Department of Agricultural Marketing and Cooperatives

Ministry of Agriculture and Forests
Thimphu: Bhutan

BUCKWHEAT VALUE CHAIN ANALYSIS 2019

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DAMC

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Acronyms, Glossary and Abbreviations

Acronyms

AMC	Agriculture Machinery Centre
ARDCs	Agriculture Research and Development Centres
BAFRA	Bhutan Food Agriculture and Regulatory Authority
BAIL	Bhutan Agro Industries Limited
BCA	Bhutan Consulting Associates
BCCI	Bhutan Chamber of Commerce and Industry
BDBL	Bhutan Development Bank Limited
CA	Competent Authority
CSMI	Cottage, Small and Medium Industry
DAMC	Department of Agriculture Marketing and Cooperatives
DANIDA	Danish International Development Agency
DoA	Department of Agriculture
DoL	Department of Livestock
DoRC	Department of Revenue and Customs
FCBL	Food Corporation of Bhutan Limited
FTA	Free Trade Agreement
GMOs	Genetically Modified Organisms
ITC	International Trade Centre
LMOs	Living Modified Organisms
MoAF	Ministry of Agriculture and Forests
MoF	Ministry of Finance
NPHC	National Post Harvest Centre
NPPC	National Plant Protection Centre
NSC	National Seed Centre
RAMCO	Regional Agricultural Marketing and Cooperatives
RDTC	Rural Development Training Centre
REDCL	Rural Enterprise Development Corporation Limited
RGoB	Royal Government of Bhutan
RNR	Renewable Natural Resources
ToR	Terms of Reference

Glossary

Ara / Bangchang: Local beverages

Chiwog	A cluster of Villages
Choydam	Hard dough
Drango	Flour paste)
Dzongkhag	District
Gewog	A block in a district (consisting of several villages)
Hentey	Dumplings
Keptang	Unleavened circular bread
Khuli	Cooked soft Roti type
Kontong	Cooked small balls

La zey	Flour baked with distilled alcohol
Puda	Noodles
Teyzey	Pancake
Tshangjay	Flour paste with fermented wine

Abbreviations

HHs	Households
Kgs.	Kilograms
MT	Metric Ton
Nu.	Ngultrum (Bhutanese currency)

Executive Summary

Introduction

Bhutan, a small Himalayan country with a total area of 38,394 KM^2 is located between the subtropical Indian plain in south and Tibetan plateau in the north. It has a total population of 681,720 persons (341,881 males: 339,839 females)[1]. Sweet buckwheat *(Fagopyrum esculentum)* and bitter buckwheat *(F. tataricum)* are sub-subsistence crop particularly grown in non-rice growing area and other highland areas where people have limited access to growing other cereals due to diverse agro-climate of the country. In Bhutan, buckwheat is grown mainly for grains, used for making flour. The Department of Agriculture Marketing and Cooperatives with fund from Food Security and Agriculture Productivity Project (funded by World Bank) outsourced buckwheat value chain study to Bhutan Consulting Associates in August 2019 focussed on production and marketing so as to improve and explore opportunities across value chain actors. The main objective of this assignment is *to conduct thorough analysis of the buckwheat value chain to further strengthen the production and marketing of buckwheat and its value added products through identification of constraints and new opportunities*.

To undertake buckwheat value chain study in accordance to the objectives, five different stepwise phases of study was undertaken as follows: 1) Desk work and design of survey (including tools); 2) Planning phase; 3) Field research (survey and consultations) in September 2019; 4) Data analysis & report writing; 5) Submission and finalisation of report.

As list of households growing buckwheat was not available, a purposive sampling was used targeting three Gewogs each from four selected Dzongkhags (as per ToR), wherein 383 producers (68.9% females: 31.1% male respondents) were interviewed as against initial target of 360 numbers. In addition, focus group discussions were undertaken, 29 retailers were interviewed, 3 processors and one exporter were also interviewed.

Value Chain Functions and Actors

The ***functions*** across buckwheat value chain in Bhutan are input supply, production, harvesting, processing, retailing and exporting. The actors are input supplier (farmers themselves), the producers (farmers), the processors (including the producers themselves), the retailers, exporter and the end consumers. As the ***input supplier***, farmers themselves retain seeds and the crop is cultivated in traditional method i.e. farmers using their own locally available seeds, using farmyard manure and human labour. Bitter buckwheat is sowed in the month of April-May and harvested in the month of July - August. Sweet buckwheat is sowed in June-July and harvested in the month of October-November. Land preparation for both sweet and bitter buckwheat is either done manually using oxen or by power tiller / tractor depending upon the landscape. Looking at the ***varieties of buckwheat cultivated*** by the producers, 44.9% HHs cultivates both bitter and sweet buckwheat; another 22.2% cultivated only bitter buckwheat and 32.9% cultivated sweet buckwheat.

Considering the ***potential producers*** in country, the agriculture statistics (2017) reflects that except for farmer-producers from Samtse Dzongkhag, all other 19 Dzongkhags have buckwheat producers. Amongst the 19 Dzongkhags that produces buckwheat, higher

[1] Population and Housing Census of Bhutan, National Statistics Bureau, Royal Government of Bhutan (2017)

quantities are produced by farmers from Bumthang, Trongsa, Chhukha, Haa, Samdrupjongkhar, Zhemgang and Dagana Dzongkhags. The total ***production*** in the country was 3480 MT with average yield of 598 Kg/acre in the year 2017.

Both ***male and female*** equally take part in the buckwheat farming. While ploughing is led by males, land preparation, sowing, harvesting and thrashing are done by both males and females. It is mostly males for grinding using water mills and for stone grinder, it is mostly females. Wherever available grinding mills are also used. As high as 44.9% HHs engaged ***two persons regularly*** during season in buckwheat farming; majority of the households (59.5%) engage one women regularly for buckwheat farming; and as high as 88.5% HHs does not have youths (15 to 24 years) in buckwheat farming.

The ***trends*** in harvested area of buckwheat for the last eight years showed a sharp increase in the year 2011 from 2010; then gradual decrease till the year 2014; again gradual increase till year 2016 and decrease in the year 2017. The production trend is also in the similar manner as that of harvested area[2].

There are no differences in ***harvesting techniques*** between sweet and bitter buckwheat. Bitter buckwheat takes only one day for drying before thrashing whereas sweet buckwheat require additional one day for drying owing to slightly larger size of the grains as compared to bitter buckwheat. Grains are dried for 1-2 days prior to thrashing. After thrashing, stones particles and other unnecessary particles like leaves and stems are segregated manually. After that the grains are stored in wooden box, drums and gunny bags. After harvesting and thrashing, bitter buckwheat plant is used for making cattle's beds which is later used as manure. On other hand, sweet buckwheat hay is fed to cattle after thrashing. Similarly, the hull from the grounded flour is also used as feed for the cattle. Pest and insects infestation are minimal. As mentioned, water mill and wherever available, the ***grinding*** mills and also the traditional stone grinder are used for making flour from both types of Buckwheat. Segregation of husk is done using traditional sieving bamboo tray. The husk is used to make pillows (reported only from Tang Gewog, Bumthang) but not for commercial purpose. These pillows are known to be popular for better sleep owing to some health benefits. Being malleable, it helps to allow better cervical alignment to support head and neck in correct position and to support spine for better relaxation. As the hulls are slightly cupped, triangular in shape and smooth, it create thousands of tiny air pockets between them, promoting airflow and allowing coolers night sleep[3].

Several ***products can be made and consumed***, from buckwheat, such as Choydam (hard dough), Puda (noodles), Kontong (cooked small balls), Teyzey (pancake), Khuli (cooked soft Roti type), Keptang (unleavened circular bread) and La zey (flour baked with distilled alcohol); Drango (flour paste); Tshangjay (flour paste with fermented wine); and Hentey (dumplings). Interviewed HHs indicated having made Khuli, Puda, Keptang, Drango, Tshangjay, Hentey and Ara / Bangchang (local beverages). The crop possesses a nutrition value that helps to maintain heart health (by lowering cholesterol level); reduces blood sugar; reduce weight (as is rich in fibre content); protects against cancer (as has antioxidants); and is source of vitamin, minerals and plant protein[4].

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[2] Agriculture Statistics, Department of Agriculture, MoAF

[3] Downloaded from https://www.thesleepjudge.com/benefits-and-side-effects-of-a-buckwheat-pillow-you-need-to-know/ on 5th November 2019 at 11.25 AM.

[4] Web information downloaded from https://www.naturespath.com/en-us/blog/health-benefits-of-buckwheat/ on 5th November 2019 at 12.31 PM

In entire survey Gewogs, there were ***no middlemen or wholesalers*** that collect buckwheat flour or any other products for further marketing to ***retailers***. There were no retail shops in Haa, Samdrupjongkhar and Trongsa town dealing with any of the buckwheat produce. As the survey area had very less numbers of retailers, some were interviewed from Thimphu as well. From a total of 29 retailers interviewed that deal in selling flour, 20.7% were males and 79.3% were females.

