Case Studies of Successful Farmers, Agri-enterprises and Farmers' Groups and Cooperatives in Bhutan

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Acronyms

ADLO	Assistant Dzongkhag Livestock Officer
AI	Artificial Insemination
APTM	Asia Pacific Tea Market
ARDC	Agriculture Research and Development Centre
BAFRA	Bhutan Agriculture Food and Regulatory Authority
BAS	Bhutan Alpine Seed
BCCI	Bhutan Chamber of Commerce and Industry
BLDCL	Bhutan Livestock Development Corporation Limited
BOiC	Bhutan Opportunity and Information Centre
CARD	Centre for Agricultural Research and Development
CARLEP	Commercial Agriculture and Resilient Livelihoods Enhancement Programme
CNR	College of Natural Resources
DAMC	Department of Agriculture Marketing and Cooperatives
DCSI	Department of Cottage and Small Industry
DOPS	Department of Forests and Park Services
DOC	Day-Old Chick
DOL	Department of Livestock
EM	Effective Microorganism
EMAS	Effective Micro-organism Activated Solution
EU-TCP	European Unit-Technical Support Project
FAO	Food and Agriculture Organization
FYP	Five Year Plan
GEF	Global Environment Facility
GMG	Geney Mushroom Group
HF	Holstein Friesian
HRDP	Horticulture Research and Development Project
ICIMOD	International Centre for Integrated Mountain Development
IFAD	International Fund for Agricultural Development
IFOAM	International Federation of Organic Agriculture Movements
ISO	International Organization Standardization
JICA	Japan International Cooperation Agency
KNC	Khenrig Namsum Cooperative

LOTS	Lothuen Om Detshen
LPG	Liquefied Petroleum Gas
LUC	Land User Certificate
MOAF	Ministry of Agriculture and Forests
MPU	Milk Processing Unit
NJBC	National Jersey Breeding Centre
NSB	National Statistical Bureau
NSC	National Seed Centre
NPT	Nubi Phendey Tshogpa
PWD	Public Works Department
RAMCO	Regional Agricultural Marketing and Cooperatives
RDTC	Rural Development Training Centre
REDCL	Rural Enterprise Development Bank Limited
RIR	Rhode Isand Red
RLP	Rural Livelihood Project
RNR	Renewal Natural Resources
RNR RC	Renewal Natural Resources Research Centre
SGTC	Samcholing Green Tea Cooperative
SLC	Southern Layer Cooperative
SSNF	Southern Seedling Nursery Farm
TIF	Tshendung Integrated Farm
UNDP	United Nations Development Programme
UNICEF	United Nations International Children's Emergency Fund
WLH	White Leg Horn

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Preface

Agriculture is critical for achieving sustainable rural development, food and nutrition security. Bhutan, in spite of the rapid development largely remains an agrarian country with 57% of the population still employed and making a livelihood from integrated small-scale subsistence farming. Farmers grow a variety of crops together with livestock rearing and are dependent on natural resources. Subsistence agriculture – small landholding using traditional methods do not provide much motivation for innovation and commercialization.

This situation is aggravated by difficult terrain limiting access to market, shortage of labour, limited awareness and know-how of improved practices, lack of appropriate technology, and lack of capacity of farmers to invest. However, with concerted efforts from the Ministry of Agriculture and Forests on agriculture development, market-oriented farming is gradually emerging.

Agriculture is a difficult sector to achieve and showcase instant success in the first place and what is achieved is not readily visible and even less reported and celebrated. Yet, there are many instances of sporadic successes at individual household and group contributing to increased production, and trade in agriculture produced over the years at the national level. Often in agriculture, trial of technologies and innovation by a few farmers, and achieving and showcasing these successes form platforms for dissemination and adoption on a wider scale. Role models and successful examples are powerful tools for farmer-to-farmer extension and agriculture education.

This book documents some of the successful agriculture practices and agro-enterprises from around the country. It is the result of the case studies conducted by the academics of the College of Natural Resources (CNR) during 2019-2020. Throughout the different cases/stories, some common threads can be drawn such as enterprise, motivation, cooperation, factors contributing to the success, challenges, and opportunities. More than mere description and show-

casing the enterprises, this book tells the story of human enterprise and livelihood, of human spirit to persevere, to overcome odds and to survive and thrive.

This book is expected to serve several purposes; for instance, it is an academic endeavour of our academic staff that serves as a teaching materials for faculty and students. Lessons can be drawn for development of policies, strategies and interventions in further developing agriculture and agri-business. Also, it could motivate our youth to venture into agriculture as a livelihood option.

During the course of the case studies, the faculty members travelled the length and breadth of the country and have hopefully gained very valuable insights and experiences about the rural and farming life in the country. This should make them better teachers and researchers. They should be better equipped to relate classroom teaching with the field situations.

I would like to thank all the faculty members who have participated in the case studies and contributed to putting this book together. My special thanks to Ms. Ugyen Yangchen, the Coordinator for the Centre for Sustainable Mountain Agriculture, for her effort and initiatives to coordinate the activities and to the Editors for putting in extra effort to review and edit the materials.

Dr. Phub Dorji
(Former President)
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Introduction

Entrepreneurship and enterprise development are critical for socio-economic development. Encouraging entrepreneurial activities can contribute to the creation of new products such as creating jobs, reducing poverty, enhancing social equity, improving living standards, and bringing overall economic growth. For these reasons, entrepreneurship development is recognized as an important strategy to achieve key development objectives. Agro-based enterprise is an important entry point for agriculture development. There is an increasing emphasis on market-led development that is facilitated by income generating activities and market participation of communities.

This book is a compilation of case studies on successful agro-enterprises covering a wide range of rural enterprises along the agricultural value chain. The case studies reflect the endeavour, enterprise and aspiration of rural communities. This book is expected to inspire and offer something for everybody, in addition to serving as a teaching learning material for the faculty members and students. The different cases presented could serve as a role model and motivate our youth to take up agriculture enterprises as a livelihood option. Furthermore, some policy imperatives can be drawn from the challenges, opportunities and recommendations presented in each case study. The language is deliberately kept simple and straight to appeal to a wide range of readers.

The book has 11 Chapters and 59 Case Studies, each reflecting success, challenges, and opportunities in farming, agri-business, farmers groups, and cooperatives. Chapter 1 presents the case studies on how farmers are contributing and gearing up to meet the national objective of achieving 100% organic agriculture. Chapter 2 through Chapter 7 deals with case studies on market-oriented production of field crops, horticultural crops, seeds production and nursery, livestock farming and apiculture. Case studies on enterprises based on food processing and food products are covered in Chapter 8 while Chapter 9 describes various farmers groups and cooperatives. Farmers managing multiple enterprises and integrated farms are presented in Chapter 10. The overall opportunities and challenges that are drawn from the case studies are presented in Chapter 11.

Chapter I: Organic Agriculture

The prevailing conventional agriculture has improved farmers' living standards by enhancing agricultural productivity (Tracy, 1989). Conventional agriculture's prime objective is to increase food production per unit area within a short period of time. This is achieved through the adoption of intensive monoculture system – using hybrid seeds, synthetic agro-chemicals, and artificial growth hormones (Lampkin, 1990; Scialabba and Lindenlauf, 2010). Besides compromising the quality and safety of food, such agricultural production practices negatively impact water resources, soil and biodiversity (Reganold et al., 2001).

Organic agriculture is promoted as a safer alternative to conventional agriculture. It is characterized by low energy/cost production system with low environmental impact. Artificial fertilizer inputs, genetically modified organisms, antibiotics and growth hormones in crop production are replaced by safer organic inputs (International Federation of Organic Agriculture Movement [IFOAM], 2008; Reganold et al., 2001) and ecological-based management practices in organic agriculture.

Organic farming in Bhutan was officially launched in 2007 to make farming sustainable without compromising the quality and health of biodiversity and environment (Tashi and Wangchuk, 2016). The principles of organic agriculture align well with the Bhutan's development philosophy of Gross National Happiness. Therefore, in 2008, the Government of Bhutan declared to fully convert into organic agriculture by the year 2020. In order to take the organic agriculture movement forward, the National Framework for Organic Agriculture was launched and the National Organic Program was established. Additionally, the five-year National Organic Flagship program was launched in 2018.

The successive governments in Bhutan have extended continuous support for converting current agricultural practice to organic agriculture. In addition to training Agriculture Extension Officers and farmers, the government under the aegis of the Ministry of Agriculture and Forests, continues to provide free seeds and other farm inputs to promote organic agriculture. In 2020, the Agriculture Research and Development Centre in Yusipang, Thimphu was certified as the National Centre for Organic Agriculture. Despite all these interventions, the organic agriculture development has been slow.

Bhutan has about 545 ha of crop land (less than 1% of the total arable land) certified as organic (FiBL-IFOAM, 2020). The country has two internationally certified organic products namely lemon grass and essential oil and 20 products certified by the local organic assurance system. Currently, 24 organic farmers' cooperatives, three organic retailers, and one exporter are involved in organic production and marketing in the country.

This Chapter contains five case studies in total. The first two cases deal with organic farmers' group, another two present organic fertilizer production as an enterprise. The fifth case study describes a female organic farmer producing a number of horticultural crops along with rearing livestock.

Organic Agriculture in Gasa Dzongkhag

Karma Wangdi[1] and Lham Tshering[2]

Until 2016, Gasa Dzongkhag was isolated from the other parts of the country since the Dzongkhag was not connected by farm road. Farmers had no access to synthetic chemical fertilizers and hence used organic manures to grow crops. In 2004, the former Minister of Agriculture, Sangay Ngedup visited the Dzongkhag and after assessing the situation declared Gasa an organic Dzongkhag. The farmers of Gasa strictly follow the principles of organic agriculture and do not use synthetic chemical fertilizers or pesticides. The Bhutan Agriculture and Food Regulatory Authority (BAFRA) certified the Rangshin Sonam Detshen from Khatoed Gewog in Gasa as the first organic group in the country in 2015.

In a village not far from Gasa town lives a 47 years old Aum Dawa Zangmo, who is one of the progressive farmers of Khatoed Gewog under Gasa Dzongkhag. She married Ap Chador Tshering, 53 years old, and together they have two daughters and one son. Both are illiterate and depend on farming for their livelihood. Aum Zangmo owns three acre dryland. They have been farming since their childhood. She practices integrated farming comprising different vegetables, dairy, poultry, and is well-known for her Shitake mushroom farming (Figure 1.1).

Aum Zangmo had once focused on cultivating wheat and barley extensively; however, due to crop failure, she incurred a heavy loss. Around the same time, the Ministry of Agriculture and Forests (MoAF) provided free vegetable seeds. Promising returns from the vegetables led her to focus on producing horticultural crops such as potato, garlic, cabbage, and other cole crops. Fresh organic vegetables generate a net income of about Nu.100,000 annually.

In 2013, Aum Zangmo started Shitake mushroom farming with free seeds and logs support from the Gewog Agriculture Extension office. She uses oak tree logs as substrates for mushroom cultivation, which last for about five years. She produces about 30 kg of mushroom annually from her small mushroom shed. Besides for self-consumption, she sells mushrooms at Nu. 350/kg.

With the increasing demand for poultry products in the country, Aum Zangmo started poultry farming in 2015. She has 40 hybrid and 13 local hens.

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[2]Lecturer, Dept. of Animal Science

The latter was reared because she noticed that the hybrids do not lay eggs during cold season. She gets 40 eggs a day from the hybrid hens and 8-10 eggs a day from local hens. The Karma Feeds (formulated feed), although expensive at Nu. 1,700 per 50 kg bag, is used as the main source of feed in her poultry farm. She said, "we use eggs in our daily meals. Besides home consumption, we sell eggs within the village for generating cash income".

Aum Zangmo started rearing eight Jersey cows and during the time of visit, she had two milking cows. She processes milk into dairy products such as cheese, butter, and curd. She said, "we have not purchased any dairy products since we started to rear Jerseys. We also earn a net profit of about Nu. 50,000 annually from the sale of dairy products". However, at times she experiences fodder shortages.

Aum Zangmo applies organic farming principles and practices farming on her farm. Instead of synthetic agro-chemicals, she uses manure from her livestock as the main source of soil nutrient. The decomposed manure is also used as mulching for crops such as cabbage. She sells her produces in the locality and at the Centenary Farmers Market in Thimphu.

Aum Zangmo said that her perseverance, determination, hard work and trust in the farm has led her to where she stands now financially. She is self-reliant in most of the essential items needed except for cooking oil, rice, salt, sugar and milk powder, which need to be bought. She owns a milling machine, a power tiller, and a vehicle for transportation.

However, farming, as Aum Zangmo said, is not always easy. Labour shortage is a major challenge. The labour wage in the Dzongkhag is comparatively high at Nu. 800-900 per day for male and Nu. 500 per day for female labours. She spends approximately Nu. 30,000 per year as labour wage, which she says is "quite disheartening". The other challenges include crop raids and damages by wild animals such as deer, wild boar, and birds.

Although she is confronted with several obstacles, she is determined to continue farming despite the challenges. Because of her strong will, she is recognized as one of the most successful and progressive farmers in her locality. Her Mantra is, "focus on what one is doing" and further she added "farming on a commercial scale is a business that involves both risk and profit; and risks should not deter us". She said that while farming, one should choose the crops that are highly demanded in the market no matter how difficult it is to cultivate them. Aum Zangmo is happy with her achievements and she looks forward to coming up with new ideas to expand her farm.

(a)

(b)

Figure 1.1: (a) Mustard green vegetable garden, (b) Stacked shitake mushroom billets

Rangshin Sonam Detshen, Gasa Dzongkhag

Karma Wangdi[1] and Lham Tshering[2]

Background

Agricultural cooperative, also known as farmers' cooperative, provides a method for farmers to work in groups to acquire better outcome than if done alone. One good example of farmers' cooperative in Gasa has been set by progressive farmers of Khatoed Gewog in 2012. The cooperative is known as Rangshin Sonam Detshen, meaning the Organic Farmers' Cooperative that focuses on Organic Agriculture.

Khatoed Gewog is the smallest Gewog among the four Gewogs of Gasa Dzongkhag. The Gewog has an area of 326 km^2 and a population of approximately 194 people and 60 households out of which 52 households practice organic agriculture. The Gewog, located at an altitude of 2300 to 2900 m asl, experiences an average annual temperature of 12°C and receives about 651 mm of rainfall annually. The Bhutan Agriculture and Food Regulatory Authority (BAFRA) certified Rangshin Sonam Detshen as an organic group in 2015.

Description of the cooperative

According to Mr. Tashi, the cooperative's Chairperson, the main objective of forming the cooperative was to promote organic vegetable production and market the produce at better price in Thimphu, Punakha, and Wangdue Phodrang Dzongkhags. He reported that after the launch of the initiative to market organic produce from Gasa Dzongkhag, more farmers have begun to cultivate their fallow fields. The cooperative secured commercial deal with high end hoteliers and signed memorandum of understanding with 11 major hotels and restaurants in Thimphu including Aman Kora, Taj Tashi, Druk Hotel, Terma Linca Resort and Spa, Hotel Ariya, and Pedling Hotel and Spa among others since the beginning of July 2017. The cooperative supplies organic products such as potato, garlic, and carrot at Nu. 30/kg, 120/kg and 60/kg respectively. Potato is supplied from July to November, garlic from June to September, and carrots from June to January.

The Department of Agricultural Marketing and Cooperatives (DAMC), National Organic Programme (NOP), BAFRA, and Gasa Dzongkhag admin-

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[2]Lecturer, Dept. of Animal Science

istration supported the formation of the cooperative and initial marketing. Additional support included supply of seeds and seedlings, development of farmers' capacity, and supply of electric fencing materials. Furthermore, farm mechanisation support was provided for land development.

Challenges

The cooperative faces several challenges including difficulty in transportation of produces; limited knowledge on grading, packaging, and labelling; inconsistencies in the real produce bought against the demand reflected; pests, diseases, and storage. The secretary of the cooperative said that it is difficult to deliver vegetables once a week to Thimphu, especially during monsoon. He added, "we have to arrange vehicles every week. At times, it is difficult to deliver vegetables to the market due to lack of a vehicle and bad road condition. There is an urgent need of utility vehicle for marketing to Thimphu and other Dzongkhags".

The cooperative faces hurdle in managing pests and diseases in the absence of availability of synthetic pesticides. They use cattle urine as a biopesticide to control pests in their vegetables. The members of the cooperative also stated that, although their vegetables are organic and competitive in prices, consumers choose imported vegetables over their produces. In addition, the cooperative members feel that due to lack of proper monitoring some vegetables sold as organic in the market are actually produced conventionally.

Future plans

The cooperative, through land development, has plans to diversify vegetable cultivation. They intend to supply organic vegetables throughout the year with the installation of more greenhouses. In order to achieve this plan, the cooperative intends to procure a utility vehicle from the National Organic Programme.

Organic Green Tea, Samcholing, Trongsa Dzongkhag

Tashi Dorji[1] and Tshering Gyelpo[2]

Background

The green tea plant, scientifically known as *Camellia sinensis*, was first said to have been planted close to the Samcholing palace in Trongsa. According to the senior citizens of Trongsa, the green tea was first brought to Bhutan by the second Druk Gyalpo. Expansion of green tea production area and promotion in Samcholing was initiated in 2009 by the Council of the RNR Research in collaboration with the Department of Agricultural Marketing and Cooperatives (DAMC) and Trongsa Dzongkhag administration with funding support from GENTEC University, Republic of South Korea (Dorji, 2017).

Description of the cooperative

Samcholing (27°24'22.6"N, 90°31'58.3"E) under Draagteng Gewog, Trongsa Dzongkhag, is 25 km south of Trongsa on the way to Zhemgang. The Gewog is located at about 1,800 m asl, receiving an average annual precipitation of 1,400 mm and experiences an annual mean temperature of 24^{o}C. The soil type is clay to clay-loam.

Samcholing Green Tea Cooperative (SGTC) is a recipient of the Best Green Tea Producers Award 2018 from the Government of India. The group is a women-led cooperative with 28 female members with age ranging from 25 to 45 years old. Although the members could not complete their schooling they received training in Nepal, Japan, China, and Sikkim with financial support from the Government of Bhutan. They grow green tea in their respective agriculture field, which ranges between one to two acre, and the total cultivated area is 43 acre. It takes around three to four years to raise the green tea plants and produces tea leaves for about 20 years. The tea leaf harvesting season usually starts from April and ends in September. With support from the government, the cooperative carries out processing and packaging in their three-storied processing house.

Ms. Rinchen Dema, 29-year-old, is one of the members and the current sales executive of the SGTC. The sale executive is selected amongst the group members for a term of two years. Ms. Dema, who leads the cooperative, start-

[1]Lecturer, Dept. of Agriculture
[2]Asst. Lecturer, Dept. of Animal Science

ed planting green tea when she was 15 years old. She was trained first by an Austrian in 2010. She also received an opportunity to attend a training on tea plantation in New Delhi, India. Ms. Dema expressed that in the past few years there was a huge demand of green tea owing to its health benefits. Financial and training supports were provided by the Government of Bhutan and JICA. Technical support extended by the Dzongkhag Agriculture Officer (DAO) and ARDC Bhur played a major role in up-scaling the green tea production. The processing unit has improved its management and product enhancement with successful delivery of green tea products to its customers on a regular basis.

Current value chain of SGTC

In Samcholing village, 43 acre land is committed for green tea cultivation and a small-scale industrial facility was set up, which helps individual farmers to produce 2,000-3,000 packets of green tea every year. Each packet weighs 60 g and costs Nu. 300. Ms. Dema reported that with additional funding support from the government, the tea is made available in tea sachets. The product cycle is represented in Figure 1.2. Ms. Dema alone could produce 3,000 packets of green tea in 2019. Individual members of the cooperative earn Nu. 50 for each packet they produce and each member's annual income ranges from Nu. 150,000 to 200,000.

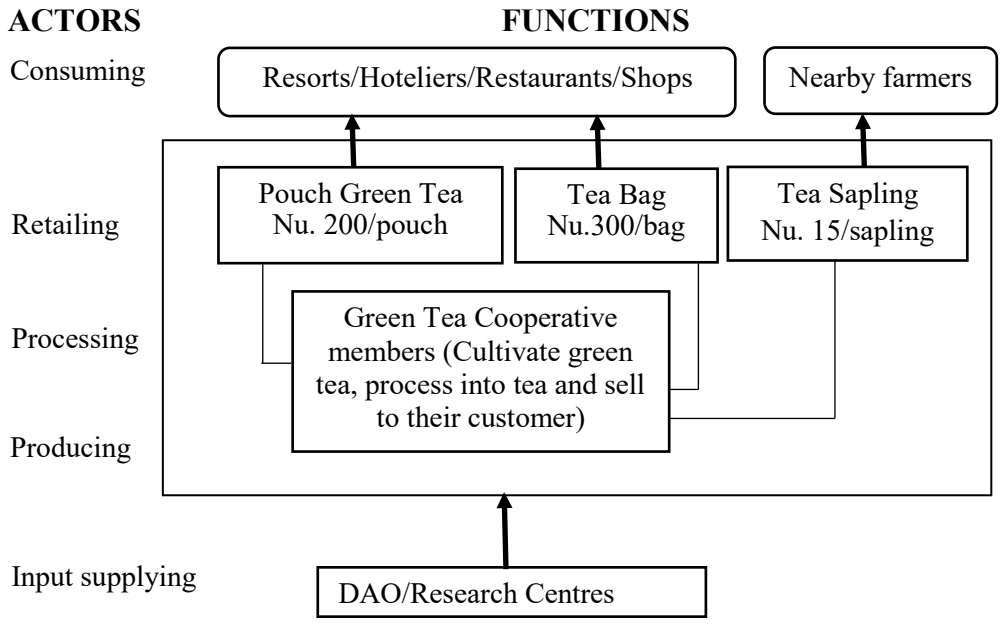

Figure 1.2: Samcholing green tea value chain

Challenges and prospects

The cooperative faces challenges to expand into regional and international market. The sales executive, Ms. Dema, expressed that one of the main challenges of the cooperative is lack of linkages and collaboration with international companies producing similar tea products. Therefore, venturing in the international market has been unsuccessful for the group.

Green tea is mostly consumed in East Asia. People in China consume approximately 50% of the total green tea produced in the world. Japan is the second largest consumer of green tea where 80,000 tonnes of green tea are consumed every year. Indonesia and Vietnam consume about 30,000 tonnes and 20,000 tonnes of green tea per year respectively. Therefore, SGTC management sees a huge market potential if linked with international market such as the Asia-Pacific Tea Market (APTM). APTM is the biggest tea distributors in the form of black tea, green tea, and herbal tea.

Technical support from the MoAF and funding from the government played an important role in upscaling green tea production in Samcholing. Transparency and trust among the cooperative members are the key tools in improving the efficiency of the business. Farmers who are not yet members of the cooperative are keen to understand the benefits and need market assurance before joining the business. Therefore, adding new members to the cooperative is not easy as the non-members are sceptical about the new venture.

Bhutan Organic Farm, Samtenling, Sarpang Dzongkhag

Yogeeta Dahal[1] and Sushila Rai[2]

Background

The entrepreneur of the Bhutan Organic Farm (also known as Bhu-Org Farm) is Mr. Kamal Pradhan, a 54-year-old former forest officer. The enterprise was established in 2015 in Samtenling, Gelephu. The motivation to develop the farm began after Government launched the Organic Flagship Programme in 2018 that focused on commercializing organic farming amongst others. Mr. Pradhan realized that there was a high demand for organic produces in the local markets and hence his farm was established. Mr. Pradhan hopes to reduce the import of food products and to support the socio-economic development of the country. Furthermore, he wanted to support the government's initiative through the development and expansion of his organic farm. The vision of the enterprise is to make organic agriculture a success by producing organic products in a sustainable manner.

Description of the enterprise

The Integrated Organic Farm was established on 1.3 acre land in Samtenling, and later extended to 1.35 acre land in Pelrithang, Gelephu. Coffee, areca nut, cardamom, avocado, and piper betel are planted. Although the government provides support to cooperatives, similar assistance is not available to individuals and privately-owned businesses. Therefore, Mr. Pradhan had to bear the cost of resources on his farm. The enterprise has three onsite staff – one supervisor, one field worker, and one marketing officer. Depending on the need of labour and season, additional six or more labourers are hired from across the border. The farm produces organic fertilizers and value-adds other consumer products grown naturally in the region. The farm also has nursery for organic crops. The farm is in the process to produce bio-pesticides.

The farm produces both the dry and liquid bio-fertilizers. The farm produces organic fertilizer and chicken manure as dry fertilizers while vermicomposting was under trial. The Organic fertilizer is produced in bulk by mixing bio-wastes such as sawdust, vegetable wastes, droppings of chicken, cattle manure, and effective microorganism (EM). The farm produces wood vinegar as

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liquid fertilizer on a trial basis. Additionally, the farm owns small-scale nursery growing saplings of betel nut, citrus mandarin, and mango. The enterprise also produces other value-added products such as yoghurt, mustard oil, yacon (*Smallanthus sonchifolius*) syrup, and foothills coffee.

The enterprise started producing yoghurt from 2017, mustard oil from 2018, and yacon syrup and coffee from 2019. On a trial basis, the enterprise has begun producing drumstick (*Moringa oleifera*) powder, turmeric power, and charcoal. Mr. Pradhan noticed that some farmers within and nearby Dzongkhags produce organic coffee, mustard, and yacon. However, they do not know how to value-add these products.

The enterprise purchases raw materials for coffee from Chuzagang farmers; mustard from farmers of Trongsa, Dagana, and Zhemgang; and yacon from farmers of Tsirang and value addition is done at Bhu-Org Farm. The farm purchases cattle manure, chicken manure, and milk from nearby farmers. Such activities create opportunities for the local communities in marketing their products through a market chain facilitation approach and value addition.

The Bhutan Integrated Organic farm is a certified organic fertilizer producer in the country and has a capacity to produce 300 MT of organic fertilizers in a year. However, the farm is able to sell around 30 MT annually. The organic fertilizers are sold in bags of 20 kg at Nu. 400 each. The demand for the organic fertilizer is steadily growing over the years as farmers are aware of the benefits and the importance of organic fertilizers coupled with the start of organic agriculture movement in the country. The demand for it is increasing because farmers are cultivating vegetables at a larger scale.

The farm produces around 150 L yoghurt per day, 350 L mustard oil, 200 L yacon syrup, and 100 kg coffee per year. Yoghurt is sold at Nu. 25 per 200 ml, mustard oil at Nu. 180/L, 400ml yacon syrup at Nu. 600, and 100 g coffee at Nu. 100. The gross income per year from the sale of various products is approximately Nu. 166,000.

Most of the income generated is invested in buying raw materials and in adding new products as the enterprise is still expanding. According to Mr. Pradhan, the income is just enough to sustain the enterprise. The enterprise banks on digital marketing through their official website and social media (Facebook) along with marketing through word-of-mouth.

Opportunities and success factors

The enterprise is certified and recognized as organic enterprise. Therefore, the customers have trust on the quality of the products which is one of the reasons for its success. Since the organic movement in the country has created awareness on the importance of organic produce on the health of people, this has made it easier and convenient to market their products.

Farmers using the organic fertilizers from the Bhu-Org Farm have provided positive feedback on its effectiveness in improving crop and soil health. People's awareness on the benefits and safety of using organic fertilizer is aiding the enterprise to keep their sales constant. So far, the enterprise has been operating successfully and according to Mr. Jivan Rai, the Manager, the success factors of this enterprise include (i) having multiple contacts in marketing the products, (ii) persistent innovation and (iii) investing in new business ideas to explore different avenues.

Challenges

Competition from cheaper imported products and the country's nascent organic industry are major challenges besides the financial constraint. The enterprise requires a huge capital to diversify its products and to buy raw materials. The enterprise has not made major profit yet as the revenue generated is just enough to sustain the enterprise. The other challenge is the lack of availability of cheap labourers in the country. The Bhutanese nationals usually demand high wage; therefore, they often resort to recruiting labourers from India.

Future plans

The future plans of the enterprise include establishing and producing diverse products. In the coming years, the enterprise plans to include a variety of crops and bee keeping. Besides honey and pollinating services from the bees, they expect that it will help to combat issues related to elephant encroachment in the farmland, which is rampant in the locality. Other ideas for future work include producing *Moringa* powder, turmeric powder, and establish an orchid nursery. The *Moringa* tree plant is gaining popularity due to its several therapeutic properties and is an easy tropical plant to grow. The enterprise aims to revive vermicomposting practice, although it had failed once in the past. Also, the enterprise is producing bio-pesticide on trial and is planning to scale-up the therapeutic properties and is an easy tropical plant to grow.

Vermicomposting Enterprise, Samtse Dzongkhag

Rekha Chhetri[1] and Monika Pradhan[2]

Mr. Sarad Gurung, 48-year-old, from Bhimtar, Norbugang under Samtse Dzongkhag, completed his tertiary education from India. In 2012, Mr. Kinzang Chophel, the then Assistant Dzongkhag Agriculture Officer from Samtse Dzongkhag visited Norbugang Gewog looking for potential farmers to take up vermicomposting. Mr. Gurung was interested in vermicomposting due to his familiarity with the topic from his time in Kalimpong, India. Together with Mr. Chophel, Mr. Gurung went to Kalimpong and met with the entrepreneurs there to learn more about vermicomposting.

Soon after returning, Mr. Gurung started vermicomposting as a family business using red worms in a small shed with a budget of Nu. 70,000 supported by the National Organic Program, Thimphu. According to Mr. Gurung, in the initial two-three years, he gave about two to five kilogrammes of vermicompost to farmers and visitors for free. In return he asked for feedback on the performance of the vermicompost. Since, using the vermicompost increased production of crops, he was encouraged by the farmers to produce more.

It was only after three years of establishment in 2015, Mr. Gurung started to increase his production. The demand for his vermicompost from individual farmers increased to 20 kg from the initial five kilogrammes. Even the government purchased his product to distribute it to other farmers. On the request of the National Organic Flagship Program, 17 MT vermicompost was supplied to the National Soil Services Centre. Since 2000, he has been supplying about one metric tonne vermicompost to a few private organic farms in Thimphu. The vermicompost is packed in 25 kg bags and sold at Nu. 25/kg. The demand for vermicompost is increasing and sometimes he is not able to meet the demand. For him, marketing of vermicompost has not been an issue.

Mr. Gurung was provided with a fund of Nu. 200,000 by the Ministry of Agriculture and Forests (MoAF), which helped to scale-up his production. The annual vermicompost production has increased to about 100 tonnes from 50-60 tonnes when he first started the enterprise. Mr. Gurung claims that the business is performing very well and he is able to support the education of his two children. According to Mr. Gurung, about 60% of the gross income adequately

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covers all the expenditure, including the payment of farm employees; three labourers with a monthly payment of Nu. 7,500 per head, excluding food.

Unlike other vermicomposting where cattle manure, maize residues, and *Artemisia* plants are used as bedding materials for worms, Mr. Gurung uses only cattle manure as he feels that the compost from cattle manure is of better quality. However, manure is needed in larger quantities; therefore, he has given three to four cows to other farmers for rearing them on a win-win basis. The farmers supply him manure while they keep the milk. Despite this arrangement, he sometimes has to buy cattle manure at Nu. 5/kg. Since the earthworms feed mainly on the cattle manure, sieving is done to separate all the foreign materials.

In the coming years, Mr. Gurung has plans to construct one more vermicompost shed with a bigger production capacity for which he will require about Nu. 300,000. Besides compost (Figure 1.3 and Figure 1.4), Mr. Gurung is determined to develop organic spray from vermicompost once again although he was unsuccessful in the past. According to Mr. Gurung, the initial three years were challenging and at one point he almost closed the business. Given the demand for organic manure these days, he sees a bright future for vermicompost business.

The advice from Mr. Gurung to young entrepreneurs is “not to give up”. By investing in hard work and energy, he says, success is bound to come. He is grateful to all the support he received from the government and the community. However, he also advises against depending solely on the government.

Figure 1.3: Vermicompost being sieved

Figure 1.4: Stored vermicompost

Chapter 2: Field Crops

The term Field Crops generally refers to cereals, oilseed, and pulses. The age-old concept of Dru-Na-Gu or nine food crops is equivalent to the modern idea of field crops. Dru-Na-Gu includes rice, maize, wheat, barley, buckwheat, millets, pulses, oilseeds, and amaranths. Their equivalent terms in Dzongkha are: Bja or Rey, Gayza, Ka, Nah, Bjo or Garey, Memja or Cham or Yangra, Peka or Yungka, Zimtse Naap, and Sem or Zhimtse Kaap. In the olden days, the successful cultivation of all nine crops was an indication of the agricultural suitability of a place and reflected the status of food self-sufficiency and security.

Other than the food, field crops play a fundamental role in the culture, tradition, religion, and livelihood of the Bhutanese people. Dru-Na-Gu provides a means for people to conduct Rimdos (religious rituals) and Loche (annual religious ceremony) that are integral part of the Bhutanese culture and tradition. Such events require preparation and offering of Torm (divine figurines) made from cooked rice, wheat or barley flour. Cereals are also used to prepare Ara (local liquor) and Bangchang (local beer) that are indispensable for social gatherings and in entertaining visitors. Ara is also served as an offering to appease local deities (Serkaim) or taken as a purification liquid (Duetsi) during Rimdo and Loche.

This Chapter on Field Crops contains three interesting case studies on spring rice in Wangdue, Rajma Daal or kidney beans in Dagana and a combination of maize, quinoa, and barley in Trashigang. Spring rice denotes rice grown as a first crop from February to July in a rice-rice rotation, which is feasible in mid and lower valleys. Research on spring rice to develop suitable varieties and crop husbandry practices was conducted at the then Centre for Agricultural Research and Development (CARD) (renamed as Agriculture Research and Development Centre (ARDC)) in the 1980s. Supported by donors, the Wangdue-Punakha valley devoted acres of wetland to rice double cropping in the late 1980s and early 1990s. However, farmers gradually withdrew from growing spring rice after the International Fund for Agriculture Development (IFAD) project concluded. This case study tracks the revival of spring rice in Rinchengang in 2013, promoted by the DAO office, Wangdue and ARDC Bajo. Although spring rice yields well and fetches a good price in the local market, farmers are challenged with flocks of birds picking up grains before har-

vest. Chasing away birds from dawn to dusk is laborious and tedious to say the least, and it discourages farmers from readily adopting the spring rice technology.

Rajma Daal (*Phaseolus vulgaris*) is a legume that requires less water and soil nutrients and performs well even in marginal lands. Rajma Daal is rich in protein and essential micronutrients, thus playing a vital role in the nutritional security of the poorer households in rural areas. In addition, Rajma is a good source of income because of its high demand in the local market as well as in the export market to India. The present case study traces the successful story of Mr. Naku, a 53 years old farmer from Tsangkha, who first experimented with rajma cultivation in 2001 with five kilogrammes seed. By 2010, he had expanded his area and started market-oriented cultivation of the crop, earning anywhere between Nu 8,000-100,000. His neighbours have followed the suit and Naku still leads the way in his community. The added advantage of Rajma is its suitability to intercrop with maize and millets. As an issue, however, farmers reported the lack of storage facilities during times of high production and depressed market price.

