of this project. Your hard work, passion and trust in us have not only ensured the success of this initiative but have also inspired us all.

We also extend our gratitude to His Excellency, Late Lynpo Chenkhab Dorji, Dasho Kuenzang Dorji, ex-Dzongda Haa, Mr. Karchung, (District Agriculture Officer), Gewog Extension Officers and Gups of Bji, Katsho, Uesu, Samar and Sombaykha for their continuous support and encouragement. Their guidance and collaboration have been vital in overcoming challenges and achieving the shared goals.

Special thanks to our funding partners Mr. Rudolf Josef Knünz, and his family members, Mrs. Regina Geisler-Knünz, Mr. Valentin Geisler-Knünz, Mrs. Anna Wieser, Mr. Jonas Hardege and rest of the family members whose generosity and belief in the vision of sustainable agriculture made this project possible. Your support has been crucial in transforming Haa Valley into a model of organic farming.

To our project team from BDBL and PMU, Mr. Karma Penjore, Mr. Jambay Dorji, Mrs. Leki Dema thank you for your tireless efforts and contributions. Your expertise, enthusiasm, and teamwork have been instrumental in making this project a reality. From planning and implementation to monitoring and evaluation, your dedication has been exemplary.

Lastly, to the farmers of Haa, thank you for embracing this project and for your continuous support. Your involvement and cooperation have been fundamental in creating a sustainable future for the valley.

As we close this chapter, we celebrate the achievements and look forward to the lasting impact this project will have on the community and the environment. Together, we have sown the seeds of a greener, healthier, and more sustainable future.

With deepest gratitude,
the HOFSI Team

“The HOFSI project is more than family to us!”

(Kinley Bidha, Ugyen Chenzom)

Annexure 1

Chiwogs and Gewogs under the project

Villages	Gewog	H/H	Males	Female	Farmers
Chumpa	Bji				
Tokey					
Yangthang					
Talung					
Bali	Kathso				
Ingo					
Wangcha					
Kajena					
Bangayna	Uesu				
Dumcho					
Kibri					
Chilungkha					
Tshaphel					
Kana					
Girina					
Shari	Samar				
Nobgang					
Dorikha					
Balamna					
Jankana					
Sombay Ama	Sombaykha				
Gayraykha					
Nakikha					
Nakha Tashigang					
Moochu					
Shaba Shebji					

Annexure 2

List of farmers allocated with poly houses and drip irrigation systems

Sl. No	Name	Village	Qty	Gewog	Farmers
1	Mrs. Chimi	Hatey	1	Bji	2014
2	Mr. Karma Dechen	Tokey	1		
3	Mr. Tshering Wangchuk	Tokey	1		
4	Ms. Tshering Wangmo	Gensa	1		
5	Ms. Yangzom	Chumpa	1		
6	Ms. Pemo	Longloo	1		
7	Ms. Tshewang lhamo	Wooka	1		
8	Ms. Lungten Dema	Tsenkha	1		
9	Ms. Thinley Wangmo	Tsenkha	1		
10	Ms. Sangay Lham	Tsenkha	1		
11	Ms. Lhaki	Wooka	1		
12	Mr. Passang	Tsenkha	1		
13	Ms. Rinchen Dema	Pongpu	1		
14	Ms. Tshering Om	Bhamjoo	1		
15	Ms. Desang	Yangthang	1		
16	Ms. Yangzom	Yangthang	1		
17	Mr. Dhendup Norbu	Chumpa	1	Bji	2015
18	Mr. Dawa Tshering	Chumpa	1		
19	Ms. Yangchen	Gensa	1		
20	Mr. Penjor	Hatey	1		
21	Ms.Pem	Chumpa	1		
22	Mr. Karma Dechen	Tokey	1		
23	Mr. Tshering Wangchuk	Tokey	1		
24	Ms. Gaki	Yangthang	1		
25	Ms. Phub Dema	Bali	1	Bji	2018
26	Mr. Sangay Dorji	Nagtsho	1	Katsho	2014
27	Ms. Tshering Wangmo	Bali	1		
28	Ms. Pema Lhamo	Bali	1		
29	Ms. Tshering Pem	Ingo	1		
30	Ms. Kiba	Ingo	1	Katsho	2014
31	Mr. Chundu	Wangcha	1	Kathso	2015
32	Ms. Tashi Wangmo	Wangcha	2		
33	Ms. Mindu Wangmo	Naktso	1		
34	Ms. Kipa	Ingo	1		
35	Ms. Ugyen	Kathso Goenpa	1		
36	Ms. Lhab Gyem	Kajena	1		