As ***processors***, in the survey area including Thimphu, there were only three processors. The Sonam Chithuen Rangshing Tshogpa at Chamkar, Bumthang (registered farmers group) makes cakes, donuts, cookies, and flour from bitter buckwheat; and only flour from sweet buckwheat. The markets for products for this processor is mainly Thimphu retail shops and buyers buying directly from the unit. Another processing unit is Sonam Dema Processing unit at Lhayulkha, Haa town that makes Khuli and liquor from bitter buckwheat; and Khuli and Hentey from sweet buckwheat. This processor markets produce in hotels and restaurants in Haa. The third processing unit is Chuniding Food in Thimphu town, which makes flour and noodles from bitter buckwheat and only flour from sweet buckwheat. Apart from above processors, most of the tourist based hotels reported serving Khuli (pancake), Puda (noodles) and soup to their guests. Langpa Nobgang Sanam Detshen (registered buckwheat farmers group) in Samar Gewog, Haa was established in the year of 2017-2018, comprising of 8 males and 12 females. The group member are losing their interest on buckwheat farming owing to lack of market in Haa and market linkage with retailers at Thimphu is not established yet.

In agriculture statistics, there are no data available for buckwheat sold. The list of ***exporters for buckwheat*** (grain) for last 8 years was obtained from Department of Revenue and Customs and there were only two exporters. One exporter (Thongphu Enterprise) exported in the year 2011 only. For remaining years till 2016, Bussi-Em Bhutan in collaboration with Tarayana Foundation marketed sweet buckwheat grain to Japan. A total of 13284 Kgs of buckwheat grain were exported in 6 years (2011 to 2016) generating a total amount of Nu. 657331. There were no exports recorded in Bhutan Trade Statistics for the year 2017 and 2018. However, the exporter (Bussi-Em Bhutan) reported exporting 5.8 tons in 2017; 10 tons in 2018 and 20 tons in 2019. Looking at the export trends, the volume of buckwheat exported increased gradually from 2011 to 2017 and sharply in recent years. The exporter collects grains directly from the producers from Trashigang and Samdrupjongkhar Dzongkhags. To Japan it is transported through shipping from India. In Japan, the buckwheat is used to make noodles and cookies, to be served in the restaurants.

Value Chain Costs Analysis for Sweet Buckwheat

From survey, the cultivated area for sweet buckwheat was 129.37 acres and the harvested area was 103.61 acres, wherein the difference of 25.76 acres is reported as damage by wildlife before harvest. The ***productivity*** stood at 490.49 kg per acre of harvest. The study has estimated the cost of production based on several factors from inputs to labour costs including the night guarding of buckwheat from wild animals. Analysing found that the most predominant cost is the labour cost (81.45%), followed by the cost of seed (10.57%). Other direct cost like using power tiller and usage of chemical fertilizer constitutes 6.64% and 1.32% respectively. The ***cost of production*** at the producer's level per Kg of sweet buckwheat grain is Nu. 38.59. The average cost of seed amounts to Nu. 50.50/kg. The total cost of sweet buckwheat grain produced (490.49 Kgs) per acre amounts to approximately Nu. 18,926. Amongst various tasks, 40% of the labour engagement for production is for

guarding the buckwheat from wild animals, followed by harvesting (21%); land preparation (18%) and thrashing (13%) amongst the significant percentages. In monitory terms, Nu. 15,416 is spent as labour costs for one acre area of cultivation.

The overhead for ***processing*** for the producers, sales and distribution is Nu. 1144 per acre of harvested area, which is Nu. 2.23 per Kg of grain. Regarding ***purposes buckwheat is used***, 23% of the produce was sold as seed and whole grains, 49% was used to convert into flour, 19% was used to preserve seed for next season, another 6% was used to make beverages and 3% was used as animal feed. The seed and whole grains are sold at an average price of 54.45 per kg to the buyers. The processed flour is sold at Nu.100 per kg. Out of the total flour produced, 95% was used for self-consumption and only 5% was marketed by producers. Estimated from the surveyed households, in a year, a sweet buckwheat cultivating household has an ***economic benefit*** of Nu. 9,058.81 per household (72.75% of benefits from self-consumed by the households and 27.25% from sales). In terms of value addition on sales of grains and seeds at producer's level, it gave profit percentage of 27.13 per Kg. The total economic benefit per acre of cultivated area amounts to Nu. 24,570.

At ***retailer's level***, the sweet buckwheat flour was bought at an average price of Nu.97.58 per kg. After incurring other overhead cost and damage, the cost per kg amounts to Nu.109.96. The main cost for retailers is the labour cost, both hired and self-employment. Out of total buckwheat flour purchased and sold, 71% constitutes sweet variety and 29% of bitter variety. The retailer sold sweet buckwheat flour at Nu. 129 per Kg fetching the net profit percentage of 14.76%.

At ***processor level***, the processor purchased grains at an average price of Nu.52 per kg last year. The processor incurred additional cost on labour, transportation and overheads which amounts to Nu. 57.96 per kg. The processor selling different products such as Khuli, flour and Hentey, makes net profit of 18.28%.

At ***exporters level*** there was only one exporter. The exporter purchased grain at the rate of Nu. 55 per kg last year and exported at the rate of Nu. 140 per Kg (in January 2019), making profit percentage of 36% after deducting all exporting costs.

Value Chain Costs Analysis for Bitter Buckwheat

In case of bitter buckwheat (from surveyed households), 59,608 kilograms was produced within a harvested area of 118.31 acres, and from cultivated area of 140.33 acres giving ***productivity*** of 503.83 Kg/acre. Out of total cultivated area, 22.02 acres was reported as damaged before harvest by wild animals.

The ***cost of production*** per 1 Kg of bitter buckwheat grain is Nu. 37.76. The cost of production is dominated by labour costs (81.31%), followed by seed costs (10.73%) and smaller percentages for others. The production cost per acre is Nu. 18959.75. As ***labour costs*** is most significant, it is same like that of sweet buckwheat, with significant costs for night guarding the crop, land preparation, harvesting and thrashing. A total of Nu. 15,416 is spent on labour costs per acre of cultivated area. The processing cost is Nu. 2.16 per Kg of grain. ***Households used bitter buckwheat*** for making flour (49% of total produce); followed by direct sales of seeds and grains (18%); stock preserved for next season (15%); making beverages for self-consumption (12%); feeding animals (5%) and used for religious purposes (1%). The seed and whole grains are sold at an average price of Nu. 54.54 per kg to the buyer. The processed flour is sold at Nu.100 per kg. From total flour produced, 96% was consumed by the households and only 4% was marketed. Analysis showed that each

household have an ***economic benefits*** of Nu. 13,012.63 per annum from bitter buckwheat (80.64% benefits is from usage by the households for self-consumption and 19.36% account for benefits from sales). For bitter buckwheat, the cost of production is Nu. 37.67 / Kg and grains were sold at an average price of Nu. 54.54 / Kg to retailers and processors, giving profit percentage of 30.93. The total economic benefit per acre of cultivated area amounts to Nu.28,377

At retailer's level, the maximum cost is for purchase (87.71% of total costs), and another significant cost is for labour as self-employment or hired (6.98%). With value addition, the retailer incurs Nu. 119.72 per Kg and sold at an average price of Nu. 130.79 per Kg making a profit percentage of 8.46. At ***processor's level***, net profit generated from sales of all varieties of products gives the processor a value addition of 29%. There is only one exporter of sweet buckwheat and bitter buckwheat is not exported.

Common Issues

As Programme coordination within Department of Agriculture, there is the ***National Organic Flagship Program*** (2018 – 2023) that will be implemented in 20 Dzongkhags for selected commodities. With regards to buckwheat, the program will identify clusters for organic buckwheat production and support producers with supply of organic seeds. The ***National Organic Programme*** (NOP) under Research and Development Centre, Yusipang is the focal agency for coordinating and implementing activities of organic agriculture in Bhutan. To support National Organic Flagship Program, the ***National Soil Service Centre*** is in the process to procure and supply organic fertilizer to the Dzongkhags and Centres, which is another supporting agency for organic buckwheat production.

As ***learning and spell over***, the best practices and better techniques are shared informally within the industry. As knowledge and technique sharing happened informally, there were no additional associated cost.

As ***locational disadvantage***, since buckwheat are grown in different Dzongkhags, transportation form a part of important component cost for the processors as the available few processors are located in Bumthang and Thimphu. Buckwheat is produced and sold at ***informal market*** and there is no organised system of sales and purchases like auctions. Farmers grow in small quantity and sell directly to buyers and processors, who then process and sell in the market. Since buckwheat are produced primarily for self-consumption, the volume is not very attractive for large scale linkages across the actors.

The ***demand supply analysis*** showed that only 31% of the total demand was met by the producers from the surveyed population wherein, 69% of the demand was met from other areas. If the farmers increase the scale production, there will be markets for sales of their produce as the demand from retailers and exporter is increasing over the years.