The third case focuses on the large-scale production of maize, quinoa, and barley, not only for consumption but also to sell as seed. Traditionally, farmers have been growing maize largely for home consumption as Kharang, Tengma, Ara, and Bangchang. Encouraged by the Dzongkhag Agriculture Office, farmers of Changmey in Trashigang started exploring agriculture as a business in 2015 with the sale of seeds for income. Being a cross-pollinated crop, the seed quality or genetic purity of maize seed quickly deteriorates and production declines with each subsequent planting. Seed replacement every alternate year is thus essential.

Farmers grow barley mainly for home brewing and for making flour to fulfill annual rituals. In recent years, however, the demand for barley has risen mainly from the community of Merak, Sakteng, and Rangjung. Marketing is not an issue for the farmers. Likewise, quinoa is a recently introduced crop by the Ministry of Agriculture and Forests, and farmers have started large-scale cultivation in 2018. Quinoa is a super pseudo-cereal with high protein content (18%) and is rich in most essential micro-nutrients. Farmers have been producing seeds and selling them back to the government for further area expansion. An average household earns between Nu. 7,000 to Nu. 40,000 per season. Some of the challenges cited by farmers include crop damage by wild animals and the scarcity of farm labour.

Spring Paddy Cultivation in Rinchengang, Thetsho Gewog, Wangdue Phodrang Dzongkhag

Ugyen Dorji[1]

Background

Rinchengang (27º28'N, 89º53'E), under Thetsho Gewog, Wangdue Phodrang Dzongkhag, is about 68 km east of Thimphu above the national high way facing Wangdue Dzong. Paddy cultivation is one of the main sources of livelihood in the area. The paddy terraces, popularly known as "Rinchengangi-ari", are along the slope facing the famous 17th century Wangdue Phodrang Dzong. The vegetation in the area is dominated by chir pine trees. Rinchengang stands at an elevation of 1292 m asl and experiences a sub-tropical climatic condition with annual average temperature of 19°C and precipitation of 1,002 mm (Dorji, Olesen, Bøcher, and Seidenkrantz, 2016).

Spring paddy cultivation

Seeing the potential for double paddy cultivation, the Wangdue Dzongkhag and RNR sector initiated the spring and summer paddy cultivation in Rinchengang community in 2013. Double paddy cultivation practice is continued by about 40 households. The paddy variety used in spring cultivation is Number 11 and the seeds are supplied by the National Seed Centre, Paro. Originally, this paddy was brought from Japan.

In 2013, Wangdue Dzongkhag RNR sector, with technical and seed support from RNR RDC Bajo, introduced this variety in Rinchengang along with demonstration on cultivation. With the success of demonstration, about 40 households of Rinchengang accepted to cultivate this variety on their 30 acre field. The spring paddy cultivation has also been initiated in areas like Gaselo Tshowom and Daga Gewog.

Key features of spring paddy cultivation

Almost all the management practices are similar as in general paddy cultivation. The only difference is in the timing of seed sowing, transplanting and harvesting, which are moved forward in the case of double cropping. Paddy nursery is raised in a plastic tunnel in February and the seedlings are trans-

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planted in April and harvesting is done in June. For the second cultivation, nursery is raised in May and the seedlings are transplanted in July and harvested in October. Irrigation water supply, which depends on monsoon that starts in June, is the main challenge for spring cultivation.

According to Ms. Deki Pem, Senior Agriculture Extension Supervisor, in Thetsho Gewog, the production per unit area is higher compared to normal summer production. The yield is about 1,900-2,600 kg/acre compared to summer cultivation, which yields about 1,600-1,700 kg/acre. The rice from this harvest fetches a higher price in the market than the summer cultivated rice. The Number 11 rice variety fetches Nu.150/Drey (equivalent to 1.5 kg) for the new stock and Nu. 140/Drey for the old stock. This paddy variety can be cultivated twice in a year and thus can have two harvests as compared to local rice cultivation. Stalk of this paddy variety is shorter and therefore is less vulnerable to lodging due to wind damage.

Opportunities and challenges

The spring paddy cultivation with this variety is suitable in the mid-altitudes. Farmers living in similar agro-ecological zone can adopt to enhance paddy production. For the success of spring paddy cultivation, irrigation water and enough labourers should be available. For raising seedlings, use of simple plastic tunnels is effective and successful.

Since this is an early spring crop with no other grains cultivated, bird attack is one of the main problems. People have to continuously guard the paddy from grain formation till the paddy is harvested. This has been very difficult for the people as they have to guard the rice from 6:00 in the morning till dusk. To solve this problem, the RNR sector supplied net to cover the crop, but was unsuccessful. The current practice is continued with incentives from RNR sector and the spring rice cultivation may take some years to be adopted by farmers of other Gewogs. The Dzongkhag RNR sector has plans to introduce spring paddy in all the rice growing areas in Wangdue Dzongkhag.

Incentives for growing spring paddy

The Dzongkhag RNR sector has been distributing free supplies of fertilizers and about 800 to 900 kg of spring paddy seeds every year since 2013. The RNR sector also supplies 600 to 700 m plastic sheet annually to construct plastic tunnel. This has been very helpful to the farmers of the Gewog.

Raajma Daal Cultivation in Tsangkha Gewog, Dagana Dzongkhag

Om Katel[1] and Anooja Nair[2]

Background

Tsangkha Gewog is one of the poorest Gewogs in Dagana Dzongkhag. The sources of income in the Gewog are from sale of livestock products such as milk, cheese, and butter. Fodder and forest areas required for animal grazing are relatively poorer than other Gewogs in the vicinity. Mr. Naku, a 53-year-old farmer, lives in Tsangkha Gewog and has been farming since he was young. After completing primary education from a nearby school, he stayed back at home to help his parents as they were not able to continue his education.

Mr. Naku's adventure

Mr. Naku owns about five acre dry land and three acre irrigated land. He has a small family and five other relatives live with him. Labour shortage is not a problem in his household. However, with water scarcity in the area, he has to depend on rainfall for rice cultivation. In the year 2001 and 2002 he suffered crop loss due to storm which posed difficulty in meeting the food requirement of his family. To overcome such events in future, he thought of starting a dairy farm. However, he realized that his land does not have fodder trees and accessing fodder from the forest would be challenging. Further, due to the poor soil quality of his land the cultivated crops did not yield as expected. Mr. Naku then realized that "Raajma Daal" cultivation does not require much water and the soil quality appears to be suitable for its growth.

Mr. Naku experimented with the cultivation of Raajma Daal in 2002 to check if it is profitable. He started cultivation with five kilogramme Raajma Daal in 2002 and began to farm commercially in 2010. Since 2012, Mr. Naku started cultivating and supplying Daal to nearby school. Three varieties of Daal namely Kalo Daal (black Daal), Bodi Daal (beans) and Pothrey Bodi or Raajma Daal are cultivated in his three acre farm. Since then, in his community, more than 40 households have started to cultivate Raajma Daal. An individual household earns Nu. 8,000-100,000 per season. Among the three varieties, Raajma Daal is highly preferred by buyers as well as the communities.

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Currently, most of the vegetables required by school is supplied by Mr. Naku and the major produce from his farm includes Raajma Daal. He is the leading producer of Raajma Daal in the locality.

The yield per acre and selling price of different Daal in the Gewog are shown in Table 2.1. By far, the yield of Raajma Daal at 300 kg/acre is comparatively higher than other Daal varieties.

One of the advantages of cultivating Raajma Daal is that other crops such as maize and millet can be cultivated in the same plot at the same time. According to the Agriculture Statistics (2017), the yield per acre of Raajma Daal is the highest in Lhuentse Dzongkhag (767 kg/acre) followed by Pema Gatshel (670 kg/acre) and Samtse (608 kg/acre). In terms of farming area, Dagana stands second at 386 acre. Monggar is in the top position with 453 acre (RGOB, 2017).

Table 2.1: Yield per acre and selling price of different Daal

Variety	Yield (kg/acre)	Selling price/kg (Nu.)
Raajma Daal	330	120
Black Daal	80	80
Beans or Bodi Daal	120	100

Challenges and future plans

There is a good opportunity for farmers to earn cash income from Raajma Daal as its demand is increasing in the market. However, lack of storage facilities in the locality forces the farmers to sell their produce as quickly as possible after the harvest. They can neither wait for better price nor safely store (save) seeds for next cropping.

Demand for Raajma Daal is high among other Daal in the locality as well as in Punakha, Thimphu, Wangdue and Sarpang Dzongkhags. In future, Mr. Naku, along with other farmers plan to increase production by extending their cultivation area.

Maize, Quinoa, and Barley Production in Changmey, Trashigang Dzongkhag

Serki Wangmo[1], Jambay[2] and Lobzang Penjor[3]

Background

Changmey is a small village with 200 households under Shongphu Gewog in Trashigang. The village is suitable for growing a wide variety of crops and vegetables as the area has fertile soil and suitable climatic condition. There are about 140 farmers actively working in the village and each farmer owns an average of two acre and fifty decimal land.

Since the farmers of the Gewog grow varieties of crops, the Ministry of Agriculture and Forests has provided various incentives to set up agribusiness. According to the representatives of farmers, they work very hard to meet their expectations of high production. They mainly produce cereals such as quinoa, maize, and barley.

Agriculture as a business

After receiving seeds from the government, the farmers have been growing maize seeds and quinoa on a commercial scale. Maize and barley are produced since the time of their forefathers. However, the maize seed business started in 2015 and quinoa in 2018 (Figure 2.1). The business idea was initiated by the Trashigang Dzongkhag Agriculture Extension office in collaboration with the farmers. Besides meeting their own consumption needs, they sell barley to the nearby communities.

Figure 2.1: Quinoa in Changmey, Trashigang

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The motivating factors are (i) monetary benefit, (ii) government support, (iii) awareness on nutritional values of crops, and (iv) personal interest. Moreover, the support rendered by the Dzongkhag Agriculture Extension office encouraged farmers to work hard. The other factors include hard work and inquisitiveness of the farmers.

Key features of business

According to the representatives of the farmers, they produce about 2,000 kg maize from about one acre and fifty decimal land. Maize is grown in the first week of April and harvested at the end of October. They try to maintain the same quantity of production to meet the demand and their consumption needs.

The Dzongkhag Agriculture Extension office supported the farmers in selling maize seeds to other communities. Until 2019, there was no marketing problem since their produce were picked up from the farm gate by the Dzongkhag Agriculture Extension office. On an average, farmers sell about 1,800 kg of maize seeds at Nu. 22/kg providing an annual income of Nu. 36,600 (Table 2.2).

Barley is sown in the first week of October and harvested in January. Farmers have been producing barley for brewing Bang Chang (alcohol beverage from barley), making flour and for using as Dru-Na (traditional cereals used in ritual). They have increased barley production after realizing its market potential. On an average, 1,500 kg is produced from about one acre and fifty decimal land. They sell barley to Merak, Sakteng, Rangjung, and in the village. Individual household sells about 100 kg in a season at Nu. 80/kg (Table 2.2).

Quinoa is sown in October and harvested in January. Quinoa production started in 2018 after the Dzongkhag Agriculture Extension office introduced the seeds. Introduction of quinoa aimed at improving food and nutrition security in the country. The farmers produce about 150 kg from 33 decimal land. Quinoa is used as Dru-Na and consumed with rice. On an average, each house-

Table 2.2: Average household sale of commodities

Crops	Quantity sold (kg)	Price (Nu./kg)	Sale/season (Nu.)
Maize	1,800	22	39,600
Barley	100	80	8,000
Quinoa	75	100	7500

hold sells about 75 kg at Nu. 100 kg (Table 2.2).

The income from three cereals is used to meet domestic expenditure. According to the representatives of the farmers, money earned is kept with the head of the household or the person who manages the daily household activities. She/he then decides to use it for their daily activities.

Opportunities and challenges

Commercialisation of potential crops can increase the income of farmers and reduce imports. This might reduce rural-urban migration and create employment opportunities. However, crop damage by wild pigs, porcupines, monkeys, and rodents is one of the important issues. Also, farmers experience labour shortage which is addressed through labour exchange. Likewise, fodder shortage is addressed by using crop residues such as barley straws and corn husks for cattle during winter.

Future plan

Farmers have plans to increase production and diversify crops for commercial purposes. Their immediate plan is to increase quinoa production since they have not farmed on a large scale due to limited experience. However, they need trainings on crop production and plant protection.

Chapter 3: Agriculture Nursery

Nurseries in Bhutan has a key role in enhancing regeneration of forest cover, development of avenue and landscapes, and in socio-economic development. Today, across the country, many successful nurseries have been developed and maintained by individuals and organizations. The nurseries established for business purposes are booming in the recent years with high demand for forest restocking, landscaping and agriculture purposes. This Chapter presents three successful nurseries from Western, Southern and Eastern Bhutan: Bhutan Alpine Seed in Paro, Southern Seedling Nursery Farm in Sarpang, and nursery of Ap Ugyen Tenzin from Lhuentse.

Located in Woochu, Paro, the Bhutan Alpine Seed belongs to Mr. Jambay Dorji. He is a seasoned expert in seed production and a retired former officer of the Ministry of Agriculture and Forests. With skills and knowledge from his educational background in seed technology, and through several capacity building trainings in his 39 years of career in the ministry, he is well versed in the field of horticulture, seed production and processing. Mr. Dorji has the skills needed to venture in a privately owned enterprise, first of its kind in the country, with the fundamental aim of achieving the national food self-sufficiency.

Bhutan's pioneer nursery grower, the Southern Seedling Nursery Farm, was established at Samtenling, Sarpang in 2001 by Mr. Hill Bahadur Thapa. It was Mr. Thapa's long wish to operate such farm. Mr. Thapa later passed the farm to his son, Mr. Rajiv Thapa. Today, the whole-sale plant nursery spans over six acre land making it the largest nursery in the country. They sell varieties of plant seedlings from indoor to garden plants and ornamental trees to wild orchids. Interestingly, they also provide landscaping services for residences and institutions.

Seed is the fundamental propagation material in vegetable production and agriculture development. In Eastern Bhutan, Mr. Ugyen Tenzin, 62 years old, has started his journey of vegetable seed production with youthful vigour and enthusiasm in Lhuentse. The Royal Government of Bhutan and the international organizations have intervened in boosting the local economy through various means either in cash, in kind, or through capacity building. Mr. Tenzin was motivated to take up the agribusiness after he attended a farmers' training on seed production at the Agriculture Research and Development Centre (ARDC), Wengkhar. Japan International Cooperation Agency (JICA) has also

been instrumental in supplying the improved varieties of seeds.

The three case studies contain the description of the enterprises. It also highlights the motivations and skills of entrepreneurs required to venture in such field. The different challenges experienced by the entrepreneurs and potential opportunities are explored in the stories.

Bhutan Alpine Seed, Paro Dzongkhag

Tshotsho[1] and Passang Lhamo[2]

Mr. Jambay Dorji, a retired agriculturist, is the proprietor of Bhutan Alpine Seed. He has a Master's degree in Seed Technology from the University of Edinburgh, Scotland. Mr. Dorji was also trained in horticulture, seed production, and seed processing in several countries. Mr. Dorji served in the Ministry of Agriculture and Forests for 39 years. Prior to working in Druk Seed Corporation as a Managing Director, he served as a Dzongkhag Agriculture Officer and Programme Manager.

The Bhutan Alpine Seed, is the first privately owned seed company aiming to promote the national food self-sufficiency through the distribution of quality seeds at an affordable prices to farmers and create employment opportunities. It was established in Paro in 2001. The company produces open-pollinated vegetable seeds and planting materials of horticultural crops. Since 2021, the company has been exporting high-quality Chinese cabbage and radish seeds to SAKATA Seed Company based in Japan. Although the export has been modest, the company takes pride in their work which is highly technical in nature.

The products of Bhutan Alpine Seed include fruit tree saplings, hybrid and non-hybrid vegetable seeds. They produce grafted apple, peach, pear, persimmon, walnut, plum, and apricot tree saplings along with non-grafted pear, grape, and chestnut tree saplings. The price of fruit saplings ranges from Nu. 70 per piece (grape variety Muscat of Alexandria) to Nu. 220 per piece (grafted walnut variety Kanthel).

Hybrid vegetable seeds which produce high yield are cultivated by the company. It is limited to cruciferous family namely cabbage, cauliflower, broccoli hybrid, and solanum family particularly tomato hybrid and capsicum. The cost of hybrid vegetable seeds is high compared to non-hybrid vegetable seeds mainly due to the high production cost. The name, variety and price per 10 g of hybrid vegetable seeds are provided in Table 3.1.

Furthermore, different types of non-hybrid vegetable seeds are grown and marketed at a lower rate compared to hybrid vegetable seeds. The Japanese watermelon (Asahi Yamato) is the sole non-hybrid fruit seed cultivated among 25 non-hybrid vegetable seeds. The price of open-pollinated vegetable seeds

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ranges from Nu. 20 to Nu. 40 for a 10 g packet.

Table 3.1: Hybrid seeds from Bhutan Alpine Seed

Name	Variety	Quantity (g)	Price (Nu.)
Cabbage hybrid	Nazomi	10	220
Cauliflower hybrid	Candid charm	10	350
Broccoli hybrid	Green Magic	10	480
Chili hybrid	Grumi-7	10	300
Tomato hybrid		10	170

Mr. Jambay said that our country is globally known for its pristine environment with negative carbon footprint and has established her reputation as an environmentally friendly country in the global arena. He added that with her reputation, the concept of brand Bhutan can be explored as a selling point for private seeds and horticulture companies. Bhutan has the edge over other neighbouring countries in terms of its climatic conditions for production of seeds. The climate in the country, ranging from temperate to sub-tropical, provides perfect conditions for producing wide varieties of seeds, which are in high demand across the bordering countries of India and Bangladesh, such as cabbage, broccoli and cauliflower. Further, the geographical location of our country provides the isolation required to produce quality seeds, minimize cross pollination and to control the spread of diseases.

However, the company has not been able to flourish beyond the category of cottage and small industry despite its establishment two decades ago. This is mainly due to certain limitations such as lack of fund, high production costs, and market fluctuation. The financial distress affected professional development of employees. Mr. Jambay is the only person in the company with comprehensive scientific knowledge. The neophyte employees assist him in completing manual task associated with production and manufacturing. The company is not able to train recruited employees on numerous aspects of commercial farming and seed production. Other limitations of the company includes lack of seed processing machinery, germination testing, inferior quality of packaging equipment, and labour-intensive tasks. These limitations increase the production cost and hence the selling price.

The owner of the Bhutan Alpine Seed, Mr. Jambay, explained that, in the year 2013-2014, with the conversion of Druk Seed Corporation to the National Seed Centre, the new policy entailed that National Seed Centre would supply

seeds to farmers at a marginal rate. Whilst the idea was to subsidise seeds to the farmers and encourage farm productivity, the market equilibrium which was maintained for the price of seeds had been disrupted. Suddenly, private sectors such as our company were running out of business.

The decisions taken by the Ministry of Agriculture and Forests to subsidise seeds and fruit tree saplings have directly affected the seed companies such as Bhutan Alpine Seed. Moreover, the company is not in a position to compete with the National Seed Centre (NSC) mainly because of the following reasons: The varieties of seeds and fruit tree saplings produced by the Bhutan Alpine Seed are similar to that of NSC as required by the government's approved list. Thus, the customers are drawn towards the lower-priced seeds and saplings produced by the NSC.

The seed Commission Agents are offered 10% commission for marketing the products from the NSC; however, privately owned seed companies are not eligible for this scheme. Hence, the company has been forced to lower the price of the seeds and seedlings besides providing 15% commission to the seed Commission Agents to sell their products in the market. Mr. Jambay asserted that, "being a small company, we cannot afford to have a separate marketing chain of our own and hence have to rely on the established market chains such as the Commission Agents*"*. In addition, farmers are already aware of the Commission Agents and they have been purchasing fertilizers, farm tools, seeds, and saplings from these outlets.

The company requested Dzongkhag Agriculture Officers to purchase their product; however, owing to audit objection made on purchase from private seed company the request was repudiated. They believe that this situation was mainly due to higher product price of the company compared to products from the NSC. However, the Dzongkhag Agriculture Officers and other seed distributors have been purchasing the products from Bhutan Alpine Seed when the NSC is not able to meet their demand.

There are certain internal limitations associated with the company. Although, it has been almost two decades since the establishment of the company, there is a gap in human resource development due to financial constraint. Mr. Jambay is the only specialized person in the company with technical knowledge, and other employees have limited agricultural knowledge. Additionally, the company has not been able to train the employees on commercial farming/seed production.

Similarly, the company's seed processing machineries, equipment for ger-

mination testing, and seed packaging are either of poor quality or labour intensive. These constraints further aggravate the cost of production ultimately leading to high selling price.

Despite the challenges, Mr. Dorji has envisaged a way forward to deal with the challenges. The company's strategies and suggestions include that the government should encourage more entrepreneurs to establish seed companies. This would create employment opportunities for the youth and assist the farmers in availing quality seeds at a reasonable price. The NSC could remain as the apex body assembling the private seed companies and provide necessary assistance rather than competing. The NSC should provide opportunities to private sectors and develop seed industries in the country rather than catering to the demands of all 20 Dzongkhags. The NSC also could consider offering market support and quality control for all the seeds and saplings produced in the country.

The Bhutan Alpine Seed flourished as a solitary private seed company in Bhutan. Notwithstanding the constraints such as a single agricultural expert, inferior and labour-intensive equipment, the company abides by the Royal Government of Bhutan's objective to achieve national food self-sufficiency through production and distribution of improved varieties of seeds and fruit tree saplings. The company exports its products particularly Chinese cabbage and radish seeds to SAKATA Seed Company in Japan.

Southern Seedling Nursery Farm (SSNF), Samtenling, Sarpang Dzongkhag

Sushila Rai[1] and Yogeeta Dahal[2]

The Southern Seedling Nursey Farm (SSNF) was established in the year 2001 by Mr. Hill Bdr. Thapa. Mr. Thapa worked in the Ministry of Trade and Industry (currently known as Ministry of Economic Affairs). He was 43 years old when he resigned from the job and started his own business. Currently, the enterprise is managed by his 33-year-old son Mr. Rajiv Thapa, who has an engineering degree. The farm is located just below the Sarpang-Gelephu highway, near Bhutan Centennial Distillery in Samtenling Gewog, Sarpang Dzongkhag. Presently, the nursey is on a six acre land and sells different varieties of plant seedlings.

The SSNF is a wholesale plant nursery and one of the largest operating nursery in the country. Mr. Thapa shared that he was always interested in agriculture and it was his dream to establish his own nursery farm. The idea of the business started when masses of re-settlement in Sarpang Dzongkhag were searching for fruit saplings to grow in their newly acquired fallow lands. The Dzongkhag Agriculture Office also encouraged farmers to set up nurseries during that time. Mr. Thapa realized that there was a business potential in nursery and so he resigned from his government job. He took loan from bank and started with a small farm, initially selling few fruit seedlings of betel-nut and orange. During the initial phase, Mr. Rajiv used to help his father in the farm during his free time and in the process, he developed interest in this field. After finishing his engineering degree, instead of getting into government job he decided to help his father and took over the overall management. He expanded the business.

Mr. Thapa is the Managing Director and Mr. Rajiv is the General Manager of the enterprise. The enterprise has five permanent employees (Production Manager, Marketing Officer and three labourers) and extra farm labourers are hired as and when needed. The land is divided into different sections to accommodate different types of seedlings for the ease of management. The enterprise only considers chemical free propagation of plants and use organic materials to produce all the products.

The enterprise sells varieties of plant seedlings such as indoor plants

[1]Lecturer, Dept. of Forest Science
[2]Assoc. Lecturer, Dept. of Environment and Climate Studies

(foliage and flowering), garden plants (outdoor shade and open), ornamental trees (flowering and evergreen), palm varieties (sub-tropical and temperate), flowering plants (perennial and seasonal), grass varieties (Bermuda, Mexican and selection), shrubs and bushes (dwarf and tall), pine varieties (sub-tropical and temperate), fruits (sub-tropical and temperate) and orchids. They offer quality landscaping services for residential and commercial companies. The enterprise sells approximately 500,000 to 600,000 seedlings per year. Demand for flowering plants is lowest (around 100,000 numbers per year) compared to other plants.

The enterprise sells seedlings to Dzongkhag Forestry Divisions, Social Forestry Division, agriculture sectors, schools, hydro-power projects, and general public. The enterprise claims of meeting the demands of more than 16 Dzongkhags since 2001. They export the seedlings to other countries like Bangladesh and North-eastern states of India. The enterprise relies on digital marketing through their official website. However, sales through word-of-mouth and social media remain the primary means of marketing the products. Over the years, demand for their products have been increasing. Some of the reasons that their products are highly demanded could be because they are one of the oldest and well-known nurseries in the region. They also produce good quality seedlings, provide good customer service and maintain good relation with the customers. The enterprise makes around Nu. 500,000 to 600,000 net profit per year. They invest most of the money in maintenance, modernizing green house, buying equipment, and in paying salaries to the staff.

The enterprise has experienced both ups and downs over the years. Mr. Rajiv explained that the initial phase (one to five years) of the business was quite challenging. The enterprise did not receive financial help from the government while setting up the business. They managed the resources to establish the nursery themselves. Although, at present the enterprise is well established, it faces challenges of water shortage, inadequate training of staff, ad-hoc demands, and competition. The nursery requires steady and large quantity of water every day. Over the years, water shortage in Samtenling has been growing causing massive loss in the productivity of saplings. The staff employed in the enterprise do not have formal training and with inadequate technical knowledge the productivity of the nursery is hampered. In the same way, ad-hoc demands are a huge challenge for the enterprise as most of the buyers place last minute orders. It is difficult for the enterprise to supply the exact number of saplings and plant species when demanded instantly. Similarly,

there is mounting competition from other nursery growers who have established in the same region such as Samtenling Agriculture Nursery and Green Bhutan Nursery.

In spite of all the above mentioned challenges, the enterprise has progressively picked up the pace of its business over the years. The entrepreneur, Mr. Rajiv, hopes the business will sustain in future because more people are interested in agriculture, horticulture, and floriculture. The most apparent and basic success factors of the enterprise are the enormous passion and interest over the business shown by the entrepreneurs. Mr. Thapa had immense passion in this field and to turn his dream into a reality, he started the business. His venture was supported by his family and also received encouragement from the Department of Agriculture. Another important success factor is consistently producing a variety of products throughout the year and ensuring good customer service.

The enterprise hopes to improve and expand gradually over the years. Their future plan is to establish a laboratory for tissue culture and an automated green house. They are also trying for vermicomposting, grafting, and layering of flower and fruit trees. In future, they would like to focus more on technical management and creating reliable business partners.

Ap Ugyen Tenzin – Lhuntse's Registered Vegetable Seeds Producer

Wang Gyeltshen[1] and Penjor[2]

Ap Ugyen Tenzin is a 62 years old cheerful man from Yurbi village, Gangzur Gewog, Lhuentse Dzongkhag. He began his agribusiness in 2011, after he had an opportunity to attend a farmers' training on seed production at Agriculture Research and Development Centre (ARDC), Wengkhar. During the training he met Japan International Cooperation Agency (JICA) expert who encouraged him to take up seed production.

Seed is the fundamental propagation material. Seeds growers keep the crop in the field for longer duration as a result of which, it is exposed to various biotic and abiotic stresses. Owing to this, many farmers do not venture into commercial seed production in the country. Ap Ugyen focuses on growing vegetable seeds of cauliflower, carrot, and radish due to high demand in the market. He received seeds of improved varieties through the Horticulture Research and Development Project (HRDP-JICA), ARDC-Wengkhar. Initially, he received support from ADRC-Wengkhar in the form of 200 cauliflower seedlings and greenhouse materials from JICA. Later on, a farm road was built for transporting his farm produce to Lhuentse town for sale. In addition to producing vegetable seeds, Ap Ugyen owns wet land where he cultivates paddy to supplement his income.

When asked about the business management, Ap Ugyen said "it is sort of a family run business, we are four members working full time on the farm." He also hires workers, about five to six people for six working days. During the peak working period it costs him Nu. 350 per head per day with free lunch and drinks. Operating an agribusiness incurs a lot of expenses and requires a steady source of income for managing the business.

The seeds are packaged to add value to his produce. A 10 g packet is sold for Nu. 30. On an average he produces 8-10 kg seeds of radish, cauliflower, and carrot earning him Nu. 24,000 to 30,000 per year. Ap Ugyen also makes income from the sale of fresh vegetables. Of the three types of seeds produced, carrot seeds are sold the least, and Ap Ugyen reportedly assumed that Bhutanese in general do not consume carrot as much which is why farmers also do not grow carrots. He sells his produce in the local market and supplies to ARDC Wengkhar to distribute to farmers in Eastern Dzongkhags.

[1]Assoc. Lecturer, Dept. of Agriculture
[2]Assoc. Professor , Dept. of Animal Science

Ap Ugyen grows seeds both in open field as well as under protected cultivation using one-fifth of an acre land. Growing under protected cultivation enables him to grow seeds throughout the year. He produces seeds of improved varieties, which attract customers, and radish seed is the most sought after. Since there is no other registered and commercial seed growers in the locality, he enjoys market free of competitors. In case, if there is any competitor in near future, to stay in the market he plans to improve packaging and maintaining seed quality and viability.

Ap Ugyen continued reporting that life of a farmer is tough, but vegetable seed production has helped him improve in many ways. He is grateful to the ARDC-Wengkhar, HRDP-JICA, and the Commercial Agriculture and Resilient Livelihoods Enhancement Programme (CARLEP-IFAD) project for their unwavering support.

Dzongkhag agriculture sector supported his business by supplying two sets of greenhouse and providing technical support through the Gewog Agriculture Extension Agent. Realizing the importance and contribution of his business to the community, CARLEP-IFAD project also supported him by supplying additional greenhouses and water storage tanks (Sintex tank). He was also supported through HRDP-JICA project based at Wengkhar with provision of seeds, water pipes, training, technical guidance, and greenhouse for which he remains ever grateful and motivated.

Perfection still remains a distant dream as the doubt over future market looms around. To address this issue, the Regional Seed Centre located at Jachedphu, National Seed Centre is going to directly link with seed growers and the market to get a reasonable price for his produce. This way, both parties will be in a win-win situation and in the process farmers would benefit with quality seeds. In order to ensure continuous and quality seed production, fencing of his farm and use of nets to cover the field are required to keep away pest attacks on flowers and fruits. Producing vegetable seeds is not an easy agribusiness, according to Ap Ugyen Tenzin, though it has better prospects to earn cash income. For Ap Ugyen, “seed is not just an embryo engulfed in a seed coat but vegetable in dormancy”.

Chapter 4: Horticulture Industry in Bhutan

Horticulture industry comprises of production, processing and distribution of fruits, vegetables, and ornamental plants. Often, spices and plantation crops such as tea and coffee are also included under horticulture. In tandem with efficient use of resources, trade and nutraceuticals, horticulture is also characterized by diversity of species, seasonality, and perishable nature of the produce (FAO, 2015). The demand for horticultural produce, both in the global and domestic markets, is rising due to growing evidence of the relationship between diet and health (Nicola and Fontana, 2010).

Formal development of horticulture sector in Bhutan dates back to early 1960s when the first few imported apple trees were planted in the temperate region of Paro, Thimphu, and Haa. The early years of horticulture sector development in the country constituted mainly apples and other deciduous fruit trees such as peach, plum, pear, evergreens such as citrus, mango, and a limited species of vegetables. Although still at a nascent stage, horticulture sector in Bhutan continues to create employment opportunities besides generating substantial revenue, providing diversified nutrition, and rehabilitating wastelands.

The official data on the land under horticulture, annual horticulture production or export, and the contribution of horticulture sector to the Gross Domestic Product (GDP) are scant. However, compared to a decade ago, the horticulture industry is expanding not only in terms of land under cultivation and production volume, but also on the diversity of horticultural crops and production activities, including private horticulture nurseries. Farmers' groups and cooperatives who grow and process horticulture crops are increasing. Production of new and exotic fruits such as avocado in the tropical and subtropical regions and kiwi in the subtropical and temperate regions are expanding both through the government support and individual initiatives.

This Chapter contains 11 short success cases of various horticultural crops, revenue generating activities, and their unique challenges and prospects. Two cases are on avocado and kiwi successfully grown in two different parts of the country by two enterprising individuals with no agriculture or farming background, four are on farmers' groups and cooperatives growing various horticultural crops, including medicinal flowers and green tea leaves or harvesting mushrooms from the wild. The remaining five cases describe successful stories of growing mushrooms, culinary herbs and assortment of vegetables, and conserving the popular local chili seeds.

Tomato Cultivation as a Business, Haa Dzongkhag

Penjor[1] and Lobzang Penjor[2]

Background

Agricultural business potential in Haa is limited due to climatic factors. However, a number of farmers have tried to start with farming business. One such farmer is Ms. Ugyen Chezom, 42-year-old, a housewife with three school going children. She did not attend school herself.

About the enterprise

The tomato cultivation as a business was started in 2014 on a six decimal land in Bangyana village under Eusu Gewog. Without any hired employees, Ms. Chezom is the sole owner and a worker on the farm. Cow dung is used as a source of fertilizer rather than the synthetic chemical fertilizers. In order to enhance productivity and to commercialise vegetables, she started with a loan of Nu.120,000 from the government on a 60:40 basis where she had to pay 40% of the loan availed. She installed three greenhouses − two big and one small. Along with the installation of greenhouses, the government provided skill development training such as bed preparation, seedling preparation, cultivation of different vegetables inside greenhouse, and harvesting techniques (Figure 4.1). The Dzongkhag agricultural sector also provided training on tomato farming, preparation of organic fertilizers and pest management. She was motivated to grow vegetables from a long time and with the support from the government her dream of farming turned into a business.

Figure 4.1: Greenhouse for vegetable cultivation

[1]Asst. Lecturer, Dept. of Environment and Climate Studies
[2]Research Officer, Office of Research and Industrial Linkages

Production and marketing

While tomato is grown as the main crop, Ms. Chezom also grows other vegetables such as spinach, coriander, spring onions, and chili for self-consumption. During the spring, she starts working inside the greenhouse preparing seed beds. At the end of spring, she starts to plant tomatoes inside the greenhouse while radish and turnips are planted outside. During winter, spinach and coriander are cultivated inside the greenhouse.

Ms. Chezom sells her produces in Phuentsholing, Thimphu and some local shops. In 2019, Ms. Chezom's total earning was around Nu. 116,000. She charges Nu. 50/kg of tomatoes and Nu. 25/kg of potatoes. After deducting the cost for inputs, transportation and other expenses, she earns a net profit of Nu. 70,000 to 80,000. The Dzongkhag Agriculture office provides support in marketing by leasing a vegetable stall in the Centenary Farmers Market in Thimphu specifically for farmers of Haa Dzongkhag to sell their winter tomatoes.