Sl. No	Name	Village	Qty	Gewog	Farmers
37	Ms. Wangmo	Gangkha	1	Katsho	2017
38	Ms. Kachi	Gangkha	1		
39	Ms. Tshering Yangchen	Wangcha	1		
40	Mr. Tenzin Zimba	Dumcho	1	Uesu	2014
41	Ms. Nim Bidha	Kana	1		
42	Mr. Gem Dorji	Kana	1		
43	Mr. Nima Tshering	Tshaphel	1		
44	Ms. Noza Dem	Tshaphel	1		
45	Ms. Zam	Tshaphel	1		
46	Ms. Pem	Dumcho	1		
47	Ms. Sonam Choden	Kana	1		
48	Ms. Lhaden	Chilungkha	1		
49	Ms. Pema Wangmo	Chilungkha	1		
50	Mr. Ugyen	Dumcho	1	Uesu	2015
51	Mr. Lhab Dorji	Bangayna	1		
52	Mr. Tshering	Bangayna	1		
53	Ms. Kinley Bidha	Bangayna	1		
54	Mr. Lhab Tshering	Bangayna	1		
55	Ms. Ugyen Choden	Bangayna	1	Uesu	2017
56	Ms. Choden	Bangayna	1		
57	Ms. Pema Choden	Bangayna	1	Uesu	2018
58	Kinley Bidha	Bangayna	1		
59	Ms. Lhamo	Balamna	1	Samar	2014
60	Ms. Tshering Bidha	Balamna	1		
61	Mr. Rinchen	Balamna	1		
62	Mr. Hodo	Bachakha	1		
63	Ms. Kesang Wangmo	Dolena	1		
64	Ms. Jamyang Lham	Jasa jangu	1		
65	Ms. Tsendu	Shari	1		
66	Ms. Sonam Dema	Balamna	1		
67	Ms. Karma Choden	Balamna	1	Samar	2015
68	Ms. Tshering Bidha	Nobgang	1		
69	Ms. Gyem	Jankana	1		
70	Mr. Tshewang Namgay	Longpa	1		
71	Mr. Namgay Dorji	Balamna	1		
72	Ms. Tshering Pem	Chungumna	1	Samar	2017
73	Ms. Phub Dem	Hataykha	1		
74	Mr. Nima Tshering	Dorikha	1		
75	Mr. Chimiwangchuk	Shari	1		

Sl. No	Name	Village	Qty	Gewog	Farmers
76	Mr. Tshering Wangdi	Sombay Ama	1	Sombaykha	2017
77	Mr. Dawa	Sombay Ama	1		
78	Mr. Tashi	Nakhekha	1		
79	Mr. Samdrup	Moochu	1		
80	Mr. Sangay Wangdi	Moochu	1		
81	Mr.Wangchuk	Shebji	1		
82	Mr. Kencho	Shebji	1		
83	Mr. Kinley	Shebji	1		
84	Mr. Chimi Wangchuk	Gareykha	1		
85	Mr. Thinley	Nakah Tashigag	1	Sombaykha	2018
86	Ms. Tshering Dema	Gyelraykha	1		
			87	**total**	

Annexure 3

Beneficiaries list of HDP pipe

Sl. No	Name	Village	Qty	Gewog	Farmers
1	Ms. Thinley om	Tsenkha	1	Bji	2014
2	Ms. Rinchen Dema	Pongpu	1		
3	Mr. Passang	Tsenkha	1		
4	Ms. Tshering Om	Bhamjoo	1		
5	Ms. Lhaki	Wooka	1		
6	Ms. Pem	Longloo	1		
7	Ms. Tshewang Lham	Wooka	2		
8	Ms. Lungten Dema	Tsenkha	2		
9	Ms. Desang	Yangthang	1		
10	Ms. Yangzom	Yangthang	1		
11	Ms. Yangzom	Jamtoe-goenpa	1		
12	Ms. Chimi	Champa	1		
13	Ms. Yangchen	Goensa	2	Bji	2015
14	Ms. Wangmo	Tokey	2		
15	Mr. Dhendup Norbu	Chumpa	3		
16	Mr. Wangchuk	Tokey	1		
17	Mr. Dawa Tshering	Chumpa	3		
18	Mr. Penjor	Chumpa	3		
19	Ms.Pem	Chumpa	3		
20	Mr. Sangay Dorji	Kajena	2	Katsho	2014
21	Ms. Tsherimg Pem	Ingoo	3		
22	Ms. Kiba	Ingoo	3		
23	Ms. Pema Lham	Bali	2		
24	Ms. Phub Dem	Bali	3		
25	Ms. Tashi Yangzom	Wangcha	4	Katsho	2015
26	Mr. Chundu	Wangch	3		
27	Ms. Balang	Kathso Goenpa	3		
28	Mr. Tsemba Dorji	Nagtso	3		
29	Wangmo	Gangkha	3	Katsho	2017
30	Kachi	Gangkha	3		
31	Tshering Yangchen	Wangcha	3		
32	Ms. Noza Dem	Tshaphel	1	Uesu	2014
33	Mr. Ugyen	Tshaphel	2		
34	Ms. Lhaden	Chilingkha	1		
35	Ms. Pema Om	Chilungkha	3		
36	Mr. Tenzin Jamba	Dumtsho	3		
37	Ms. Pem	Dumtsho	2		

Sl. No	Name	Village	Qty	Gewog	Farmers
38	Ms. Kinley Bidha	Bangayna	2	Uesu	2015
39	Mr. Tshering	Bnagayna	2		
40	Mr. Lhab Dorji	Bangayna	2		
41	Mr. Lhab Tshering	Bangayna	2		
42	Ms. Lhaden	Chilungkha	1		
43	Mr. Rinchen	Balamna	2	Samar	2014
44	Mr. Lham	Balamna	3		
45	Ms. Karma Choden	Balamna	3		
46	Ms. Kesang Choden	Balamna	3	Samar	2015
47	Ms. Gyem	Jankana	3		
48	Mr. Tshewang namgyel	Longpa	3		
49	Ms. Tshering bida	Nobgang	3		
50	Tshering Pem	Shari	3	Samar	2017
51	Chimi Dorji	Shari	3		
52	Phub Dem	Shari	3		
53	Nima Tshering	Dorikha	1		
54	Samdrup	Moochu	3	Sombaykha	2017
55	Ugyen	Moochu	3		
56	Tshering Wangdi	Sombay Ama	3		
57	Dawa	Sombay Ama	3		
58	Tashi	Sombay Ama	3		
59	Chimi Wangchuk	Geldakha	3		
60	Wangchuk	Shaba	3		
61	Kenchoi	Shebji	3		
62	Kinley	Shebji	3		