The analysis on ***trends in buckwheat cultivation*** over the last five years reflected that for 48.6% HHs, the area under cultivation is decreasing over the years; 25.6% said it is constant; and 24.8% HHs mentioned it to be increasing. Looking at the ***reasons for decreasing area under cultivation***, it was mentioned to be wild animals destroying crops by 39.4% HHs; manpower shortage for 26.9% HHs; changing food habit as staple food by 17% HHs; changing cropping pattern by 15.1% HHs and other reasons with smaller percentages of households.

Challenges

While significant percentage of total produce is sold as seeds and grains (23% of sweet buckwheat and 18% of bitter buckwheat), the ***flour produced and sold*** by the households are extremely small in quantity. ***The cost of production*** is high owing to high labour intake mainly for guarding the crop from wild animals, the cost for seed, labour engagement for land preparation and for harvesting. As ***post-harvest processing*** and marketing, maximum cost has incurred for grinding grain to convert to flour using traditional grinders which is labour intensive. While the demand from retailers and exporter is increasing over the years, the area under ***harvest, production and yield is decreasing*** over the years (as per national agriculture statistics). Except for one processing group and ***few retailers*** as vegetable vendors that sell buckwheat flour at Bumthang, the retail business is limited, though good numbers of retailers are available in Thimphu. Likewise, except for processor at Bumthang, that makes good quantity of flour as compared to other products, the ***processors are limited in numbers***, to have backward linkage to boost scale of production at producer's level.

Opportunities

The study shows that despite high cost of production, ***opportunity exists to increase value addition at producer's level*** for both varieties with measures to be supported and adopted to have slightly large scale farming with minimised labour intake for guarding, harvesting and grinding. Despite small scale of buckwheat flour and other products being marketed, the value addition at retailer's level (27.13% for sweet buckwheat and 30.93% for bitter buckwheat); at processor's level (18.28% for sweet buckwheat and 29% for bitter buckwheat); and at exporter level (36% for sweet buckwheat) shows that there is ***opportunity to enhance the value addition across all actors*** including the producers with increased scale of production. Opportunities exists to ***organise few more numbers of processing groups*** across the country that can cater to the increasing demand of flour and grains from retailers and exporter. As the scale of production increases, opportunities also exists for the processors for ***product diversification*** through exposure and capacity building for making other products such as packed pancakes, noodles, pasta, mixed packed food with Quinoa, organic buckwheat cream, vegan buckwheat and husk pillow amongst others. As ***National Flagship Program*** will identify pockets for organic buckwheat cultivation and will also support the producers with supply of seeds, opportunity exists for the producers to ***avail support from the program*** to produce organic buckwheat, which with Brand Bhutan will fetch higher margins to the producers.

Recommendations

Short-term Interventions

- As the study revealed that the economic benefits and value addition can be increased at all levels of actors across the chain with increased scale of production, there is a need to make producers aware on the possibilities to increase value addition and economic benefits with increased scale of production. To this effect, supports are required to minimise the cost of production at producer's level, mainly to minimise labour engagement for night guarding and harvesting by means of supporting electric fencing and small machineries for harvesting. At the same, as the productivity has been decreasing over the years, it is suggested that good quality seeds and organic fertilizers are supported; and knowledge on good practices for the cultivation are imparted to the producers.

- It is suggested to organise farmers into the buckwheat processing groups with measures to support with processing facilities and technologies (small processing units, packaging materials, technology on processing with machineries mainly for grinding to make flour and gunny bags for storage) and proper packaging of flour into packets of several sizes. With establishment of processing groups, it will slowly have backward linkage to the producers, encouraging increased scale of production and creating proper linkages with producers and retailers domestically.
- With support provided to increase the scale of production and establish few more numbers of processor groups, and as demand from retailers and exporter is increasing, suggestion is to bring together the processors, retailers and exporters so that formal market linkages are created. As only one exporter exports buckwheat to Japan, exploration of other export markets and identification of more exporters will add value to buckwheat value chain.

Long-term Interventions

- Generally, groups of producers and processors lack basic knowledge on costing, concept of selling products in the markets, entrepreneurial skill and business knowledge. As long-term strategy, there is need to educate producer groups and processors on business skills, use of ICT for market linkages and entrepreneurship development so that they are able to understand market dynamics and business perspectives.
- Another long-term strategy is to explore market demand for other products in domestic and export markets and provide support to processing groups for products diversification as per the market demand.
- Research and development is suggested as long-term strategy to increase productivity with good varieties of seeds and to increase commercial production. Further research is also suggested to identify health benefits of buckwheat to expand domestic markets and penetrate into export markets.

1. Introduction

1.1 Background

Bhutan, a small Himalayan country with a total area of 38,394 KM^2 is located between the subtropical Indian plain in south and Tibetan plateau in the north. More than 60% of the total population lives in rural areas where farmers undertake subsistence agriculture along with livestock rearing and harvesting non-wood forest products. It has a total population of 681,720 persons (341,881 males: 339,839 females)[5]. The physical feature is characterised by rugged mountains with 71% of the land area under forest cover; 2.76% as cultivated agricultural land; 9.74% as shrubs; 5.35 as snow and glaciers; and other smaller percentages of land area as meadows, water bodies, rocky outcrops, alpine scrubs amongst others[6].

Buckwheat is a sub-subsistence crop which is indispensable food for the Bhutanese people particularly in non-rice growing area and other highland areas where people have limited access to growing other cereals due to diverse agro-climate of the country. Sweet buckwheat *(Fagopyrum esculentum)* and bitter buckwheat *(F. tataricum)* are two buckwheat species grown in Bhutan. Within a few decades, buckwheat in the form of pancakes and noodles has acquired the status of restaurant food. In Bhutan, buckwheat is mainly grown for grains. The grains are used in the form of processed products, mainly flour. Buckwheat is a versatile food grain and can be used in several culinary preparations. The most popular buckwheat dishes are *khuli* (a pancake-like preparation, and *puda* (noodle-like preparation).

For diversification of the future agriculture and marketing, buckwheat deserves special value chain analysis for improvement and exploration of opportunities within the chain of actors in the system. To conduct the value chain analysis study, the Department of Agricultural Marketing and Cooperatives (DAMC) have appraised Ministry (MoAF) for fund support basically to outsource the study. To this effect, the Food Security and Agriculture Productivity Project (FSAPP) funded by World Bank, supported this short-term consultancy service, which was outsourced to Bhutan Consulting Associates (BCA) in August 2019 to undertake this study.

The value chain study on buckwheat was focused towards the production and market, with intend to provide recommendations that will address the existing constraints and identify new opportunities to boost the industry to cater the demand and supply, both domestic and exports.

The main objective of this assignment is *to conduct thorough analysis of the buckwheat value chain to further strengthen the production and marketing of buckwheat and its value added products through identification of constraints and new opportunities.*

The specific objectives are as follows:

- Value chain mapping that depicts the chain actors and their functions and inter relationships,
- Identify the challenges and constraints of the existing value chains and provide recommendations and interventions to mitigate them.

[5] Population and Housing Census of Bhutan, National Statistics Bureau, Royal Government of Bhutan (2017)
[6] Statistical Year Book of Bhutan (2019), National Statistics Bureau, Royal Government of Bhutan

1.2 Methodology

To undertake buckwheat value chain study in accordance to the objectives, five different stepwise phases of study was undertaken as follows:

1. Desk work and design of survey (including tools)
2. Planning phase
3. Field research (survey and consultations)
4. Data analysis and report writing
5. Submission and finalisation of report

Accordingly, the technical approach applied were a series of stepwise tasks as elaborated below:

1. **Step 1: Desk review and design of survey:** The review of the available secondary data to identifying the data needs for making a comprehensive value chain study (required to be collected during field survey) was undertaken. The sample and survey tools were designed.
2. **Step 2: Planning phase:** During planning phase, suggestions and comments received from the Department officials were incorporated into the sample framework, the tools (questionnaires) for survey, and the field work itineraries. BCA recruited and trained field work team leaders and the enumerators.
3. **Step 3: Field research (survey)** to collect both qualitative as well quantitative data was undertaken in the month of September 2019 to collect data from all actors: producers, processors, wholesalers, retailers and exporters.
4. **Step 4: Data analysis** was revisiting the transcribed qualitative information to look for significant and concurrent information. The quantitative data gathered through field survey were computed, assimilated, processed and analysed. The analysis triangulated from various sources including the secondary sources were combined to generate **a comprehensive value chain report**.
5. **Step 5: Submission and finalisation:** The **report** was submitted and presentation on the same was made to the stakeholders, to collect further comments to the reports. With incorporation of necessary changes to the reports, this comprehensive report was finalised.