Challenges and future plans

Some issues faced by Ms. Chezom are limited market outlets to sell farm produce and blockage of water pipelines during cold winter. However, she plans to install additional greenhouses to maximize productivity. She also plans to continue with tomato farming as it has proven to be a profitable business.

Conclusion

Ugyen Chezom is a dedicated young entrepreneur who started agribusiness with a special focus on tomato cultivation. The government supported her with loan and skill development. Despite the challenge in marketing, Ms. Chezom plans to expand and improve her tomato business.

A Case of Successful Mushroom Business, Geney Gewog, Thimphu Dzongkhag

Sonam Gaki[1] and Phub Dem[2]

Background

Mushrooms are known to be the best alternative food for vegetarians. Matsutake mushroom (Sangay Shamu) is the most prized and expensive mushroom in Bhutan. It grows at an altitude of over 3,000 m asl. Since 2000, Genekha Gewog under Thimphu Dzongkhag and Ura under Bumthang Dzongkhag were found to be the only two suitable habitat for Matsutake growth in Bhutan. Since then, local people started harvesting and exporting Matsutake to Japan and Singapore. It has become a crucial source of livelihood and community development in both the areas.

Geney Mushroom Group (GMG) was formed in 2007 with 127 households. As of December 2019, the group had savings of Nu. 2.2 million. The collection and commercialisation of matsutake in Geney Gewog became successful after Dasho Rinpochey, in 2000, took interest in the said mushroom and started helping the farmers in marketing it.

Marketing strategy

In 2001, with additional support from the Ministry of Agriculture and Forests (MoAF), local farmers started selling the mushroom in larger quantities at Nu. 500/kg. In 2007, due to mass collection and exploitation, the MoAF identified and mapped the whole area for sustainable harvesting. Later, the GMG was formally formed with 127 households for long-term sustainability. The group started exporting their product to Japan and Singapore besides selling it to the Bhutanese consumers. In 2019, the market price of the mushroom reached Nu. 1,300/kg enabling each household to earn Nu. 0.1 million.

Management strategies

For sustainable management and to enhance its benefit, the group started collecting a fee of Nu. 5 for one kilogramme of mushroom sold, since 2007. Within two years, the group had collected Nu. 2.2 million. Additionally, in 2019, to further benefit the members, the group started lending their collected money to the group members with a maximum ceiling of Nu. 0.1 million at an

[1]Asst. Lecturer, Dept. of Agriculture
[2]Asst. Lecturer, Dept. of Environment and Climate Studies

interest rate of 7% annually.

Challenges

Lack of competent persons to handle finance, market the produce, and promote their services are the major challenges for the group. The group is also worried about the declining production mainly due to the destruction of the forest ecosystem and change in weather pattern.

Of the total 127 households, Mr. Karma Gyeltshen, 53 years old, is one of the group members who is benefiting from the sale of mushrooms. He ventured into mushroom collection in 2007 and is one of the oldest and an important member in managing the group. He has been taking the lead role in the development of an Agro-tourism Centre near Geney Zampa for annual mushroom festival. The centre is also constructing a guesthouse along with other tourism services such as stone bathing centre, a nursery farm, and an artificial lake.

Future prospects

In order to improve the business, the group plans to train the unemployed youth of the Gewog in financial and hotel management, explore options on value addition, and marketing. The group also aims to reach beyond local, regional and international markets. The group needs competent personnel to reduce dependence on others, and additionally start hotels for tourist accommodation.

Benefits and concerns

Income from this mushroom business has been used for purchasing necessary household items besides supporting education of the members' children. Mr. Gyeltshen has received many trainings and information from their annual mushroom exhibition and also from international tourists. The busiest month for the Geneeps is from July till mid-September, which is the peak mushroom season. During the season, people wake up at 2:00 a.m. and start their mushroom harvesting journey at around 3:00 a.m. with packed lunch on their back. However, the group is concerned that the mushroom production in the wild could decline due to increase in temperature, change in rainfall pattern, and destruction of ecosystem in the process of harvesting.

Conclusion

Collecting and selling of mushroom is an important source of income to the group members. In the process, they are also contributing to the promotion of eco-tourism, cultural tourism, and community-based tourism in Geney Gewog. Mushroom business also helps in creating job opportunities. However, members need to be well-trained on sustainable harvesting methods, product packaging, marketing, and managing community-based ecotourism.

Mushroom Production, Bjabcho Gewog, Chhukha Dzongkhag

Jigme Tenzin[1] and Chogyel Wangmo[2]

Jangchubshing Organic Farm in Bjabcho, Chhukha, produces fresh organic mushrooms. Mr. Jangchuk Dorji, with a bachelor's degree in Information Technology, founded the farm in 2012 with support from his wife who has a background in business management. Mr. Dorji had served in the civil service before venturing into mushroom cultivation.

The pair stated that the scarcity of mushrooms in large-scale production motivated them to begin mushroom farming with support from the Ministry of Agriculture and Forests. The farm's objective is to cultivate organic mushrooms. Through the farm they expect to educate young people and farmers about farming and entrepreneurship.

The farm has grown from 500 to 22,000 billets (Figure 4.2) where three varieties of mushrooms are grown on the farm namely Shiitake, Oyster, and Rishi (Figure 4.3). Thus far, the farm has generated approximately 8,000 kg of mushrooms. The owners have established a spawn production laboratory, which has been certified as a mushroom production training centre in the country. The farm has completed second round of entrepreneurship training for youths and farmers.

Social media platforms such as Facebook, WhatsApp, and WeChat are used for marketing of mushroom. The farm has a Facebook page with the name "Jangchubshing Organic Farm" and they accept online orders and facilitate home delivery. The farm is able to sell its mushroom as it is organic certi-

Figure 4.2: Soaking logs for injecting mushroom spawn

Figure 4.3: Rishi mushroom cultivation

[1]Lecturer, Dept. of Animal Science
[2]Lecturer, Dept. of Environment and Climate Studies

fied. The owners discovered that buyers prefer locally produced mushrooms. In their farm, the Shitake mushroom is sold at the rate of Nu. 500/kg, while oyster mushroom are sold at Nu. 300/kg and Rishi mushrooms are sold at Nu. 10,000/kg.

Initially, the farm encountered numerous obstacles. The farm only had a limited supply of spawns. Additionally, the loan support the owners received was insufficient to build the required infrastructure. Investment in infrastructure is critical for consistent output and entrepreneurial success.

Labour shortage was one of the significant challenges on the farm, particularly during log collection and spawn injection. Mr. Jangchuk's family opposed the decision to leave the government job for the mushroom business venture. He believes that this is one of impeding factors for many young people planning for a business or venturing into entrepreneurship.

To encourage more farmers to venture into mushroom production, the farm owners believe that the government should produce more quantity of high-quality spawn, as farmers currently do not have access. Additionally, the logs offered for mushroom production are insufficient, and it would be helpful if the government increased the quota of logs for mushroom production. Additional support in the form of innovative technology for humidity and temperature monitoring is required in the mushroom shed, as these must be maintained at the required level for optimal output.

Despite failures along the way, the farm has established itself as a model for successful agri-preneurship. The farm owners credit their achievement to mentors and friends who provided them with inspiration and support.

Progressive Vegetable Farmer, Wokuna, Punakha Dzongkhag

Ugyen Yangchen[1] and Tashi Lhamo[2]

Background

Ms. Kinley Dema, 34 years old, a mother of one son and a high school graduate, is a passionate and hardworking woman farmer from Wokuna, Punakha. Her husband works as a taxi driver and her father, Ap Kencho Tshering, 82 years old, was one of the progressive farmers during his time.

Ms. Dema is the youngest daughter among three siblings and has inherited 1.5 acre wet land and 29 decimal dry land in Wokuna, Punakha. Wokuna, 16 km north of Punakha Dzong towards Gasa, is a village with terraced wet lands stretched on the gentle slopes above the banks of Mo Chhu River. She grows paddy and different kinds of vegetable such as chili, brinjal, broccoli, cabbage, cauliflower, potato, and onion. She grows vegetables both in the open field and in green house.

Ms. Dema has been working in the farm independently since 2013, although she started farming with her father since the age of 13. She and her two elder sisters assisted their father in the farm during their vacation. She said that she often helped her father in watering onion seedlings during cold winter. For transplanting seedlings, Ms. Dema said, "after bed preparation, first the soil is cupped and adequate water is poured into it before transplanting the seedlings. Transplanting is generally done towards late afternoon to avoid the scorching mid-day sun. Low evening temperatures and night temperatures not only reduce evapotranspiration but also provide enough time for the seedlings to establish themselves. This also prevents the seedlings from heat shock when transplanted in the early hours of the day. Proper spacing between plant-to-plant and row-to-row enhances yield".

The practice of watering the site of seedlings before transplanting was first started by her father. This technique not only saved labour and time in watering the seedlings the following day, but the success rate of seedling survival was also high. Other farmers were encouraged to adopt this technique practiced by her father.

[1]Lecturer, Dept. of Sustainable Development
[2]Lecturer, Dept. of Agriculture

Motivation for farming

Although Ms. Dema had experience in farming, she never thought of taking farming as an occupation. After completing her High School, she aspired to look for a job in Thimphu, like any other youths in Bhutan. Her decision was influenced by her father's belief and passion in farming. His advice to his daughters was to live in the village and continue farming even after their schooling as he strongly believed that farming would bring benefits in the future.

Ms. Dema's father took careful steps in involving his daughters in farming. Before she took up farming independently, a small plot of land (small terrace) was given to each of the siblings to grow chili for a season. They were responsible for managing their own field and harvesting the produce. Later, they were engaged in packaging and counting harvested chili bags.

Money earned from the chilies grown on a small terrace was shared amongst the siblings, and Ms. Dema recalls getting Nu. 10,000 as her share. At that moment she thought if she grew chili in a larger plot of land, she would earn even more. This gave her the motivation to continue farming.

For the following two years, Ap Tshering made all his daughters to gain experience working in the farm under his guidance. He made them to grow cabbage, cauliflower, broccoli, chili, brinjal and potato, amongst other vegetables. After two years of experience in cultivating a wide variety of crops, Ms. Dema's father handed over the land to his daughters with Nu. 20,000 each to meet expenses for agriculture inputs. With this money and a bank loan of Nu. 245,000 from the Bhutan Development Bank Limited (BDBL), Ms. Dema bought a power tiller in 2017.

Key features of the farm

Ms. Dema's vegetable business is profitable. She earned about Nu. 247,000 in the year 2019 from the sale of different vegetables. She produced more quantities of chili and less of cabbage, cauliflower and spring onions (Table 4.1). Demand for vegetables other than chili is comparatively small. She hires few labourers from within the village as and when needed. There is also labour exchange practice in her village.

Table 4.1: Production and income from vegetables in 2019

Harvest months	Crop	Cultivated area (decimal)	Production	Price (Nu.)	Amount earned (Nu.)
May-July	Chili	70	55 bags	1200-5000/ bag	120,000
May-July	Brinjal	25	26 bags	70-200/kg	30,000
April-May	Potato	25	8 bags	50-60/kg	20,000
	Cabbage	12	4-5 bags	25-30/kg	
Feb-March	Broccoli	60	500 bundles	50-70/ bundle	70,000
	Cauliflower	12	4-5 bags	80/kg	
April-May	Spring onion	12	250-300 bundles	20-30/ bundle	7,000
	Total				**247,000**

Note: Each bag is equivalent to approximately 50 kg

Marketing

Ms. Dema sells her vegetables at the Khuruthang weekend market and supplies to vegetable dealers in Thimphu, Gelephu, Bumthang, Paro, and Haa. Networking with vegetable dealers in Thimphu, Khuruthang, and Gelephu and supplying as per their demand are Ms. Dema's marketing strategy. This strategy has helped her to fetch a good price as well as maintain constant demand for the vegetables.

Ms. Dema spends income from her farm on household expenses, annual Rimdo (ritual) and repays the loan. She also has some savings in the bank. In Wokuna, none of the households receive financial support from their children or relatives living in towns, particularly for performing annual Rimdo but the income from farming has made the village financially independent. She compares with other villages in the country where male members of households temporarily migrate during dry winter months to other places in the country for non-farm works. However, in Wokuna, such practice does not exist. The male members also work in the farm round the year.

Success factors

Ms. Dema's success is attributed to self-interest, hard work and consistency in her farm. Besides support from the Dzongkhag Agriculture Extension for seeds, advice from parents, cultivation methods and choice of vegetables

made her to be one of the progressive farmers in her village.

Challenges in farming

Raids by vertebrate wild animals such as monkeys are big challenges. Monkeys damage potatoes when the tubers bear two to three leaves. Due to such issue, instead of expanding the area under potato cultivation, Ms. Dema has started to grow potatoes near her house.

Labour shortage in the village has also affected cultivation of crops like onion production. Moreover, due to the production of different types of vegetables, Ms. Dema has not been able to expand onion production.

Onion from her village is the first to appear in the market and as such buyers wrongly assume that the onions produced in Wokuna is actually imported from India. Ms. Dema had been requesting agriculture officials to create awareness to consumers about onions grown in Wokuna so that the misconception can be cleared and the farmers in Wokuna can expand onion production. It is a potential crop in the area.

Future plans

Ms. Dema plans to grow asparagus in her farm, as there is a huge market demand. As of now, Paro Dzongkhag is the highest producer of asparagus in the country. Altitude difference between Wokuna and Paro provides potential to produce early asparagus in the western region. Asparagus is a perennial crop that continues to produce spears for more than 15 years (Shimizu, 2006). Ms. Dema sees growing asparagus is easier than other vegetables and had been looking forward to cultivating it from 2020 onwards.

Conclusion

Hard work and dedication has turned Ms. Dema's vegetable cultivation into a lucrative business. Proper guidance and support from her father motivated her to take up farming after completion of her school. Accessibility to market and Ms. Dema's networking strategy with vegetable dealers from other dzongkhags have helped her to fetch good price. Despite challenges such as vertebrate pests, labour shortage and misconception of buyers on the onion coming from her village, Ms. Dema is bent on diversifying vegetable production to meet the growing market demand.

Herb Grower of Kabjisa, Punakha Dzongkhag

Tashi Lhamo[1] and Ugyen Yangchen[2]

Background

Ap Passang from Botokha village, Kabjisa Gewog, Punakha Dzongkhag is an avid herb grower. Although 70 years old, he grows a number of exotic culinary herbs and spices such as parsley, dill, arugula, oak leaf lettuce (red/ green), romaine lettuce, green basil, Thai basil, thyme, chervil, kale, water cress, oregano, mizuna, rosemary, celery, horse radish, mint, marjoram, lemon grass, ground apple, and other popular tea species such as butterfly pea and hypericum. All these are grown on his three acre dry land, and the fresh herbs are sold to the country's finest high-end hotels.

Other than watercress, mint, common basil, all the other species are introduced. Culinary herbs are aromatic, fresh, dried, or processed leaves and flowers of herbaceous plants that enhance the flavour and fragrance of food. Both plate and palate can be diversified with subtle culinary flavouring and delicious teas that are made from herbs (Bishop, 2015). Ap Passang also rears livestock, which supply him with organic manure, milk, dairy products, and poultry products; thus, diversifying his market and income.

Ap Passang lives with his wife and they have two daughters and a son. His eldest daughter works in one of the resorts while the younger one attends school and stays with them. His son is a monk.

Journey of herb growing

Ap Passang has been cultivating vegetable crops for almost three decades. In 2011, when Ap Passang's eldest daughter started working in one of the high-end resorts in the country, the resort was in search of a local supplier of culinary herbs. Knowing that her father could take up the proposal, the daughter shared the idea with him. Since the cultivation practices of herbs are similar to that of most other vegetables, Ap Passang willingly accepted the proposal.

Impressed with his farming practice, the resort provided him the culinary herbs, seeds and training in herb cultivation. Ap Passang shares, ''growing herbs is like vegetable cultivation and I am happy that it was a success for me''. He recalls his first sell of a popular romaine lettuce in December 2012 to

[1]Assoc. Lecturer, Dept. of Agriculture
[2]Lecturer, Dept. of Sustainable Development

the resort. Amazed that he could earn Nu. 55 per bundle of herb, he got motivated to experiment on various types of herbs. Thus, began Ap Passang's journey into herb production.

Within eight years, Ap Passang has not only enriched his knowledge and skills in growing herbs, but also captured some of the country's most popular high-end hotels. The herbs are harvested throughout the growing season (summer-fall). Ap Passang takes advantage of multiple successive harvests of herbs, which result in greater cumulative yield per plant. The same cannot be applied with most other crops, as it takes longer time and successive harvests are not as good as the initial harvest. However, he has also learnt that when making multiple harvests off the same plant, he ensures to leave enough leaves to support shoot re-growth.

Due to the highly perishable nature of herbs, it is important to ensure a ready market before herbs are harvested or even planted. It also pays to work closely with buyers on what to produce, when to produce, and in what volumes (Davis, 2017). The fresh herbs are sold to different branches of Six Senses and Uma resorts in Punakha, Thimphu, Paro and Wangdue (Gangtey) Dzongkhags. He makes fresh delivery directly to the nearby resorts.

Cultivation practices

Ap Passang says "farming involves a lot of hard work and dedication; you have to take care of your plants like babies". Relying on his general horticulture knowledge and seeking advices from herb growers, he has gained a rich experience.

Ap Passang's farming practice starts with an early preparation of land. He says overnight flooding is necessary before preparing the land, if it is hard. After flooding, the land is mixed with cow dung. He uses 130 baskets (each weighing 25 kg) of cow dung in three acre land. The seeds are then sown in a small nursey bed. The raised nursery bed is 6 m x 1 m. Transplanting is done as per the size of seedlings/plants, and fertilization is done only at the time of field preparation to avoid nitrogen toxicity and vigorous vegetative growth of herbs, which cause loss of flavour. Harvesting is done mostly in early morning hours after the dew dries. Most herbs are harvested by hand pinching the leaves at the tips. They are handled gently and packed maintaining the freshness of the herbs.

Livestock integration

In addition to herb cultivation, Ap Passang raises a few heads of dairy cattle and poultry birds. He owns four Jersey cows, which supply milk and cow manure. The poultry provides him with eggs and chicken manure. Since organic milk and eggs are in demand, these are supplied to nearby hotels and resorts. Cow dung and poultry manure are the only sources of fertilizer on his farm. With support from livestock sector in the Gewog, Ap Passang has built a biogas plant from which bio-slurry is obtained to be used as a source of organic fertilizer in his field.

Marketing strategy

Despite not having a formal education, Ap Passang maintains a good record of monthly farm business with the help of his younger daughter. He only knows a bit of Dzongkha numeric. Knowing that herbs are perishable, harvesting is planned only on receiving the demand. For the distant markets in Paro, Gangtey and Thimphu, the supply order is received twice in a week i.e., every Friday and Saturday. The price of the produces increases by Nu. 10 per bundle every third year (Table 4.2). The total annual earnings estimated from the sale of the herbs (November-December 2019) is Nu. 12,760, which projects to Nu. 72,000 per annum. However, the annual projection could increase during the peak tourist season (March-October) when the demand for the herbs is higher.

When asked about his opinion on consuming herbs on his own, he said, “it is only for the foreign taste.” He believes that with such a good opportunity in the herb market, he encourages the youth to take up such a venture.

Challenges

Finding skilled labourers has always been difficult. Hired labourers cannot differentiate herbs and weeds. Managing wildlife damages on the herbs, such as by deer and wild pig, is also challenging. In case of any pest problem and disease outbreak, he seeks help from the Gewog Agriculture Extension Agent.

Future plans

Ap Passang is the only herb grower in the community, and he is confident on sustaining his venture. His hard work and dedication has kept him going strong since the beginning. He wishes his daughter to take up his business in

future and increase herb production together with expansion of the market to other Dzongkhags in the country.

Table 4.2: Production and income from two months (November-December) 2019

Crop	Production	Price	Amount earned (Nu.)
Arugula	7 bundles	70/bundle	490
Baby arugula 'Baby rocket'	2 bundles	70/bundle	140
Basil	4 bundles	110/bundle	440
Chervil	6 bundles	70/bundle	420
Dill	8 bundles	70/bundle	560
Kale	43 bundles	70/bundle	3,010
Parsley	15 bundles	70/bundle	1,050
Thyme	2 bundles	80/bundle	160
Water cress	18 bundles	70/bundle	1,260
Mixed leaf (assorted herbs)	29 bundles	70/bundle	2,030
Milk	10 L	70/L	700
Local cheese	50 balls	40-50/ball	2,500
Total			**12,760**

Note: Each bag consists of 150 g (approximately)

Senior Youth Group and a Dream Model Garden, Gomtu Gewog, Samtse Dzongkhag

Monika Pradhan[1] and Rekha Chhetri[2]

Enwrapped in a thick blanket of cinereal smoky air lies the sparsely populated village of Muktiar Bagan on the rugged terrain of the southern foothills. While majority of the people are syphoned towards bustling industries, the farming activity is a rare sight in most villages. This situation has made people to depend mostly on processed food and vegetables imported from neighbouring Indian borders. Unhappy with the current practice, a group of three individuals of Muktiar Bagan, in Gomtu Gewog, had a vision to develop their community and motivate the people to change their lifestyle. They aimed at encouraging villagers to practice agriculture farming and be self-sustainable. So, they started sowing seeds to establish fruit farm for the long run and to grow vegetables, mostly chilies as their short-term objective.

Mr. Birkha Chhetri, 56-year-old, who had previously worked as a senior engineer had an idea to do something for community development as his retirement plan. His idea was shaped and further supported by Mr. Sukman Tamang's proposal to start avocado plantation. Mr. Tamang, 48-year-old, owns a private fruit nursery and takes great pride and interest in agriculture activities. In fact, all the avocado saplings were raised in his nursery. This saved them a huge cost from buying the same at the rate of Nu. 450 per plant. Later, their friend, Mr. Bhim Bahadur Basnet, 46-year-old, who had served as a former Gup in the village also joined them for the good cause.

The synergy of their individual experience and skills contributed in developing a model garden, an exemplary farm to motivate rest of the community members, to take up agricultural activities. Their model garden would have organic fruits and vegetables grown to fetch good profit and be a prominent brand in the market. They aspired to be independent and self-sufficient from the sale of their farm produce and be a role model for the rest of the community members. They plan to sell fruits such as avocado, lemon, and watermelon in the long run and grow vegetables which have high market demand until the trees start fruiting.

The trio appealed for a 10-year lease of a 10.5 acre land to start their business in the year 2015. They pay Nu. 6,600 annually as a rental charge. After

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clearing the land (Figure 4.4), they started planting chilies. However, without a caretaker to look after chilies and without a proper fencing, the chilies were damaged by wild animals. Their first trial was a devastating failure and the land remained fallow for another four years.

Figure 4.4: Land cleared for chili planting, Muktiar Bagan

In mid-2019, the trio got together and decided to grow fruit trees instead. Considering the price in the market, Mr. Tamang proposed to grow avocado trees. He then started raising its saplings in his nursery. The senior group had initially invested about Nu. 800,000 to establish the farm. They first began by clearing five acre land. After vigorous weeding and hoeing, they were able to convert the overgrown shabby land into neat garden beds in which they planted avocado and lemon saplings.

They hired local farmers and villagers for the work with the intention to make the latter learn and take similar initiatives. Fields of the local farmers are generally left fallow as most of them are engaged as factory workers. The trio spent Nu. 400,000 from the collective fund to purchase a second-hand bolero.

They also had plans to grow cauliflower on large-scale, but it failed in the nursery stage. In the meantime, the ban on Indian chilies imposed by the government indeed came as a blessing in disguise for them. They planted chilies (Figure 4.5) along with the avocado saplings and were able to harvest 5,135 kg of chilies. Chilies were sold at the rate of Nu. 150/kg, which fetched them a good income of Nu. 770,000 in less than a year. Inspired by the success of their first harvest, they decided to expand the plantation in remaining portion of 10.5 acre leased land.

Recently, they also received farm machineries and other items worth Nu. 730,000 through the funding support from the Dzongkhag Development Grant. The fund covered irrigation facilities worth about Nu. 200,000 and a power tiller worth Nu. 438,000. From the remainder Nu. 100,000 the group plans to procure a greenhouse. The main markets for chilies are Gedu and Thimphu. Small quantities are also sold in the local town of Gomtu. They weigh the

chilies, pack them in sacks of 20 kg, and get the same certified and approved by Bhutan Agriculture and Food Regulatory Authority (BAFRA) before getting dispatched to their regular vendors at Gedu. In Thimphu, a dealer collects their produce and sells it in auction system at the Centenary Farmers Market. Their produce stands out because it is organic and has relatively longer shelf life. The chilies, which are comparatively pungent, suit the Bhutanese consumers' taste bud accustomed to spicy and spicy dishes. Until the fruit trees start to bear fruit, the group plans to grow tomato, ginger, and turmeric. Additionally, they plan to recruit a caretaker who would guard the farm and earn his livelihood. For this they intend to construct a house and buy a cow for the caretaker to live in the vicinity.

Figure 4.5: Chili plantation in the model garden, Gomtu

Battling wildlife crop depredation is the group's biggest challenge as of now. Located in the midst of a thick forest and fenced using only the green nets, their agriculture farm is vulnerable to vertebrate pests such as wild pig, deer, rabbit, monkey, and unattended cattle and goats. Nevertheless, they outsmart the monkeys by planting chilies and lemons as monkeys are not fond of these crops. Moreover, they would be fencing the farm with barbed wires supplied by the Gewog.

Lack of proper road is another obstacle for them. It is difficult for workers to reach the farm especially when the river swells during rainy season. This also interferes with transportation of their farm produce as they have to carry it manually leading to post-harvest loss.

A good team work and support from the community have helped the group's business to flourish. The secret behind their success is systematic and well-coordinated management among three of them. While Mr. Chhetri focuses on procuring materials and resources, Mr. Tamang manages the labour and plantation in the field, and Mr. Basnet is responsible for marketing their produce. They have two permanent workers, paid Nu. 7,500 monthly salary, who carry out the daily farming activities such as timely weeding, watering, and other chores. The workers also watch the area against wild and domestic

animals throughout the day but return to their homes by evening. So, most of the time at night, it is Mr. Tamang who stays all by himself in a small shack to watch over the area.

During the peak planting and harvesting seasons, local villagers come forward for the manual work at a minimum wage of Nu. 250 per day. The highest number of labourers hired is 26. Even youths come forward as it fetch them pocket allowance while on vacation. They are encouraged when youth take part in such farming activities, as it is their ultimate objective to involve and encourage farming in the community. Although, the youth's involvement is for a short duration, it would provide them with an opportunity to learn the basic farming techniques, skills, and sometimes ingenerate interest in them to take farming as a career.

The only advice the group has for young entrepreneurs is to start with the business of their interest. They recommend the amateurs to begin with what they know, as success in business is determined by myriad of factors apart from experience. The group said, "if farmers with a qualification of just the primary education can successfully carry out such business, then it should not be a problem for educated youths".

Indeed, the group has already succeeded in inspiring a few youths in their community; a high school graduate and his brother have recently leased a land to start similar farm in Dumtae Gewog. There is also a bunch of primary school leavers who are unemployed, and the group plans to encourage them as well. According to Mr. Tamang, farming is one incredible career in which you get the job without having to attain any academic qualification or need for job experience.

Success cannot be assured in the beginning; however, even if it is a failure, one would have experience to learn from and improve in future. As was the case with the senior youth group of Gomtu who overcame a number of hurdles and failures before achieving success. However, their accomplishment is because of their decision to continue with what they had begun. Their first failure was a good lesson for them to plan for a systematic management; they overcame wildlife and pest attacks by fencing, employing daily workers, and guarding the field at nights. With an anticipation for a good road connectivity in their village, they plan to cultivate other cash crops which would fetch them a good price. However, their primary objective would always remain to be a role model to encourage other laymen and unemployed youths in farming.

Kiwi Fruit Production in Doonglagang, Tsirang Dzongkhag

Bhagat Suberi[1] and Purna Prasad Chapagai[2]

Background

Kiwi fruit (*Actinidia deliciosa*) grows on large vines that are similar to grapevines in their general growth and fruiting habits as well as their training and trellising requirements. Kiwi vines can be grown on a wide range of soil types at elevations ranging from 1,000 to 2,500 m asl. The kiwi fruit is native to China, previously called Chinese gooseberry, and is now more commonly known by its marketing name of Kiwi fruit. The fruit normally ripens within 25 weeks after the flowers first appear. The fruits range in weight from 40 to 90 g and can be picked shortly after the first frost in autumn; after that, they can be kept in cold storage for four to six months.

Mr. Kalyan Mahat, an economics graduate, took over the Ashish Horticulture and Kiwi Nursery from his ageing father, Mr. Santa Bahadur Mahat, who retired from the health service. The nursery was established in 2015 on a two acre land. Initially, citrus mandarin was grown in the nursery, but it was replaced with kiwi plantation because of citrus greening disease.

Description of the business

The nursery enterprise was started through self-interest and motivation. About Nu. 100,000 was initially spent for its establishment and the seedlings were brought from Nepal. Mr. Kalyang Mahat started kiwi plantation on his own initiative. About 500 kiwi plants (Red Enza) each costing Nu. 350, were planted in one acre land. The plant is well suited to Tsirang's climatic conditions and the fruits fetch good price.

Figure 4.6: Kiwi fruit

The nursery has two permanent employees who are required especially during pruning and manuring of the kiwi plant. Pruning and manuring are done during winter (Figure 4.6) and the fruit plants are given basal fertilizer dose with compost manure.

The Red Enza variety is hairless with attractive red pattern inside and gives

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higher yield than the common hairy Hayward Kiwi variety. This was imported from Nepal, through a special permit given by the Ministry of Agriculture and Forests with the recommendation of the Bhutan Chamber of Commerce and Industries (BCCI). This was the first initiated Kiwi farming in Bhutan on trial basis in collaboration with ICIMOD, Nepal. Mr. Mahat said that today his enterprise is the only red kiwi commercial farm in the country, and also the first organic certified kiwi farm.

Opportunities and challenges

Mr. Kalyan Mahat had attended study tour and training on management of kiwi fruits in Nepal and Bangkok through the support of Ministry of Agriculture and Forest (MoAF) and BCCI. After establishing the nursery, he was in a position to manage without financial support from other sources. During 2019, the farm produced 40 crates of kiwi fruits and each crate weighs 30 kg. A kilogramme of kiwi fetches Nu. 500-600, depending on the demand. The money earned from the sale of kiwi is used for household expenses, maintenance, and management of the existing orchard.

The produce is sent to Thimphu, Phuentsholing, and Damphu as and when there is a demand. Marketing is done by the entrepreneur through his personal link with the people residing in the locality. Mr. Mahat also highlighted that having linkages with other vendors is found to be useful in case of marketing. Kiwi production has not gained popularity in Bhutan and there are not many large-scale kiwi growers.

Future plans

Mr. Mahat plans to set up cold storage facility to extend the shelf-life of his produce. He also plans to buy other farmers' produce for storage and processing, which could be sold during winter. Additionally, he has plans to set up fruit processing cottage industry, commercialise vermicomposting and Jivumrut (liquid organic fertilizer), install drip irrigation system for irrigation, and export the value-added products. Further, he intends to extend his kiwi plantation and set up a nursery. He has purchased 10 acre land for the plantation. Later, he wants to diversify his enterprise through turmeric cultivation.

Buli Soenam Nyamsung Detshen, Zhemgang Dzongkhag

Cheten Dorji[1] and Sangay Tshering[2]

Background

Buli village under Nangkor Gewog in Zhemgang has 96 households with 95% of the population predominantly dependent on agriculture. In line with the Bhutan Vision 2020 to promote organic agriculture, government came-up with 57 farming groups and agriculture cooperatives for agriculture sustainability in the country, including Buli Soenam Nyamsung Detshen. The Buli Soenam Nyamsung Detshen, Zhemgang Dzongkhag, was initially started as a vegetable farmers' group with support from the Dzongkhag Agriculture Office in April, 2014. Later, the group name was changed to Buli Soenam Tsesey Tshonglay Detshen with 28 members.

The group initially received basic facilities such as polyhouse, water tanks, flexible water pipes, and other tools to produce commercial vegetables and generate income. The group produces seasonal vegetables such as potato, raddish, cabbage, tomato, cauliflower, and beans among others for self-consumption and sale. The vegetables are sold to local institutions like School, Shedra, Gewog administration, and at Gelephu Market. This initiative was the first of its kind in Zhemgang Dzongkhag and the group maintains crop diversity and contributes in preserving and promoting the nine-cereal crops (Dru-Na-Gu) in Buli.

Change in name and focus

In October 2016, the group received financial support of Nu. 2,652,000 (USD 40,800) from United Nations Development Programme (UNDP) Bhutan under the Global Environment Facility (GEF) small grant programme. After receiving the financial support, the group name was changed to Buli Soenam Nyamsung Detshen from Buli Soenam Tsesey Tshonglay Detshen. From there on, the focus shifted to conservation of diverse traditional crops (Dru-Na-Gu) of Buli village. From the grant, the group constructed a community gene bank also called community seed bank (Figure 4.7). They procured power tiller, rice mill, mustard oil expeller, post-harvest machine, potato tubers, and barbed

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wires as well as created awareness on importance of agro-biodiversity in the community.

Status of crop diversity (Dru-Na-Gu) in Buli

Nine-cereal crops (Dru-Na-Gu) are very important in Bhutanese tradition, religion, and livelihood. The culture of cultivating and conserving variety of crops has been decreasing in Buli village with modernization and change in consumption pattern. Seeds of various crops such as paddy, maize, millet, wheat, barley, foxtail millet, local quinoa, amaranth, soybean, mustards, and pulses have started to get locally extinct.

However, Buli Soenam Nyamsung Detshen has started to revive the tradition of cultivating Dru-Na-Gu and now almost every household grow all varieties of crops. In addition, the community gene bank is used for storing seeds (Figure 4.8) to preserve genetic diversity of crops. Their main aim is to address the loss of agricultural diversity and enhance access to seed that is well adapted to local conditions.

Community gene bank plays vital role in promoting agro-biodiversity through enhancing seed selection, treatment, seed repository, and distribution to farmers besides income generation through sale of seeds to other villages and Dzongkhags. Additionally, the gene bank is used as a knowledge hub, learning centre, and exhibition centre for both locals and visitors. However, the group members have not benefited economically as annual income generation is very minimal. Therefore, for the success, sustainability, and efficient functioning of the Soenam Nyamsung Detshen, the group has a management structure; led by a chairperson, a secretary, an accountant, and a group facilitation officer (Agriculture Extension Officer) of Nangkor Gewog.

Figure 4.7: Community Seed Bank

Challenges

Human wildlife conflict is the main challenge. Pests and diseases, farm labour shortage, water scarcity, and lack of farm technology are other challenges faced by the Buli Soenam Nyamsung Detshen.