Annexure 4

Beneficiaries list of plastic sheets

Sl No.	Name	Village	Total Cost Nu.	Farmers contribution Nu. (20%)
1	Mr. Passang	Tsenkha	12,850.00	2,640.00
2	Ms. Tshering Bidha	Tsenkha	12,850.00	2,640.00
3	Ms. Thinley Om	Tsenkha	12,850.00	2,640.00
4	Ms. Pem	Longlo	12,850.00	2,640.00
5	Ms. Tshering Om	Bhamjoo	12,850.00	2,640.00
6	Mr. Lhendup Norbu	Chumpa	12,850.00	2,640.00
7	Mr. Rinzin Namgay	Chumpa	12,850.00	2,640.00
8	Ms. Kiba (A)	Ingo	12,850.00	2,640.00
9	Ms. Kiba	Ingo	12,850.00	2,640.00
10	Ms. Tshering pem	Ingo	12,850.00	2,640.00
11	Mr. Chundu Tshering	Wangcha	12,850.00	2,640.00
12	Ms. Tshering Yangchen	Wangcha	12,850.00	2,640.00
13	Mr. Lhab Dorji	Bangayna	12,850.00	2,640.00
14	Mr. Lam Tshering	Bangayna	12,850.00	2,640.00
15	Ms. Kinley Bidha	Bangayna	12,850.00	2,640.00
16	Ms. Tashi Om	Bangayna	12,850.00	2,640.00
17	Ms. Choden	Bangayna	12,850.00	2,640.00
18	Ms. Pema Wangmo	Chilunkha	12,850.00	2,640.00
19	Ms. Lhaden	Chilunkha	12,850.00	2,640.00
20	Ms. Ugyen Yangzom	Tshaphel	12,850.00	2,640.00
21	Ms. Zangmo	Tshaphel	12,850.00	2,640.00
22	Ms. Noza Dem	Tshaphel	12,850.00	2,640.00
23	Ms. Damchey Pem	Dumcho	12,850.00	2,640.00
24	Ms. Pem	Dumcho	12,850.00	2,640.00
25	Mr. Gem Dorji	Kana	12,850.00	2,640.00
26	Ms. Tshering Lham	Kana	12,850.00	2,640.00
27	Ms. Sonam Choden	Kana	12,850.00	2,640.00
28	Mr. Hodo	Shari	1,2850.00	2,640.00
29	Ms. Tshering Pem	Shari	12,850.00	2,640.00
30	Ms. Jamyang Lham	Shari	12,850.00	2,640.00
31	Ms. Jigme	Balamna	12,850.00	2,640.00
32	Ms. Lham	Balamna	12,850.00	2,640.00
33	Ms. Sonam Dem	Balamna	12,850.00	2,640.00
34	Ms. Tsindu	Shari	12,850.00	2,640.00
35	Ms. Lungten Dem	Tsenkha	12,850.00	2,640.00
36	Ms. Yangzom	Yangthang	12,850.00	2,640.00
37	Ms. Phub Dem	Bali	12,850.00	2,640.00
38	Mr. Sangay Dorji	Kajena	12,850.00	2,640.00
39	Ms. Gaki	Yangthang	12,850.00	2,670.00
40	Mrs.Yangzom	Yangthang	12,850.00	2,670.00
41	Mrs. Tshering Om	Gensa	12,85000	2,670.00
42	Mrs. Tshewang Dem	Chumpa	12,850.00	2,670.00
43	Mrs. Desang	Yangthang	12,850.00	2,670.00
44	Mrs. Chimi Om	Chumpa	12,850.00	2,670.00
45	Mr. Dechen Wangdi	Jamtey Goenpa	12,850.00	2,670.00
46	Mr. Tshering Wangchuk	Tokey	12,850.00	2,670.00
47	Ms. Rinchen Dem	Makona	12,85000.	2,670.00
48	Mr. Chimi Dorji	Shari	12,850.00	2,670.00
49	Mr. Nima Tshering	Dorikha	12,850.00	2,670.00
50	Ms. Phub Dem	Shari	12,850.00	2,670.00
51	Mr. Kinley	Shebji	12,850.00	2,670.00
52	Mr. Gongloo	Shebji	12,850.00	2,670.00
53	Mr. Wangchuk	Shaba	12,850.00	2,670.00
54	Ms. Pema Choden	Bangayna	12,850.00	2,670.00
55	Ms. Ugyen chenzom	Bangayna	12,850.00	2,670.00
56	Mrs. Pema Thungzom	Kana	12,850.00	2,670.00
57	Mrs. Dawa Dem	Tshaphel	12,850.00	2,670.00
58	Mr. Tobgay	Bangayna	12,850.00	2,670.00
59	Mr. Ugyen	Dumcho	12,850.00	2,670.00
60	Mr. Nim	Nobgang	12,855.00	2,670.00
			771,031.00	159,060.00