1.3 Sample Framework

Given that the list of households cultivating buckwheat is not available, a purposive sample was applied to make fair representation. Therefore, three Gewogs each from the four indicated Dzongkhags for survey (as in ToR) where buckwheat is predominantly cultivated were selected and a purposive sample of 30 producers from each Gewog were targeted. In addition, the survey team interviewed retailers, processors, and exporters including the hoteliers. There were no wholesalers that collect products from producers and undertake onward marketing. Apart from individual interview of the actors, the focus group discussions were also undertaken with the producers.

In terms of survey coverage, the surveyed households from four Dzongkhags harvested 221.92 acres, with total production of 110.4 MT of buckwheat. This is 3.8% coverage in terms of harvested area as compared to total harvested area from all 19 Dzongkhags (5817 acres in year 2017, as data for 2018 is not available yet) and 3.2% coverage in terms of production (3480 MT from all 19 Dzongkhags). Comparing the production and harvested area from the surveyed households to the total from 4 Dzongkhags, it is 9.9% of harvested area and 5.8% of production volume (table 1).

Table 1: Percentage of Survey coverage in terms of harvested area and production

	Harvested Area (Acres)	Production (MT)
All 19 Dzongkhags (data from 2017)	5817	3480
Four Dzongkhags	2558	1916
Surveyed Households	252.13	110.4
% (HHs compared to total from 19 Dzongkhags)	3.8	3.2
% (HHs compared to total from 4 Dzongkhags)	9.9	5.8

2. Description of Buckwheat

The buckwheat plant is a fast growing, spindly, broad leaf plant with small heart-shaped leaves and hollow stems. The plant produces many small white or pink flowers which, when pollinated, quickly produces seeds. The seeds are triangular in shape and change from light green in colour, to red-brown. The seed consists of a true seed which is surrounded by a thick hull. Buckwheat plants can grow between 40 and 120 cm (15.7-47.2 inches) in height and survive for just one growing season. In Bhutan, buckwheat is mainly grown for grains (S. Norbu and W. Roder).

In addition to making of Khuli and Puda as already mentioned, buckwheat is also used for making A*ra* (distilled alcohol). A special *ara* called *menchang* or medicinal alcohol distilled from a mixture of sweet and bitter buckwheat is made (Choden, 2001). The Bhutanese people in the south take buckwheat during fasting days in the form of flour and husked kernels. Husked kernels are cooked as rice (Norbu, 1995). The uses of buckwheat varies from region to region. In one region (Tang Gewog in Bumthang Dzongkhag), cooked sweet buckwheat dough is traditionally served on the twenty first day of death anniversary to all the people who come to mourn and sympathize with the bereaved family. A roll of buckwheat dough sprinkled over with a spoon of chilli powder is followed by a drink called *roth chang* which literally means chasing away demon (Choden, 2001). In another region (Chumey Gewog in Bumthang), a very special fried buckwheat biscuit called *phob* is commonly prepared and offered at the altar during rituals. According to Norbu, 1995, while the uses of grain are indispensable, other parts of the plant have their share of contribution in the Bhutanese dietary pattern. In fact, no part of the buckwheat plant can be left out. Tender leaves are used as leafy vegetables (Gurung and Roder, 1988). Just before flowering when the buckwheat plants are still tender, the leaves can be collected and cooked in a broth of buckwheat flour and bone marrow seasoned with chilli, garlic and salt, and eaten as a thick soup. Straw is fed to cattle as fresh as well as dried, but mainly used as bedding materials. In the past, Bhutanese people used bitter buckwheat for the treatment of

livestock cattle suffering from foot and mouth disease (Norbu, 1995). The various types of products made from buckwheat are explained in subsequent section.

The crop possesses a nutrition value that helps to maintain heart health (by lowering cholesterol level); reduces blood sugar; reduce weight (as is rich in fibre content); protects against cancer (as has antioxidants); and is source of vitamin, minerals and plant protein[7].

[7] Web information downloaded from https://www.naturespath.com/en-us/blog/health-benefits-of-buckwheat/ on 5th November 2019 at 12.31 PM

3. Demography

While 360 numbers of producers from twelve Gewogs were targeted for the field survey, in actual 383 numbers of producers were interviewed (respondents count and percentage by Gewogs and Dzongkhags provided as table 1 under annexure). A focus group discussion (one each in each Gewog) were also undertaken to collect qualitative data. In addition, 29 numbers of retailers, three processors and one exporter were also interviewed. There were no wholesalers in the surveyed Gewogs and in Dzongkhags towns.

Out of 383 producers, 68.9% (264 numbers) were female respondents and 31.1% (119 numbers) were male respondents. For these 383 households, 55.1% (211 numbers) were female headed households and 44.9% (172) were males headed households (table 2). Out of 383 producers, 14.1% (54 households) were single mother headed households (table 3).

Table 2: Gender of the respondent and gender of the household head

Gender	Gender of the Respondents		Gender of HH Head	
	Frequency	Percent	Frequency	Percent
Male	119	31.1	172	44.9
Female	264	68.9	211	55.1
Total	383	100	383	100

Table 3: Count and percentage of single mother headed households by dzongkhags

	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
Yes	Count	15	11	18	10	54
	% of Total	3.9%	2.9%	4.7%	2.6%	14.1%
No	Count	90	79	72	88	329
	% of Total	23.5%	20.6%	18.8%	23.0%	85.9%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

4. Value Chain Functions and Actors

The functions across buckwheat value chain in Bhutan are input supply, production, harvesting, processing, retailing and exporting. The actors are input supplier (farmers themselves), the producers (farmers), the processors (including the producers themselves), the retailers, exporter and the end consumers.

4.1 Input Supply and Land Preparation

As the input supplier, farmers themselves retain seeds. Those that do not retain seeds, buy from their peer farmers or neighbours. Buckwheat is cultivated in traditional method i.e. farmers using their own locally available seeds, using farmyard manure and human labour. Land preparation for both sweet and bitter buckwheat is done either manually using oxen or by power tiller / tractor depending upon the landscape. The weeds are collected and burned which act as natural manure for the fields. Bitter buckwheat is sowed in the month of April-May and harvested in the month of July - August. Similarly, sweet buckwheat is sowed in June-July and harvested in the month of October-November. Some households not having oxen, hire it from neighbours at the rate of Nu. 1300 to 1500 per day. In some areas, manure is also used. Sweet buckwheat ripens before bitter buckwheat by almost 1-2 weeks. In Nimshong Chiwog, Korphu Gewog, double cropping is practiced (once in summer and then in winter) for both sweet and bitter buckwheat. Here, in summer, sweet and bitter buckwheat is sowed in February and harvested in May. In winter, it is sowed in August and harvested in December. In Samdrupjongkhar Dzongkhag majority of the households cultivate sweet buckwheat, which is sowed in September and harvested in December.

Analysis from individual interview with the producers showed that as high as 65.8% HHs used oxen for ploughing, followed by 43.9% using spades as well; 28.5% using power tiller and another 5.5% using tractor (table 4 on next page).

Looking at the varieties of buckwheat cultivated by the producers, 44.9% HHs cultivates both bitter and sweet buckwheat; another 22.2% cultivated only bitter buckwheat and 32.9% cultivated sweet buckwheat (table 5 on next page).

Table 4: Types of technique used for ploughing by households for buckwheat farming

Technique	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
Oxen ploughing	Count	89	18	84	61	252
	% of Total	23.2%	4.7%	21.9%	15.9%	65.8%
Power Tiller	Count	34	70	4	1	109
	% of Total	8.9%	18.3%	1.0%	0.3%	28.5%
Spades	Count	87	17	10	54	168
	% of Total	22.7%	4.4%	2.6%	14.1%	43.9%
Tractor	Count	0	21	0	0	21
	% of Total	0.0%	5.5%	0.0%	0.0%	5.5%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

Table 5: Types of buckwheat cultivated by the households

Buckwheat Type	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
Sweet Buckwheat	Count	15	8	6	97	126
	% of Total	3.9%	2.1%	1.6%	25.3%	32.9%
Bitter Buckwheat	Count	16	7	62	0	85
	% of Total	4.2%	1.8%	16.2%	0.0%	22.2%
Both Varieties	Count	74	75	22	1	172
	% of Total	19.3%	19.6%	5.7%	0.3%	44.9%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

4.2 Producers and Production

Considering the potential producers in country, the agriculture statistics (2017) reflects that except for farmer-producers from Samtse dzongkhag, all other 19 dzongkhags have buckwheat producers. Amongst the 19 dzongkhags that produces buckwheat, higher quantities are produced by farmers from Bumthang, Trongsa, Chhukha, Haa, Samdrupjongkhag, Zhemgang and Dagana dzongkhags. The total production was 3480 MT with average yield of 598 Kg/acre in the year 2017 (table 6).