Khengrig Namsum Cooperative (KNC), Zhemgang Dzongkhag

Sangay Tshering[1] and Cheten Dorji[2]

Background

Khengrig Namsum Cooperative is located in Zhemgang Dzongkhag and was established in August 2014. The cooperative members comprise of two dedicated youths from each of the eight Gewogs in the Dzongkhag. It was founded by Mr. Thinley Wangdi, a former civil servant, who aspired to contribute in farming. He is also the chairperson of the cooperative. The plan came to life after the approval of the project, worth Nu. 3.2 million, from Business Opportunity and Information Centre (BOiC) at the interest rate of 4%. The cooperative started working on 80 acre land owned by a group of farmers in 2015. The cooperative worked on the fallow land for free for certain years. The land was left fellow due to water scarcity and massive erosion in the past.

Product and marketing management

The cooperative started to produce organic vegetables and fruits which were sold to schools and monasteries within the Dzongkhag. Initially, while the cooperative was struggling to produce, they started to collect vegetables and fruits from other farmers and marketed with marginal profit. However, inconsistency in production volume due to seasonality was a challenge in terms of marketing and storage. Large scale production with less demand during peak vegetable production season led to wastage. Thus, the cooperative experienced severe fall out in terms of repayment of the monthly loan. In order to maintain a constant supply of farm produce, they started procuring produce from other Dzongkhags. They also started to buy produce from small groups such as Takabi ginger and turmeric groups.

Due to excessive production by other farmers during the peak agriculture seasons, the cooperative engaged itself in buying from farmers and marketing their produce (Figure 4.8). The excess produces were stored and processed into different products (Figure 4.9). During winter, when production from local farmers drastically reduced, the cooperative focused on producing large-scale off-season crops. Currently, the cooperative produces more than 10 products.

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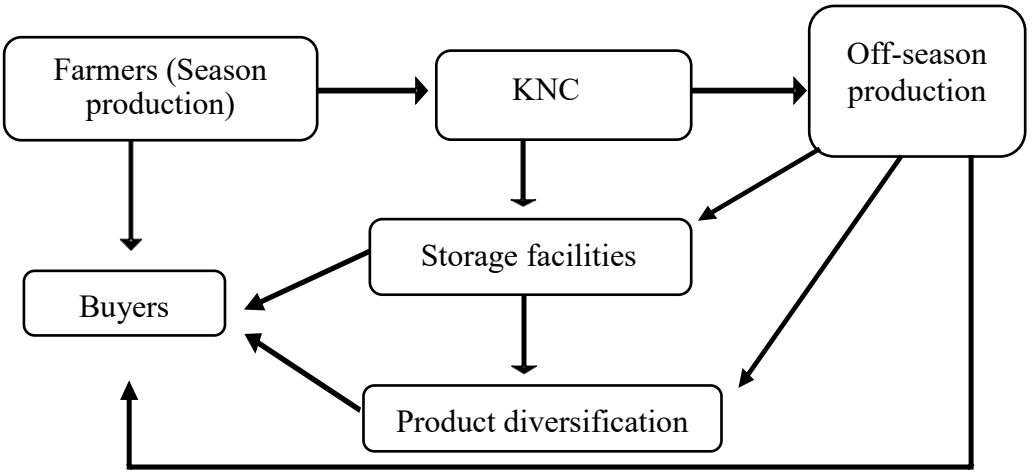

Figure 4.8: Existing agriculture crop production and marketing strategies

which are marketed in the region. They have also started to store citrus mandarin in large-scale for the production of orange pulp for Bhutan Agro-industries.

Financial support

In addition to BOiC loan (Nu. 3.2 million), the group received other support in terms of fund, equipment, training, and infrastructure. The small grant project under United Nations Development Programme (UNDP) Global Environment Facility (GEF) provided USD 49,000 for the continuity of the cooperative. Further, Department of Agricultural Marketing and Cooperatives (DAMC) and Rotary Club supported with equipment. Under Mangde Chhu project, the cooperative also received utility vehicle for marketing of products. The members were also provided two months' training on agriculture production and post-harvest by the National Post Harvest Centre (NPHC) and DAMC.

Challenges and future plans

Some of the challenges faced by the cooperative are inconsistent production, difficulty in marketing of produce due to cheaper import from India, poor post harvest technology, wildlife depredation, and lack of innovation and technology for off-season production.

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[2]Lecturer, Dept. of Forest Science

Figure 4.9: KNC members processing turmeric powder

Future plan and opportunities of the cooperative includes diversification of products, product value addition, new infrastructure development such as storage and development of new site for mass production of vegetables. The team also realized the importance of marketing; hence, they plan to establish international marketing of special product such as turmeric and ginger. Maintaining consistent supply of vegetables all year round with the aim to replace imported vegetables is also one of their goals.

From Conservation to Business: Urka Bangala Group, Trashi Yangtse Dzongkhag

Ugyen Dorji[1] and Dhan Bdr Gurung[2]

Background

Urka Bangala (ˈurkəˈbæŋ.glə) (Bangala – chili in local dialect) (Figure 4.11 L) is a native variety of chili found in Yangtse Gewog, Trashi Yangtse. Its flavour is unique and the shape is appealing. The chili is a delicacy in Trashi Yangtse as is in the most parts of Bhutan.

The importance of native Urka variety was not realized until the community experienced the mixture in the seed. In 2016, the Royal Government of Bhutan assisted the formation of Urka Bangala group with the premise to maintain the purity of Urka and to help boost the local economy through the sale of chili. The group is based in Brimshing village, Yangtse Gewog.

The group has 26 members and Ms. Sonam Cheki (Figure 4.11 R) from Yangtse Gewog is the Chairperson. The group produces fresh Urka Bangala chili and also makes chili powder, dried chili, and chili pickle. The group began their entrepreneurial journey in the form of conservation of native chili and at the same time making it a source of income.

Key features

The group has no separate farm of its own, instead, each individual member

Figure 4.11: Fresh Urka Bangala (L) and Chairperson, Ms. Sonam Cheki (R)

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[2]Professor, Dept. of Forest Science

contribute from their own farm to the group for chili plantation. About one acre land is used for chili plantation from each individual member. The group produces and sells approximately 30,000 kg of chili annually and each individual member earns about Nu. 100,000 to Nu. 150,000.

Challenges and opportunities

Ms. Cheki and her group face numerous challenges. Selling of chili produced in a season and selling all of it at once is challenging; because, most other farmers, groups, and entrepreneurs also produce and sell chili during the same season.

Chili production needs proper care from seedling stage till its harvest. The group has to deal with mortality of chilies at seedling stage and losing chili to pests such as cutworm, porcupine, deer, and monkey. The challenges, Ms. Cheki feels, are exacerbated by climate change.

Ms. Cheki is motivated to work in the group because the business is lucrative and very fulfilling. The government has provided electric driers, green houses, solar driers, and about 20 trays. Agriculture Extension Agents in the locality provided the group with necessary technical support, including supply of fertilizers and fungicides, which have boosted the group's motivation to continue farming. Furthermore, with rapid development of the country, mechanization has made farming easy and power tiller is used by almost all the members of the group.

Chili planting process involve skills such as preparing and sowing seeds and raising seedlings. Of many pivotal skills needed for such business, farmers should possess knowledge of chili cultivation and marketing. Ms. Cheki affirmed that maintaining the genetic purity of chili variety was assisted by the Gewog Agriculture Extension Agents through selective planting of only the pure variety.

Avocado Farming in Eastern Bhutan: A Case of Pema Gatshel Dzongkhag

Tashi Dendup[1] and Jigdrel Dorji[2]

Background

Mr. Gyembo Namgyel, 52-year-old, is a lead farmer in avocado production in Shumar, Pemagatshel. Before taking up farming, Mr. Namgyel served in the Department of Livestock for five years and in Bhutan Observer for eight years. He worked in the citrus mandarin business for several years; however, diseases wrecked his orchards. He perceived avocado production as another profitable business instead of citrus mandarin. In addition to his interest in horticulture, high market price, less labour-intensive work involved in avocado plantation compared to other cash crops, and only one-time initial investment motivated him to pursue the avocado business.

He also perceived a promising market for the avocado as the majority of the nearby farmers were concentrating on vegetables and livestock farming. He started the on-farm trial production of avocado in 2011. The Agriculture Research and Development Centre (ARDC) Wengkhar, Monggar, provided the technical support.

Mr. Namgyel is an educated, licensed, and a lead farmer inspiring other farmers to pursue the avocado business in the community. He received technical support from stakeholders in his earlier establishment.

Key features of the avocado farm

The orchard has an area of one acre with about 100 trees. As of 2019, about 50 out of 100 trees were fruiting. The average yield is about 50 kg/tree. The farm owner got the trade license; thus, the business produces grafted saplings in the greenhouse for sale.

Unique features about his farm are that it produces several varieties of organic avocado fruits. Moreover, it produces grafted saplings that are favourable to the local agro-climatic conditions. One full-time employed owner with support from family members and wage labourers carry out all key activities of the farm, including orchard management and grafting of saplings.

Mr. Namgyel's key clients are locals who place orders or come to buy from

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the farm. The Dzongkhag Agriculture Office also support him in distributing saplings to other farmers who aspire to venture into avocado production. On the other hand, local people not only buy fruits for consumption, but also buy saplings for orchard development. The farm sold avocado grafted saplings to other Dzongkhags, including Trashigang, Samdrup Jongkhar, and Pema Gatshel. The saplings were supplied to farmers of Samtse, Sarpang, and Tsirang.

The marketing channel includes direct sale, sale on order basis, and sale through the Dzongkhag Agriculture Office. Replacing dead saplings of nearby farmers and allowing customers to taste avocado are some strategies adopted by the business to maintain customer relation. The major expenses were during the initial establishment of the farm. The operational cost is minimal and includes labour charges, utility bills, and materials for greenhouse and grafting. Selling of fruits and saplings are the two sources of revenue.

One kilogramme of fresh avocado is sold at Nu. 300 while the grafted seedlings are sold at Nu. 500. The income in 2019 from the sale of fruits was about Nu. 750,000 and from grafted seedlings was Nu. 300,000. The sale is expected to increase when all 100 trees bear fruits and reach their optimal production.

Success factors

The grafted saplings raised in Mr. Namgyel's nursery are more suitable to the local conditions, with more than 80% survival rate, than those imported. He also gives replacement for dead saplings to the nearby customers for free. Unlike non-grafted, the grafted saplings not only bear fruits in one or two years, but also fruit yearly. Thus, a non-grafted plant in his orchard is kept for demonstration to compare the production of avocado with that of grafted trees.

Mr. Namgyel is engaged full time in his one acre farm with about 100 trees. This allows him the time to innovate management practices and become successful. Whereas, many other farmers cultivate avocado as a backyard farming. Since the Dzongkhag Agriculture Office buys grafted saplings from him, his avocado saplings have gained popularity and value in the market.

Whilst many local farmers sell their fruits prematurely at Nu. 250/kg, Mr. Namgyel waits until the fruits are ripened and develop a better taste. His avocado fruits fetch Nu. 300/kg. Customers place order or come to his orchard to buy avocado. Since Mr. Namgyel has several varieties of avocado, customers

have the options to choose from the variety they prefer.

Challenges and opportunities

Despite making a considerable profit, the business also has been experiencing several challenges. For instance, Mr. Namgyel sells fresh fruits without any value addition. When his and other local farmers' production increases, there are chances of local market saturation due to backyard avocado farming by several farmers. This indicates that there is an opportunity to promote avocado as an alternative cash crop in Eastern Bhutan and also the opportunity to establish processing plants for value addition. Although predation of saplings by deer is not a severe problem, but those damaged by deer do not easily regenerate. Birds also attack avocado fruits once it is ripen.

Mr. Namgyel did not get any formal training on avocado orchard management. However, as an educated farmer he often resorts to YouTube tutorials which at times are not practical in Bhutan's context. Fruit trees require proper management for timely fruiting. Survival of only about 70 to 80% grafted saplings indicates the need for training on grafting.

Future plans

Mr. Namgyel grows different varieties of avocado to cater to the varied tastes and preferences of consumers. He is also exploring to export avocado and expand his orchard. At the same time, he intends to continue supporting local farmers in establishing avocado orchards.

Conclusion

Avocado is a relatively new business in Shumar, Pema Gatshel. By growing avocado, Mr. Namgyel is not only earning very well but is inspiring other farmers in the community to take up avocado farming. So far, more than 200 farmers have started the backyard avocado production in Shumar. Training on avocado orchard management, ensuring markets, and assisting in value addition might encourage farmers like Mr. Namgyel to expand their business, and have positive ripple effects in the communities.

Chapter 5: Poultry Farming Enterprises

Scientifically, poultry is a collective term for those species of birds that have been domesticated to reproduce and grow in captivity, and that render products of economic value. Poultry includes chicken, turkey, ducks, geese, pheasants, pigeons, and quail among others. In Bhutan, the term poultry is applied to chickens as they are the predominant birds reared in the country. The domestic chicken (*Gallus domesticus)* is believed to be descendants of red jungle fowl *G. gallus* that are found in Southeast Asia.

Chicken rearing has been a part and parcel of Bhutanese farming system and livelihood since time immemorial. Chickens have played an important socio-cultural and economic role in Bhutan. It is one of the sources of animal protein in the form of egg and meat, which contribute to household food, nutrition security, and income. Moreover, the manure produced is highly valued in crop production for its rich nitrogen content. For these potentials, poultry development is seen to be a good entry point for rural development, income generation, and poverty reduction. In addition, they also serve other purposes such as offerings in rituals, cultural festivities, and as show animal for entertainment such as cock fighting, which remain very much alive to this day in some rural villages. On a national level, around 60-70% of the households rear four to seven chickens on an average. Dzongkhag wise, Samtse has the highest number of households (5,518) keeping chickens while Gasa has the lowest (72) (MOAF, 2018).

Planned poultry development in Bhutan started with the advent of the first Five Year Plan (FYP) in 1961. Prior to that, native chickens collectively called as Yubja, meaning village chicken, were reared by farming community. In the FYP plan (1961-1966), chicken farms were established in Samtse and Paro. Rhode Island Red (RIR) and Australorp parent stock were introduced and reared on farm for egg production and pullets. The pullets were distributed to farmers in order to increase egg and meat production, improve nutrition, increase household income, and reduce rural poverty. White Leg Horn (WLH), which did not perform well under the scavenging system of rearing, was introduced later. This was replaced by 380 BV strain that produced brown-coloured pullets and eggs, which proved to be popular among farmers. In the 11th FYP, pullets of Hyline Brown, a commercial strain producing brown eggs were multiplied at the government breeding farms and distributed to farmers. During this time, with the aim to attain self-sufficiency in egg, the poultry devel-

opment approach shifted from backyard poultry rearing to market-oriented intensive rearing.

The ban on import of poultry products in the wake of the H1N1 outbreak proved to be a blessing in disguise for Bhutan and its farmers. It provided the impetus for the government to reinforce market-oriented poultry farming. This caught on very fast as farmers realized the opportunity to fill the void in supply of eggs left by the ban on import. In the last decade, chicken farming has picked up as is evident by increase in the number of chickens, egg, and meat production. Between 2008 and 2018, there has been more than five-fold increase in overall number of chickens, more than 15-fold increase in egg production, and 12-fold increase in meat production. During the same period, the total population and proportion of native chickens declined by around 15% and 53% respectively (MOAF, 2018; DOL, 2009-2018). Bhutan has become self-sufficient in eggs, and chicken farming appears to be one of the popular and successful rural enterprises.

This Chapter features six cases to underscore the developing trends in the field of poultry enterprise. However, chicken meat production has fallen behind. In 2018, Bhutan imported around 1,574 MT of chicken meat valued at Nu.199.3 million and data from 2014 to 2018 show an increasing trend (NSB, 2018). While there is progress in poultry development in Bhutan due to the support from the government in providing inputs, credit, and formation of groups, several challenges and constraints still remain and hamper poultry development. These includes among others (1) difficulty in getting replacement stock, (2) high cost of feed, (3) difficulty in marketing of eggs particularly transportation and (4) disposal of spent hens.

To meet the demand for replacement stock, establishment of more hatchery needs to be explored through the Public Private Partnership. Review and control of feed pricing could increase profits for farmers as feed constitutes around 70% of the total cost of production in poultry business. Buy back intervention of the Government with minimum price guarantee for eggs and spent hens may encourage more farmers to go for poultry farming. Product development using surplus eggs and spent hens (protein shakes, egg powder, pet food, etc.) are opportunities that might be explored for sustainable and profitable utilization.

Poultry Farm Business, Goshi Gewog, Dagana Dzongkhag

Om Katel[1] and Anooja Nair[2]

Mr. Padam Gurung established a poultry farm as a family business venture in 2016 with 200 chicks. The main motivation to start the poultry farm was that his family members were unemployed and support in the form of bank loan to entrepreneurs was provided from the government.

The farm is located near the road and this adds to the convenience in transportation of farm inputs and produce. Initially, Mr. Gurung sold eggs in the local market and from 2018 he started supplying eggs to Thimphu. The income from the first batch of chickens encouraged him to replace the old batch of chickens and expand to 700 birds in 2019. He explained that feeding commercial layer feed is expensive, and to reduce the cost, Mr. Gurung supplements the feed with rice and maize from his farm. Chicken droppings are used as manure for his crops. The details of the farm establishment are given in Table 5.1.

Table 5.1: Details of expenditure and income from the poultry farm

Particulars	**Amount (Nu.)**
Poultry farm construction	300,000
Cost of chicken - Nu. 30/chick (started with 200 individual)	6,000
Cost of chicken feed - Nu. 1,170/bag (10 to 20 kg/day depending on availability of other feeds such as corn and rice supplement. Estimated about 500 kg/month.	12,000/month
Income from sale of eggs in the year 2016	367,500
Income from sale of eggs in the year 2017	630,000
Income from sale of eggs in the year 2018	630,000
Income from sale of eggs in the year 2019	1,155,000
Estimated income for the year 2020*	1,980,000

*Estimation is based on the assumption that there is no outbreak of any diseases.

One of the challenges faced by the entrepreneur is marketing of eggs as there are numerous farms producing and selling eggs in the Dzongkhag. While there are markets outside the Dzongkhag, the transportation cost incurred would make it difficult to earn profit. Moreover, increasing cost of chicken feed re-

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sults in increased egg price and risk of not being able to sell the eggs. In future, the proprietor plans to make the farm more integrated with the addition of vegetables and fruit trees as chicken dropping can be used as manure. Mr. Gurung also plans to expand the number of poultry birds to 1,000 chickens.

(a)

(b)

Figure 5.1: (a) and (b) Poultry (Hyline Brown breed)

Sarpang Layer Cooperative (SLC), Sarpang Dzongkhag

Sushila Rai[1] and Yogeeta Dahal[2]

Sarpang Layer Cooperative (SLC) was established in the year 2012 and its full operation began in 2015. Initially, the cooperative had 36 members and had increased to 64 including 10 females. The members come from 11 villages of five Gewogs and their age ranges from 30 to 60 years. Regarding the literacy level of the members, 50% are literate with tertiary level of education and 50% have not attended formal education.

The SLC basically produces eggs. The members raise three breeds of layers namely Hyline Brown, Hyline Silver Brown, and Bovan. The government's support was the biggest factor in starting the farm. Earlier, Bhutanese farmers could not compete with cheap eggs imported from India and farmers were reluctant to raise layers due to lack of secure market. When Bhutan banned import of eggs from India in 2010, it motivated and provided a secure market for farmers.

The Dzongkhag Livestock Office supplied four varieties of layers to the farmers at a subsidized rate. The Department of Agricultural Marketing and Cooperatives (DAMC), played a key role in the formation of the cooperative. Once the cooperative was established, individual farmers did not have to worry about marketing of eggs. With the help of DAMC and Regional Agricultural Marketing Cooperatives (RAMCO), the SLC received around 20% of the fund for the construction of individual farmers' poultry shed. The SLC office and sales counter located at Dekiling was built with the support from Helvetas Bhutan.

The office bearers of SLC including the Chairperson , Secretary, Treasurer, and Internal Audit and Sale Executives are democratically elected among the members after every five years. The SLC holds at least two general meetings in a year to discuss the pertinent issues with all the members. Each member contributes Nu. 30 for sale of one carton of eggs, which is deposited in the common fund. The fund is used to buy necessities like egg trays, cartons, and medicines for the layers, equipment and stationaries for the SLC office and also to pay minimal salary to the office bearers.

On an average, the cooperative produces 800 cartons of eggs weekly (around 168,000 eggs per week). There are seven trays in a carton and 30 eggs

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in each tray. Apart from Sarpang Dzongkhag, eggs from the farm are also distributed to 11 other Dzongkhags. Their eggs have higher demand in the market because they meticulously clean and grade their eggs and have different pricing system according to the size. Marketing is done through agents and they also advertise their products through Facebook.

The farm, thus far is managed successfully. It received a prestigious award for being the most successful cooperative in Bhutan on the International Day of the Cooperatives celebrated on 6 July 2019. The credit for the success of the SLC goes to the hard work, motivation, cooperation of the individual members, and their excellent management. The members feel that transparency and accountability are the key factors which determine the success of the cooperative. The farm intends to continue to contribute towards achieving the national self-sufficiency goals in egg production.

The SLC also faces a fair share of challenges. Some of these challenges are (i) poor feed quality imported from India, (ii) ever rising price of the feed, (iii) black marketing of eggs from border towns, (iv) competition from state-owned layer farms, which sell eggs at a cheaper rate than the market rate and (v) lack of awareness among farmers about the benefits of joining a cooperative.

In 2018, the cooperative earned around Nu. 57 million from the sale of eggs of which Nu. 43 million was spent on buying feed. With the establishment of two mega poultry farms with a capacity of 80,000 birds in the Dzongkhag by the Ministry of Agriculture and Forests, the SLC faces the biggest competition. Though the SLC is well established, they feel that they need continued support from the government. To support agro-enterprise in Bhutan, the government should not only provide financial help but also provide conducive policy, marketing, awareness, and capacity building programmes for the entrepreneurs.

The SLC has many plans for the future including exploring feed resources within the country, creating position of marketing officer, vice-chairperson, promoting internal auditing system, exploring capacity building programmes, introducing Semso (bereavement support) system to members, promoting effective micro-organism activated solutions (EMAS) for application in poultry farms, construction of EM shade, and instalment of EMAS tanks in Dekiling. The SLC, with help of RAMCO, plans to integrate layers/poultry farms with other agricultural activities like nursery, crop production, horticulture, and fisheries.

Woman Poultry Farmer of Chungupang Village, Trongsa Dzongkhag

Tshering Gyelpo[1] and Tashi Dorji[2]

Background

A 50-year-old Aum Yangdon is a successful poultry farmer from Chungupang village under Trongsa Dzongkhag. Her poultry farm is located at an elevation of 2,300 m asl, 10 km away from Trongsa towards Zhemgang. Encouraged by the success of other poultry enterprises and high demand for eggs and meat in the market, she decided to start her own layer farm.

The main source of motivation to start the enterprise was her husband and Dzongkhag Livestock Sector (DLS). She started her enterprise seven years ago and currently owns around 350 layer birds in an area of 30 decimal leased land. Initially, day old chicks (DOCs) were distributed by the DLS at a subsidized rate to encourage farmers in poultry farming. She purchases Karma feeds once in two months. The Dzongkhag veterinary health and Livestock Extension officials provide veterinary services to the farmers.

As an owner-manager, Aum Yangdon carries out all the management activities like feeding and cleaning of poultry shed. Medical services like deworming and routine vaccination are done with the help of Dzongkhag Livestock Health officials. Her farm produces around 300 eggs per day and earns a profit of Nu. 19,000 per month. The Trongsa town, schools, nearby shops and bakery are the main buyers of the farm produce. She engages her school dropout children and need not have to hire labourers. She thinks that personal interest, dedication, and more importantly the support from family, society, and government are crucial in establishment and sustaining the enterprise.

Some of the challenges faced by Aum Yangdon are expensive leased land, gradual increase in cost of feed and transportation. She also shared on the difficulty of disposing the spent birds as there are less demand for meat of layer bird after the production stage. The religious sentiments of committing sin by slaughtering and consumption of meat added to the challenges in disposing the spent birds.

With enough skill and experience acquired in rearing poultry, the entrepreneur desires to increase the number of layer birds and market the produce beyond Trongsa Dzongkhag to meet the growing demand of eggs in future. The poultry owner also shared the need for capacity building (medication and exposure to scientific rearing of poultry) opportunities.

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Poultry Farm of a Retired Livestock Officer, Damang Village, Trashigang Dzongkhag

Serki Wangmo[1], Jambay[2] and Lobzang Penjor[3]

Background

Mr. Tshewang Tobgay from Bikhar under Samkhar Gewog is a retired Livestock Officer. After retirement, he set up a poultry farm in Damang, Shongphu Gewog, in Trashigang Dzongkhag with the realization of market potential for eggs.

Description of the business

Mr. Tobgay started the enterprise on his own initiative with 300 birds in 2010, which has increased to 3,000 birds on 36 decimal leased land. In the beginning, he received egg trays and debeaking machine from the government. Mr. Tobgay was motivated to take up poultry farming for its attractive income generating opportunity, which exceeded the monthly salary of his former job. Moreover, he wanted to set up a family business for his son so that he does not have to look for employment elsewhere. Above all, being the gold medal recipient from His Majesty motivated him to remain economically active even after retirement.

Key features of business

The farm sells eggs and pullets. The selling price of pullets is Nu. 170 for 45 days old and Nu. 210 for 56 days old pullet. The cost per egg is Nu. 12. Mr. Tobgay is able to earn a net profit of Nu. 150,000/month in winter and Nu. 250,000/month in summer. The pullets are sold in Lingmethang in Monggar and eggs in Rangjung Higher Secondary School, Phongmey. Besides these supplies, he sells eggs and provide door-to-door service. The enterprise is able to find customers as they make sure that eggs are cleaned and well packed.

Opportunities and challenges

The entrepreneur mentioned that such business has a huge potential for income

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generation and poverty alleviation. It also creates employment opportunities and reduces dependency on other countries for egg supply. However, poultry farming has several challenges as well. Transportation and high cost associated with poultry farming are major challenges. Mr. Tobgay has been using his personal utility vehicle for transportation of eggs and pullets. He feels that it would help entrepreneurs like him immensely if the government could support transportation specifically for marketing the agriculture and livestock products in the country.

Another challenge is conflict with neighbours due to foul smell generated by the poultry farm. Since the beginning, the farm has been receiving complaints on the foul smell and remains an issue. Also, the farm located at Gamri river valley faces the risk of flood as they already incurred a loss of Nu. 1,200,000 worth of chicken to the flood in August 2018.

Future plan

Mr. Tobgay is planning to expand his farm to contribute to achieving egg self-sufficiency in the country. He commits to persevere and work hard in spite of all the challenges. A priority for him in the near future is to explore and find ways to reduce foul smell from his farm.

Badal Poultry Farm, Gomtu, Samtse Dzongkhag

Monika Pradhan[1] and Rekha Chhetri[2]

Ms. Bhadra Kumari, 34-year-old, owns and manages a chicken farm of 880 birds on a 96 decimal land. She is a mother of three children. With the privilege of attending only a basic education till primary school, her teenage was mostly spent as a worker on other's poultry farm. Being the sole bread winner in the family, the meagre wage earned by working as a labourer in the farm was not sufficient for her to raise her children or support her parents. Dejected and restless about her adversity, she decided to establish her own chicken farm in 2015 with 6,300 birds. She was able to start the farm with a loan of Nu. 800,000 from one of the banks and subsidized (30%) building materials and pullets from the government. Since then, her business has been operating successfully.

It takes about 45 days for the birds to attain marketable weight after which they are sold to meat vendors in Thimphu at Nu. 140/kg of chicken. Her turnover is Nu. 200,000 in 60 days, of which the net profit ranges around 15-20%. Apart from the chicken meat, she also sells poultry manure at Nu. 20 for a kilogramme.

Ms. Kumari manages her farm diligently and has just one employee to help her in the work. Whenever she feels that things are not going the way they should be or her business incurs a loss, she checks and analyses every step to find out what went wrong. Still then, feed shortage and untimely supply of feed is the biggest challenge. Although, she pays for the feed on time, it takes long time to reach her farm. This leads to underfeeding of birds affecting their growth and market value. Another barrier is the market competition with frozen meat. To overcome this competition, she aspires to be trained in processing of frozen meat so that she can also supply such products. While she is thankful to the government for providing various trainings; however, she feels that such training should be provided only to genuinely interested candidates and not as compulsion to mass, as it reduces the effectiveness of the training.

According to Ms. Kumari, good communication and social skills are important factors for her success. For her, unfortunate times are blessing in disguise. Her difficult state of not being able to support her family led her to pursue poultry business.

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Broiler and Layer Poultry Farm, Phuntshothang, Samdrup Jongkhar Dzongkhag

Shekhar Chhetri[1] and Sonam Tashi[2]

Background

Ms. Jasmati Budathoki, 50-year-old, never got a chance to go to school as a child. She lives in Samdrupchoeling under Phuntshothang Gewog with her husband and three children, including a daughter. Whilst one son stays home to help on the farm, the other two are away studying. Ms. Budathoki has three acre dry land, two acre wet land, and one acre under areca nut cultivation. Her house is located right next to the road, which gives easier access to transportation facilities.

Apart from poultry farming, Budathoki family also grows a wide range of crops, including beans, broccoli, chili, ginger, potato, pumpkin, cabbage, cauliflower, saag, tomato, radish, carrot, onion, peas, turmeric, paddy, areca nut, guava, papaya, avocado, mango, coconut, and banana. Although it is possible and easy to grow maize and cassava, these crops are not cultivated because of wild pigs' depredation. Besides these agricultural crops, the major focus of Ms. Budathoki is on raising chicken and fish farming. There are four people working permanently on the farm.

Due to easy accessibility, most customers prefer to come to her home to purchase the farm produce, including animal products such as eggs and broiler chicken. Farm produce and products are also supplied to the Bhutan Livestock Development Corporation Limited (BLDCL) located in Samrang.

Poultry farm

Started in 2010, with day-old chicks procured from Sarpang for broiler and Lingmethang for layer birds, Budathoki's poultry farm currently has 200 broiler birds and 800 layer birds. These days, day-old chicks are procured from the village itself.

The daily egg production from the Hyline Brown layers is around three cartons, i.e., 21 trays or 630 eggs. This works out to a hen house production of 78.75% per day, which is good enough to meet the expenses of the farm. The broiler birds are sold from the farm itself as live and or dressed. The poultry farm, to a large extent relies on external feed bought from Karma Feed.

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Farm income and expenditure

Local buyers and the BLDCL in Samrang are the two main markets. The market price of egg fluctuates between Nu. 7/egg to Nu. 10/egg. But when it is sold as a whole tray, it is about Nu. 9/egg (or Nu. 270/tray). The broiler meat is sold at the rate of Nu. 230/kg for dressed meat and Nu. 200/kg as live birds.

The family also has three Jersey cows, one of which is milking and gives about 8 to 10 L of milk in a day. The second cow is pregnant and the third is a heifer. Fodder and hay from the farm are used as feed in addition to the Karma feed. Milk is sold to the locals at Nu. 40/L. The remaining milk is kept for self -consumption. It is also made into butter and cheese. Dung from the cattle is used to make biogas thus eliminating dependence on commercial cooking gas (LPG). The resultant slurry from biogas is used on the farm as manure together with the chicken manure. Besides dairy cattle and poultry, Ms. Budathoki has also ventured into fish production since 2013 with support from the local Livestock Extension officials. Fish is sold at Nu. 250/kg to the locals.

The total annual household expenditure is about Nu. 300,000. Whilst the total annual income is around Nu. 500,000 to 600,000, a bulk of the income is from the sale of broiler chickens, eggs, and other farm produces. Farm labour and commercial feed account for the maximum share of the expenditure.

Daily chores

Most of the time, Ms. Budathoki works from dawn till dusk on her farm. Three other members of her extended family help her with the farm work. There is always something to do on the farm. She sleeps for about seven hours a day. She watches television as and when she has time away from the farm work.

Challenges and opportunities as a farmer

The major challenges on Budathoki's farm are similar to the ones faced by many other farmers in the country. These include water scarcity, human wildlife conflict and labour shortage. Fortunately, in the case of Ms. Budathoki, accessibility and market are not a problem.

Ms. Budathoki strongly believes that working in one's own land is better than working on others' farm, which she did before she started her own farm. She realized that she will forever remain a slave if she continued to work as a labourer for others. It also made her realize that with similar effort she can

grow her own food, support the family, and be self-sufficient. The thought of supporting her family motivated her to work on her own farm. She now feels that she made a right choice. Ms. Budathoki is now not only self-sufficient, but her farm is thriving and she is happy to continue this lifestyle. With hard work, proper planning, and good management, she feels she can be comfortably self-sufficient. For all things to go well, she also believes that "there has to be harmony in the family". She strongly believes that one has to strive to be independent and self-sufficient in order to overcome suffering. She added that hard work, smartness, and willingness to serve others are prerequisites to becoming a successful farmer.

Happiness and sources of unhappiness

Ms. Budathoki is happy working on her own family farm as this provides her the opportunity to support her family. The source of happiness is "when everything is alright". On a scale of one to five on subjective happiness and life satisfaction ranking, Ms. Budathoki chose three implying she is not the happiest nor the unhappiest farmer. Somewhere at the back of her mind, she had this wish to be born a male. Had that been the case, she said, she would have worked somewhere away from home.

Chapter 6: Dairy Farming

The Royal Government of Bhutan has emphasized on the importance of improved dairy farming since the start of first Five Year Plan in 1961. The only way to improve production in native dairy cattle was through upgradation with the introduction of exotic breed. Pure Brown Swiss bulls were imported from India for cross breeding with native dairy cattle. Later, Jersey cows were introduced with the establishment of National Jersey Breeding Centre (NJBC). NJBC's objective was to produce breeding bulls to be supplied to the rural communities for cross breeding. The Department of Livestock (DoL) trained artificial insemination (AI) technicians and produced semen of Jersey, Brown Swiss, and Mithun. Artificial insemination centres and cross breeding programmes were initiated since these were the components of development activities in all the Five Year Plans of the DoL. During the 11th FYP, DoL in an attempt to boost milk production in Bhutan, purchased dairy cows from India and supplied to farmers in the country at a subsidized rate.

Dairy Cooperatives were initiated to help farmers convert milk into dairy products and market in groups, thereby earning better income. Some of the cooperatives are doing very well while others are dependent on subsidies. The problems faced by the cooperatives are many; however, taking products to market, shortage of green fodder in winter, and increasing cost of commercial feed are highlighted as the main problems faced by many cooperatives.

Recognizing the potential, the government has accorded high priority to dairy development since development in Bhutan started in the early 1960s. Dairy development has been strategized through the improvement of the breed, development of pastures, provision of free healthcare services, improved management practices, and providing incentives in terms of materials for building shed and cost sharing (30 to 70% basis) for the purchase of dairy cows. This has made a substantial impact on dairy development resulting in increased milk production in the country.

With the improvement of breed and management practices, dairy farmers are producing a substantial quantity of dairy products that demand a viable market on a daily basis. Dairy farmers are challenged by remoteness of farm locations from markets and accessibility to the market. The government had facilitated marketing through farm road constructions in the last one and half decades. Road access merely could not address the market problem due to lack of transportation facilities at individual level. The cost of production has in-

creased with escalated transportation charges thus leading to frustration of the farming communities.