Annexure 5

Beneficiaries list of compost sheds

Sl. No	Name	Village	Gewog	Remarks
1	Mr. Rinchen	Balamna	Samar	Pilot
2	Ms. Ugyen Chenzom	Bangayna	Uesu	Pilot
3	Ms. Pema Choden	Bangayna	Uesu	Pilot
4	Ms. Wangcha group	Wangcha	Katsho	Pilot
5	Ms. Chimi Om	Talung	Bji	Pilot
6	Ms. Tshering Pem	Engo	Kathso	20% contribution
7	Ms. Kiba	Engo	Kathso	20% contribution
8	Mr. Lam Sangay	Engo	Kathso	20% contribution
9	Mr. Kipchu Tshering	Engo	Kathso	20% contribution
10	Mr. Tsemba	Engo	Kathso	20% contribution
11	Mr. Dawa Tshering	Engo	Kathso	20% contribution
12	Ms.Dem	Engo	Kathso	20% contribution
13	Ms. Chimi Dem	Engo	Kathso	20% contribution
14	Mr. Namgay TShering	Engo	Kathso	20% contribution
15	Ms. Thinley Bidha	Engo	Kathso	20% contribution
16	Ms. Gaki	Yangthang	Bji	20% contribution
17	Ms. Tshering Om	Yangthang	Bji	20% contribution
18	Ms. Tashi Om	Bangayna	Uesu	20% contribution
19	Ms. Kinley Bidha	Bangayna	Uesu	20% contribution
20	Ms. Choden	Bangayna	Uesu	20% contribution
21	Mr. Ugyen	Dumcho	Uesu	20% contribution
22	Mr. Kinley Wangchuk	Dumcho	Uesu	20% contribution
23	Ms. Pem	Dumcho	Uesu	20% contribution
24	Mr. Tshewang Dorji	Chilungkha	Uesu	20% contribution
25	Ms. Dem	Kana	Uesu	20% contribution
26	Ms. Tshering Lham	Kana	Uesu	20% contribution
27	Ms. Pema Thungzom	Kana	Uesu	20% contribution
28	Ms. Phub Gem	Kana	Uesu	20% contribution
29	Ms. Sonam Dem	Balamna	Samar	20% contribution
30	Ms. Sonam Choden	Balamna	Samar	20% contribution
31	Kincho Zam	Chumitenkha	Samar	20% contribution
32	Sangay	Shungaychongna	Samar	20% contribution
33	Sangay Dawa	Longpa -Nobgang	Samar	20% contribution
34	Kinzang Wangmo	Kintshokha	Samar	20% contribution
35	Lham Tshering	Barasham	Samar	20% contribution
36	Choden	Lhakhang chenkha	Samar	20% contribution
37	Sonam Choden	Longpa -Nobgang	Samar	20% contribution
38	Rinzin Lham	Nobgang	Samar	20% contribution
39	Tshering Bidha	Sagachen	Samar	20% contribution
40	Naphay	Phuntsho pelri	Samar	20% contribution
41	Sonam Zam	Talamten	Samar	20% contribution
42	Kinley Yangzom	Nobgang	Samar	20% contribution
43	Nima Tshering	Dorikha	Samar	20% contribution
44	Norbu Zangmo	Kibri	Uesu	20% contribution
45	Ugyen Dem	Kibri	Uesu	20% contribution
46	Tshering Pem	Kibri	Uesu	20% contribution
47	Ugyen Zam	Kibri	Uesu	20% contribution
48	Yeshi Choden	Kibri	Uesu	20% contribution
49	Chimi Dem	Dumcho	Uesu	20% contribution
50	Lhanzo	Bangayna	Uesu	20% contribution
51	Lhab Dorji	Bangayna	Uesu	20% contribution
52	Tshewang Dem	Chumpa	Bji	20% contribution

Annexure 6 Terms of reference

I.
Motivation and objectives

Haa District is a vegetable growing district in western Bhutan. It is mainly dominated by small farms (< 2 acres). Vegetable farming has steadily increased over the last two decades. After fruits and potato, vegetables remain the primary source of livelihood for majority of the farmers in this district. The main vegetables include cabbage, cauliflower, carrot, asparagus, green pea, radish, beans, cucumber, chili and greens. Vegetable production and productivity in general is low. Low productivity can be attributed to natural and man-made reasons. Natural factors include shortage of irrigation water, inconsistent rain, insect pest, wild animals and crop diseases.

Man-made factors are poor soil management and lack of improved agricultural inputs. All of these problems have resulted in low productivity of vegetables.

Farmers in Ha and close-by districts usually produce more or less similar crops leading to stiff competition. Diversification of vegetable production is important to ensure many sources of both income for the farmer and product for the general consumers.

Vegetable farming in Ha is a challenge because of small land size holding and rugged topography with steep land, making farm labour intensive and mechanization difficult. Further, the growers face challenges with managing pest, disease and wild animals. Consumers generally demand for better quality vegetables. Quality vegetable to them means healthy, succulent and fresh looking vegetables with no visible rashes or blemishes caused by pests or diseases. To satisfy this demand, farmers have to tackle pest and disease problems by all means. The use of agrochemicals including pesticides has been found to be the immediate and cheaper way to produce unblemished vegetables and increased farm productivity. This practice has unfortunately created numerous problems associated with pesticide abuse such as accidental poisoning to man, upset of natural environment balance and toxic residues that are hazardous to health and the environment. Major pest and disease in vegetables include late blight, leaf spots, wilts, club root, aphids, cut worms, white butterfly, fruit flies etc.

Sustained supply of the quality seeds at the right time for augmenting agricultural growth is a key issue that needs to be recognized. Farmers in these areas often face problems with availability of quality seeds.

Further, the project will have a positive impact on the decrease of pesticide use.

Within the broad framework of the national development strategy the government is promoting the production of cash crops that has seasonal advantage over other crops in the neighbouring countries. The RNR policy (renewable natural resources policy) is geared towards transforming the agriculture sector from subsistence farming to a market-oriented commercial farming. The Royal government has taken various initiatives for balancing the trade deficit by replacing imports for domestic consumption and generating a surplus for export. The Ministry of Agriculture and Forests (MoAF), particularly the crop sector has on its part have taken steps to enhance and scale up exports from crop-based agriculture. On its priorities is the initiative to be self-sufficient in vegetables to replace imports in 2 years and to generate a surplus for export to earn foreign exchange. Hence, the MoAF has come up with a National Vegetable Production and Marketing Plan coordinated through the Vegetable Coordination Committee.