Table 6: Buckwheat harvested area, production and yield for the year 2017

Sl. No	Dzongkhag	Harvested Area (Acres)	Production (MT)	Yield (Kg/acre)
1	Bumthang	1,160	843	726
2	Chhukha	529	251	475
3	Dagana	310	250	807
4	Haa	423	193	455
5	Lhuentse	10	5	506
6	Mongar	266	73	276
7	Paro	106	50	474
8	Pemagatshel	265	62	233
9	Punakha	99	73	739
10	Samdrupjongkhar	304	465	1527
11	Samtse	216	91	420
12	Sarpang	166	66	396
13	Thimphu	1	0.1	161
14	Trashigang	270	99	366
15	Trashiyangtse	150	79	527
16	Trongsa	671	415	618
17	Tsirang	114	33	291
18	Wangdue	349	207	594
19	Zhemgang	406	225	554
	Total	**5,817**	**3,480**	**598.23**

Source: Agriculture Statistics (2017), Department of Agriculture, MoAF

As high as 44.4% households (HHs) engage two persons regularly in agriculture, followed by three persons for 24.8% HHs; one person for 14.4% HHs; and four persons for 12.8% HHs (table 2 under annexure). As high as 44.9% engaged two persons regularly during season for buckwheat farming (table 7). About 25% also engages three persons during season; and also four persons as indicted by 12 % HHs.

Table 7: Persons regularly involved in buckwheat farming by the dzongkhags

Persons Involved	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
One person	Count	19	4	9	30	62
	% of Total	5.0%	1.0%	2.3%	7.8%	16.2%
Two persons	Count	63	34	35	40	172
	% of Total	16.4%	8.9%	9.1%	10.4%	44.9%
Three persons	Count	17	31	26	19	93
	% of Total	4.4%	8.1%	6.8%	5.0%	24.3%
Four persons	Count	5	16	16	9	46
	% of Total	1.3%	4.2%	4.2%	2.3%	12.0%
Five persons	Count	1	3	2	0	6
	% of Total	0.3%	0.8%	0.5%	0.0%	1.6%
> five persons	Count	0	2	2	0	4
	% of Total	0.0%	0.5%	0.5%	0.0%	1.0%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

Similarly, majority of the households (59.5%) engage one women regularly for buckwheat farming; followed by 32.4% HHs engaging two persons and very few HHs with higher numbers of women in buckwheat farming (table 3 under annexure). Looking at youths involved in buckwheat farming, as high as 88.5% HHs does not have youths (15 to 24 years) in buckwheat farming, and only 8.4% HHs engage one youth and 3.1% HHs engage two youths in buckwheat farming (table 4 under annexure).

The trends in harvested area of buckwheat for the last eight years shows a sharp increase in the year 2011 from 2010; then gradual decrease till the year 2014; again gradual increase till year 2016 and decrease in the year 2017 as shown in figure 1. The production trend is also in the similar manner as that of harvested area.

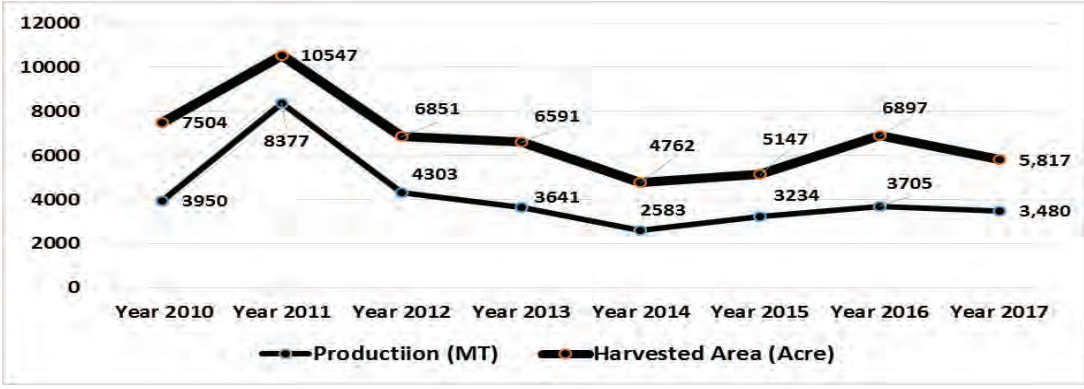

Figure 1: Trends in harvested area (acres) and production volume (metric tons) for buckwheat in Bhutan. *Source: Agriculture Statistics, Department of Agriculture, MoAF*

Similarly, the yield (kg/ acre) sharply increased in the year 2011 as against 2010 and gradually decreased till 2014. It then slightly increased in the year 2015, followed by slight decrease in the year 2016 and again slight increase in the year 2017 (which has average yield of 598 kg/acre) as shown in figure 2 on next page.

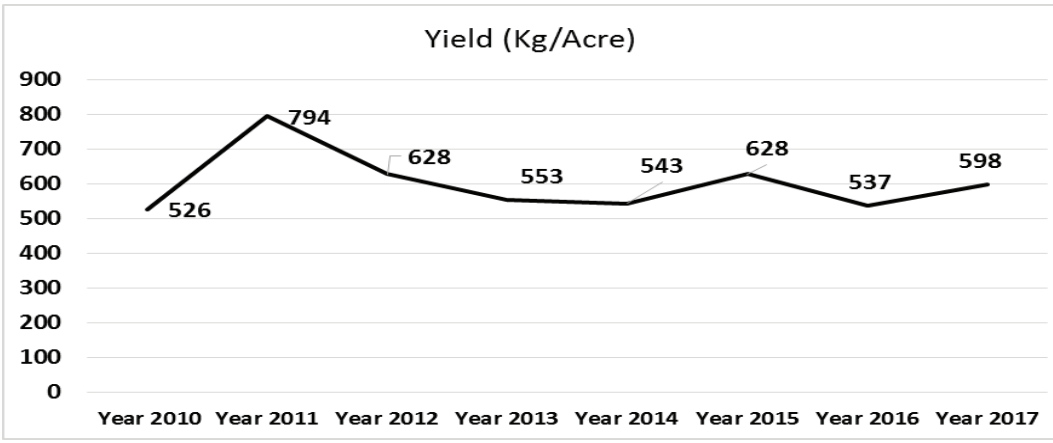

Figure 2: Trends in yield of buckwheat (Kg/acre) in Bhutan.
Source: Agriculture Statistics, Department of Agriculture, MoAF

4.3 Harvesting and Processing

There are no differences in harvesting techniques between sweet and bitter buckwheat. Bitter buckwheat takes only one day for drying before thrashing whereas sweet buckwheat takes one additional day for drying, owing to slight larger size of the grain as compared to bitter buckwheat. Both male and female equally take part in the buckwheat farming. While ploughing is led by males; land preparation, sowing, harvesting and thrashing are done by both males and females. Grains are dried for 1-2 days prior to thrashing. After thrashing, stones particles and other unnecessary particles like leaves and stems are segregated manually. After that the grains are stored in wooden box, drums and gunny bags. After harvesting and thrashing, bitter buckwheat plant is used for making cattle's beds which is later used as manure. On other hand, sweet buckwheat hay is fed to cattle after thrashing. Similarly, the hull from the grounded flour is also used as feed for the cattle. Pest and insects infestation are minimal. Water mill and wherever available the grinding mills and also the traditional stone grinder are used for making flour from both types of buckwheat. It is mostly males for grinding using water mills and for stone grinder, it is mostly females. Segregation of husk is done using traditional sieving bamboo tray.

Assimilated from secondary information, from buckwheat various products can be made such as Choydam, Puda, Kontong, Teyzey, Khuli, Keptang and La zey that are usually prepared after processing as explained below (S. Norbu and Walter Roder).

Choydam: Buckwheat flour is mixed with some fermented grains and cold water and made into a hard dough. Traditionally, the dough is kneaded in a leather pouch. The pouches are passed around and each person knead a lump of dough and take a piece of it. Basketful of *rna* (a strong tasting and pungent smelling plant of the onion family) and radish leaves are

eaten fresh. Chili sauce seasoned with *dozey* (a strong well aged cheese), pepper and salt is served.

Puda: Dough is kneaded and pressed in a noodle pressing tool. The noodles are put into a boiling water and cooked until they float on the surface. They are then immersed in a bowl of cold water with the help of strainer and then rinsed. After the dough has been made into noodles, they are mixed thoroughly with a mixture made from heated mustard oil, partially crushed garlic, red chilli and salt. Beaten fried eggs are cut into small pieces and tossed in with noodles and finally garnished with a handful of finely chopped fresh onion leaves. The noodles are then ladled out into the individual bowls and served. Either *singchang* (an alcoholic drink extracted from the fermenting grains) or butter milk is served with this preparation. Sometimes butter milk is poured over the entire preparation so that noodles are in a sauce of butter milk. The flat type of same products is called Jangbali, which also have a mix of maida flour.

Kontong: After dough is kneaded, small balls are made and depressions are made by pressing with fingers in such a way that it becomes triangular in shape. They are put in a boiling water and cooked for some time until they become firm. Traditionally, *Kontongs* are prepared and served along with other edible items during religious festivals, especially in the eastern Bhutan.