Channelling of livestock products to viable market at individual farmer level was a mere dream. Government introduced a borrowed but successful proven idea of group formation to address the issues holistically. The government initiated farmers group and subsequently cooperatives in the Seventh Five Year Plan. Trainings on group formation, group mobilization, leadership, and conflict and resource management were conducted through donor funds at the local and national level for different stakeholders by different agencies. The outcome of these initiatives by the government has given birth to livestock farmers groups and cooperatives across the country which are actively operating.

Literatures say cooperatives are voluntary organizations governed by their members, who actively participate in setting their policies and making decisions. Men and women serving as elected representatives are accountable to the members. In primary cooperatives, members have equal voting rights (one member, one vote) and cooperatives at other levels are also governed based on mutual agreements. Cooperatives are autonomous and self-reliant organizations governed by the members. If they enter into agreements with other organizations, including the government, or raise capital from external sources, they do so based on mutually agreed terms that ensure effective governance by their members and maintain their co-operative autonomy.

The success stories in this Chapter consist of dairy cooperatives that are performing very well and have contributed to the development of rural communities, provided employment, improved cash income, and above all brought changes in the life of rural communities.

Dairy Farm in Goshi Gewog, Dagana Dzongkhag

Om Katel[1] and Anooja Nair[2]

Background

Mr. Changloo started a dairy farm in 2008 on a trial basis until 2011. It appeared that the dairy products were fetching good money so a Jersey cow was acquired in 2012 and in 2018 one more Jersey cow was added to the herd at Nu. 45,000 each. The dairy farm on a 60 decimal land is a family enterprise. The farm is located in Goshi Gewog and is 37 km south of Dagana.

The motivation factors that led to the establishment of the farm was firstly, the location of the farm and its proximity to town provided easy marketing of the dairy products. Secondly, availability of family owned land for the farm. Thirdly, the Department of Livestock supported with technical services that encouraged him to venture into dairy farming. With the start of the farm, the family could enjoy other benefits such as employment for family members, generation of manure for vegetable farming, and of course the income.

Income from farm

Mr. Changloo produces cheese and butter which are sold in the nearest town. Milk is delivered to households everyday while cheese and butter are delivered to the outlet, weekly. The details of the sale and income from the farm is given in Table 6.1.

Table 6.1: Sale of dairy products

Products	Quantity and sale frequency	Price (Nu.)	Income/month (Nu.)
Butter	15 kg butter/month	400/kg	6,000
Cheese	375 balls/month (sold once in two days)	30/ball	11,250
Milk	12 L milk/day.	60/L	21,600
	Total		**38,850**

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In addition to fodder grasses, Karma feed is given as supplement to the Jersey cows. Procurement of Karma feed incurs expense at Nu. 1,375 per 50 kg bag which takes the major share of expenses. A minimum of three bags per cow is required in a month. Therefore, a minimum of Nu. 4,125 is spent every month and in winter months, when fodder is not available, more Karma feed is needed.

Challenges and future plans

Labour shortage is always a challenge and it is relatively difficult to find a dedicated person to work on the farm. Dairy farming requires taking care of cows, processing, and packaging of dairy products where sanitation and hygiene are very important. In future, Mr. Changloo plans to start a vegetable farming as manure is available in abundance from the dairy cattle.

Figure 6.1: Cattles (Holstein Friesians) feeding on straw

Lothuen Om Detshen, Sarpang Dzongkhag

Sushila Rai[1] and Yogeeta Dahal[2]

Background

The Lothuen Om Detshen (LOTS) is a milk producers' group. It started functioning in the year 2008 and later in September 2010 it was registered under the Cooperatives Act of Bhutan. Initially, the cooperative included four Gewogs namely Sompangkha, Gakidling, Dekiling, and Senghe with 80 members (71 males and 9 females). In 2010, Senghe Gewog opted out of the group because the Gewog was remotely located from the other three Gewogs. The total members of the cooperative has increased to 176 (151 males and 25 females). Whilst two members have completed tertiary education, most other members have not attended or completed formal education.

Most of the members are farmers who at their individual level could not find a stable market to sell their milk. Therefore, after the formation of the cooperative, it was easy to find a stable market for milk sale and the farmers earned steady income. The cooperative collects milk to be sold and the unsold milk is processed. Because of the cooperative, unproductive cattle population in the Dzongkhag reduced and also reducing import of milk from across the border.

Initially, most of the farmers were raising local cattle which did not yield enough milk. After the Dzongkhag Livestock Office's Jersey breeding programme, most of the members could own high yielding cross breeds of Jersey cattle. The cooperative also received help from the Department of Agricultural Marketing and Cooperatives (DAMC), Rural Livelihood Project (RLP), supported by Helvetas Swiss-International Cooperation and EU-Technical Cooperation Project (EU-TCP) in terms of supply of essential equipment, machines, and appropriate trainings including overall management guidelines.

The cooperative is managed by a Chairperson, a Secretary and three Tshogpas from each Gewog. The members meet at least twice a year to discuss important issues and develop plan. Emergency meetings are held by the cooperative management whenever there are problems that need immediate attention.

The cooperative has two sales counters; one located in Sompangkha (Sarpangtar) and other in Dekiling (Dholpani). The two sales counters are

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managed by treasurer and a helper. The cooperative also has transporters who collect milk from the stations and distribute to the sales counters. Each member has to pay Nu. 50 as a membership fee. In addition, Nu. 5 is deducted from every litre of milk sold. The debited money is deposited in the common fund of the cooperative. The common fund is used in buying medicines for the cattle, providing milk cans for the members, buying utility vehicle, procuring and maintaining of equipment, and paying minimum salary to the office bearers.

The main product of the cooperative is milk. However, yoghurt, Paneer, butter, buttermilk and cheese are other products. Milk is sold at Nu. 50/L, butter at Nu. 380/kg, cottage cheese at Nu. 35/ball, yoghurt at Nu. 15/100 g, Paneer at Nu. 450/kg and buttermilk at Nu. 25/L. Monthly, on an average, the cooperative is able to sell 4,000-5,000 L milk, 90 kg butter, 25 kg Paneer, 150 L yoghurt, 1,500 balls of cottage cheese, and 400 L buttermilk from the sales counter located in Sompangkha. The cooperative makes a net profit of around Nu. 6,000-7,000 per month from Sompangkha sales counter. The profit is deposited in the common fund. In addition, the cooperative sells their products to the locals and hotels in Gelephu.

The cooperative is operating successfully and membership is increasing every year. The success of the cooperative is attributed to the efficient management. Other factors contributing to the cooperative's success are hard work, cooperation among the members, and the large number of members.

The members feel that their business will be sustainable over the years as there is an increasing demand for the dairy products. People are becoming more aware of the nutritional value of dairy products in their diet. There is a high demand for their products because they maintain the quality of products and hygiene in their processing house. The quality of milk supplied is checked every day.

Although the cooperative is functioning smoothly, they face some challenges; lack of adequately trained person to diversify the products, maintaining milk quality, supply of quality milk from non-members, and transportation of products. To address these problems, the members are made aware of these issues in the general meetings. The milk quality is strictly monitored and if in case the milk quality is below standard the members do not get paid. The cooperative feels that the government should continue supporting such enterprises and cooperatives, especially in terms of trainings, providing necessary equipment, and machineries at least in the initial phase.

In future, the cooperative plans to diversify its products and introduce

products like Lassi and milk based Indian sweets such as Rasgulla and Gulab Jamun. The cooperative also wants to buy more Jersey cattle and expand its market to other Dzongkhags.

(a)

(b)

Figure 6.1: (a) and (b) Jersey Cross Cattle

Chokhor Gonor Gongphel Chithuen Detshen, Bumthang Dzongkhag

Thubten Sonam[1] and Pema Rinzin[2]

Background

Chokhor Gonor Gongphel Detshen is located under Chokhor Gewog, Bumthang Dzongkhag. The Detshen is a smallholder dairy farmers' group formed in 2004 with technical assistance and guidance from the Dzongkhag Livestock sector. The group was formed to collect fresh milk for processing and marketing and to cater to the dairy demand in the locality and beyond. The group operates a Milk Processing Unit (MPU) constructed with financial support from the government. In addition, the MPU workers were trained on yoghurt, Lassi, and Paneer making techniques by the government. The group was registered under the Cooperative Act of Bhutan 2009 in October 2010.

The group is composed of 67 regular members supplying milk. Each member deposits Nu. 60 monthly as a membership fee. Initially, new members could join the group on payment of membership fee of Nu. 4,000. Later, the fee was reduced to Nu. 1,500 due to the inability of some interested farmers to pay the fee and also to encourage new members to join the group.

Working modality

The administrative team of the group is composed of one Chairperson, an Accountant, five Tshogpas, one Technician, and three workers. Each Tshogpa represents a village and functions as a medium of communication between the group administration and the milk suppliers. The Chairperson and the Accountant are elected for three-year term and the group bylaw is amended annually, if needed. The group convenes one annual meeting which is attended by all the members. The administrative members meet four times a month to discuss issues related to the functioning of the group.

Milk Collection

The group collects milk daily before 8 a.m. from 127 farmers, which include members and non-members. The daily milk collection differs between summer and winter. The daily milk collection amount exceeds 700 L in summer

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months whereas it ranges between 400-500 L in winter. The highest milk supplied by an individual in summer and winter months ranges between 60-70 L and 30-40 L respectively. The registered group members who fail to supply milk has to pay Nu. 15 for each day and will be compulsorily deregistered after two years if they fail to resume milk supply to the cooperative.

The milk is delivered by individual members who are located nearby the MPU. Others in the far-flung areas bring their milk to an identified milk collection point from where the private milk van collects and transports to the MPU.

Vehicle for milk collection

Initially, the group purchased a utility vehicle (Bolero pickup) and employed a driver for milk collection. However, due to frequent break down of the vehicle and high monthly maintenance cost of about Nu. 15,000-20,000, the group sold the vehicle to a private individual on a monthly instalment basis. Currently, the same vehicle has been hired by the group at Nu. 35,000 per month for milk collection. From the amount, Nu. 20,000 is retained as the payment for the vehicle, and Nu. 15,000 is paid to the vehicle owner. The operational cost of the vehicle is borne by the owner.

Product marketing

The group currently produces and markets fresh milk, skimmed milk, butter milk, cream, butter, and cottage cheese. The fresh milk, skimmed milk, and butter milk are sold at Nu. 47, Nu. 32 and Nu. 25/L respectively. In addition, the group also markets milk cream at Nu. 350/L although there is not much demand for the product apart from bakeries. The products are sold locally from the MPU. Selling butter milk is said to be more profitable over cottage cheese due to less work.

The group also has two sales outlets in Thimphu for marketing butter and cheese. In summer, the group retails monthly about 1,000 kg butter per outlet, whereas in winter, the monthly sale drops to about 200 kg per outlet. The price for butter and cheese slightly differs for the peak and lean season. In summer a kilogramme of butter is sold at Nu. 370 and a cheese-ball of 200 g is sold at Nu. 60, whereas in winter, the price for each unit increases by Nu. 10 for both cheese and butter.

Credit, welfare, and benefit sharing

At the moment, from the group's common fund, each member can avail a maximum loan of Nu. 30,000 at an annual interest rate of 12% for a loan period of one year. The loan is recovered by deducting Nu. 3,000 monthly from the concerned member's monthly milk supply. The group also maintains a welfare scheme through which in the event of death of a member, the group provides Nu. 10,000 to the bereaved family and Nu. 5,000 on demise of the family of the group member.

Challenges and opportunities

According to one of the group's Tshogpa, it is very difficult to employ and retain dedicated fulltime sales person, which has affected product marketing. The group management sometimes have to divide butter among the members when marketing through the sales outlet is not possible.

Low sense of ownership among the members is a concern for the growth and development of the group. The members are only concerned about receiving payment for the milk supplied with very little or no contribution to the functioning of the MPU, marketing of products, and other operational challenges. For example, according to the Tshogpa, in summer the water supply to the MPU gets damaged, none of the members are forthcoming to solve the problem even when being called for help.

Unreliable water supply particularly during monsoon season is a challenge to the MPU making it difficult to maintain basic hygiene in the MPU. The group does not have cold storage facilities due to which the products gets spoilt especially during warm summer months. In such a case, quite often the unsold products are distributed among the members.

Diversification plan

In future, the group plans to develop new products such as yoghurt, Lassi, and Paneer. The group feels that there is market for these products in their locality and beyond. There is also potential to increase daily milk collection as some farmers in the far-flung villages of Chokhor Gewog have expressed their interest to supply milk if collection service is provided.

Chumig Gonor Lothuen Tshogpa, Bumthang Dzongkhag

Pema Rinzin[1] and Thubten Sonam[2]

Background

Chumig Gonor Lothuen Tshogpa, a smallholder dairy farmers' group under Bumthang Dzongkhag was formed in June 2008 with 40 members to collect fresh milk for group processing and marketing. Agricultural activities in Ungsang village, under Chumey Gewog, Bumthang have been constantly challenged by wild animals damaging crops. That was when the five households of Ungsang village decided to form a dairy group. The technical assistance for group formation was provided by the Dzongkhag Livestock sector. The group received funding support of Nu. 400,000 from Helvetas for the construction of the dairy processing unit with labour and wood contributed by the members. Initially, the group used traditional processing method due to lack of modern equipment.

The group is managed by a committee consisting of Chairperson, Secretary, Accountant and a Technician. The group, particularly the Chairperson and the Secretary have received trainings on book keeping and maintaining cash book, and technicians received training on Paneer and yoghurt processing techniques from the Livestock sector. Competent personnel to manage and run the group activities is lacking.

Working modality

Presently, the Milk Processing Unit (MPU) is leased to the group's accountant for a term of one year on a pilot basis due to product marketing problem faced by the group and improper accounts maintained by the previous technician. The lessee is required to deposit Nu. 5,000 monthly to the group's account and is responsible for the collection of milk, processing, marketing of products, timely payments of milk supplied, and salary to the MPU employees. According to the Chairperson, in light of the management problem faced by the group, the current option appears reasonable and if viable the same will be continued. Further, increasing the monthly lease rent to the group by the lessee will be reviewed.

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[2]Professor, Dept. of Sustainable Development

Milk collection

The group buys milk from the members and non-members at Nu. 34/L. The group collects on an average about 400 L and 150 L daily in summer and winter months respectively. The group bylaw mandates all members to contribute a minimum of three litre milk a day or be fined Nu. 15 per day as compensation. The highest daily milk collection per member was 35 L a day in summer and 15 L a day in winter.

The group's dairy products are highly sought after in the locality. The Chairperson shared that the quality of their butter and cheese is better compared to other groups' products. For a kilogramme of butter the group charges Nu. 360, and for a 200 g cheese-ball the group charges Nu. 55.

Milk processing and marketing

The group produces and markets butter and cottage cheese. According to the Chairperson, because of the discouraged use of meat in religious and other social events, butter and cheese are increasingly becoming indispensable for any socio-cultural events in the locality and other parts of the country. Therefore, the demand for butter and cheese is reliable not only for consumption but also for religious offerings and as gift items for friends and families. While production of hardened cheese (Chugo) is more profitable compared to cottage cheese, the Chairperson feels fulfilling societal needs should be a priority over profit for a social enterprise like their group.

Credit, welfare, and benefit sharing

The group maintains a savings account with the Bhutan Development Bank Limited, and presently has about Nu. 900,000. From its savings, the group provides two types of credit to its members. The first type is personal loan of up to Nu. 30,000 and the second type is for the purchase of dairy cows up to Nu. 40,000. Both types of loan are for one year with the interest rate of 2% per annum.

The group collects Nu. 30 annually from each member for the group welfare fund. From the fund, Nu. 5,000 is provided in case of a death of a group member to help ease financial burden on the bereaved family. The profit is shared equally among the members every two to three years irrespective of the amount of milk supplied to the group. At one point, each member received Nu.

15,000 and each of the MPU workers were given Nu. 7,000 as a bonus.

Group leadership

The group's Chairperson is a dynamic person and has a strong managerial skill. He believes that for the growth and development of the group, a strong group cohesion and a sense of ownership among group members are important and necessary conditions. He has organized a picnic for the group members where he invited leaders from the local government and the Renewable Natural Resources (RNR) sectors. He believes that such occasions allow members not only to celebrate their successes but also to form stronger bond as a group. It is also during such gatherings that the Chairperson awarded a prize money of Nu. 3,000 to the highest milk contributor of the year. He said that such small gestures and appreciation motivates the members to work hard for the group. In addition, the Chairperson is also considerate to the workers of the MPU; when the profit money was equally divided among members, he also discussed the bonus money for MPU workers.

Opportunities and challenges

Similar to other parts of the country, agricultural fields are increasingly left fallow in Chumey valley due to crop depredation by wild animals and due to labour shortage as the younger generation choose to settle in urban areas after attending school. In this context, there is an opportunity for the group to assess the viability of initiating community dairy farm. It could also lead to employment generation, increase the group's income, and eventually enhance the sustainability of dairy farming.

On account of most members being illiterate and physically far away from financial institutions, the culture of maintaining savings account is quite minimal especially in rural areas. Facilitating individual savings account for the members is another opportunity that the group could undertake as this is currently not practiced by the group. From the monthly payment for the members' milk contribution, the group could directly deposit certain amount into their personal savings account. This could not only improve financial inclusion, but it could also enhance the members' sense of belongingness to the group.

Shortage of household labour has become a big concern for the group's sustainability in the long run due to aging members and increasing outward movement of younger generation with little or no interest to live in the village

to continue farming. Already a member supplying highest daily milk amount was compelled to resign due to household labour shortage and health issue. The group bylaw mandates withdrawing member to deposit Nu. 2,000 to the group's account.

Greatest set-back

The group initially employed two school drop-out girls from the locality for carrying out the group's activities like milk processing, keeping records and accounts, and marketing the products. Sincerity and hard work of the girls benefited the group with a properly maintained record and profitable financial return but the girls resigned after getting married. The group then employed a young graduate as an accountant and operator for a term of three years. However, after one year without any significant contribution to the group, the accountant embezzled Nu.150,000 from the group's account and disappeared along with the account book and his own contract agreement. Later, the group also found he had illegally lent Nu.100,000 to a member exceeding the maximum permissible amount of Nu. 40,000 as per the bylaw.

Future plan

According to the Chairperson, the group is considering to establish a community dairy farm for the sustainability of the group and increasing the volume of milk. The group also intends to open a few permanent sales outlets in strategic places. For this plan to be realized, the Chairperson shared that the group needs to save a minimum of Nu. 2 million in the group's account.

Lord Zambala Blessed Dairy Cooperative

Penjor[1] and Wang Gyeltshen[2]

Background

The milk collection centre is located uphill, nearly 45 minutes away on a narrow road, from the bifurcation near Tangma Chhu Chazam. Driving uphill, the road passes through paddy fields, scattered farm houses all over the mountain side facing Menbi Gewog on the other side of the Kuri Chhu.

Figure 6.1: Aum Phuntsho

According to Aum Phuntsho Wangmo, the cooperative Manager, Lhamo Norguen Phendey Tshogpa (Lord Zambala Blessed Dairy Cooperative) was named by a Tsampa when he was consulted at the inception of the group (Figure 6.1). As per the Assistant Dzongkhag Livestock Officer (ADLO), the cooperative was established as a milk collection centre. The cooperative has 25 members of which 10 are male and 15 are female.

Aum Phuntsho Wangmo explained that the main objectives of forming the dairy cooperative was to organize milk collection from members, process it into different dairy products, and market the same at a reasonable price. She further explained that working as a group helped solve a lot of problems. For example, a huge volume of milk can be processed on daily basis when is pooled from the members. This was not possible when operated at an individual family business.

Description of enterprise

The group was established in 2014 with fund support from the Commercial Agriculture and Resilient Livelihoods Enhancement Programme (CARLEP-IFAD) under which one focus area was on developing dairy value chain. The technical inputs were provided by the Dzongkhag Livestock sector. The support also included purchase of cows at a 30:70 ratio (project:farmer) cost sharing basis. Other inputs and support provided were roofing sheet, cement, and materials for the construction of the cow shed and milk collection centre, and

[1]Assoc. Lecturer, Dept. of Agriculture
[2]Assoc. Professor, Dept. of Animal Science

milk processing equipment; such as cream separator, butter churner, freezer, milk cans, and yoghurt packaging materials.

Aum Phuntsho works alone to run the centre; she records the milk contributed by the members and pays them at the end of every month. Dairy products such as butter and cheese are sold to a regular contract buyer from Thimphu. Butter is sold at Nu. 300/kg and cheese at Nu. 40/ball. Yoghurt is sold to a nearby school and local town.

The group members contribute Nu. 100 each per month while the Manager contributes Nu. 1,000. The group's savings account has grown to Nu. 300,000. Members are paid Nu. 35/L milk supplied to the centre, which is processed into various dairy products. After paying the members for the milk contributed, the left-over income from the sale of milk belongs to the Manager as there is no fixed salary for the Manager. The milk production in summer, on an average, is 250-350 L/day while in winter it drops to about 60-70 L/day. Based on the average milk production by the members in summer and winter months, a rough estimate of income generated is given in Table 6.2. This estimation shows that during summer months, the Manager earns about Nu. 51,425 after all the expenses and payments are made, and during winter the income drops to about Nu. 12,000.

Opportunities and challenges

Some of the opportunities are increasing the membership by inviting more farmers to join, which will help boost volume of milk collected daily. With increase in membership the collection centre can be upgraded to milk processing centre. The members can be trained to conserve fodder during summer to overcome the winter fodder shortage.

The challenges faced by the cooperative are rising cost of commercial feeds due to transport cost and fodder shortage in winter due to lack of fodder conservation knowledge and techniques. Long distance to market for sale of products is another challenge.

Future plan

The Manager and the cooperative members are looking for strategies to upgrade the collection centre into a milk processing unit (MPU), which at this juncture is not possible due to low number of registered members. The effort to invite and increase membership registration is underway; the registered

members are unable to understand the reluctance of other households to join the cooperative even after knowing about benefits t current registered members are reaping.

Table 6.2: Cooperative's earning in summer and winter months

Earning made in summer				
Quantity of milk/day	**Rate (Nu.)**	**Amount paid/ earned**	**Total paid/earned**	
300 L	35	10500	10500 x 30=315,000	(A)
9.625 kg butter	300	2887.50	2887.50 x 30=86,625	(B)
36 kg cheese	260	9360	9360 x 30 =280,800	(C)
Income for Manager = (B+C) - A				52,425
Contribution to Cooperative's savings				1,000
Net income for the Manager				51,425
65 L (winter)	35	2275	2275 x 30=68,250	(E)
2.275 kg butter (winter)	300	682.50	682.50 x 30=20,475	(F)
7.8 kg cheese (winter)	260	2028	2028 x 30=60,840	(G)
Income for Manager = (F+G) - E				13,065
Contribution to Cooperative savings				1,000
Net income for the Manager				12,065

Tashi Gongphel Dairy Farm, Dewathang, Samdrup Jongkhar Dzongkhag

Sonam Tashi[1] and Shekhar Chhetri[2]

Background

Mr. Bhim Bahadur Karki, 60-year-old, owns Tashi Gongphel Dairy Farm located in Samdrup Jongkhar, Dewathang. He lives with his 62-year-old wife, whilst all his seven children (two sons and five daughters) are away in various parts of the country. His wife, a retired nurse, supports him in farming activities.

The current farm location was relatively remote and was under thick forest cover with various kind of fodder when Mr. Karki first came from Kilkhorthang, Tsirang, more than three decades ago. Coming from a farming background and with good knowledge of dairy farming, he knew that the land located on the slope could be more suitable for dairy farming. Growing up in Tsirang, his love and attachment towards cows was another incentive to quit his salaried job in the Public Works Department (PWD) and start the current dairy farm. Prior to working in PWD, Mr. Karki also served in the Ministry of Finance and UNICEF.

For being a progressive dairy farmer and for his innovative and inspiring ideas, Mr. Karki was conferred Successful Farmer's award by His Majesty the King during the 107th National Day celebration in the year 2014. During the same occasion, his wife Ms. Tashi Yangzom was also recognized with an award for her dedicated service to the nation as a nurse. Mr. Karki and Ms. Yangzom are respected both in and outside the community for their hard work.

Dairy farm

With a loan of Nu. 70,000 from the Bhutan Development Bank Limited and seven Jersey Cross breed cows bought at Nu. 10,000 per cow from Guwahati, Assam, Mr. Karki first started the dairy farm in Dewathang in 1992. Cattle shed construction, fencing and pasture development were done through his savings amounting to Nu. 400,000. In 1993, he joined Dewathang Milk Marketing Cooperative. The government helped the cooperative through provision of vehicles and setting up a market. Over the years, his farm expanded and after a visit to Shillong, Meghalaya, where he learned about Holstein Friesians

[1]Assoc. Professor, Dept. of Agriculture
[2]Asst. Lecturer, Dept. of Animal Science

(HF), he switched to this breed and now owns 22 HFs, seven of which were milking at the time of this study.

With more cows and increased workload compounded by dairy cooperative not functioning as expected, in the year 2016, after 23 years of active participation, Mr. Karki left the cooperative to establish his current dairy farm. This move also motivated other members of his former cooperative to venture into rearing high yielding breeds.

On his 10 acre dairy farm, Mr. Karki grows Napier, Guatemala, Ruzi, broom grass, and fodder trees. Along with these fodders, he also feeds his cattle with homemade feed formulation consisting of wheat bran, maize, grams, salt, mustard cake mixed in warm water along with mineral mixture. This homemade feed formulation is fed to the milking cows three times a day in order to boost milk production. Mr. Karki prefers this home-grown fodder and self-made feed formulation rather than Karma Feed, which is too expensive. He feels that cows are healthy and yield more milk when fed with homemade feed formulation.

Daily farm chores

Mr. Karki works alone on his dairy farm. He starts his day at 3:00 in the morning and finishes around 5:30 in the evening. His daily chores include cooking feed, feeding, washing shed, milking (twice a day at 3:30 a.m. and at 3:00 p.m.) and marketing milk. His wife, who retired after 30 years in the government service, does other household chores such as cooking and fetching feed. Free-time is hard to come by; it is only after dusk when the work is over, Mr. Karki gets to relax and he does that by watching television together with his wife.

With age catching up and farm work being tedious, Mr. Karki bought milking machine, but he still prefers hand milking as he is used to it. He has also purchased grass cutting machine and maize grinding machine for feed formulation. He has a utility vehicle which is used for marketing milk and fetching fodder.

Besides attending to his farm work, Mr. Karki is also kept busy by visitors; farmers from both within and outside the country, students, researchers, government officials, and interested groups from outside the country. He is happy to show, share, and inspire all visitors. He also diligently maintains a visitors' register where besides the name and address, the visitors also have to provide

feedbacks on the farm, particularly on improvements needed.

Milk yield, income, and expenditure

On an average, Mr. Karki's farm produces about 70 L milk/day, with each cow yielding about 18-20 L milk/day. Since there is no product diversification through processing due to limited farm labour and because of ready market for fresh milk, Mr. Karki sells fresh milk to the local community as well as to consumers across border in India. There are also a few regular customers who come at the farm to collect milk as the farm is just beside the road. Mr. Karki's farm milk is in high demand not only because customers know him for being a long-term farmer, but also for the good quality milk.

When the dairy farm first started, price of milk was Nu. 6/L. It has gradually increased over the years and reached Nu. 50/L. Mr. Karki earns more than Nu. 100,000/ month from milk sale. It costs him about Nu. 200 a day to take his milk to the border town located about 18 km south of Dewathang.

The income earned is spent on repaying loan, buying feed, and procuring farm equipment and daily household needs. Mr. Karki also donates money for religious events, charities, and underprivileged students in rural areas.

Being successful

Being successful, Mr. Karki is well-known both within the locality and in many dairy farms across the border. He feels that hard work, besides dedication and passion contributed to his success. Mr. Karki also added that proper planning, monitoring, and support from the Department of Livestock were equally important in becoming successful. To sustain the success, he feels one has to eat healthy and stay dynamic.

Despite the success and popularity he has gained, he is rather down to earth and takes his work seriously. He doesn't seem to slow down despite his wife's suggestion to work less given his age. Mr. Karki is still keen to further expand his farm if there is a land for lease. He plans to set up a HF breeding farm to sell the HF heifers to rest of the farmers in the region.

Happiness and satisfaction from farming

Mr. Karki said he is happy because all his children can look after themselves while he is earning well and does not have to depend on others. Additionally,

to him, happiness means children's well-being, existence of goodness in mankind, being self-sufficient, and maintaining harmony in the community. There cannot be perfect happiness, and so he chose four on a subjective happiness and life satisfaction in the ranking scale of one through five.

Challenges as a dairy farmer

The biggest challenge of Mr. Karki is his land's topography, as it is located on a steep slope, it is risky for him to let the cattle move free on such gradient. The other challenges are similar to the ones faced by many farmers across the country which includes labour shortage and lack of improved dairy breeds.

(a)

(b)

Figure 6.2: (a) and (b) Jersey Cross Cattles

Gonor Gongphel Nyemley Tshogdhey, Chaskhar Gewog, Monggar Dzongkhag

Kuenga Tshering[1] and Tulsi Gurung[2]

Background

Chaskhar lies on a gentle slope; 30 km east of Monggar town with a cool humid sub-tropical climate. The vegetation is dominated by Chir pine (*Pinus roxburghii* L.) mixed with cool broad leaved species. The land is suitable for pasture and other dry land crops. Almost entire Gewog is connected with a black-topped motorable road, as the adjacent Gewog centre road passes through Chaskhar Gewog.

Farmers of this Gewog are mostly dependent on livestock farming. As per the local authority, the Gewog is a progressive Gewog in terms of livestock farming in the Dzongkhag. About 90% of the households own one or two improved cattle. The community also has a good number of quality local cattle and Mithun cross. The annual livestock production of this Gewog, as per 2019 census, was about 878,645 L milk, 43,932 kg butter and 307,526 balls cheese. More than 95% of the milk is processed into cheese and butter as fresh milk is hardly consumed. The butter and cheese produced are mostly sold to nearby markets and other Dzongkhags like Thimphu, Bumthang, and Chhukha.

The Chaskhar Gonor Gongphel Nyemley Tshogdhey dairy group was formed in Chaskhar, under Monggar Dzongkhag in the year 2006 with 35 members, which later in 2014 was upgraded to a Cooperative by the Dzongkhag Livestock sector. The Nyemley Tshogdhey (cooperative) came into existence to address the issues of dairy products transportation and marketing.

Farmers from outside the village and local shopkeepers joined the group as there was some benefits from the government to kick-start the group. With the passage of time and withdrawal of government support, the number of members declined gradually. Currently, there are 20 active members in the cooperative (8 males and 12 females). Other reasons for the decline in the number of members were the membership fee and the lack of flexibility in selling individual's dairy products to vendors, which fetched a higher price than the cooperative's buying rate. Therefore, those within the cooperative agreed and levied penalties on any member exiting the cooperative.

[1]Lecturer, Dept. of Animal Science
[2]Assoc. Professor, Dept. of Agriculture

The farmers' cooperative was the first of its kind in the region and the farmers were not aware of the importance and benefits of such entity. Also, a series of trainings were provided by different agencies. The trainings emphasized on establishing a proper market channel, establishing retail outlets for the dairy products, processing milk into various dairy products, and inculcating group saving for the benefit of the members and rest of the farmers in the community.

Training on group formation, group mobilization, dairy management, feed and fodder development, record keeping among others were also conducted for several days. A series of trainings on different themes were also conducted and funded by Rural Development Training Centre (RDTC), Agriculture Research and Development Centre (ARDC) Wengkhar, CARLEP (Commercial Agriculture and Resilient Livelihoods Enhancement Programme) and RAMCO (Regional Agricultural Marketing and Cooperatives). Numerous study tours and excursions were also conducted to exchange knowledge and information within and outside the country.

Cooperative's infrastructure and financial support

The Dzongkhag Livestock sector supported the infrastructure development. A milk processing unit was established in 2010 with butter churner, cream separator, milk cans, digital weighing scale, insulated box, and deep freezer. Group members were also trained on milk processing, maintaining hygiene and sanitation, and packaging.

Interest-free loan was given by the RAMCO on a rotational basis to the group members to purchase Jersey cows. The members availing the loan had to repay it within a year so that the fund could be provided to other members.

Activities of cooperative

The main activities of the cooperative are collecting and processing milk into butter and cheese. Milk collection from the members is done by vehicle from the designated collection points while nearby members drop to the Milk Processing Unit (MPU). Each month, two members are employed on rotational basis for processing and each of them is paid Nu. 2,000 per month. The members had to keep monthly record of the sales made, so a sales person was recruited. However, the position of sales person was withdrawn later to reduce expenses and provide work experience for the members to encourage sustaina-

bility of the group. Besides producing dairy products, the group also embarked on selling Karma Feeds to enhance income for the group by establishing a retail outlet.

The group is managed by a Chairperson, Secretary, and a Treasurer. The management body holds monthly meeting to discuss about the issues related to milk supply, processing, marketing, and settling revenues and monthly account. Group opened a savings account and had about Nu. 206,000 at the time of this study. The profit from the group is shared among members every five years.

Products and services

As per the record, the milk collection in summer is about 200-250 L/day and in winter it is about 100-150 L/day. Annually, the group collects 70,342 L milk. For transportation, Nu. 6/L is charged per delivery. The products for sale include butter and cheese. Annually, the group produces 3,357 kg butter and 34,872 balls cheese earning them about Nu. 2.5 million.

Challenges

Most of the group members own local breeds of cattle and as such they are hardy and resistant to disease compared to the improved breeds. The local cattle do not require special care and attention. However, in livestock dependent farming with semi-intensive system, such breeds are not able to produce as much milk as that of by improved breeds like Jersey, Friesian, and Brown Swiss, although the feed and fodder consumption are at par. This has resulted in a 'high input low output' situation. Other challenges include less milk production during winter, reluctance of some members to supply milk to the MPU, and interference of local dealers in management issue.

As population inflates, demand on forest produce increases. Over collection of timber, firewood and other non-wood forest products depletes local resources resulting in reduced flora and fauna that are key feed resources for extensive livestock. Excessive dependence on forest resources gradually leads to depletion of feed and fodder resources from the forest.

Conclusion

Formation of farmers' groups and cooperatives are misunderstood as conveyed by the farmers. In the Bhutanese context, groups are formed to harvest the yield rather than to sow and reap the benefits. The notion of group can be translated as 'we also contribute to the cause and you do the job". The other notion of group formation is the expectation of perpetual flow of incentives from the government to the members. Consequently, the essence of trying to address individual problem through joint approach is not inculcated.

Sustainability of farmers group or cooperative depends basically on the dynamics of the group members. Group or cooperative sustains when each member realizes common goal, shoulders responsibility equally and contributes to the growth of the organization. Group persists on the ground of transparency of its management system and humane quality of the leaders. Conditions imposing penalties compel members from exiting the group. Group cohesion are often shattered by vested interest of members and quite often by the most influential individual in the community. Of all these, local leaders are the most important figure who decide the future of the group.