Given this scenario, there are many opportunities to encourage and enhance vegetable production in Ha to diversify farmers´ source of livelihood in line with the national policies.

The main goal of this project is to improve the livelihood of Ha farming households, by increasing their income and giving them the opportunity to optimize their productivity in vegetable production. This will be accomplished through providing material (poly tunnels, drip irrigation and fencing) as well as intensive training for the farmers. This will enhance the livelihood of the participating farmers and their families, and also increase the economic growth in this rural area of Bhutan.

After meeting those goals in the Haa area, follow-up projects will be initiated to transfer the success to other, more challenged districts in Bhutan. Therefore, this project can be regarded as a pilot project. For this reason, it is of utmost importance to qualitatively and quantitatively evaluate the progress and success of the initiative.

II.
Project details

A | General organization

Within the timeframe of three years, roughly 200 households will participate. Half of those will receive materials for fencing, the other half will be equipped with poly tunnels and drip irrigation systems. These materials (including seeds) will be provided half through subsidy and half through loans. The distribution and reimbursements of these loans will be organized by the BDBL. The coordination and distribution materials themselves as well as technical assistance to the farmers will be conducted by the project management unit (PMU), located in Paro.

As the budget for the material is fixed, the exact number of participating households depends on the final costs of material and the exact proportioning between households supported with fencing and those with poly tunnels.

The selection of the farmers will be conducted by a selection committee, to be defined by the local authorities of the Ha district. In order to reach the project goals, participating farmers have to be chosen wisely. As a guideline for the selection process precise selection criteria are defined.

B | Technical details

The Haa district lies in the cold temperate regions with shorter seasons. Majority of vegetable cultivation is done on the dry lands located on the mountain slopes. The following measures and interventions will enhance vegetable production.

Seeds are one of the most important inputs for successful vegetable production. The commonly used seeds are the open pollinated seeds produced by government organizations and some private firms. In order to diversify the vegetables, high value crops like salad crops (Lebanese cucumber, herbs, salads...) need to be introduced into their production system.

Though the framers have enough experience of working on farms, they still need to be trained in managing their crop, water and nutrient management and pest and disease management. Therefore, training, supervision and technical assistance is a crucial part of the project.

These activities will be conducted by Bhutanese specialists. The PMU is responsible for the organization of those activities.

Further, the implementation of a cooperative marketing strategy in cooperation with authorities within the MoAF is contemplated to optimize the effect on farmers´ livelihood and the overall performance of the project.

01 | Poly tunnels

Crop growth is rapid during the summer with the potential for several crops in the season. Vegetable cultivation with poly tunnels offers the following advantages:

- It extends the growing season by allowing extended season and over-winter production;
- It allows more diverse, higher value niche crops to be produced, leading to higher returns;
- It provides protection from rain, insects, wild animals and diseases;
- Protection from natural seasonal weather conditions.

One major constraint faced by the vegetable growers in this district is not only the availability of irrigation water but also increasing the efficiency of use of the available water. In many of the vegetable farms the growers use earthen channels to carry water to their field by gravity and then water allowed to flood the field. This method of irrigation is inefficient leading to loss of water, nutrient and soil through surface runoff. On other occasion the farmers time their seedling transplanting with the rain. One means to improve efficiency of available water is the use of drip irrigation system.

After the expected product life of around 6 years for poly tunnels sheets, additional loans for the renewal can be provided, in case the farmers cannot cover the costs themselves.

02 | Fencing

Damage of crops by wild life is a common reality faced by many of Bhutanese farmers. Wild animals have ruined entire field of crops on many occasions. Therefore protection of crops from wild animals is very important to enhance vegetable and seed production. The farmers provided with fencing will be able to produce more and higher value vegetables. Further, about 50% of the selected farmers for mesh-wire fencing will specialize in seed production.

Mesh-wire fencing will provide economical safety and enable farmers to invest in high value crops and to do long term planning.

C | Financial organization

The donor will transfer the project costs (on a yearly basis) for the following year to the BDBL account. A fixed portion of this budget will be allocated for operational costs (PMU), administrated by the project coordinator. The remaining portion will be allocated for material costs, also administrated by the project coordinator. Each participating household will receive 50% of the material value as subsidy, while the remaining 50% will be given as loan. BDBL is responsible for giving out loans as well as collecting the reimbursements. The loans will have a fixed interest rate of 10%, which BDBL will receive to cover operational costs. The loans are designed for duration of the reimbursement of three to five years. The returned loans will flow back to the project account and used to help finance other farmers and eventually a follow-up project and the renewal of poly tunnels in case farmers cannot provide this independently.

D | Selection criteria

In order to distribute the resources in the most effective and reasonable way, the following selection criteria should be considered. Selected farmers must fulfil all of the listed criteria below.

01 | Technical Requirements

- Land must be large enough for poly tunnels
- Land must not be too steep
- If poly tunnels are required, there must be a source of water for drip irrigation systems
- Land must be in the geographical regions that are considered within this project (which will be defined at a later stage)

02 | “Personal” Requirements

- Farmers must be highly motivated
- Willing to attend multiple trainings and pass on their knowledge to other community members
- Must show a positive attitude concerning the use of new crops and new techniques
- Willingness to regularly give feedback to coordinators. In return coordinators assist with any related questions
- Personal resources to cope with increased labour needs
- Responsibility
- Patience and Diligence, as the project lasts for years
- Each household can only be provided with material for either poly tunnels or mesh-wire fencing

03 | Aspects connected to the goal of the project

- Farmers must be economically challenged
- Farmers who struggle with some sort of constraint (financially, in terms of agricultural constraints etc.) should be preferred if they meet the “Personal” and “technical” criteria
- must not already own a poly tunnel or wire-mesh fencing.