Teyzey: After dough is kneaded, circular thick pancakes are prepared and roasted either on a frying pan or directly on fire. They are served with *Azey* (pounded mixture of chilli and garlic)

Khuli: After adding water into flour, a batter is made. The batter is then poured onto the griddle toasted with butter. Batter for *khuli* is usually prepared at least an hour in advance mainly to give the pancakes a spongy consistence.

Cooked dough: After the cooked dough has become hard, it is eaten with a lump of butter placed in hole in the lump of hot dough. Pieces of dough are also broken off and dipped in the melting butter and eaten.

Keptang: It is made either with plain water or mixed with fermented grains. The addition of fermented grains to flour enhances its taste. *Keptang* is literally an unleavened circular bread.

La zey: The flour is mixed with ara (distilled alcohol) and sugar and baked. It is similar to keptang but is smaller in size. *La zey* is traditionally food for the mountain passes.

Phob: A palpable dough is prepared and then hand rolled into endless lengths of noodles.
Drangro is flour paste in water and ready to eat.
Tshangjay is flour paste with fermented wine and ready to eat.
Tokari is sweet buckwheat made in triangular form (small pieces), boil and served. It is usually made during annual rituals in the eastern Bhutan and also during death rituals.

Pillow from husk: Pillows making from husk were reported from Tang Gewog in Bumthang only, wherein rural households use them. There are no pillows for sale in the markets. These pillows are known to be popular for better sleep owing to some health benefits. Being malleable, it helps to allow better cervical alignment to support head and neck in correct position and to support spine for better relaxation. As the hulls are slightly cupped,

triangular in shape and smooth, it create thousands of tiny air pockets between them, promoting airflow and allowing coolers night sleep[8].

The analysis from individual interview with producers showed that 95.2% HHs makes Khuli from bitter buckwheat flour; followed by 61.2% HHs with Puda; 53.6% makes Keptang; 39.6% makes Ara / Bangchang and another 15.2% makes other products such as Drangro, Tshangjay and Hentey (table 8).

Table 8: Types of buckwheat produce made and consumed by the households from bitter buckwheat

Products	Count and %	Dzongkhags			Total
		Haa	Bumthang	Trongsa	
Khuli	Count	91	82	65	238
	% of Total	36.4%	32.8%	26.0%	95.2%
Puda	Count	15	81	57	153
	% of Total	6.0%	32.4%	22.8%	61.2%
Keptang	Count	4	76	54	134
	% of Total	1.6%	30.4%	21.6%	53.6%
Ara / Bangchang	Count	42	24	33	99
	% of Total	16.8%	9.6%	13.2%	39.6%
Others	Count	6	9	23	38
	% of Total	2.4%	3.6%	9.2%	15.2%
Total	Count	92	82	76	250
	% of Total	36.8%	32.8%	30.4%	100.0%

Similarly a higher percentages amongst all (73.2%) makes Puda from sweet buckwheat; followed by 70.7% that makes Keptang; and others as reflected in table 9.

Table 9: Types of buckwheat produce made and consumed by the households from sweet buckwheat

Products	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
Khuli	Count	70	78	14	4	166
	% of Total	25.4%	28.3%	5.1%	1.4%	60.1%
Puda	Count	29	76	16	81	202
	% of Total	10.5%	27.5%	5.8%	29.3%	73.2%
Keptang	Count	12	69	16	98	195
	% of Total	4.3%	25.0%	5.8%	35.5%	70.7%
Ara / Bangchang	Count	8	19	9	15	51
	% of Total	2.9%	6.9%	3.3%	5.4%	18.5%
Others	Count	75	5	5	3	88
	% of Total	27.2%	1.8%	1.8%	1.1%	31.9%
Total	Count	78	78	22	98	276
	% of Total	28.3%	28.3%	8.0%	35.5%	100.0%

[8] Downloaded from https://www.thesleepjudge.com/benefits-and-side-effects-of-a-buckwheat-pillow-you-need-to-know/ on 5th November 2019 at 11.25 AM.

4.4 Wholesalers and retailers

In entire survey Gewogs, no middlemen or wholesalers that collect buckwheat grain or flour or any other products for onward marketing were reported. There were no retail shops in Haa, Trongsa and Samdrupjongkhar towns dealing with any of the buckwheat produce. As the survey area had very less numbers of retailers, some additional were interviewed from Thimphu as well. From a total of 29 retailers interviewed that deal in selling flour, 20.7% were males and 79.3% were females (table 10).

Table 10: Retailers of buckwheat flour distributed by the gender

Gender	Count and %	Dzongkhag				Total
		Bumthang	Trongsa	S/jongkhar	Thimphu	
Male	Count	3	0	1	2	6
	% of Total	10.3%	0.0%	3.4%	6.9%	20.7%
Female	Count	10	1	4	8	23
	% of Total	34.5%	3.4%	13.8%	27.6%	79.3%
Total	Count	13	1	5	10	29
	% of Total	44.8%	3.4%	17.2%	34.5%	100.0%

Looking at the numbers of persons regularly engaged in retail business, for majority it was only one person (58.6%); two persons (37.9%) and four persons for 3.4% retailers (table 5 under annexure). In an another analysis to look at numbers of women regularly involved in buckwheat retail business, it was one women for 86.2% retailers; followed by two persons for 10.3%; and none for 3.4% retailers (table 6 under annexure). Similarly, majority of the retailers (89.7%) does not have youths (between 15 to 25 years of age) in retail business and few have one or two youths as reflected in table 7 under annexure.

4.5 Processors

In the survey area including Thimphu, there were only three processors. The Sonam Chithuen Rangshing Tshogpa from Chamkar, Bumthang (registered farmers group) makes cakes, donuts, cookies and flour from bitter buckwheat; and only flour from sweet buckwheat. It was established in the year 2010 with the main objective to revive the old age cropping pattern of buckwheat. With increasing non-communicable diseases cases especially diabetics, both buckwheat flour demands are increasing in the market. Potential to make income and more importantly, to contribute towards minimizing import of other cereals crops, the group was formed. The markets for products from processor in Bumthang is mainly Thimphu retail shops, though buyers buy directly from the unit as well. There is no gender differentiated roles as most of the group activities are carried out by women members (7 numbers). The lone male who is also group chairman facilitates the timely procurements of raw materials, processing and marketing of products.

Another processing unit is Sonam Dema Processing unit at Lhayulkha, Haa town that makes Khuli and liquor from bitter buckwheat; and Khuli and Hentey from sweet buckwheat. This processing unit markets produce in hotels and restaurants in Haa. The third processor unit is Chuniding Food in Thimphu town, which makes flour and noodles from bitter buckwheat and only flour from sweet buckwheat. Apart from above processors, most of the tourist based hotels reported serving Khuli, Puda and soup to their guests.

Langpa Nobgang Sanam Detshen (registered farmer group) in Samar Gewog, Haa was established in the year of 2017-2018, comprising of 8 males and 12 females. The main reason for group formation was to develop the economy of group members by undertaking buckwheat production and marketing. However, the group member are losing their interest on buckwheat farming because there is no available markets in Haa and market linkage with retailers in Thimphu is not established.

4.6 Exporters and Exports

In agriculture statistics, there are no data available for buckwheat sold. The list of exporters for buckwheat (grain) for last 8 years were obtained from Department of Revenue and Customs and there were only two exporters. One exporter (Thongphu Enterprise) exported in the year 2011 only. For remaining years till 2016 Bussi-Em Bhutan in collaboration with Tarayana Foundation marketed sweet buckwheat grain to Japan. A total of 13284 Kgs of buckwheat grain were exported in 6 years (2011 to 2016) generating a total amount of Nu. 657331. There were no exports recorded in Bhutan Trade Statistics for the year 2017 and 2018. However, Bussi-Em Bhutan reported exporting 5.8 tons in 2017; 10 tons in 2018 and 20 tons in 2019. Looking at the export trends, the volume of buckwheat exported increased gradually from 2011 to 2017 and sharply in recent years as shown in the figure 3.

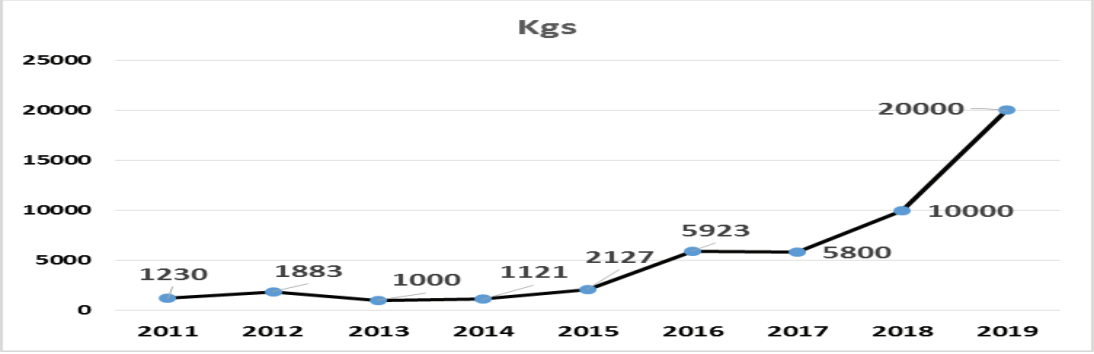

Figure 3: Trends in quantity of buckwheat grain (in Kgs) exported from Bhutan
Source: *Bhutan Trade Statistics (2011 to 2016), Department of Revenue and Customs (DoRC), Ministry of Finance (MoF), RGoB and Bussi-Em Bhutan (Exporter)*
Export Data for three years (2017 to 2019) obtained from the exporter
Accordingly, the amount generated every year from export till 2016 and its trends is reflected in figure 4. The exporter maintained confidentiality regarding the revenue generated for three years (2017 to 2019).