This study indicates that awareness on the importance of the groups or cooperatives needs strengthening. While forming group, one should thoroughly study individual member's need and the cause on which the group was formed. Some members are not aware of the benefits of being in the group, while some are forced to join and few join un-knowingly. Importance on benefits and commitment to the group needs to be emphasized initially.

Chapter 7: Apiculture

Honey bee rearing and production of honey through beekeeping have become relatively popular among small-scale farmers in recent years. Beekeeping has helped farmers in earning additional income besides crop and livestock farming, and reduced dependency on single source of income. In addition to economic benefits, honey production provides social benefits such as using honey as food and as medicine for treatment of various ailments such as cough, constipation, diabetes, indigestion, and arthritis among others. Honey also has an important place during rituals as it is used as offerings.

Honey production brings improvement in agro-forestry systems as bees assist pollination of crops while foraging. Consequently, enhancement and increase in apiculture can have multiple outcomes; such as honey as income and material goods, well-being and contentment as non-material goods. Rearing honey bee contributes to pollination of flowering plants, both wild and cultivated. In addition, beekeeping can improve aesthetics. Bees provide ecosystem services by maintaining integrity of biodiversity, ensuring global food web, and promoting human health. Bees are not only indicators of biodiversity, but are also effective monitors of environment. As in many parts of the world, honey production is also seen as one of the lucrative enterprises in Bhutan. This Chapter documents production, challenges, opportunities and economic benefits of beekeeping in four Dzongkhags of Bhutan.

Beekeeping in Dagana Dzongkhag: A Case of Aser Moti Gurung, Tsendagang

Anooja Nair[1] and Om Katel[2]

In Dagana Dzongkhag, there are three beekeeping groups comprising of 11 households. The households keep honey bee and produce honey for commercial purpose. Although there are more than 50 households keeping one or two hives of honey bee, it is kept for home consumption and not for commercial purpose. For rearing or keeping honey bees, Department of Agriculture, Ministry of Agriculture and Forests provided technical and financial support to the bee keepers. The bee keeping was initiated by the Department of Agriculture on advice of Her Majesty the Queen. Currently, farmers are encouraged to adopt beekeeping as it can improve cross pollination yielding better crop production.

For the purpose of this case study, Ms. Aser Moti Gurung's bee farm from Tsendagang, Dagana was selected. Ms. Gurung started beekeeping in 2009 after availing a short training in Dagana. Her effort to keep honey bee did not result into fruition until 2012 as she did not know how to trap the queen bee. She explained that every time she collected colonies of bees, they escaped immediately as queen bee could not be trapped. However, after attending a training in Kathmandu, Nepal in 2012, she learnt about the queen gateway and began beekeeping successfully. She explained that beekeeping is relatively easy and beehives can add exquisiteness to the home backyard (Figure 7.1). Keeping honey bees also requires vegetable and flower gardens around the house, hence the agroforestry around the house also improves subsequently.

Figure 7.1: Bee farm of Ms. Gurung, Tsendagang

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Beekeeping in Haa Dzongkhag: A Case of Mr. Leela Pulami, Namchu, Katsho Gewog

Penjor[1] and Lobzang Penjor[2]

Mr. Leela Raj Pulami, a young entrepreneur with Masters in Business Administration, has initiated a honey production farm on a 15 decimal leased apple orchard. It is located in Namchu village in Haa Dzongkhag.

Mr. Pulami started the firm in the year 2019 by availing a loan of Nu.186,000 from the Bank of Bhutan through the Priority Sector Lending scheme. The idea to establish an apiculture farm was conceived while carrying out an assignment on apiculture for his master's degree in India. Since his father was a beekeeper, the knowledge and skill were right at home to learn from, he could continue the business as his father's legacy.

His initial plan was to start beekeeping in Bumthang. However, he felt that starting beekeeping in Bumthang was not favourable with the existence of well -established beekeepers in Bumthang. Hence the location to start beekeeping was shifted to Haa (Figure 7.2). Mr. Pulami started with 84 colonies of bees (*Apis mellifera*) bought from Bumthang. *Apis mellifera* was chosen because it is mostly domesticated and is less aggressive. In addition to honey colonies and gears required for beekeeping, he also bought few tools required for honey extraction.

Extraction of honey usually begins in June and July. After extracting the honey, the waste honey comb is reused to house the subsequent batch of honey bees. During the spring, bee colonies are placed in different locations within the village. During winter, bees are fed with sugar owing to lack of flowers for bees to forage.

Figure 7.2: Bee hives in Namchu, Haa

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Beekeeping in Samtse Dzongkhag: A Case of Mr. Romnath Acharya, Dorokha Gewog

Rekha Chhetri[1] and Monika Pradhan[2]

After completing his high school, Mr. Romnath Acharya, 26-year-old, from Manaygoan village in Dorokha Gewog, ventured into beekeeping in Bumthang about 10 years ago. In 2011, he went to Samtse as he had to look after his home in Dorokha. In 2012, he started beekeeping with six members and six bee (*Apis cerana*) colonies (Figure 7.3). using his experience, knowledge, and skills. During the initial three years he learnt that *Apis cerana* is well-suited to Dorokha's environment and climate.

Since Mr. Acharya had prior knowledge and skill in bee keeping, he provided training to 100 households belonging to Dorokha, Denchukha, and Dumtoe Gewogs. The Dorokha beekeeping group has increased to 13 members, rearing two species of honey bee, namely *Apis cerana* and *Apis mellifera;* the latter was under trial at the time of writing this piece. Rearing bees, according to Mr. Acharya, also provides opportunity to develop agro-forestry around households.

Figure 7.3: Bee hives in Dorokha, Samtse

The Queen's Project also provides crop seeds such as *Quinoa* sp. and millet, which are expected to benefit bee rearing through pollination of crops and fruits. So far, Mr. Acharya received funding support of Nu. 700,000 from Queen's Project and Nu. 1,100,000 from ICIMOD through Department of Agriculture. The support from Queen's Project was used to construct the beekeeping centre.

Mr. Acharya sells bee colonies to other farmers within and outside of the Gewog. In 2019, Mr. Acharya sold 27 *A. cerana* colonies to farmers in Samdrup Jongkhar, 18 colonies to farmers in his Gewog, and nine colonies to members outside of his Gewog. Currently, Mr. Acharya has 13 hives.

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Beekeeping in Tsirang Dzongkhag: A Case of Patshaling Serjang Detshen

Purna Prasad Chapagai[1]and Bhagat Suberi[2]

Background

The Patshaling Serjang Detshen beekeeping group was formed in 2010 and is located in Thakorling village under Tsirang Dzongkhag (Figure 7.4). During the inception of the group, the Department of Livestock provided Nu. 600,000 as seed money for the construction of the honey bee collection centre. The Livestock Extension Officer of Patshaling Gewog framed the bylaws for the group.

The beekeeping group underwent three trainings. Firstly, the farmers received training on the group formation and framing bylaws. The second round of training included technicality of beekeeping, hive making, and honey harvesting. The third training was on sharing the success of the members' enterprise to others and learn from one another. In the year 2011, the members were taken to Nepal for a tour to gain exposure on how beekeeping is done elsewhere.

Initially, the motivation to start beekeeping group was provided by Patshaling Livestock Officer to improve the living standard of farmers. The farmers produced and sold only organic vegetables which was labour intensive.

Beekeeping is easy and low cost as there is no requirement for inputs unlike vegetable production or rearing livestock. This motivated the members to quickly accept the proposal to diversify their source of income. Daily attention is also not required to rear bees so the farmers can use their time for other farming activities.

Figure. 7.4: Beehives in Patshaling

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[2]Lecturer, Dept. of Forest Science

Economy, business plans, and prospects of the four cases

In Tsendagang, Dagana, a bee colony can produce 4-8 kg of honey annually. A bottle of honey (680 ml) can fetch Nu. 800. Currently, Ms. Gurung has 25 honey beehives. So far, she sold 69 bottles of honey and earned about Nu. 56,000. From the total earning, about Nu. 30,000 was spent on sugar.

In case of Katsho Gewog, Haa, the extracted honey is bottled and transported to Thimphu for sale. The price of 500 g honey is Nu. 350. The first harvest in the year 2019 fetched a gross amount of Nu. 1,400,000.

In case of Dorokha Gewog, Samtse, Mr. Acharya shared that the honey is extracted three times in a year with an average yield of about 10 kg per hive. While other members could produce an average of 15 kg of honey per year from *Apis cerana.* Mr. Acharya's income per year is about Nu. 300,000. The members are paid Nu. 600 for a kilogramme of honey. The honey collected from the members is sold to the Queen's Project in Thimphu at Nu. 700/kg. Transportation, marketing, and networking are done by Mr. Acharya on behalf of the members of all the three Gewogs.

In Tsirang, the group collects and sells honey to the Queen's Project in Thimphu. The group is supported by the Dzongkhag Livestock sector of Tsirang. Initially, the members were provided with three beehives each. Later, they were encouraged to buy additional hives at a subsidized rate of Nu. 600/ hive; the non-members paid Nu. 3,000/hive. The members were trained to build the hives. Each household has about 30 to 50 hives. Today, there are 82 households in the Patshaling Beekeeping Group.

The group sells honey at Nu. 750/kg. Each household harvests honey twice a year using the honey harvesting gears. Harvesting honey neatly without killing bee is their working principle. "Not a single bee is to be killed during honey collection" said Mr. Tamang. The group members said that people believe consuming honey or rearing bee is considered sinful in the olden days as the bees were killed due to rough handling. "Now it is like rearing a milking cow", he added. Today, the members know how to rear queen bee, make royal jelly and split beehives to propagate for better management.

The latest development is building of honey collection centre for the group. The centre is located near the national highway and centrally located for the members to bring their honey. The centre has a honey extractor so the members do not have to extract individually. Honey combs are intact while using honey extractor. Use of honey extractor maintains hygiene and the emp-

ty wax combs are re-used. The process of successive honey formation becomes faster since the bees need not make new wax again. The group's Chairperson collects and transports the honey to Thimphu.

Now the group wants to value add their honey by bottling honey in the centre in order to fetch better price. Bottles and tags were initially supported by the Queen's Project based in Thimphu. Main success factor of the group is the support from Livestock sector. Also, group members work as a team and come for meetings periodically. They also have a culture of frequent social get-togethers. Whenever there is a need for shared work for other activities, like cardamom harvesting, the group members come together to help each other.

Challenges and future plans

In case of Ms. Gurung's beekeeping in Dagana, she does not need to put extra effort except feeding bees during winter and protecting them from birds, insects, ants, and worms which requires regular monitoring. Protecting bees requires knowledge and skill so periodic training would be an advantage in beekeeping. Handling of bees requires patience and skill; therefore, before planning to keep honey bees, training is necessary. The number of households keeping honey bee in Tshendagang is expected to increase and the goal of the community is to increase the group size to 20 households in the near future.

In the case of Katsho Gewog, Haa, Mr. Pulami said that he has not faced any major challenge. However, selling honey bee requires reliable marketing channel, which is yet to be established in the region. In the absence of such channels, it becomes relatively difficult to reach the product to the customers. Mr. Pulami plans to increase bee colonies to 300 or more within the next five years as the expectation is that the quantity of honey produced will be enough to sustain the business in the future. Increasing the scale of honey production would also create job opportunities to the local people and provide additional income.

The bee farming in Dorokha is successful. Mr. Acharya plans to add value to honey by making honey wine. Currently, the transportation and packing charges are high. Mr. Acharya plans to improve packaging of honey by adopting the ideas that he had observed during his visit to Thailand, which was supported by the government.

In Tsirang, the group plans to expand their honey market in addition to first supplying to the Queen's Project. Some of the challenges faced by the group

are attack of beehives by hornets, insufficient nectar/flowers in off season during winter, unexpected departure of bees from the hives, and difficulty in splitting hives to increase the population. The group is looking forward to seek help from different agencies in future.

Conclusion

Beekeeping at the community level is a socio-economically beneficial farm activity. It fosters community bond that is essential in supporting each other in rearing bees. Beekeeping also helps to boost crop productivity due to the crop pollination service rendered by bees. Such initiatives are laudable and similar projects elsewhere among rural communities are recommended.

(a) (b)

Figure 7.5: (a) and (b) Modern beehives

Chapter 8: Food Processing and Food Product Development

Food Processing industry in Bhutan is in its budding stage with enthusiastic youths taking charge of Food Processing Plants in most parts of the country. Transformation of agricultural and livestock products into various food forms is sustaining a number of farmers' group in the country. The story of soya-and -cheese fermentation from east, pickling of Dalley chili (*Capsicum annum* L.) in Central-west region, and various dairy processing units in southern and northern regions illustrate the myriad opportunities in employment and income generation in the food processing sector.

Until recently, Bhutanese foods were mostly processed using crude fermentation process, sun drying, preserving with salt, pickling, and using various types of cooking methods (such as roasting, smoking, and steaming) in earthen oven. However, sophisticated dehydrating machines, ovens, and grinders have replaced most of the manual activities and the processes have become much safer, faster, and hygienic. Nevertheless, the entrepreneurs are yet to explore food preservatives, artificial flavours, and food packaging techniques to take the food products to higher quality and better sensory appeal. The common trend of primary and secondary food processing units in rural areas makes headway for tertiary processing units. On the contrary, use of locally available ingredients preserves the unique organoleptic characteristics of traditional Bhutanese food, which holds good potential to be exported for its originality.

The country's vision to turn agriculture into fully organic has encouraged and persuaded many citizens to start farming activity. Some youths have returned to their villages to take up farming activity with pride. This trend would soon demand a good market which can combat post-harvest loss and lead to sustainable food security in the nation. In order to achieve a sustainable food system in Bhutan, encouraging food processing initiatives is of paramount importance.

Sonam Gonor Detshen, Yangtse Gewog, Trashi Yangtse Dzongkhag

Ugyen Dorji[1] and Dhan Bdr Gurung[2]

Background

The Sonam Gonor Detshen (dairy group) in Yangtse Gewog, Trashi Yangtse was started in the year 2009. However, the group could not sustain due to limited market opportunity attributed to sparse population in the locality, poor group management, and lack of coordination. After being idle for some years, the group restarted in 2017 and by mid-2019, it attained its breakeven point. Since then, the group has been reaping the benefits of their hard work.

Sonam Gonor Detshen has five staff and 20 farmers from eight Gewogs with age ranging between 20 to 37 years. The farmers in the group own at least two milking cows each. Farmers bring milk to the two milk collection booths (Figure 8.1) located in Yangtse and Doksum. In winter, the plant has a capacity of 300 L/day while in summer 500 L is collected. The group plans to increase the plant's capacity to collect and store 1,000 L milk in future.

The Sonam Gonor Detshen sells its products through livestock products sales outlet in Trashi Yangtse. The group sells nine products which include milk, curd, yoghurt, local cheese, butter, paneer, dried cheese (local delicacy called as Yangtsepa Paa), poultry, and poultry products (Figure 8.2). These are sold through Bhutan Livestock Development Corporation located outside Trashi Yangtse. Marketing has never been an issue for the group as the demand is usually very high. Among all the products, local cheese is in high demand in the market. Hence, the group has to produce large quantities of local cheese. Even if the cheese is not sold out, the group has the facility to process into Yangtsepa Paa.

The market demand for dairy products is high in winter due to a greater number of rituals and religious offerings compared to other times of the year. Meeting the demand at such times is one of the major challenges. However, due to low demand for butter locally, it is sent to Thimphu where there is bigger market for it. In gross, the outlet earns around Nu. 300,000 to Nu. 400,000 per month.

The group's Chairperson, who is in his early 30s, is neither interested in government job nor has any interest in finding any other job. Despite being a

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[2]Professor, Dept. of Forest Science

BSc graduate, Mr. Sangay Jamtsho was always interested in starting up his own business. He was optimistic about coming back to his village to start a business as his native land offers both opportunity as well as support. He says, "the place and time is right" for him.

The government has always been very supportive to all the aspiring entrepreneurs. More than 60% of the support for the group came from the government, which includes provision of CGI sheet and 30% of the total cost of the cattle. Instead of remaining idle and unemployed, coming to his hometown and starting a business was truly satisfying and fulfilling for Mr. Jamtsho.

Challenges

Weak coordination is one of the major challenges that has been hindering proper functioning of the group. Lack of technologies and mechanisation have also impeded the efficiency and production capacity of the plant. Currently, the group uses both the conventional and traditional methods to process the dairy products. Lack of skilled and knowledgeable staff is another challenge in addition to limited manpower.

To address the challenges, exposure trips to different places and institution are provided to the group members by the Dzongkhag Livestock sector. Mr. Sangay escorted farmers to India on one such exposure trips in order to encourage the farmers. Training on mechanisation was provided, which included installing and operating machines and equipment. The government provided the expenses for some machines and equipment, and few others were purchased on cost sharing basis (60% of the cost borne by the government and 40% by the group).

Future plans

The group looks forward to upgrade processing machines and equipment and diversifying products. At the time of this study, the group had started to sell pickles and eggs from the outlet. Money is saved for upgradation, purchase, and maintenance of the equipment. The group was able to save Nu. 65,000 within a span of three to four months after the breakeven point. The group plans to increase milk quantity by collecting from other farmers and expand their outreach for the supply of milk. The group has been working on upgrading the group into a cooperative and open a shop in Thimphu. Enhancing the standard of processing and packaging of products is another plan for the future.

Conclusion

The Sonam Gonor Detshen started in 2009 and had a rough beginning. In the year 2017 the group could restart and reach the breakeven point within two years. Twenty farmers from eight Gewogs in Trashi Yangtse are contributing milk to the group. This is one of the best examples in the Dzongkhag of an exceptional cooperation among a number of Gewogs coming together for a cause. Today, the group sells about nine products. The reason for the success of the company is its unique marketing strategy. Instead of waiting for customers to purchase the products through their outlet, the group explores market and reaches its products to its customers.

Figure 8.1: Milk collection booth and production plant

Figure 8.2: Different products sold by dairy group

Woman Operated Yoghurt Processing Unit, Yoeseltse, Samtse Dzongkhag

Monika Pradhan[1] and Rekha Chhetri[2]

Ms. Sonam Choden, 43-year-old, who owns a yoghurt processing unit in Yoeseltse, under Samtse Dzongkhag could be one of the best examples of how motivation and independence can change one's life. She had never heard or known of yoghurt until she attended a 15 day training offered by Rural Development Training Centre (RDTC) at Zhemgang in the year 2017. Ever since, she was inspired to start a small processing unit in her village. No barrier was insurmountable to stop her from establishing the processing unit of her dream. With financial help from the Dzongkhag Livestock sector, she initiated the construction of a processing unit through a committee contract on a 12 decimal government leased land. With the inauguration of the unit in July 2019, she had been walking on the learning curve to acquire various skills starting from management and leadership to communication and driving.

Ms. Choden began to Chair the dairy business with 17 members in her group, initially. All the members were a part of dairy farmers group of their Gewog. However, a few of them withdrew from the group as they were not interested in the business. Therefore, the membership got reduced to 10 members.

The processing unit generates a net profit of Nu. 15,000 a month, out of which 5% of the total amount is deposited in the group's joint savings account. About Nu.12,000 per month is spent on electricity, maintenance of dairy processing equipment, and fuel price. But the expenses on maintenance varies as the machines do not have to be repaired unless for a major break down.

The yoghurt processing unit is located a few kilometre away from the main highway in the heart of Tsakaling village under Yoeseltse Gewog. With only one helper to work with her in the dairy processing unit, the group manages to produce about 500 cups of yoghurt every day on an average. Their day begins with a tour to collect milk from four Jersey groups in the Gewog. Ms. Choden drives her personal van to fetch the milk from contributors scattered across the village. Excess fat is removed to produce butter while the skimmed milk is set to boil at 90 ^{o}C. Thereafter, it is left to cool at 40 ^{o}C and cultured with strains of *Lactobacillus thermophilus* added to it.

The group buys the starter culture from Paro at a discounted rate of Nu.

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750 per 50 g. The officials from Dzongkhag Livestock sector have been helping her to procure the strain imported from Denmark. The milk is then poured into cups of 400 ml and kept in the incubation chamber. It takes about 2 hours for the milk to congeal, which is then refrigerated until it is transported to destined market.

Samtse and Phuentsholing towns are the immediate market to sell out the products. The yoghurt is in high demand especially during summer months in the southern region of the country. The product stands out in the market as it contains less fat, and can be consumed without any hesitation of cholesterol related health problems. The product was first introduced to the general public during the 111th National day celebration in Samtse on December 2018. She had produced 22,000 cups of yoghurt to serve the public during the event. Apart from yoghurt, Ms. Choden also produces cheese and butter, but these products are not as profitable compared to yoghurt. At the moment, the unit does not have machines for making butter and cheese, so Ms. Choden and her helper usually churn the milk manually. She is planning to buy machines soon if the products gain good market value and gain customers' confidence.

Ms. Choden is thankful to the government for the initial financial support and strives to work harder to mechanise the unit, since labour shortage is a major concern when it comes to producing large quantities of products. Apart from labour, shortage of milk during winter and procuring plastic cups for yoghurt are some of the challenges faced by the team. "It is difficult to get the plastic cups for making the product as we have to get it all the way from Kolkata and it is also a bit expensive as a single cup costs Nu. 3", says Ms. Choden. She hopes that Bhutan would start producing similar containers in future.

Storage of yoghurt is also a challenge as she has only one refrigerator at the moment. As the demand increases in summer, it is difficult for her to stock more than 500 cups. Additionally, it is challenging to deliver the product to market in large quality every day with limited helpers. Currently, there is no sales counter for her to advertise and sell the product, and as the processing unit is located at the core of the village, most of the people do not know of its existence. Nevertheless, she is certain that this issue would soon be solved when a village sales outlet will be constructed to sell locally produced agriculture, livestock, and handicraft products in the Gewog.

Ms. Choden plans to enhance her business by selling the yoghurt in nearby schools in Samtse Dzongkhag. However, she is not able to start the supply as most of the schools demand yoghurt in smaller cups (200 ml). She also hopes

to address the problem of milk shortage by buying a few milking cows.

With a message that, “hard work and perseverance can take you to any heights”, Ms. Choden encourages youth to join or start such business as the government is very supportive. However, she also highlighted that one should not be relying on government all the time, rather begin by taking the very first step. Ms. Choden strongly believes that one factor which leads to the success in business is good communication skills. She sees business as network and emphasizes on communicating well with the people as they are the ultimate consumers.

Fermented Soybean Cheese Group, Shingchongri, Pema Gatshel Dzongkhag

Tashi Dendup[1] and Jigdrel Dorji[2]

Background

In a beautiful bowl-like landscape lies Shingchongri village in Dechenling Gewog under Nganglam Dungkhag, Pema Gatshel. The village has a total of 131 households growing soybean as their major cash crop. With an abundance of soybean in the locality, one of the elderly women of the village communicated an idea to other villagers to start a fermented soybean cheese manufacturing unit. Since then, a small group was formed comprising six members under the guidance of the Gewog Extension office at Dechenling who also helped in funding the construction of the manufacturing unit. Although the inception of the group was realised in 2012, they began manufacturing formally in the year 2014. The group invested Nu. 150,000 to establish the unit.

At the time of the study, the manufacturing unit produced 400 pieces of fermented soybean cheese in a week and sold at Nu. 30 per piece. It is still profitable as they pay Nu. 50 for a kilogramme of soybean. Despite high demand for the product, the group is unable to supply due to fewer number of workers and lack of technical expertise, particularly in operating the modern equipment.

Opportunities, current issues, and challenges

With every household growing soybean, there were no alternatives for the villagers to make use of the mass production. With this thought in mind, the villagers communicated to the Gewog Extension Officer to utilize the soybean for making fermented cheese and to sell it to other Dzongkhags. Moreover, they were able to employ some people of the community. Since the firm became operational, every household started to cultivate soybean, and the farm lands are never left fallow unlike in the past.

According to the members, youth's disinclination to take up such business is a major issue, particularly due to negative sentiments attributed to obnoxious smell from the final soybean product. Besides smell, the manufacturing unit mostly involves manual work and most of the youths look for white collar jobs. This issue has somehow created hurdles in maintaining proper records of the firm's activities as most of the members are illiterate. Meanwhile, most of the

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management tasks such as keeping records of raw materials, sales made, and fund generated are maintained with the help of the Gewog Extension Agent. They also rely on educated individuals outside the group to help them manage revenues. However, they constantly fear about mismanagement of the revenues, which demotivates the members.

Moreover, in the absence of electric dryers, the group has to depend on solar energy for drying raw materials. Cold winter with short day length interferes with the amount produced in a batch affecting the overall income of the group. Prior to this study, the Gewog Extension office had provided two electric dryers costing Nu. 26,000 each, but due to lack of technical expertise, the dryers are not used efficiently.

Furthermore, the fermented soybean odour has caused hindrance in marketing the product. Due to irregular production and labour shortage in the group, product certification and formal registration of the group with the government have been differed. However, the team consisting of six members along with Agriculture Extension Agents are preparing proposals to seek grants elsewhere to initiate laboratory tests for product specification and to enable certification.

Since the inception, the group has been saving the profit to purchase modern equipment and a utility vehicle to help in transportation of their products to the market. Once they have enough funds to purchase vehicle and recruit an educated member for management, they expect to further expand the processing unit to increase the income.

Future plans

Presently, the group does not have any issue with the availability of raw materials. However, due to urbanisation, the trend of mass cultivation of soybean may decline in future. As a preventive measure, the group has plans to initiate contract farming of soybean and branding the product as organic. Although no herbicides are being used in the current farming system, when product demand spikes in future, use of herbicides could become inevitable. Yet, the group feels that if contract farming is initiated, then proper monitoring of soybean cultivation would prevent the use of herbicides. Once they have adequate members, they would diversify the product by packaging fermented soybean in bamboo containers, which could be consumed fresh.

Meanwhile, the group is striving to identify potential markets and agents who could help them sell their products. As of now, they are unable to meet the

market demand due to labour shortage and difficulty in operating the equipment. An alternative solution to the issue of fermented soybean odour could be to explore strategies to reduce the smell through application of food-based chemicals through trial and error as well as improve on packaging materials in collaboration with relevant agencies in the country.

Success factors

When enquired on the success of their business, they were not sure of the success yet, but were aware that the product's demand is very high and supply has been made whenever an order is received. They are unable to get adequate members as farmers prefer to take up cultivation of raw materials rather than making soybean products. As of now, the group members do not consider the business to be successful with the shortcomings faced by the group.

Figure 8.3: Fermented Soybean wrapped in leaves

Milk Processing Unit: A Platform for Dairy Farmer Groups in Punakha Dzongkhag

Ugyen Yangchen[1] and Tashi Lhamo[2]

Background

Ms. Sonam Euden, 28-year-old, (Figure 8.3a) from Monggar manages the Milk Processing Unit (MPU) at Khuruthang, Punakha. Her husband, Mr. Kinley, supports her in managing the MPU. Initially, the Dzongkhag Livestock sector opened a MPU at Thinleygang in the year 2015. However, long distance for milk producers of Kabjisa Gewog (largest milk producers) and poor market led to relocation of MPU at Khuruthang in September 2017. Khuruthang town is nearly 70 km east of Thimphu. The town serves as an important location for farmers in Punakha Dzongkhag to sell their vegetables and local produce during weekends. Shops in the town supply with several kinds of basic amenities required by the households.

The MPU at Khuruthang was constructed at a cost of Nu. 1.4 million with funds support from the Dzongkhag Development Grant and Government of India Livestock project of the Department of Livestock (Dzongkhag Livestock Sector, 2017). When MPU started in Khuruthang, initially Ms. Euden's mother -in-law managed the processing unit. Later on, Ms. Euden and her husband took over the MPU. Since then, they have been managing the processing unit and the livestock product sales counter.

Ms. Euden, as the Manager of MPU, was responsible for marketing of the dairy products and was paid monthly salary. No additional employees were recruited for operating the MPU. Transportation charge for milk collection from dairy farmers of different Gewogs was fixed at Nu. 10,000 per month. After the failure to generate profit from the salaried system, the group discontinued this practise. Eventually, farmer groups proposed to sell milk at the rate of Nu. 55/L from which Nu. 45 was paid monthly to individual farmers and Nu. 5 was deposited in the group's bank account. The group declared the savings at the end of year as bonus and divided the same among the members. The Group owns a utility vehicle for milk collection, which is contracted to an individual who receives Nu. 5 for every litre of milk collected.

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Figure 8.4: (a) Sonam Euden, (b) Yogurt, (c) milk, (d) curd from the MPU, Khuruthang Punakha

Key features of the enterprise

At the time of the study, the processing unit collected milk from Dairy Farmers' Group (DFG) that consists of farmers from Kabjisa Gewog (32 members), Dzomi, Chubu, Toewang Gewogs (23 members) and seven members from Bemsisi village, Guma Gewog. The daily milk collection was 230 L on an average. An increase in milk quantity to 298 L/day was recorded during the summer of 2019.

Contract between the MPU Manager and Dairy Farmers' Group is renewed every year. Decision to change price of the products is done in consultation with the group. In 2018 and 2019, the group received a bonus amount of Nu. 400,000 and Nu. 440,000, respectively. Her total revenue was Nu. 850,000 in winter and Nu. 1,700,000 in summer. The unit generates a minimum profit of Nu. 40,000 per month. During summer months (March-August) with increased milk production the average monthly earning rises to Nu. 100,000.

Ms. Euden has employed two permanent and five temporary staff. While Ms. Euden manages records of sales, production and processing, her husband distributes the produce to Bajo and Lobesa town. Ms. Euden had received a five-day training from livestock officials to make yoghurt and to operate the machine. She pays Nu. 3,000 per month to every temporary staff and Nu. 7,000 per month to the permanent employees. In addition to the salary paid to the staff, her monthly expenditure also includes Nu. 1,500 for lunch and travel expenses for the permanent staff. Expenses incurred for operation of MPU are on rental of space (Nu. 2,000 per month) and electricity bill (Nu. 8,000 per month).

Products from MPU

Ms. Euden sells milk (Figure 8.4c), yoghurt, lassi, curd (Figure 8.4 d), buttermilk, butter, and cheese. Yoghurt is the most popular product with high demand compared to other products in the market. Sales are highest on Fridays and Saturdays (weekend market). During summer, sale of yoghurt peaks 1,000 cups/day. However, it drops during winters and cold conditions.

Yoghurt (Figure 8.4b) production, starts from 8:00 a.m. to 11:00 a.m. involving five to six people. Milk is transferred into the incubator and is kept for six hours to process. During winter, about 100 L yoghurt per day is produced and production does not happen every day. However, during summer, MPU produces more than 200 L/day. Retail price of yoghurt is Nu. 30/cup and that of wholesale is Nu. 25/cup. Each cup measures 200 g.

Lassi is another product from the processing unit. Each cup contains 250 ml Lassi and costs Nu. 50. Buttermilk, locally called Daw, is sold at Nu. 40/L.

In winter, the MPU produces about 7 kg butter and 28 cheese-balls a day from 140 L milk. One kilogramme butter is sold at Nu. 400 and 400 g cheese at Nu. 170. Local farmers who sell butter and cheese at a relatively cheaper rate than MPU are Ms. Euden's main competitors. Sale of butter and cheese is better in winter because winter is the season for annual rimdro in many communities. However, milk production during winter slumps due to scarcity of cattle fodder.

Marketing of processed products

Ms. Euden supplies yoghurt to Bajo, Lobesa, and Khuruthang. She also tried to sell milk to schools, but due to high price of milk the plan failed. The price of milk differs depending on the distance from the MPU to the destination.

Compared to other dairy products, sale of curd is low. Consumers prefer the taste of yoghurt produced in the MPU and Ms. Euden has been making yoghurt as per the instruction of livestock officials of Punakha. She attributes good taste of yoghurt to the strict monitoring of milk quality as well as non-separation of cream from the milk. The quality of milk is maintained by using a milk analyser, which checks the level of water, fat, solids, and filters out the impurities from the milk. Bhutan Agriculture and Food Regulatory Authority (BAFRA) inspectors of Punakha also monitor the hygiene and provide advice on the quality of milk. There were instances of adulteration in the milk with

sugar, salt, or water.

Ms. Euden is confident that competitors would find it difficult to sell their yoghurt in Punakha-Wangdue valley markets. The MPU also cares for customers' satisfaction. Damaged yoghurt is replaced with fresh yoghurt.

Success factors

Ms. Euden attributes the success of the MPU to the diversity of products and the helping hand of her husband who supports in marketing the products outside Khuruthang. Work in MPU is mechanised and does not involve intensive physical activities. Dedication, interest and love towards the work has kept the MPU going well for all these years.

Challenges of MPU

The MPU faces the challenge of packaging materials supply for products. Ms. Euden orders yoghurt cups about two months in advance from Siliguri, India, as there are no yoghurt cup manufacturers in Bhutan. There were times in the past when she did not receive supply of cups on time and she had to resort to using cups from other MPUs. This led to drastic reduction in yoghurt sell due to different brand name on the cups. The MPU requires 180,000 cups annually, and the cost of 90,000 cups is Nu. 400,000 excluding the transportation cost of Nu. 7,000.

Besides yoghurt cups, availability of milk bottle is another challenge. The MPU buys milk bottle from Gasa at Nu. 5/bottle and once due to the breakdown of bottle manufacturing machine in Gasa, milk bottles had to be purchased from Phuentsholing at Nu.7/bottle. Recycled bottles are also used and each of these cost Nu. 1.

Ms. Euden finds it challenging to maintain proper records of operation and sale of MPU products. Lack of financial capacity to invest in diversifying products is another challenge since investing from money saved is difficult with the current system. Moreover, competition in the market is expected with Wangdue Dzongkhag Livestock sector's plan to start yoghurt business very soon.

Future plan

Ms. Euden has plans to expand the processing unit with addition to products such as Paneer, Chugo (dry cheese), sweet using milk, and pasteurized milk in small packets. She has undergone a training in processing Paneer, mozzarella cheese, and Rasgulla (Indian sweet). If her plan materialises, she will extend milk collection area from other Gewogs in Punakha Dzongkhag. She is confident that with more milk producers in Punakha, price of milk will decrease.

Advice to aspiring entrepreneurs

Ms. Euden's advice to the youth is to explore wide variety of jobs in agriculture and related fields as entrepreneur. There is a huge potential in agro-entrepreneurship. Being self-confident, hardworking, forthcoming, and developing interest in agro-business is very important to be productive and successful entrepreneur.

For entrepreneurship culture to grow in the country, government should provide training on skill development (processing). Supply of raw materials for the identified entrepreneurs and other support in the initial stage of business is very important to sustain the business and to achieve success. Sharing of success stories through video, pamphlet, print, and social media could encourage youth to venture in agro-based entrepreneurships.

Tsirang Gonor Thoenked Detshen, Tsirang Dzongkhag

Purna Prasad Chapagai[1] and Bhagat Suberi[2]

Background

The Tsirang Gonor Thoenked Detshen is a registered Milk Processing Unit (MPU) established in Tsirang in 2014 (Figure 8.6) to support the livelihood of local farmers. The initial fund for the establishment was provided by the Gewog Livestock sector. Later, support from Dzongkhag Veterinary sector of Tsirang, European Union project and the Government of India was provided in the form of infrastructure, equipment, group formation, and training. After the formation of the unit, Mr. Mon Bahadur Chhetri joined the group as a member with a business motivation.