E | Details of technical assistance, training of farmers

During the period of the project implementation, the following key activities will be performed by the consultants.

It is required that the field expert works closely with the farmers to guide them through out the project period. This project on enhancement of vegetable and seeds is to be initiated in a region which is much colder compared to other parts of Bhutan. Therefore, high priority is given to the vegetable and seed production using poly tunnels.

The use of poly tunnels for producing vegetables and seeds is relatively new to most of the farmers under the project area and they will require guidance right from construction of the poly house. With proper guidance, features like insect proofing, access to irrigation water and other features to facilitate easy inter cultural operation can be incorporated. Unlike the field production system, the crop production under poly houses can extend the cultivation season and will have to be intensive to get the maximum benefit. There will be intensification in terms of soil management, water management and pest management. While the farmers can deal with basic production practices, it is envisaged that farmers would require expert’s opinion and guidance on plant protection, soil and nutrient management and other specific agronomic practices. Therefore, the field expert would be required to visit the project site frequently to guide and train farmers till they are able to take specific measures and decisions independently.

One important activity of the project is to build the capacity of the farmers to sustain vegetable and seed production once the project exits. Farmer need to be supported in understanding the problems associated with vegetable production and required measures to solve the problems. Some key problems visualized are pest and disease, crop management and nutrient management. Capacity of the farmers can be developed through short trainings on specific topics, conducting field days and through guided practice. Such short

gatherings will also provide opportunities for project beneficiaries to share views and successful stories with each other. While conducting trainings on specific subject matter, as a normal practice in Bhutan, farmers are required to be provided with simple working lunch and refreshments (tea and snacks).

In addition, pictorial guides with simple and clear instruction will be developed which can be used as a ready reference by the farmers. Such pictorial guides can be on pest and disease management and specific crop management practices.

F | Details of the consultants´ tasks

01 | Project Coordinator: Mr. Jambay Dorji

1. Liaising with BDBL
2. Liaising with Dzongkhag Administration
3. Liaising with Gewog Administration
4. Liaising with input suppliers within and outside Bhutan
5. Undertaking administrative duties, managing budgets and accounts, updating information, and preparing reports
6. Arrangement of (Local) technical assistance
7. Identification/selection of farmers
8. Supply chain development
9. Attending meetings, Conference and seminars related to PMU
10. Overseeing the overall project activities
11. Liaising with donor agency

02 | Technical Expert: Mr. Karma Penjore

1. Identification/selection of farmers
2. Training of farmers on crop management (water and soil fertility etc.)
3. Identify core pest and disease in vegetables and train farmers on their management
4. Provide on site advice on good agriculture practices (GAP)
5. Dissemination of research-based information on vegetable and seed production
6. Assist farmers in improving the existing practices and adopting new ones
7. Monitoring farmer's performance and vegetable production
8. Facilitating the delivery of inputs (pipe house, fertilizers, pesticides etc.)
9. Writing advisory leaflets
10. Organizing farmers' meetings and field days
11. Attending meetings, Conference, and seminars related to PMU

03 | Office Assistant

1. Maintain and organize the PMU office at all time.
2. Receive and respond to telephone calls, fax messages
3. Perform bank and postal duties
4. Maintain records for purchases, disbursement and stocks
5. Update book keeping and accounts of PMU
6. Correspond with clients, donors, and coordinators through emails and phone calls
7. Draft letters and documents related to training materials

G | Details of capacity development

01 | Capacity development (Farmers)

1. Basic bookkeeping
2. Marketing
3. Post-harvest technology for vegetables

02 | Capacity development of Training of Trainers (Extension agents)

1. Group formation
2. Pest and disease management
3. Soil and nutrient management

03 | Details of Technical assistance required by PMU

PMU will have to outsource the following activities to local TA to train the farmers:

1. Group formation
2. Marketing
3. Post-harvest technology

The budget for any outsourced activities is already included in the budget (see budget details, Tables 3-5)

H | Additional guidelines

In order to ensure the project´s success the following aspects have to be kept in mind:

- Go in sync with National strategies
- Integrate national authorities as extensive as possible
- Loan distribution has to be as impartial and fair
- Respect and integrate opinions and ideas from communities
- Be flexible and aim for individual solutions considering the specific situation of the individual farmers.

III.
Constraints

A | Timescale of the project

The core of the project will be operated within three years.

First year
- Selection of all farmers
- Evaluation of a priori life situation of selected farmers
- Start of training for all participating farmers
- Providing 40% of the participating farmers with the material
- Monitoring of project

Second year
- Continuous training for all participating farmers
- Providing 60% of the participating farmers with the material
- Monitoring of project

Third year
- Continuous training for all participating farmers
- Evaluation of project outcome

After third year
- Farmers will continue to reimburse the loans
- Further needs of farmers will be estimated

B | Project board

The board will be formed by

Lynpoo C Dorji (Chairman)
Jambay Dorji (Member secretary)
Regina Geisler (Donor representative)
One more member nominated by the BDBL
There will be one meeting each year, where the PMU and BDBL present the report of the project's progress.

The project board member secretary will prepare the agenda for the meeting and provide a report on the resolutions taken during the meeting as well as general overview of the discussed items.