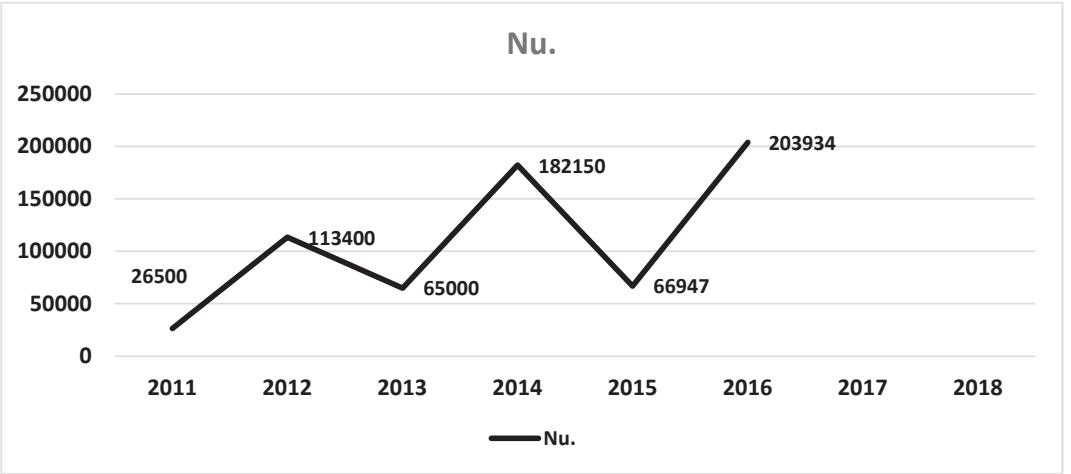

Figure 4: Trends in revenue generated (in Nu.) from export of sweet buckwheat grain
Source: *Bhutan Trade Statistics (2011 to 2016), Department of Revenue and Customs (DoRC), Ministry of Finance (MoF), RGoB*

Using support from Regional Agriculture Marketing and Cooperative Office (RAMCO) at Mongar and the Gewog agriculture extension officers, the Bussi-En Bhutan (exporter) collects sweet buckwheat grains directly from the producers from Trashigang and Samdrupjongkhar. To Japan it is transported through shipping from India. Owing to high moisture content, at times the grain starts to sprout. In Japan, noodles and cookies are made from flour and are served in restaurants.

5. Value Chain Costs Analysis for Sweet Buckwheat

5.1 Scale of Production

The area under harvest of sweet buckwheat from surveyed households stood at 103.61 acres, from cultivated area of 129.37 acres with total production of 50820 Kgs grains. The difference of 25.76 acres is reported as damage by wildlife before harvest. Therefore, the productivity stood at 490.49 kg per acre of harvest. The seed rate per acre of cultivated area is 39.60 Kgs (table 11).

Table 11: Production area, production and seed rate of sweet buckwheat from the surveyed households

Particulars	Quantity	Quantity
Area under cultivation	12937 decimals	129.37 acres
Area under harvest	10361 decimals	103.61 acres
Cost to farmers before harvest (area damaged)	2576 decimals	25.76 acres
Production and productivity of sweet buckwheat	50820 Kgs	490.49 Kg/Acre
Total Seeds Used and Seed Rate per Acre	5123 Kgs	39.60 Kg/Acre

5.2 Economics on Scale of Production at Producer's level

Traditional method is used for the production of sweet buckwheat. The study has estimated the cost of production based on several factors from inputs to labour costs including the night guarding of buckwheat from wild animals. Analysing found that the most predominant cost is the labour cost (81.45%), followed by the cost of seed (10.57%). Other direct cost like using power tiller and usage of chemical fertilizer constitutes 6.64% and 1.32% respectively. Though the cost of seed is preserved from last years' harvest, still its monetary value has been computed as paid cost of seed. The cost of production at the producer's level per Kg of buckwheat grain is Nu. 38.59. The average cost of seed purchased by producers last year amounts to Nu. 50.50/kg. The total cost of sweet grain production per acre of harvested area (490.49 Kgs) amounts to approximately Nu. 18,926. The value of damage is computed at cost and treated as a part of the cost of sales. The labour cost for production includes cost for land preparation, manuring, crop guarding, harvesting and thrashing (table 12).

Table 12: Cost of Production for Sweet Buckwheat per acre and per Kg

Production Inputs	**Cost/Acre (Nu.)**	**Percentage**
Seeds Owned	1,984.70	99.24%
Seeds Purchased	15.22	0.10%
Total seed cost per acre (kg)	1,999.92	10.57%
Labour cost	15,415.52	81.45%
Power tiller hire charges	1,257.55	6.64%
Chemical fertiliser	249.92	1.32%
Pesticides	2.92	0.02%
Total production cost per acre	18,925.84	100.00%
Production per Acre	490.49 Kg /acre	
Cost per kg of grain production	38.59	

The detailed breakup of the labour cost per acre of sweet buckwheat cultivated by types of labour engagement and its associated weightage in percentage is shown in table 13. Amongst various tasks, 40% of the labour engagement for production is for guarding the buckwheat from wild animals, followed by harvesting (21%); land preparation (18%) and thrashing (13%) amongst the significant percentages. In monitory terms, Nu. 15,416 is spent as labour cost for one acre area of cultivation. As night guarding is included in the labour cost, a nominal rate of Nu. 250 per day is used as the labour deployed is self-engagement of the farmers and not hired labour.

Table 13: Labour cost analysis per acre of sweet buckwheat cultivation by types of works

Labour cost	Days / Acre	Rate (Nu.)	Amount / Acre (Nu.)	%
Land preparation	10.86	250.0	2,714	18%
Sowing	0.86	250.0	214	1%
Weeding	0.57	250.0	143	1%
Guarding from wild animals	24.69	250.0	6,173	40%
Harvesting	12.98	250.0	3,245	21%
Others (spades / sickles)	0.06	250.0	14	0%
Manuring	3.50	250.0	874	6%
Thrashing	8.16	250.0	2,039	13%
Total labour cost			15,416	100%

At producer's level, there were additional processing, sales and distribution cost, which is insignificant as compared to the total direct cost incurred for production. The overhead for processing, sales and distribution is Nu. 1144 per acre of harvested area, which is Nu. 2.23 per Kg of grain. Amongst the processing costs, highest is for grinding (68.69% using traditional method and 25.69% using machines) as shown in table 14.

Table 14: Processing, sales and distribution cost at producers' level

Particulars	Total (Nu.)	Cost/Acre (Nu.)	Percentage
Grinding cost (machine)	30,461.50	294.00	25.69%
Labour cost of traditional grinding	81,440.26	786.03	68.69%
Transportation	2,960	28.56	2.50%
Marketing cost	3,694	35.65	3.12%
Total	118,555	1,144	100.00%
Production in kg /acre		493.06	
Cost to farmers per kg of Grain		2.23	

5.3 Value Addition and Sales Revenue from Sweet Buckwheat to Producers

The produced sweet buckwheat was used for various purposes: 23% was sold as seed and whole grains, 49% was used to convert into flour, around 19% was used to preserve seeds for next season, another 6% was used to make beverages and 3% was used as animal feed as shown in table 15.

Table 15: Purposes for which the sweet buckwheat was used by the HHs by the quantity

Particulars	Quantity (Kgs)	Percentage
Direct sales of seed and whole grains	11,489.93	23%
Used for flour making	24885	49%
Stock preserved for next season	9509	19%
Used for making beverages for consumption	2939	6%
Used religious purpose	391	1%
Used for animal feeds	1606	3%
Total	50820	100%

5.3.1 Income generation for farmers from sales of seeds, grains and flour

From total production of sweet buckwheat from surveyed households, 2694 kg of seeds and 3860 kg of whole grain was sold to growers; followed by 4936 kg of grains sold to others (retailers, exporters and processor) as reflected in table 16. The seed and whole grains are sold at an average price of 54.45 per kg to the buyer. The processed flour is sold at Nu.100 per kg. It is evident that from income generated from sales, 39% is from sale of grains to others (exporters and processors); 30.3% is from sale of grains to local buyers (growers); 21.2% is from sale of seeds and 9.8% is from sale of flour. The cash income generated is estimated to analyse, in subsequent section, the economic benefits to the households.