The unit has 150 farmers as group members who supply milk to the MPU. The MPU has three milk distributors (who own a milk van each), five workers, and three Chairpersons (one from each of the three Gewogs) including Mr. Chhetri himself, who is credited for taking the unit forward as a business model. In the beginning, he started with collection and distribution of raw milk as the quantity of milk was sufficient for consumers of Tsirang Dzongkhag only. Gradually, as the quantity of milk increased, Mr. Chhetri started sending the additional milk to Thimphu. Milk supply from the farmers further increased as new members joined the group. This prompted the idea of value addition through product diversification. The products developed include curd, yoghurt, butter, cheese, butter milk, Paneer, and Gulab Jamun. Besides these, fresh milk is also sold.

The management plan of the unit was drafted since its inception. The members strictly follow the bylaws framed as agreed in the beginning. As such the unit is thriving well. The income of the unit is shared between five workers, three transporters, and three Chairpersons.

Opportunities and challenges

Daily collection of milk is about 400 L out of which 70 L is sold as raw milk to daily consumers in the locality. The rest is converted to various dairy products and sold locally while the surplus is sent to Thimphu, which is a reliable market. There is high demand for dairy products in Thimphu. In the event of dis-

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ruption in transportation between Tsirang and Thimphu, there would be no alternative market. Therefore, the unit is exploring the market options besides Thimphu.

The products of the unit are clean, well packed, fresh, and relatively cheaper, so most of the consumers prefer the unit's products. The unit's products have gained the trust of the people and has established a good market brand. "There's no negative feedback till date from the consumers", said one of the employees working in the MPU.

Farmers earn Nu. 39 from every litre of milk supplied and the unit in turn sells the same to the consumers at Nu. 45. Unsold milk is used to make other products including but not limited to cheese, butter, Paneer, yoghurt and sweets. A kilogramme of butter, Paneer and yoghurt is sold at Nu. 370, Nu. 400, and Nu. 60 respectively, while a ball of cheese is sold at Nu. 30 and milk sweet at Nu. 20 apiece.

Prices of the products are fixed after careful cost benefit analysis and the profit margin is set at the minimum. Mr. Chhetri is of the opinion that the profit will be seen only after 15 to 20 years. His net monthly income is about Nu. 40,000. The milk van owners get Nu. 10,000 each while the unit's employees are given Nu. 8,000 each monthly. The three Chairpersons at the Gewog level earn about Nu. 2,500 per month. Farmers' earning depends upon the quantity of milk supplied to the MPU. On an average, each farmer earns about Nu. 150 to Nu. 200 a day.

Money earned by a farmer is used to buy feeds and fodder for cattle and household items. Nu. 5/L of milk is deposited as group fund in the bank for use later. The workers sustain on the salary they receive.

Mr. Chhetri said that to succeed in dairy business one needs to be persistent, have patience, and maintain good team work. The group members come together as frequently as possible to discuss and find solutions to the problems they face to pave a way for better future. Group meetings in MPU happens once in every two months.

The group wants to extend membership to all the interested farmers from 12 Gewogs in Tsirang Dzongkhag in future. Some of the strategies they have planned include: increasing the number of members in the MPU by encouraging farmers from other Gewogs to join and to extend the market beyond Thimphu. They have identified Gelephu, Wangdue Phodrang, Punakha, Paro, and Chhukha Dzongkhags as potential markets for future.

Thus far, the unit has been operating well; however, there is also scepti-

cism on its sustainability. Since the group is getting bigger with many members, each Gewog may be considered as an independent group for better management in future. It is probable that MPUs in Tsirang would be established in individual Gewogs in the near future.

Mr. Chhetri sends message to other potential entrepreneurs saying that although there are a lot of business opportunities, but one should be very clear about their own plan from the inception. Furthermore, if the idea is clear and the problems are attended to as and when they arise than any venture would succeed. The government is very supportive particularly to the rural agricultural business. Mr. Chhetri strongly feels that youth need not be in urban areas when opportunities can be found in rural Bhutan.

Figure 8.5: Local Cheese processed in MPU

Dalley Pickle Production in Palokha Village, Wangdue Dzongkhag

Karma Sherub[1]

Background

The farmers of Palokha village under Rubesa Gewog in Wangdue Phodrang Dzongkhag, formally was registered as a farmers' group called Palokha Sonam Yargay Khenphen Tshogpa in the year 2005. This group is one of the exemplary groups in producing and marketing agricultural goods and services.

The group's mission is to strengthen its financial position through production of Dalley chili (*Capsicum annum* L.) pickle and lending loan at a minimal interest rate to its members. The group is governed by its own management plans and by-law administered through a group of leaders such as Chairperson, Secretary, and Treasurer. Currently, the group has 15 active members.

Key features of the enterprise

The group initially started with seed money collected from its members at Nu. 100 per member every month. This practice is being continued and the group has saved more than Nu. 2 million including the profit generated from sale of the group's products.

Owing to high surplus production of Dalley chili in Palokha village, Dzongkhag Agriculture sector at Wangdue supported the group in Dalley chili pickling. The equipment for processing Dalley chili were purchased with financial support from Dzongkhag Development Grant (DDG) and Royal Government of Bhutan (RGoB). The group bought 18 decimal land through their joint savings and constructed the Dalley pickle production unit with support from the government.

Individual members of the group cultivate Dalley chili in their farms and supply red-coloured (matured) Dalley chili for processing into pickle. In return, the farmers are paid Nu. 200/kg from the group's savings account. Moreover, members can also avail a loan upto Nu. 1,000/month at an interest rate of 6% from this account.

Management and marketing of products

All members actively participate in processing of Dalley chili pickle in their

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unit. They produce a minimum of 1,500 bottles of red Dalley chili pickles during the peak season, which usually falls around August and September. Each bottle weighs 200 g and is sold at Nu. 180 in Wangdue Phodrang, Punakha, and Thimphu local markets. The group also takes supply order from their customers and the income generated is deposited in the group's account.

Success factor

The group members strongly support this business as there are dual benefits of selling the raw material as well as the final product followed by the provision to take loan with a minimum interest rate from the group's savings. Moreover, they get continuous support from the Agriculture sector of Wangdue Dzongkhag. They receive training in terms of growing and processing chilies which keeps them engaged and motivated. Group members are also interested in cultivating chili as it is one of the main sources of their income.

Challenges and opportunities

The group can not sell all their products in local market. Therefore, it is important that the group links with markets in other Dzongkhags to sell and promote their product. Chili, being highly perishable vegetable, the group has to process the Dalley chili soon after it is harvested. All members being illiterate, the group aspires to involve an educated individual who can advertise the group's product and also help in marketing.

To provide sustainable supply, the group expects to establish a preserving unit to store fresh Dalley chilies so that processing and selling of pickle can be carried out whenever there is demand in the market.

Milk Processing Unit (MPU), Thripang, Trongsa Dzongkhag

Tashi Dorji[1] and Tshering Gyelpo[2]

Background

Nubi Phendey Tshogpa (NPT), managed by Ms. Wangmo, is a public owned Milk Processing Unit (MPU) located at the heart of Trongsa town. It was established in 2011 through the initiative of the Dzongkhag Livestock sector. Initially, the group had 30 members; however, due to long distance and high transportation cost, the group membership has reduced to 20. The members supply milk on daily basis to the MPU at Nu. 40/L.

Initially, the group members contributed Nu. 500 each to buy a milk processing equipment. At the time of this study, the MPU was one of the successful enterprise in Trongsa Dzongkhag. The Manager shared that the equipment such as incubator and temperature regulatory machines have helped in product diversification and marketing. The quality of the product is maintained according to the International Organization for Standardization (ISO) regulations and officials from Bhutan Agriculture and Food Regulatory Authority (BAFRA) regularly inspect the quality of their products and the workplace hygiene.

The MPU processes milk into yoghurt, curd, cheese, and butter. A kilogramme of butter is sold at Nu. 350 whilst yoghurt (200 ml) and curd (1 L) are sold at Nu. 20 and Nu. 60 respectively, including fresh milk at Nu. 55/L (Figure 8.6).

To motivate the existing members of the group and to encourage other farmers, the Manager of the MPU plans to save certain amount monthly from the profit to introduce mini welfare loan scheme for the members. Such initiative will not only enhance the current production but it will also encourage farmers to be members of the group. Unlike subsistence dairy farming, the Nubi Phendey Tshogpa has helped farmers to organize themselves for commercialisation of dairy farming and supply various dairy products to Trongsa Dzongkhag.

Success factors and prospect of Nubi Phendey Tshogpa

The success factors of the group include proper baseline survey and problem analysis carried out by the Dzongkhag Livestock sector. Their survey result

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showed the need to build the farmers' capacity in various areas so they could overcome the issues related to production, management, and marketing. According to Ms. Wangmo, the Dzongkhag Livestock sector provided funds to buy processing equipment, which helped in diversifying dairy products. This made farmers realise the importance to go beyond subsistence dairy farming. Many of the farmers revived dairy farming and the Agriculture Extension staff trained them in various technical, management, and leadership skills.

Lesson learned from the Nubi Phendey Tshogpa

Some of the lessons learned after the establishment of Nubi Phendey Tshogpa were that the formation of group provided farmers to have a stronger voice, to take advantage of economy of scale, reduce cost, and enable the group to access credit and attract training opportunities. Formation of group based on the collection and analysis of sound technical and economic information benefits in sustaining the group. Market orientation enables the farmers to increase their income and invest in better ventures. Finally, the success of MPU is also attributed to the support of the government.

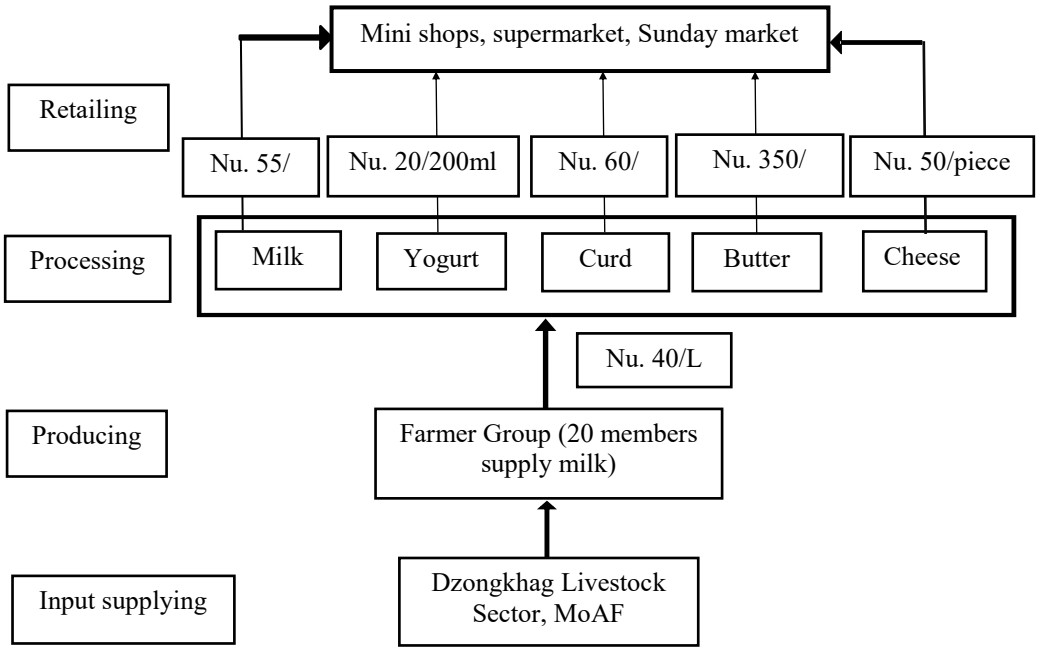

Figure 8.6: Milk value chain for Nubi Phendey Tshogpa

Organic Cassava Flour, Chhoekhorling, Pema Gatshel Dzongkhag

Jigdrel Dorji[1] and Tashi Dendup[2]

Background

Chhoekhorling village is located in a remote area in Pema Gatshel Dzongkhag. There are about 80 households in the community with majority of the population belonging to older age group. Remoteness of the place has driven most of the youth towards urban areas in search of job. The income from the agriculture sector is very minimal and not reliable. Therefore, the cassava flour production group was set up, under the guidance of Jampel Trulku, to diversify the source of income for local people and to attract youth back to the village. Informally, the group started cultivating cassava plants in 2016 with 17 members. Cassava flour production began only in 2018 because it took a year to construct the processing plant. The International Fund for Agricultural Development (IFAD), through the Dzongkhag Agriculture Office, provided Nu. 3,300,000 to establish the processing plant and to source machineries. However, most of the members got married and left the group, leaving only seven active members.

Management

The group cultivates cassava on a 59 acre government-leased land and processes it into cassava flour, which can be used for making cookies and noodles. The group produced about five metric tonnes of cassava flour in the year 2019. The flour is organic and well packed (Figure 8.10). It is sold at a wholesale price of Nu. 50/kg at the processing plant, and Nu. 60/kg in nearby areas such as Pasakha, Nganglam, Monggar, Gomtu, and Pema Gatshel. The flour costs Nu. 70/kg in other markets. The National Post Harvest Centre, in Lingmithang, Monggar, regularly buys about 300 kg every month. Under the Queen's Project, the National Post Harvest Centre uses cassava flour to produce biscuits and other snacks. Whenever possible, the group tries to deliver their product to customers by bus or taxi to minimize the cost. Besides that, not much is done by the group to maintain customer relations. The main source of revenue is through the sale of cassava flour. As of February 2020, the group had Nu. 150,000 in their joint savings account.

[1]Asst. Lecturer, Dept. of Animal Science
[2]Assoc. Lecturer, Dept. of Sustainable Development

The business has provided part-time employment to seven women of the community. The group hires wage labourers from the community for harvesting and transporting raw cassava. Moreover, members help each other in cash and kind in times of need. The group also offers cassava flour for free during festivals and rituals in the community.

Success factors

Lack of regional competitors is one of the most significant advantages for the group. Having access to 59 acre leased land at a cheap rental charge is an advantage to the group. The group has also access to external funds and support. The Dzongkhag Agriculture sector and Gewog administration provide the group with financial and technical support. Furthermore, the group members are optimistic of receiving help from other sources if they can formalize the group.

The Local Organic Assurance (LOA) certified the group's cassava flour as an organic product in the year 2019. The LOA is the system of product registration with the National Organic Programme in Bhutan. With the increasing number of educated and health-conscious people in the country, the sale of organic flour will fetch good market value.

Challenges

As the number of group members dropped by more than two folds, from initial 17 members to seven members, labour shortage is a prominent challenge. The cassava field, without motorable road connection, is a few kilometre away from the processing plant. Hence, it requires a considerable workforce to carry the harvested cassava to the plant for further processing. The group hires wage labourers during planting and harvesting time. The wage rate in the village is Nu. 300 for women and Nu. 350 for men. The land being large, the group is not able to afford to fence the entire area; thus, wild animals like porcupines and wild pigs frequently attack their field.

Whilst the processing plant has the capacity to produce more than 500 kg of flour/day, the group produces 150 to 200 kg/day. This is primarily due to the limited number of dryers in the processing plant. Initially, they had three dryers, but it stopped functioning after one to two years of operation. Thus, the group had to buy a dryer worth Nu. 90,000 using their savings. The group experiences post-harvest loss due to limited dryers. They aspire to scale up their

production if they are provided with a few more dryers.

Shelf life of cassava flour is about six months after packaging. Currently, the group does not have the technical capacity to increase the product's shelf life. If production increases in the future, the group must also explore the use of preservatives and other means to extend the shelf life of cassava flour.

Management is another issue hindering the smooth functioning of the group. For instance, the group does not have good bylaws. They keep changing their Chairperson on a rotational basis making it challenging to maintain proper financial records. Moreover, the group could not afford to pay their members for quite some time.

Figure 8.7: Cassava tubers

Local Chips Processing Company, Thimphu Dzongkhag

Sonam Gaki[1] and Phub Dem[2]

Background

Maize is an important staple food in many countries of the world. Production and consumption data indicate that it is also a major staple crop cultivated widely in Bhutan. It is a major food crop cultivated widely in the six eastern Dzongkhags, accounting for up to 46% of the total maize area and over 54% of the total production (DoA, 2015). It is well known as "poor man's nutria-cereal" due to the presence of high content of carbohydrates, fats, proteins, and some important vitamins and minerals. Over the last 20 years, Bhutan's maize production remained stable at around 70 to 1,000 tonnes. About 69% of the Bhutanese households grow maize and it contributed to 46% to food basket in 2010. However, in Bhutanese market, value addition in maize is significantly low due to lack of knowledge, finance, and appropriate machines.

Among many budding entrepreneurs, Mr. Pelden Wangchuk, 30 years old, is an innovative youth and founder of Nazhoen Food Processing Unit in Changzamtok, Thimphu. The food processing unit was started in the year 2018 with a focus on maize and potato products. Soon after his graduation from Bangalore University with a degree in Financial Management, he along with his friends conducted a market survey on the need and demand for maize and potato related products in Thimphu Dzongkhag. Having positive response from his market survey, he started the chips manufacturing company in mid-2018 with an investment loan of Nu. 1 million granted by the Rural Enterprise Development Corporation Limited (REDCL). He also received support from the Department of Cottage and Small Industry (DCSI), Ministry of Economic Affairs (MoEA).

As expressed by Mr. Wangchuk and his friends, the unit was started mainly to make Bhutan resource-independent and to provide employment for young people. With the training provided by the DCSI and cooking tutorials on YouTube, Mr. Wangchuk learnt to make varieties of snacks and passed the skills to his young staff. The company currently has 13 young employees (seven young women and six men). Some of them have completed their university education whilst others have attended high school.

[1]Asst. Lecturer, Dept. of Agriculture
[2]Asst. Lecturer, Dept. of Environment and Climate Studies

Products and marketing strategy

Today, the company produces 15 different snacks such as Tengma (roasted corn), Bhujia (crispy snack made with chickpea and potatoes), spicy chips and different kinds of Bhutanese Khabzey in the Changzamtok Start-up Centre, a space provided by DCSI, MoEA. The unit collects raw materials from Eastern and Southern Dzongkhags at a reasonable rate. With rate ranging from Nu. 30 to Nu. 150, the products are sold in 11 Dzongkhags in Central and Southern Bhutan. The unit is earning a monthly income of around Nu. 0.1 million. According to Mr. Wangchuk, since his products are spicy, improved with variety, and sold at affordable rate, the demand is high in the market. Their products are sold in various sales outlets, shops and hotels in Thimphu city.

Challenges and future prospects

As there is no local supplier in providing packaging materials for his products, he procures these from India and other countries, which is a huge challenge for him. Moreover, as Bhutan and India share a long porous border, market for his products become very competitive especially in Southern Bhutan. After improving the packaging design and increasing the production, the company is planning to market throughout the nation and to neighbouring countries like Nepal and India.

Mr. Wangchuk and his friends are happy that they are doing well. They are also very enthusiastic and ready to share their experience to young and novice Bhutanese entrepreneurs. By collecting maize and potatoes from local residents in large quantities, his small chips processing company is benefiting small holder farmers in increasing their income, creating employment opportunities, and diversifying locally processed products in Bhutan.

Chapter 9: Agriculture Development Approaches

Agriculture in Bhutan is considered the backbone of the nation. Agriculture accounts for the employment and livelihood of 49.9% of the population (NSB, 2020). The sector contributed 15.82% of the GDP in 2019 (NSB, 2020). The current low agricultural productivity in the country can be attributed to factors like poor soil fertility and other factors such as inadequate input supply; low-quality seeds, lack of production techniques and knowledge, inefficient management, labour shortage and poor infrastructure (Neuhoff et al., 2014).

Bhutanese farmers have traditionally practised integrated-subsistence farming, but in the last decade efforts have been made to gradually transition to commercial farming (Dendup, 2018). Factors like urbanisation, farm mechanisation, community institutions, high-value products, and youth aspirations have been identified as some of the factors driving the transformation of farmers and youth into entrepreneurs (Dendup, 2018). Some of the challenges that Bhutan faces in the transformation are the reservations people have towards agriculture and the educated population considering farming as an inferior career option (Dendup, 2018).

This Chapter presents three case studies of farmers' group with different approaches in farming; vegetable groups in Genekha, Thimphu, and Women's Marketing Vegetable Group in Bongo, Chapcha and Youth Group in Bjabcho, Phuentsholing.

Linking Farmers' Vegetable Group with Local School's Feeding Programme, Genekha, Thimphu Dzongkhag

Sonam Gaki[1]

Background

In Genekha Gewog, a farmers' group was formed with nine members in 2017 with the intention to cultivate shitake mushroom. When the group was planning to get connected with the local boarding school for marketing, one more farmer joined the group. However, four of the members later dropped out due to some personal reasons, thereby leaving the group with six active members.

During the first cycle of the production period, the entire shitake mushroom production failed, which created panic amongst the farmers. They incurred loss for a while before gaining some stability in mushroom production in the second season. At the same time, the group members were engaged in vegetable production and product development.

The compound effect of the first failure of their initial target crop (mushroom) and the benefits of the diversification of crops encouraged the group to change the course of their target production. The farmers then focused on production of vegetables such as chili, potato, cabbage, carrot, peas, and cauliflower. The only focus fruit crop was apple, as all the members were already growing apples. This transition from mushroom production to being a predominantly vegetable group was also made possible due to the availability of a cold storage facility, which was borrowed from the Food Corporation of Bhutan (FCB) to store apple and potato for off-season marketing.

Motivation

The farmers were motivated to form the group for two main reasons namely a) to increase their income through collective production and marketing and b) to produce crops without or with minimal use of synthetic inputs, especially the pesticides. The idea of linking the group with school's feeding programme came in the wake of a dire need for an easy access to local market. At the same time, the group was also inspired to feed students with "clean" food. Since the farmers had small land holdings, working together was one way of empowering themselves to negotiate in the market, both in the local community and beyond.

However, the linkage with the school's feeding programme was not easy

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for all the stakeholders (farmers, school, and the Extension Agent) involved. The farmers were not able to produce a wide range of vegetables in bulk throughout the year. This caused some reservations on the school's part to deal with local producers and suppliers on a contract basis. Price of vegetable supplied by farmers was lower than the actual market value. For example, potatoes were sold at Nu. 27/kg to the school whereas the market value was between Nu. 40 to Nu. 50/kg. Despite the challenges, farmers were glad to be able to have a regular market at the farmgate.

Financial background

Initial investment made by the members for mushroom production was approximately Nu. 50,000 for the construction of sheds and purchasing of billets. Farmers were not financially sound at that time therefore they sought a group loan of Nu. 500,000 for a year from a local farmers' mushroom group that was being supported financially by the Department of Agriculture. The loan was paid in lump sum amount at the interest rate of 10% per annum.

Although the group was not able to pay back the loan through the production of mushrooms, the members were able to clear their debt. The group had created a savings account by contributing Nu. 100 each per month. In addition, the group also deposited the earnings from the sale of vegetables. The group had Nu. 169,000 in their savings account at the time of this study.

External support received

The group members were provided with CGI sheets by the government according to the size of their sheds ranging from 5 to 30 numbers each. The farmers also received a week-long training on jam making and in the beginning of 2020 the Chairperson was sent on a study tour to Kerala, India for 10 days. It was supported by the Ministry of Agriculture and Forests. The National Post Harvest Centre (NPHC), Paro supported the farmers' group in apple wine preparation in 2019. The group also received 50 plastic crates and two weighing balances from the Department of Agriculture Marketing and Cooperatives (DAMC) in 2017, 600 apple trays from NPHC, Paro in 2019.

Challenges

In a span of three years, the group experienced various obstacles, which either

affected their performance or barred them from progressing further economically. Agriculture Extension Agent and the farmers' group identified challenges they faced over the years. It ranged from a smaller number of group members and owning small land (less than one acre) that impeded crop diversification as well as the quantity produced. Inadequate knowledge and skills of farmers in agriculture enterprise and limited capital for investment, linking the groups' produce with the school's feeding programme, and sustaining the continuous supply in terms of diversity and quantity were the additional constraints. Initially, the group could not find appropriate market for their apple wine. In addition, they could not access adequate support from the relevant institutions and experienced poor communication and coordination between the institutions.

Opportunities

Despite the aforementioned challenges, the group members received benefits of being in a group such as learning to function as a team, networking with people outside their community, learning about agri-enterprise, and personal development. The group also benefited from several other opportunities like crop diversification and product development, expansion of market beyond local school, apple wine production, explore new business ideas and practices. The group members also benefited from increased income, improved network, and gained confidence and self-esteem.

Future plan

The group members and Extension Agents are focusing on both short-term and long-term plans to maintain the sustainability of the group. The Extension Agents have been seeking agencies to collaborate on the pulping of apple for juice production so as to diversify products and explore new markets. Furthermore, they are looking forward to collaborate with other upcoming youth's groups on wheat product development and processing potato chips. These new groups may also allow the group to learn through observation and networking. In coming years, the group has plan to extend their vegetable production to winter and expanding their area of production by leasing government land if possible. They are also looking forward to developing their capacity in book keeping and using the money strategically to develop the group.

Women's Vegetable Marketing Group in Bongo, Chhukha Dzongkhag

Jigme Tenzin[1] and Chogyel Wangmo[2]

Background

Ms. Sangay Lhamo initiated the Women's Vegetable Marketing group in Bongo, Chapcha in 2018 with five members. The main aim of the group is to support women entrepreneurs. Ms. Lhamo is 33-year-old with two children and has extended family of 16 members. Before the group was formed, the farmers faced difficulty in selling their produce. Initially, members had reservation in joining the group. They felt that they may not be able to meet the demand. However, as they began to earn good income, they have been willing to continue in the group.

Traditionally, Bhutanese women are seen to be homemakers without any avenues to earn for earning. Formation of vegetable marketing group has helped the women of Bongo Gewog to earn and lead a dignified life. The vegetable group was started with technical support from Gewog Extension Office. The group buys vegetables from villagers as well as cultivates in their farm land.

Product and revenues

The women's group sells vegetables from their village. Before starting this group, the villagers could not sell their produce and now finding a market is not an issue as they supply to nearby schools and to institutions in Chhukha Dzongkhag (particularly to hospital and schools in Gedu area). The consumers prefer their produce as it is organic as the farmers do not use any synthetic chemical fertilizers.

The group sells potatoes, squash, cabbage, and radish. Sometimes, when they are not able to meet the demand from their production, they buy from farmers in Punakha and Wangdue. Each member easily earns up to Nu. 15,000 from a 12 decimal land. Income generated is mostly spent on buying essentials for their family. They also buy seeds as well as pay the labourers.

[1]Lecturer, Dept. of Animal Science
[2]Lecturer, Dept. of Environment and Climate Studies

Challenges and prospects

The biggest challenge for the farmers has been the lack of storage or cold chain facility. They would like to have a designated storage place especially on a nearby road, so that they can supply their produces easily to the market. Moreover, the leafy vegetables and chilies are highly perishable and cold chain storage can help to increase their shelf life. Cold chain facilities can save farmers from incurring loss due to rotting of vegetables. In addition, hiring labourers is expensive; having to pay Nu. 350-500 per day besides providing food. However, labour exchange amongst members of the group is practised. Sometimes, being a marketing group, they are disadvantaged by not having access to seeds. The group sees future prospects in year-round production of vegetable, especially if greenhouses are provided.

Figure 9.1: Vegetable field

Green Hands Youth Group of Phuentsholing, Bjabcho, Chhukha Dzongkhag

Jigme Tenzin[1] and Chogyel Wangmo[2]

Background

The Green Hand Youth Group based in Bjabcho, Chhukha, was started in the year 2016 by three friends to earn and support themselves. They are pre-university graduates and were inspired to start the group as they were provided with financial support by the Rural Enterprise Development Corporation and Loden Foundation to engage and encourage youth in agriculture. The youth group produces vegetables like broccoli, cauliflower, cabbage, mustard green, spinach, and other greens (Figure 9.2). Inspired by demand for local and organic produce in the locality and in the country, they have started to produce strawberry on a pilot basis.

Rural Enterprise Development Corporation Limited (REDCL) and Loden foundation financed the initial set up and in addition Dzongkhag Agriculture office and Agriculture Extension office provided seeds and technical inputs. As the venture became successful, the group acquired a loan of Nu. 50,000 to scale up their production. In addition, they have been approaching farmers in Phuentsholing for collaboration in farming and marketing. The group believes that it will help the farmers to get a premium price and increase their access to the market.

Figure 9.2: Vegetable production in net house

Marketability and revenue

Most of their produce is sold in the locality where they have established vegetable sheds along the Thimphu-Phuentsholing highway, and in Phuentsholing. They take online orders through social media like WeChat, WhatsApp, and Facebook. Online orders have been increasing, but comparatively most of the sales are channelled through offline market. They have

[1]Lecturer, Dept. of Animal Science
[2]Lecturer, Dept. of Environment and Climate Studies

also established a marketing outlet in Phuentsholing to cater to the demands of the largest commercial hub in Bhutan. In addition, they are planning to supply to other Dzongkhags in future.

The sale proceeds of the farm amount to about Nu. 400,000 to 500,000 per annum. They could improve the management of their sale proceeds by having a sound record keeping system in place.

The farm does not use any synthetic chemical fertilizers. They use manures such as animal dung purchased from the locality. Therefore, consumers prefer the group's vegetables as these are organic and naturally grown. In addition, many consumers have become increasingly health conscious and are sceptical on the food safety of the produce imported from India.

Opportunities and challenges

Agriculture involves hard labour and many youths therefore prefer to avoid the drudgery of farming. As a result, the group has been unable to recruit any new member, despite floating vacancies for several times in the official platform and in social media.

On an average, each member earns Nu. 12,000 a month. The group has reached a breakeven point and the profit earned is invested in farm development including leasing land, buying land and introducing more vegetables. Moreover, as the farm size and production increases, they are hoping that their remuneration will increase.

Support structure and the future

The group felt that it is difficult to get support from parents for agriculture related works. This may be because parents dream of their children opting for careers such as being a doctor or an engineer. The first thought of a parent is 'why study to finally return to the farm'. However, as the group members earned decent amount of money and could look after themselves, parents are becoming supportive and proud that the youth can earn through agriculture too. The local community have been supportive towards the Green Hands Youth Group and their engagement in farming.

Policies and consistent encouragement to engage youth in farming and agriculture related business would be imperative. Moreover, additional support is needed to promote farm mechanisation and introducing new technology to reduce the drudgery associated with farming.

Chapter 10: Integrated Farming Enterprise

As the human population has increased exponentially in the last few decades, farming as an enterprise has become a priority to produce enough food to feed the growing population. The knowledge of mixed and integrated farming has revolutionised the farming system. While the mixed farming system incorporates several types of farming practices in the same area, integrated farming is more aligned towards management of mixed farming system considering consumer's interests in the business. The integrated farming enterprise aims at generating sustainable livelihood and self-employment opportunities. It incorporates crops and vegetable production along with livestock development, fishery, and poultry management. Since the waste generated by one component of the integrated farming system is useful in another component, integrated farming enterprise is at times referred as integrated bio-system.

In Bhutan, a substantial number of young entrepreneurs have taken up integrated farming enterprises to pursue sustainable livelihood option in recent years. These enterprises have integrated several components such as growing vegetables along with poultry, dairy, fruit crops, and piggery. This Chapter describes some of the successful integrated farming enterprises established in different agro-ecological zones of Bhutan.

Raju Mongar Integrated Farming Enterprise, Gelephu, Sarpang Dzongkhag

Yogeeta Dahal[1] and Sushila Rai[2]

Background

Mr. Raju Mongar, 43-year-old from Zomlingthang village in Gelephu, is the owner of the Raju Farming Enterprise. He attended primary school and is currently working at Bhutan Centennial Distillery, Gelephu, as a plant operator. Since his job is on shift basis, he is able to contribute his time to his farm. His enterprise was initiated in 2016 with a focus on growing vegetables, rearing few cattle, and poultry birds. Mr. Mongar shared that more than earning money from the vegetable production, he enjoys growing vegetables and maintaining a green surrounding.

Mr. Mongar, who always wanted and desired to be surrounded by greenery, was motivated immensely by the success of Mr. Deepak who is an established entrepreneur. According to Mr. Mongar, Mr. Deepak enjoys farming and earns from it at the same time. Thus, Mr. Mongar began to explore farming as an option. He gathered information on farming from social media such as YouTube, which provided him a platform to learn and enrich himself with ideas and techniques on growing vegetables. Mr. Raju expressed with enthusiasm that through videos from social media he learned to grow vegetables smartly, using space efficiently, and integrating a variety of vegetables based on seasons and availability of water. He said that the social media has lots to offer if time and effort is used wisely to learn from it. One can learn many easy techniques for mass production of vegetables. He also keeps his social media page updated with pictures of his farm products in his Facebook page. In addition to this, he hopes that he can also be an example and motivate other interested individuals to take up similar enterprise.

Over the years, the integrated farm produced a variety of vegetable crops (Table 10.1). Some of the major crops grown in the farm includes chilies, beans, cauliflower, cabbage, radish, potatoes, quinoa, tomatoes, peas, cardamom, onion, garlic, eggplant, bitter gourd, sponge gourd, ridge gourd, pumpkin, bottle gourd, cucumber and maize. The income earned from the farm is sufficient for education of his children, and developing the farm further.

[1]Assoc. Lecturer, Dept. of Environment and Climate Studies
[2]Lecturer, Dept. of Forest Science

Table 10.1: Vegetables grown in the farm per season in the year 2019

Vegetable/crop	Quantity/Season	Rate (Nu)/Unit	Total Amount (Nu)
Tomato	100 kg	40	4,000
Broccoli	900 kg	60	54,000
Maize	2,000 nos.	15	30,000
Cabbage	14,000 kg	25	350,000
Mustard greens	400 bundles	30	12,000
Beans	300 kg	60	18,000
Cauliflower	900 kg	60	54,000
Coriander	200 bundles	15	3,000
Pea	50 kg	50	2,500
Bitter gourd	600 kg	30	18,000
Potato	900 kg	40	36,000
Cucumber	1,000 kg	30	30,000
Bottle gourd	300 kg	30	9,000
Radish	100 kg	10	1,000
Chili	100 kg	50	5,000
Eggplant	200 kg	30	6,000
Pumpkin	200 kg	20	4,000
Ridge gourd	200 kg	30	6,000
Sponge gourd	200 kg	30	6,000
Carrots	50 kg	50	2,500
Onion	100 kg	80	8,000
Garlic	20 kg	100	2,000

Management of the farm

The integrated vegetable farm is established on his family land. Initially, his family owned few cattle and poultry birds where he began working on vegetable farm along with his father. After the establishment of the farm, he received help from the Dzongkhag Livestock office. He also received infrastructure development accessories such as the greenhouse, e-fencing, syntax, green net, and drip water irrigation system. Mr. Mongar explained that without the support from the government in the initial stage, it would have been difficult to start the enterprise.