C | Budget details

	Activities	Units	Year 1	Year 2	Year 3	Total
	Activities	units	Year 1	Year 2	Year 3	Total
1	Provision of seeds	Pkts	500	500	500	1500
2	Provision of Poly tunnels	Sets (20m)	40	60	0	100
3	Provision of drip irrigation	sets	40	60	0	100
4	Wire mesh fencing	Acres	40	60	0	100

Table1: Required units of material (hardware)

It is noted, that the budget below is a final budget, including all taxes and extra costs.

	Activities	Cost per unit	Year 1	Year 2	Year 3	Total
1	Provision of seeds	0,0001	0,05	0,05	0,05	0,15
2	Provision of Poly tunnels	0,1	4	6	0	10
3	Provision of drip irrigation	0,03	1,2	1,8	0	3
4	Wire mesh fencing	0,051	2,04	3,06	0	5,1
	Total hardware		**7,29**	**10,91**	**0,05**	**18,25**
5	Project administrative cost		2,60	2,39	2,39	7,38
	Total		**9,89**	**13,30**	**2,44**	**25,63**

Table2: Financial requirement (in million Nu.)

*Approximately 395000 Euros

	Particulars	Qty	Estimated cost	Remarks
1	Project coordinator	1	0,54	0,045 pm
2	Technical expert	1	0,48	0,04 pm
3	Office assistant	1	0,18	0,015 pm
4	Field supervision budget		0,2	Perdiem for field inspection
5	**Total PMU staff pa**		**1,40**	**Million Nu.**

Table 3: Personal/Staffs (in million Nu. per annum)

	Particulars	Qty	Estimated cost	Remarks
1	Office rental	1	0,12	Lump sum
2	vehicle rental	1	0,2	Hire charges for hiring car for field inspection and other visits (lump sum)
3	Stationeries/ cartridges, toners		0,1	
4	Over head cost		0,1	(electricity, telephone, internet, fax, postal)
5	**Miscellaneous expense**		**0,3**	**To cover the expense pertaining to the mission visit interms of arranging meeting/ conferences (lump sum)**
5	**Training**		**0,17**	**Estimated cost: 3000 Nu. per training per head**
	Total PMU other pa		**0,99**	**Million Nu.**

Table 4: PMU (in million Nu. per annum)

Total projected cost per annum for the PMU = Total PMU staff (1.4) + Total PMU other (0.99)= 2.39 Million Nu ; approximately 37000 Euros

	Particulars	Qty	Estimated cost	Remarks
1	LCD projectors	1	0,07	For farmers training
2	Photocopy machines with fax	1	0,05	
3	Laptops	3	0,09	Laptops for each of the staffs for project administration and coordination
	Total PMU extra		**0,21**	**Million Nu.**

Table 5 : PMU (in million Nu. for full project time)

D | Measures of success (evaluation)

To measure the impact of the project it is necessary to qualitatively and quantitatively monitor and evaluate the progress and the status quo of activities and to discuss it with the donor

01

After the selection of the farmers is finalized, an ex-ante evaluation of the living situation of the participants will be conducted. This baseline study will include a rough overview of economic status, family situation, details about the specific agricultural conditions etc. The information will be gathered through visits and interviews and will help during the monitoring process and serve as comparison material for the final evaluation at the end of the project. This will be carried out by Regina Geisler, the costs will be handled externally.

02

During the course of the project, monitoring is an important part to secure the success of the project. Detailed information about the project has to be provided by the project management unit. This includes updates on the adherence of budget, possible challenges during the phase of building the poly tunnels and fences, progress of vegetable production etc.

03

At the end of the project there will be a final evaluation to investigate the impact of the project. This impact will be measured quantitatively (“To which percentage did the income increase?”, “How did the financial status change?” etc.) and qualitatively (“How did this project effect life situation within the family/ community?”, “Did the amount of daily labor increase?” etc.). Again interviews with participating farmers and site visits will be used to gather the information. After the data is analysed, it will be compared to the outcome of the ex-ante-evaluation and will give a precise overview of the progress and the effects of the project. This last step of the project evaluation aims to reveal the impact of the project. It further can be used to optimize the project outline for follow-up projects.

F | Details of the consultants´ tasks

01 | Project Coordinator: Mr. Jambay Dorji

1. Liaising with BDBL
2. Liaising with Dzongkhag administration
3. Liaising with Gewog administration
4. Liaising with input suppliers within and outside Bhutan
5. Undertaking administrative duties, managing budgets and accounts, updating information, and preparing reports
6. Arrangement of (Local) technical assistance
7. Identification/selection of farmers
8. Supply chain development
9. Attending meetings, Conference and seminars related to PMU
10. Overseeing the overall project activities
11. Liaising with donor agency

02 | Technical Expert: Mr. Karma Penjore

1. Identification/selection of farmers
2. Training of farmers on crop management (water and soil fertility etc.)
3. Identify core pest and disease in vegetables and train farmers on their management
4. Provide on site advice on good agriculture practices (GAP)
5. Dissemination of research-based information on vegetable and seed production
6. Assist farmers in improving the existing practices and adopting new ones
7. Monitoring farmer’s performance and vegetable production
8. Facilitating the delivery of inputs (pipe house, fertilizers, pesticides etc.)
9. Writing advisory leaflets
10. Organizing farmers’ meetings and field days
11. Attending meetings, Conference, and seminars related to PMU

03 | Office Assistant

1. Maintain and organize the PMU office at all time.
2. Receive and respond to telephone calls, fax messages
3. Perform bank and postal duties
4. Maintain records for purchases, disbursement and stocks
5. Update book keeping and accounts of PMU
6. Correspond with clients, donors, and coordinators through emails and phone calls
7. Draft letters and documents related to training materials

IV.
Roles & Responsibilities

A | Donor

Dr. Rudolf Knünz

B | BDBL Liaison

Karma Dorji

C | Project Management Unit

Project Coordinator: Jambay Dorji
Providers of technical assistance: Jambay Dorji; Karma Penjore Book keeping: Office Assistant

D | Agreement terms with and responsibilities of the Project coordinator

To ensure that the project succeeds in reaching it's goals, the Donor has determined that it needs to obtain administrative and general management services. That for and in consideration of the mutual covenants and promises between the parties hereto, it is hereby agreed:

- The Project Coordinator shall protect the Donor's interest in all matters concerning the project.
- The Project Coordinator fully supports the agreements and project details laid out in the ToR. He will be responsible for the tasks laid out in section "Details of the consultants´ tasks.
- The Project Coordinator shall provide necessary bookkeeping. For this responsibility, he shall employ an Office Assistant, with a monthly payment of 15.000 Nu. (including all taxes and fees), on a basis of 50% of a full employment.
- The Project Coordinator shall set up and maintain a complete correspondence file.
- The Project Coordinator shall respond in a timely fashion to any correspondence concerning the project.
- The Project Coordinator shall provide a detailed yearly report showing the performance and progress of the project, containing both financial and technical status, to be reported in the yearly Project Board meeting.
- In the first year of the project, the Project Coordinator shall provide a monthly report to the donor and the representative of the BDBL, showing the performance and progress of the project, containing both financial and technical status. In the following years, the frequency of these reports will be reduced to a bi-monthly basis.
- The Project Coordinator shall review and recommend actions on all payments and agrees that the books, documents, records, files, and papers are accessible to the Donor and his authorized representatives.

- The Project Coordinator is responsible for organizing Visa and travel permissions for the Ha Valley, for the visits of the donor and the donor's representatives.
- The Project Coordinator shall keep a running account of the balance in the contingency account and ensure all payments are made in accordance with the payment schedule. If the actual performance strays significantly from the projected schedule (over 10%); adjustments must be made to control the outlay management and reported to the donor and regulatory agencies involved.
- The Project Coordinator manages project staff. He will set out agreements with the other members of the PMU in correspondence with the donor.
- The Project Coordinator shall employ a Technical Expert, with a monthly payment of
- 40.000 Nu. (including all taxes and fees and any additional costs), on a basis of 50% of full employment.
- Together with the Technical Expert, the Project Coordinator is responsible for the planning and execution of all technical assistance to the farmers, as specified in detail in Section II F.
- The Project Coordinator is responsible for the choice of the hardware materials and the corresponding reseller, the corresponding payments, the delivery of the hardware materials to the farmers, as well as giving the farmers guidance for the build up and use of the materials.
- Initiating the process of building a selection committee, consisting of local authorities of the Ha Valley, and to give the committee the task of selecting the participating farmers, according to the list of selection criteria.
- No changes in the ToR and the project outline shall be made without the approval of the donor through the Project Coordinator.
- It is understood that the Project Coordinator will receive a monthly reimbursement for his services of Nu. 45.000 including all taxes and fees and any additional costs). The Project Coordinator affirms that he will devote 30% of the equivalent of a full employment to the work specified in this agreement.
- It is understood that the Project Coordinator will be responsible to maintain a representative project coordination office (allocated budget: office rental) and that he will use his personal vehicle for any uses related to the project (allocated budget: vehicle rental). These financial expenses are to be understood as lump sums and are defined as shown in the budget details, Table 4).

E | Agreement terms with and responsibilities of BDBL

To be filled out by the BDBL

F | Agreement terms with and responsibilities of Donor's side

- The Donor will closely follow national strategies for rural and agricultural development.
- He will take care of external evaluation visits on a yearly basis.
- The Donor shall provide prompt decisions on questions of policy or approval of recommended changes presented to the Donor by the Project Coordinator.
- The Donor or his authorized representatives shall be available for board meetings.
- The Payment from the donor to the BDBL shall be made according to a schedule as agreed to by the parties.

A photographic report

Fig. 1: Ms. Kinley Bidha from Bangayna Village of Uesu Gewog harvesting tomatoes inside her poly house.

Fig. 2: Use of drip bottles for irrigating tomatoes in poly house.

Fig. 3: ToT participants preparing insulators using HDP pipe.

Fig. 4: Trainers assisting farmers in installing energizers.

Fig. 5: Inauguration ceremony of the 9 km electrical fence for the community in Talung with Ms. Kinley Wangmo (parliament Upper Haa), His Excellency Lyonpo Chenkhab Dorji, Dr. Rudolf Knünz (f.l.t.r., November 2014)

Fig. 6 & 7: The noticeable difference in the life span of the post fixed on the iron clamp and one set in the soil.

Fig. 8: Lush wheat crops in field at Yangthang.

Fig. 9: Farmers transporting harvested wheat in pick-up trucks.

Fig. 10: Tomatoes, carrots and beet ready for market.

Fig. 11 & 12: Farmers at Yangthang and Wangcha planting asparagus.

Fig. 13 & 14: Heap composting and compost shed at Engo Village.

Fig. 15: Members of the marketing group during the launching of tomato at centenary farmers market in Thimphu.

Fig. 16: Members of the marketing group discussing quality aspects of tomato with a food inspector from Bhutan Agriculture and Food Regulatory Authority (BAFRA).

Fig. 18: The official certificate of appreciation from the Dzongkhag Administration.