Besides government support, the success of the enterprise depends on proper management, constant care of the farm, and hard work. From Mr. Mongar's

experience, for youth who wants to pursue similar venture, he suggests to focus more on management of vegetable; paying attention and incorporating techniques of growing vegetables such as knowing the right season to sow right kind of seed and vegetables, using modern techniques that make growing easier, maintaining adequate spacing between plants, and thinning of fruits and pruning of vegetative parts of vegetables. According to his experience, education never ends and anyone can learn from multiple sources available including social media.

Opportunities and challenges

According to Mr. Mongar, one of the encouraging factors of continuing the practice of integrated farming is that the vegetables are never a waste. The farm products are either sold for income generation or consumed at home, while the leftover vegetables are fed to the cattle. Therefore, nothing is wasted.

Mr. Mongar expressed that growing vegetables besides rearing cattle and poultry farming has contributed to a wholesome farming system. Cow dung is used in generating biogas. The resulting manure and poultry litters are used in the farmland to enrich soil allowing vegetables to grow well. Since he has poultry birds, he is also a member of the Sarpang Layer Cooperative.

Most of the farming activities are carried out by the family members, especially by Mr. Mongar and his father. Occasionally, when extra labourer is needed in the farm, two to three workers from India are engaged for a few days. While Mr. Mongar takes the responsibility to market and distribute vegetables, many locals prefer to come to his farm to purchase vegetables. He sells the products at cheaper rate compared to the market price; therefore, he does not have to go distances for marketing. His regular customers are consumers and vendors from the Gelephu market.

Many buy his farm produces because it is fresh, organic in nature, and he also lets the buyers enter his field to choose and harvest vegetables themselves. Since he does not use synthetic agro-chemicals, the vegetables are safe to consume and are of good quality. Besides these qualities, the ban on vegetables from India also greatly benefited the sale of vegetables from his farm.

The farm faces water shortage frequently. Mr. Mongar said that water for farm use has to be stored as it is not available throughout the year. Wildlife damage, especially from elephants and deer entering the farm are recurrent issues in Gelephu.

Future plans

Over the years, Mr. Raju Mongar has been able to grow and diversify his farm produce and enhance the productivity. He plans to lease and expand the farm and introduce new varieties of crops that have high demand in the market. He also plans to buy a tractor, and cultivate kiwi and mushroom.

Tutu Rai Integrated Farming, Langchenphu Gewog, Samdrup Jongkhar Dzongkhag

Sonam Tashi[1] and Shekhar Chhetri[2]

Background

Mr. Tutu Rai, 35-year-old, took up full-time farming at the age of 29. Although he completed higher secondary school in 2004, Mr. Rai saw opportunity in farming, and the desire to live a self-reliant life further motivated him to take up farming. Mr. Rai is third in line of four sons in his family. His parents, both over 65 years, and his wife help him on their 10 acre integrated farm. The lone farm in Namchazor under Langchenphu Gewog in Samdrup Jongkhar is hidden in the midst of elephant-infested subtropical forest. The thick forest that surrounds the quiet farm also houses numerous wild animals, including sambar deer and wild pigs. A small stream that swells during monsoon season flanks the western side and exits through the southern edge of the farm.

Integrated farm

The farm, without any neighbour or a shop nearby, is rich with goats, poultry birds, fish ponds, horses, pigs, bees, and ducks. Mr. Rai cultivates paddy in his four acre wet land and citrus mandarin in five acre dry land. Between citrus trees, which are increasingly becoming susceptible to Citrus Greening (as in other parts of the country), areca nut trees are intercropped. The latter is economically promising and farmers across the southern belt of the country are planting it *en-masse*. Mr. Rai also grows 23 varieties of fruits, vegetables, cereals, and spices, which makes it possible to have something fresh to serve round the year. The young farmer has also tried planting more than a dozen drumstick trees (*Moringa olifera*) along the fish pond and on the western periphery of the farm. Moringa is a medicinal plant and its tender leaves, flowers and highly-priced bean-like string fruits are eaten as vegetables.

Farm income and expenditure

Over 85% of the crops grown in the farm are consumed at home due to difficult accessibility, and small and uncertain market. The family also has a decent amount of assorted farm outputs to send to other siblings living in other

[1]Assoc. Professor, Dept. of Agriculture
[2]Asst. Lecturer, Dept. of Animal Science

parts of the country. Among the farm products that are sold in the market, which is two hours drive along the bumpy and difficult farm road, are citrus mandarin, fish, poultry, honey, rice, and assortment of vegetables.

The average annual income from the farm is Nu. 700,000, with 40% coming from the sale of citrus mandarin and another 15% from paddy, fish and assorted vegetables. Food-wise, the farm is self-sufficient. The only other items purchased are salt, cooking oil, and sugar.

The farm is also self-sustaining as it integrates the practice of sustainability. The young farmer has not resorted to any external inputs. The manure to enhance soil health is generated from cows and other waste materials generated on the farm. So far, there has been no incidence of major pests and diseases outbreak owing to mixed and multiple cropping that keep pests and diseases other than citrus greening in check. It is a dynamic and robust farm by design requiring good care and time investment. This is not easy for beginners.

Daily chores

The young farmer is routined to the tough life and says, "it has now become a good habit". His typical day starts at around 3:00 in the morning. The first task of the day is to attend to animals (cattle, chicken, goats and fish), followed by planning for the day's work. By 7:00 a.m., he breaks for a heavy breakfast comprising mostly of fried rice or pounded flat rice (Chewra) or noodles. For rest of the day, depending on the day's work, Mr. Rai either ploughs the field or fetches animal feeds or does other farm chores. A day for the young farmer ends late in the evening, but he has no complains or regrets.

Although 75 years old and a chain tobacco smoker, his father helps with many of the farm activities, including guarding the orchard at night and looking after the cattle as they roam about freely in the jungle. Mr. Rai's mother does her share of the farm work that includes cooking, gardening, cleaning and other chores, while his young wife takes care of all the household chores. It is a team work, each contributing to building a healthy, happy, and successful farm life.

What makes Mr. Tutu successful?

What makes Mr. Rai successful is his hard work and passion to learn and do new things such as rearing bees, raising grain seeds (to use as fodder) on wooden trays inside self-made prototype plastic house, early chili and tomato

planting, and flower production among others. Besides working on his farm, he also advises and encourages other youths not to idle away their lives. He also contributes to his community by shouldering three other portfolios namely as a Treasurer of Bee Keeping Group and Piggery Farm Group, and Chairperson of Farm Road Maintenance Group.

Happiness and sources of unhappiness

Success does not seem to contribute to Mr. Rai's subjective happiness. In fact, on a scale of one to five on subjective happiness and life satisfaction, Mr. Rai chose three and said he has "miles to go to achieve happiness". But his sources of happiness and satisfaction are different, which include "no hunger, no poverty and his family being happy", whilst unhappiness comes "when things do not go as planned", which sometimes happens on the farm.

Challenges as a farmer

Amongst the several challenges, Mr. Rai listed labour shortage, crop raids by wild animals, transportation, and porous border with India, landslides, and flood as the major issues in the farm. He is not deterred by these challenges and feels that challenges will always be there. "One has to accept the challenges and move on" he added.

Integrated Enterprise of Saling Gewog, Monggar Dzongkhag

Tulsi Gurung[1] and Kuenga Tshering[2]

Background

Aum Sonam, a 50-year-old entrepreneur from Saling Gewog, Monggar said "being a farmer's daughter I was more interested in farming even as a child and looking back, I am so happy that I am following my parents' footstep''. After primary school, she started working on her family farm after her father fell sick. She says there was not much development then and the farm production was only for home consumption. At times, it was not even sufficient to meet the need of the family of nine members.

Aum Sonam inherited three acre land from her parents of which 2 acre 23 decimal is dry land and the remainder wet land. As she worked on her farm, she also took part in many other developmental activities in the village. She worked as a village health worker from 1990 for four years. In 1990s, almost all the Bhutanese homes used firewood for cooking which consumed lots of time and it was also hazardous to health due to smoke. Therefore, the government organized training in Bumthang on the construction of smokeless stove. She was one of the participants among other women from the region. She constructed a smokeless stove model in Saling Gewog after the training and also constructed five such stoves in Pangsibi village helping other rural women.

Sonam Phenrig Peldrup Detshen

Aum Sonam was elected as the National Assembly member from the Gewog in 2000 and served till 2006. For her, it was a great learning experience. However, she never left farming work. As development started in the country, she received trainings and inputs for agriculture which helped to increase production and market the surplus. In 2004, with support from ARDC, the then Renewable Natural Resource Research Centre (RNR-RC) Wengkhar, and JICA, she formed a group named Sonam Phenrig Peldrup Detshen with 13 members. Aum Sonam was nominated as the Chairperson of the group and headed the group for three years. They were given Nu. 40,000 to buy potato seeds which they planted in a five acre private land. They also opened a group bank account and made it mandatory to deposit Nu. 100 per member per month as their savings.

[1]Assoc. Professor, Dept. of Agriculture
[2]Lecturer, Dept. of Animal Science

In the beginning, they grew mainly potato and maize and in three years they were able to purchase a power tiller and a cornflake machine. She travelled to Thimphu and Paro to sell Tengma (beaten maize) for the group. Working on the farm was hard, but she persisted as she wanted the group to grow and succeed. As a Chairperson, she carried out planning, coordinating, gathering the inputs, and exploring markets. For effective implementation of the group activities, she also attended training in book keeping offered by the Rural Development Training Centre (RDTC), Zhemgang. The group also started growing vegetables with initiative and support from the Regional Agricultural Marketing and Cooperative Office (RAMCO) Monggar, they were linked to Gyelposhing Higher Secondary School to sell their vegetables. There were four groups and each week the group took turns to supply vegetables to the school. It was a very good arrangement and the group members benefitted immensely. However, the supply had to be stopped due to the closure of hostel facilities in the school.

As the group members got experience in production and in operating farm business, their interest to carry out farming at individual level also grew. As the maintenance cost increased, the power tiller and cornflake machines were sold from which each member received Nu. 30,000. Currently, the group has reduced to nine members as most of the members have bought their own cornflake machines and are operating on their own. However, the group members sell Tengma and fruits at a common shop in the middle of the village. This business has brought positive changes and is evident as those living in huts have constructed permanent houses and have become self-sufficient.

As the group members started their own farming activities, Aum Sonam also started her own. She has planted avocado in an acre of her land. She also grows mandarin orange, sugar cane, potato, ginger, carrot, and radish. Additionally, she has dedicated 0.8 acre land to pasture production for her three cross breed cattle.

Appreciating her keen interest in agriculture, in 2006, Mr. Yuichi Tomiyasu, a JICA expert working at RNR-RC Wengkhar sent her to Japan for 48 days along with the Extension Officers to get training on agriculture production, processing, and floriculture. This training gave her many entrepreneurial ideas. In Japan, staying in a farm house during the training period she got the idea of homestay. When she returned, she started homestay business with three rooms certified by the Tourism Council of Bhutan. Her clients are mainly those wishing to experience Bhutanese life in a rural household. Moreover, when she

started the homestay, there was no guest house in the locality and her homestay business was good. However, with time, many other homestays have emerged and the competition is growing with better facilities.

Aum Sonam was the first person to start a floriculture nursery in her community, applying the knowledge and skills she acquired in Japan, and earned as high as Nu. 100,000. Similar to homestay, others from the community have started the same business thus creating competition. However, her business is operating well. Her main clients are Kuri Chhu project staff, project guests, and civil servants.

Aum Sonam has also diversified her business in processing. Her processed products include Khabzey, cookies from maize and cassava, chips from potato and banana, flour of Kharang and cassava. She prepares Zaw (puffed rice) from the rice ordered particularly from Kurtoe. She received a vegetable dryer and a fryer of five litre capacity and a sealing machine as a gift from His Majesty the King. This has made her work easier. She sources the raw materials locally and from the group members. Sometimes, she orders banana from Nganglam if the locals are not able to meet her demand. Aum Sonam prepares candies from ginger, carrot, gooseberry, Assam apple, papaya, peach, and pear. In 2016, the regional office of National Post Harvest Centre was established in Lingmithang and this has benefitted her a lot in terms of training and skill development. She also uses the facilities of Lingmithang laboratory in producing jam, jellies, marmalades, and kumquat nectar to avoid health-safety issue of her farm products.

In 2008, recognizing the inspiring hard work and for being a progressive and exemplary farmer, His Majesty the King awarded Aum Sonam the Order of Merit (Gold). She says that she is extremely honoured to have received the medal which she had never dreamt of. It has boosted her motivation and will never stop working and prove worthy of the award.

The success of Aum Sonam has now become widely known because of which she receives internship students from abroad and also Bhutanese youth on attachment to learn different trades. She makes sure that they get the real field experience.

Market

Aum Sonam sends her farm products to One Gewog One Product (OGOP) shop, a part of the Queen's project in Thimphu. A vehicle from OGOP office comes to collect her farm products if the quantity is very high; for small quan-

tity, Aum Sonam arranges vehicle herself. She gets her payment within a week or two. Small quantity of farm products is also sold in Kuri Chhu, Gyelposhing, and Lingmithang. As of now, there is no problem in selling her farm products. Her annual profit is around Nu. 200,000. She bought 97 decimal land from the income she earned. She does not sell the dairy products instead these are used for processing and for home consumption.

Challenges

According to the Bhutan Agriculture and Food Regulatory Authority's requirement, there should be a separate room for processing. Since she does not have enough space, she cannot scale up her production. Moreover, she does not have the processing equipment especially for jam and jelly. Therefore, she has to depend on others which is not always comfortable. These processing and testing equipment need huge investment which cannot be done without support from the government.

Loden Foundation provided Nu. 600,000 as a loan for renovating her house for homestay, buying small processing equipment, and fencing of fruit orchards, which has already been paid. Aum Sonam says, "having a loan makes you work harder and be more responsible. Collateral and interest free loans benefit the start-ups which otherwise is difficult". Since there are only four of them (including husband, son and daughter), it is difficult to meet the market demand at times. She hires students during winter vacation to help with some tasks.

Future plan

Her son and daughter have both shown interest in taking forward the business and are working with her at home after completing Higher Secondary School. If they do well, she plans to lease land, plant fruit trees to start processing on a large scale. Since there is much support from the government for homemade products, she is motivated to continue. She is keen to support youth who come forward with interest in farming.

Message to youth

"As you have the education to take you forward, you can understand better, faster and explore further. Therefore, work hard and do not waste what His Majesty has been providing for the youth of the country".

Integrated Farmer, Boeri Village, Chhukha Dzongkhag

Chogyel Wangmo[1] and Jigme Tenzin[2]

Background

Mr. Kinley, 47-year-old, and his wife Mrs. Karma Wangmo are both retired school teachers who run a poultry and vegetable farm in Boeri village, under Chhukha Dzongkhag. Mr. Kinley, originally from Woling, Orong, Samdrup Jongkhar resides in his wife's village along with their two sons and two daughters. The family owns 18 acre land of which 10 acre is under cardamom cultivation, 50 decimal under kiwi plantation, and a few acre under vegetables and paddy cultivation. The couple had not only worked as teachers for many years but also lived in Australia for some time. They chose to settle and work in the village because they did not want to leave the land fallow, and at the same time, they wanted to leave a desirable inheritance for their children.

Before starting their farm business, they owned a small shop in Gedu town. The villagers of Boeri invited the couple to settle in the village as many people seemed to emigrate from their village. The villagers convinced them that their presence in Boeri village will not only bring success for the couple in terms of new sources of earning, but will also benefit the community. The villagers believed that Mr. Kinley and Mrs. Wangmo will bring new ideas, new technologies, and inspire other farmers of the community. Moreover, the couple's presence in the village will be able to add man-power to the Boeri village as they have been facing labour shortage.

Integrated poultry farm of Boeri

When Mr. Kinley and Mrs. Karma first settled in the village, they cultivated cardamom. They invested a lot of money on hiring labourers for vegetable cultivation. However, for the first two years the production from the farm was very low. They realized the shortage of manure to fertilize the poor quality soil. They sought help from Gewog Extension Agents and carried out online search to get ideas on how to improve the soil quality of their farm. They decided that having poultry birds would not only supply nitrogen to improve the soil quality, but would also generate income from selling the eggs.

To build a poultry shed, the duo met the Dzongkhag Livestock Officer

[1]Lecturer, Dept. of Environment and Climate Studies
[2]Lecturer, Dept. of Animal Science

who recommended them to contact Rural Enterprise Development Corporation Limited (REDCL) for acquiring loan with low interest. With the loan, they built a poultry shed and bought birds from Paro. They continued to learn from online sources about poultry farming and its management, and with guidance from the Gewog Livestock Extension Officers.

Figure 10.1: Poultry farm at Bori, Chukha

The production from the first batch of 500 poultry birds was very good and lucrative (Figure 10.1). This inspired the couple to invest more in poultry farming. They also employed one poultry Farm Manager. In the second batch, they bought 900 birds. Unfortunately, a flood in the summer of 2019 killed around 600 birds. They were disheartened to see a large number of birds die and the poultry sheds damaged. However, they were determined to maintain at least 1,000 birds in their poultry farm, so they bought additional 600 poultry birds through the Dzongkhag office. They started selling eggs in the Gedu town and in few local shops. Mr. Kinley has been receiving good feedback from the consumers on the quality of the eggs from his farm. Due to high demand for eggs in the market, his farm is not able to meet the demand.

Besides the Farm Manager, the couple hire farm labourers on need basis. On an average, Nu. 70,000 is spent on hiring farm labourers, Nu. 125,000 on poultry feed and saw dust, and Nu. 8,000 as Farm Manager's salary, on monthly basis. Record keepings of the financial matters and marketing are carried out by Mr. Kinley.

Investing in horticulture crops and vegetables

The family has diversified the farm by planting 120 kiwi plants, from which eight plants have started fruiting. The harvest from eight stands is used for self

-consumption. They harvested around 180 kg of cardamom in 2019 compared to 30 kg in 2018. Cardamom was sold at Nu. 450/kg to an exporter in Phuentsholing. Vegetables such as broccoli, cabbage, spinach, and cauliflower are also cultivated for the market. Broccoli and cauliflower alone generated about Nu. 58,000. The duo were experimenting with vegetable production in small amount as they were not sure about the market demand for the produce.

The couple encouraged other farmers in the village to practice organic farming. They have also helped in forming Boeri Women Farmers' group, which produces and sells vegetables. The Women's group was able to generate Nu. 18,000 from vegetable production.

Advantage of farming

They plan to develop their village and attract youth to settle and work in the village. Despite their struggle in investing and developing the farm in the first two years, the family is happy, healthy, and independent back in their village. If one is determined to work hard in the farm and willing to take risk, there is a good return from the farm. While working in one's own farm the couple gets to spend quality time with family. In order to establish community bonding, the family has started celebrating Losar together in the village. The farm also engages students for part time jobs during their vacation. The couple is willing to help anyone who is interested to learn farming skills and setup farms in their village.

Tshendung Integrated Farm: Youth Group agribusiness, Trashi Yangtse Dzongkhag

Ugyen Dorji[1] and Dhan Bdr Gurung[2]

Background

Tshendung Integrated Farm (TIF) is a Land User Certificate group based in Tshendung in Lichen village, Trashi Yangtse Dzongkhag. The TIF was started by a group of youths in June 2018. Today, the farm has eight members whose age ranges from 20 to 24 years and all of them have completed their high school. The farm management staff comprises of a Chairperson, a Secretary, and a Treasurer.

Support from the government

The Chairperson, Mr. Leki Dorji and his friends wanted to start an integrated farm because they had no interest in searching for alternative employment. The youths are highly motivated to be independent, responsible and make their own living. The Royal Government of Bhutan, with support from the Royal Project, boosted their motivation by supplying the group with farming equipment such as spade, grass cutter, sickle, hoe, knife, and two power tillers; and the construction of a house among other essential items.

The integrated farm

Figure 10.2: Tshendung Integrated farm

The total area of the farm is 14.5 acre of which 2 acre is under natural forest (Figure 10.2). Tshendung Integrated Farm produces vegetables, fruits, mushrooms, field crops, orchid plants, flowers, and poultry products. Tomato, chili, beans, radish, cabbage, broccoli, turnip, cauliflower, asparagus, and cucumber are some of the prominent vegetables grown in the farm. Besides strawberry, the group has

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planted 165 saplings of pear and about 600 saplings of passion fruit. Cereal crops such as sweet buckwheat and quinoa cover three acre farm land. Orchids are also grown for ornamental as well as consumption purposes. Both shitake and oyster mushrooms are cultivated in mushroom shed. The group also has poultry birds for egg production.

The farm earned about Nu. 1,300,000 from marketing of the farm produces. Selling eggs alone fetched about Nu. 260,000/month. Unlike with other farm produces, eggs are directly supplied to customers as the demand is good. The group expects to earn about Nu. 2,800,000/annum through sale of eggs. Oyster mushroom is sold at Nu. 350/kg. The members are paid a salary of Nu. 15,000/month. The members have a joint account and make a recurring deposit of Nu. 30,000/month.

Challenges

One of the major challenges the farm faces is the infertile red soil on which the vegetables and fruits do not grow well. To improve the soil, the members have been applying manure, leaf litters, humus, and other fertilizers continuously. The intensive care of soil is yielding good result. The farm is 10 km away from the market. Due to poor condition of the road, transportation cost is high at Nu. 1,200 for a round trip to the market where their farm products are sold. The group has plan to buy a utility vehicle to ease the transportation challenge. Sometimes, the produce do not fetch good price in the market and to address this issue, they have plan to link their produces to hotel and restaurants.

Message to future entrepreneurs

The Tshendung Integrated Farm is one of the best examples of successful integrated farm in the country initiated by a group of hard working youth with support from the government. The youths acknowledge that for a farm to flourish, a person has to have passion, experience, and multitasking capabilities. For instance, one should have knowledge and skills to operate farm machineries. The Chairperson said that proper planning is indispensable when a large area of land is to be managed. Knowledge of space management and rotation of crops are important skills. According to one of the members “there is a vibrant future and scope for farm businesses which will always remain there as long as one is ready to work hard”.

Vegetable and Tengma Production, Chali Gewog, Monggar Dzongkhag

Tulsi Gurung[1] and Kuenga Tshering[2]

Background

Mr. Tashi Wangchuk, 45-year-old, is the former employee of Mountain Hazelnut Project in Lingmithang, Monggar. He did not receive any formal education yet has a rich knowledge in farming based on his experience. While he worked in Agriculture and Research Development Centre (ARDC), Wengkher as a helper, he had the opportunity to learn plumbing. Therefore, he was employed in Hazelnut project because of his versatility to work as a carpenter, plumber, mason, and helper in maintaining the infrastructures of the project. While in the project, his monthly salary and allowances added to Nu. 22,000, which he considered a good earning. During weekends, Mr. Wangchuk often visited his home to help his parents, which prompted him to start commercial farming, albeit on a small scale. In 2018, he had to resign after his father passed away and his mother was all alone to take care of their seven acre land.

The farm

Mr. Wangchuk uses two acre of his land to cultivate maize and vegetables such as cabbage, cauliflower, broccoli, radish, onion, garlic, and coriander. He uses hybrid seeds for cabbage and cauliflower as the yield is good. He explained enthusiastically that he could earn more than Nu. 4,000 just by selling onion, garlic, and coriander from a small plot of land. He is encouraged by the opportunity to sell whatever he produces due to farm road connectivity. Middlemen from Bumthang, Trashigang, Pema Gatshel and Panbang come to collect farm produces from his village. Sometimes, in absence of middlemen, he takes his produces to Monggar town and Gyelposhing vegetable market on his power tiller. Mr. Wangchuk has got his farm produces certified as organic by the Gewog Agriculture officials and Bhutan Agriculture and Food Regulatory Authority (BAFRA) to authenticate the origin of the produces.

Since there are only two people to work on the farm he cannot cultivate as much as he wishes. Yet, he earns approximately Nu. 150,000 from vegetables and Nu. 70,000 from Tengma annually. To make sure that he gets market for Tengma, he staggers the date of sowing maize.

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[2]Lecturer, Dept. of Animal Science

Mr. Wangchuk has planted 20 avocado trees which are yet to fruit. Additionally, he grows citrus mandarin for self-consumption and to be sold in the local market. Apart from vegetable production, he also rears cattle. Cow dung from the cattle is used as manure. Agricultural residues are used as cattle feed or for composting.

With a loan of Nu. 400,000 from one of the banks, Mr. Wangchuk has also constructed a three-storied house, which is rented at Nu. 12,000 per month. His earning is used for education of his two sisters studying in India. He is able to support his mother to visit religious places such as Bodhgaya, which he finds it very rewarding.

Challenges

Vegetables are a good source of income, but with short shelf life and lack of storage facility when there is no demand is a challenge. Price fluctuation is another challenge which Mr. Wangchuk feels is inevitable. He mentioned that going to Gewog office to certify their produce is time consuming, which started due to misconduct of a few individuals. Since there are only two people working on the farm, Mr. Wangchuk does not have bigger plans at the moment. He hopes that the avocados will bring in more profit in the future. He is happy with the development that is taking place in the country as he is able to sell all the produces from his farm.

Integrated Farm in Tsendagang Gewog, Dagana Dzongkhag

Om Katel[1] and Anooja Nair[2]

Background

Mr. Nima Sherpa could not become a progressive farmer due to lack of technical knowledge and limited productive land. So he decided to start a small grocery shop at Dagapela, Dagana. However, the grocery shop also did not fetch him enough income to support his family. He was then forced to explore various ways to improve his livelihood. During this time, Mr. Sherpa got an opportunity to attend a short training on integrated farming at Regional Training Development Centre (RTDC), Zhemgang. For him, the training was interesting and realized that he could have better livelihood options if he resumed farming.

Integrated farm business

In 2010, Mr. Sherpa invested Nu. 85,000 in starting a forest nursery. He raised seedlings (Figure 10.3) of various species purchased from Tsendagang in 2007. The seedlings (Table 10.2) were sold to the Department of Forest and Park Services (DOFPS) in Dagapela with a net profit of Nu. 13,000 in 2010. Although small, it provided him satisfaction and determination to continue his nursery. In 2011, he made a net profit of Nu. 30,000, which increased over the years to Nu. 90,000 in 2015, Nu. 120,000 in 2016, and Nu. 130,000 in 2017. So, he decided to diversify his farm products in 2018 and started raising seedlings of fodder, medicinal, and aromatic plant species in addition to timber species. Un-

Figure 10.3: Seedlings at Mr. Sherpa's nursery

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[2]Lecturer, Dept. of Food Science and Technology

til 2019, all the seedlings of timber species were bought by DOFPS, and about 60% of the fodder and aromatic plant species were bought by farmers. In 2010, he started with beekeeping and in 2017 added vegetable, orchard and fruit farming that gave him enough reasons to label his farm as an integrated farm.

Table 10.2: Rate of seedlings at the integrated farm

Name of species (seedling)	**Rate (per seedling in Nu.)**
Japanese Avocado	180
Japanese chestnut	400
Eugenia sp.	5
Kiwi	200
Cinnamomum sp.	150
Coffea sp.	60
Pomegranate	50
Schleichera sp.	100
Bambusa sp.	35
Mallagiri	15
Champ	15
Angarey	15
Ficus clavata	15
Ficus nemoralis	15
Thysanolaena sp.	5

Challenges and future plans

The demand for seedlings are increasing, indicating a good market. However, there are other established farms in the region, so the quality of seedlings has to be superior compared to others to survive the competition. Seedlings also need constant care and lots of input, which increase the cost of production. Mr. Sherpa is optimistic that his farm can be further expanded, however, he feels there is a need for assessing the market.

Chapter 11: Challenges and Opportunities

Ugyen Yangchen[1]

This Chapter describes opportunities and challenges faced by farmers and agri-entrepreneurs while farming or operating agro-businesses in Bhutan. Depending on the type, nature, geographical location, available resources, qualification, experience, and planning of farming as an enterprise, challenges vary despite similar nature of agro-enterprises. Paradoxically, many of these factors also have been the main drivers of opportunities for the agro-entrepreneurs.

Typical barriers faced by entrepreneurs in nursery, field crops, and vegetable production are labour and water shortage, high labour wage, damage of crops by rodents and other wild animals, and poor post-harvest storage facilities amongst others. These obstacles adversely affect yield and income. Though road construction had been the priority in the 10th and 11th Five Year Plan (FYP) in Bhutan, poor road connectivity and lack of farm road maintenance are issues faced by progressive farmers in Chhukha, Gasa, Samtse, Samdrup Jongkhar, and Trashi Yangtse Dzongkhags. Farms located along the Indian border face difficulties to sell farm products due to cheaper imports. The farmers of Khenrig Namsum Cooperative in Zhemgang are interested to produce fruits and vegetables. However, lack of innovation and technology and limited technical competency, the group members are deprived from benefitting from such farming activities. The Bhutan Alpine Seed (BAS) also experiences limited skill and technical competencies. Lack of technical knowledge and specialization of employees in commercial farming and seed production, poor quality equipment for germination testing, and seed packaging in the BAS Company have contributed to escalation of seeds and seedlings price. The policy of subsidisation of crop seeds and temperate fruit tree saplings by the government also has affected the business of private seed producers.

Similar to crop farming, beekeepers face difficulties warding off birds, insects, ants, hornets, and worms, which attack beehives. Further, the beekeepers have to deal with limited nectar/flowers during winter, unexpected disappearance of bees from hives, and difficulty in splitting hives to increase the population. To overcome these challenges, periodic upskilling on knowledge and skills on bee management is a priority for beekeepers in Dagana. Moreover, unreliable marketing channel is also a challenge for new beekeepers.

There are cooperatives as well as individual farmers rearing poultry birds.

[1]Lecturer, Dept. of Sustainable Development

Based on the location of farms, challenges faced by these farmers are different. Farms located in the south such as in Sarpang encounter poor feed quality supplied from India, smuggling of eggs from border towns, and competition from state-owned farms amongst others. On the contrary, other farms find difficulty in transportation of eggs, pullets and feeds, expensive rental charges for leased land, difficulty in disposing spent birds due to less demand and religious sentiments attached in slaughtering and consumption of meat, lack of financial support, water scarcity, and wild animal attacks. The most common challenges the farmers grapple with are rising feed prices and feed shortage for both broiler and layer bird farms. Lack of technical skills in processing frozen meat and competition from imported frozen meat are the difficulties faced by broiler farms.

Similar to crop farming and other agro-businesses, dairy farming also experiences labour shortage and lack of cold storage to preserve milk during warm summer months. Recurrent issues in dairy farming in Bhutan are rising cost of commercial feed, poor knowledge and technique on fodder conservation, and fodder shortage in winter that eventually reduce milk production. A few dairy farming communities such as in Chaskar, Monggar Dzongkhag and Samdrup Jongkhar continue to raise local breeds over improved. Other challenges are topography that hinders free grazing, labour intensive job, difficult and high cost of transporting inputs, collection and distribution of milk to markets, and threats of wild animals to livestock. The Department of Livestock had extensively initiated and supported establishment of many Milk Processing Units and dairy groups in different Dzongkhags. There are a few community-led initiatives like the fermented soybean cheese processing unit, organic cassava flour (Pema Gatshel), and Dalley chili pickling unit (Wangdue Phodrang). The challenges in these food processing units vary from inadequate skills and knowledge of workers, poor technologies, lack of mechanisation, illiterate members, no or poor book keeping practise, irregular supply and expensive packaging materials, and limited financial support for diversification of products.

Opportunities

There are ample opportunities for farmers and entrepreneurs engaged in farming and agro-enterprises. They can have advantage to develop a wide spectrum of agro-industries in Bhutan and sustain their livelihood.

Seed is one of the critical inputs in farming. At farmers' level, focusing on seed production can be a lucrative business by growing high quality vegetable seeds and fruit seedlings, and supplying these to the National Seed Centre and other farmers. Commercial seed growers such as Bhutan Alpine Seed (BAS) is perceived to have huge potential in producing seeds and seedlings for domestic as well as international markets.

Double cropping and group formation for commercial production of crops such as paddy, Rajma Daal, maize, quinoa, barley, and kiwi can enhance the volume of production, reduce imports, and add to the cash income of households. Organic vegetables and herbs have a good demand in domestic market including the high-end tourist hotels. Organic tea from Samcholing, Trongsa, has potential to compete in the international market, including in the Asia Pacific tea market. The farmers have scope in crop diversification and value addition through pickle production and fermented cheese from soybean.

There is increasing demand in the Bhutanese market for organic fertilizers owing to the health benefits, environmental concerns, and food safety issues. In addition to the benefits of commercialisation, integrated enterprises have opportunities to produce varieties of fruits, vegetables, livestock products as well as organic fertilizer. This will benefit the farms to plough back the plant and animal-based nutrients and minimise dependency on external inputs. Mixed and multiple cropping also keep pests and diseases in check besides providing financial benefits.

Creating conducive environment for bee farming can induce more production and diversify honey products. Indeed, suitable environment for beekeeping will also improve agro-forestry in the community and develop resilient community against impact of the changing climate.

Enabling policy environment, infrastructure, technical and financial support from the government has boosted poultry, dairy, and processing business in Bhutan. Rising demand for livestock products has huge potential for income generation. Increasing milk production and diversification of dairy products can contribute to gradual reduction in import of meat, eggs, milk, and dairy products in the country.

Overall, in farming and agro-based industries, progressive farmers and entrepreneurs see employment opportunities. Majority of our unemployed youths can be absorbed in farming business. Therefore, farming and agro-industries can create a vibrant rural life in the future.

Chapter 12: Conclusion

To achieve food self-sufficiency, the Food and Nutrition Security policy was adopted to boost food production. Food and nutrition security continues to be maintained as the 8th National Key Result Areas (NKRAs) in the 12th Five Year Plan. The policy drive to ensure food and nutrition security and investment in agriculture sector over the years have created suitable environment for farmers to continue crop and livestock farming.

Agriculture sector engages 49.9% of the population and contributes around 15.82% to the Gross Domestic Product (GDP). The trend of educated population migrating out of rural communities and opting for city life is a critical challenge leading to aging population and labour shortage left in farming. On the other hand, unemployment of youth is a concern. The rate of unemployment has increased to 5% in 2020 from 2.7% in 2019 (NSB, 2020). This mismatch shows that youth are not interested in farming and prefer non-farm related jobs.

Various case studies of successful farmers and agri-businesses documented in this book highlights that farming sector can offer several opportunities, including employment. However, drudgery and physical intensive nature of work amongst other factors make farming unattractive for youth to venture into, particularly in the rural areas. In order to boost the economy and create sustainable livelihood, the government along with relevant agencies of MoAF, academia, and other stakeholders need to collaborate in making farming an attractive profession. Changing the system of education and continuing the support for agriculture such as investment in basic infrastructure and facilities, skills development in farming and farm management, and restructuring markets are essential. Periodic capacity development and monitoring are crucial in improving as well as developing agriculture sector in the long run. Inclusion of smart technology with Internet of Things (IoT), digital agriculture, and smart farm management could make farming more attractive besides reducing the drudgery.

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