Table 16: Sales of seed, whole grains and flour and % weightage

Particulars	Quantity (Kgs)	Rate (Nu.)	Amount (Nu.)	%
Sales of seed	2,694.17	54.45	146,697.56	21.15
Sales of whole grain to growers	3,860.00	54.45	210,177.00	30.30
Sale of grains to others (retailers, processors and exporters)	4,935.76	54.45	268,752.13	38.74
Sales of flour	680.50	100.00	68,050.00	9.81
Total Cash Income			**693,676.69**	100

5.3.2 Estimated revenue from other usage of sweet buckwheat in the households

On monetising the usage of sweet buckwheat by the households, 12945 Kgs of flour were consumed, estimated at Nu. 1294,471 for the surveyed households. Likewise, stock preserved for next seasons was worth Nu. 366,923; followed by stock used for making beverages (Nu. 113,418); religious purposes (Nu. 15,068) and fed to animals (Nu. 61,968) as shown in table 17 on next page. The total revenue from usage by the households is Nu. 1,851,848, which is computed to estimate in subsequent section, economic benefits to the households. Amongst all estimated revenue, flour consumed accounts highest (69.9%) followed by stock preserved (19.8%); used for making beverages (6%); fed to animals (3%) and used for religious purpose (1%).

Table 17: Monetised usage of sweet buckwheat by the households

Other benefits monetized	Quantity (Kgs)	Rate (Nu.)	Amount (Nu.)	%
Flour consumed	12,944.71	100.00	1,294,471.00	69.90
Stock preserved for next season	9,509.40	38.59	366,923.31	19.81
Used for making beverages for consumption	2,939.40	38.59	113,417.71	6.12
Used religious purpose	390.50	38.59	15,067.57	0.81
Fed to animals	1606	38.59	61,968.04	3.35
Total probable revenue from sweet buckwheat			1,851,847.63	100

5.4 Economic benefits from sale and usage of sweet buckwheat

Looking at the flour produced, consumed and marketed, a total of 24,885 kg of sweet buckwheat grains were converted into flour, producing 13,625 kg of flour which is around 55% conversion rate. Out of the total flour produced 95% was used for self-consumption and only 5% was marketed by producers (table 18).

Table 18: Quantity and percentage of flour used for self-consumption and marketed by the producers

Total productions of grains	Quantity (kgs)	Percentage
Grain used for conversion into flour	24,884.95	49% of total produce
Flour produced	13,625.21	55% conversion rate
Flour used for self-consumption	12,945.00	95%
quantity of flour sold	680.21	5%

The table 19 shows economics benefits in monetary value (from both sales and consumed by the households). From the benefits, 72.25% accounts for the sweet buckwheat used by the households for self-consumption including the stock preserved for next season and grain fed to animals. Another 27.25% of the benefits are obtained from sales. Estimated from the surveyed households, in a year a sweet buckwheat cultivating household has an economic benefit of Nu. 9,059 per household.

Table 19: Economic benefits of sweet buckwheat in monetary value per household

Particulars	Amount (Nu.)	Percentage
Cash benefits from sales of grains and seeds (Nu.)	693,676.69	27.25%
Benefits from usage of sweet buckwheat (Nu.)	1,851,847.63	72.75%
Total Benefits (Nu.)	2,545,524.32	100.00%
Total households growing sweet buckwheat	281	
Total economic benefits per households per year	Nu. 9,058.81	

The economic benefits per acre of cultivated area, compared with the cost of production per acre give the ratio of 1.30, and in terms of percentage it is 23%. Analysis on total economic benefits per acre of cultivated area amounts to Nu. 24,568 (table 20).

Table 20: Economic benefits of sweet buckwheat in monetary value per acre

Benefits per acre	AMOUNT
Cash benefits per acre	6,695.07
Other benefits monetized per acre	17,873.25
Total benefits from sweet buckwheat per acre	24,568.33
Total cost per acre	18,925.84
Ratio of economic value addition per acre	1.30

5.5 Economics of sweet buckwheat at retailer's Level

The cost incurred for retailers are for both varieties. The costs are allocated based on the quantity of buckwheat variety (flour) purchased and sold by retailer. Out of total buckwheat flour purchased and sold, 71% constitutes sweet variety and 29% as bitter variety. The cost allocation is presented in table 21, which was used to estimate the economics to the retailers.

Table 21: Cost allocation for Retailers between sweet and bitter buckwheat flour

Cost allocation	Total cost	Sweet	Bitter
Allocation percentage	100%	71%	29%
Labour cost	21,953.13	15,669.67	6,283.45
Self-employment cost	107,612.50	76,811.50	30,801.00
Total labour cost	129,565.63	92,481.18	37,084.45
Transportation cost	9,275.00	6,620.30	2,654.70
Local conveyance	15,100.00	10,778.06	4,321.94
Total cost at retailers level	24,375.00	17,398.35	6,976.65

The retailer buys flour directly from producer and processor at Bumthang. At times, the producers drop as they come for shopping to the town. The sweet buckwheat was bought at an average price of Nu.97.58 per kg by the retailer. After incurring other overhead cost and damages, the cost per kg amounts to Nu.109.96. The main cost for retailers is the purchase cost (88.74%); followed by labour as self-employment and slightly hired (7.61%). Other cost such as transportation and local conveyance takes a small share of total cost attributable to processing of final products by the retailers (table 22).

Table 22: Cost analysis of sweet buckwheat at retailer's level

Particulars	Quantity (Kg)	Rate (Nu.)	Amount (Nu.)	%
Purchase of flour	11,060.00	97.58	1,079,271.67	88.74
Damage	277.00	97.58	27,030.58	2.22
Labour cost			15,669.67	1.29
Self-employment cost			76,811.50	6.32
Transportation cost			6,620.30	0.54
Local conveyance			10,778.06	0.89
Total cost			**1,216,181.78**	100.00
Cost per kg			109.96	

5.6 Sales revenue to retailers from sales of sweet buckwheat

The retailer sold sweet buckwheat at Nu. 129 per Kg fetching the net profit percentage of 15% as shown in table 23.

Table 23: Sales revenue and profit percentage to the retailers

Particulars	Quantity	Rate	Amount
Sales	10,951	129	1,411,766
Net profit			195,585
Profit percentage			14.76%

5.7 Economics of sweet buckwheat at processors level

Processor purchase both varieties of buckwheat grains, process into different products and sell to the buyers. The total quantity of buckwheat grains purchased by three processors is provided in table 24 on next page, where in 45% of total was bitter buckwheat and 55% as sweet buckwheat.

Table 24: 2Purchase of buckwheat grains by processor by variety and quantity

Total purchase quantity	quantity	weightage
Bitter buckwheat	13,000.0	45%
Sweet buckwheat	16,000.00	55%
Total quantity processed	29,000.00	100%

Common cost allocation at processor level

Since the cost are incurred by processor for processing both varieties of products, the cost incurred are compiled and allocated between sweet and bitter variety, based on the volume of buckwheat purchased from producer/retailer. The cost allocation is tabulated in table 25.

Table 25: Common cost allocation at processor's level between sweet and bitter buckwheat

Cost of processing	Total	Sweet (55%)	Bitter (45%)
Labour cost	40,240.0	22,201.4	18,038.62
Input cost	11,580.0	6,389.0	5,191.03
Transportation	77,980.0	43,023.4	34,956.55
Rental expenses	6,000.0	3,310.3	2,689.66
Taxes	3,000.0	1,655.2	1,344.83
Interest cost	5,833.0	3,218.2	2,614.79
Total processing cost	144,633.0	79,797.5	64,835.5

Detailed cost analysis of sweet buckwheat at processing

At processors' level, the processor purchased around 16,000 kg of sweet buckwheat at Nu.52 per kg last year. As processors necessarily do not only buy from surveyed producers but others as well, the average purchase price was Nu. 52/Kg of grain. From total costs for purchase and processing, 91.4% of the costs was for purchase and 8.6% for processing. The processor incurred additional cost on labour, transportation and other overhead cost which amounts to Nu. 57.96 per kg as shown in table 26. It also showed that amongst the processing costs, highest cost incurred was for transportation (53.92%); followed by labour costs (27.82%) and smaller percentages of costs for inputs, rental, interest and taxes.

Table 26: Cost analysis of sweet buckwheat at processor level

Value chain analysis of processor	Quantity (Kg)	Rate (Nu.)	Amount (Nu.)	%
Purchase cost	16,000.00	52.00	832,000.00	
Damage	300.00	52.00	15,600.00	
A. Total cost of purchase	91.39% of total cost		847,600.00	
Processed	15,700.00			
Flour obtained	9,360.00			
Processing				
Labour cost			22,201.4	27.82
Input cost			6,389.0	8.01
Transportation			43,023.4	53.92
Rental expenses			3,310.3	4.15
Taxes			1,655.2	2.07
Interest cost			3,218.2	4.03
B. Total processing cost	8.60% of total cost		**79,797.5**	100
Total cost (A+B)			927,397.52	
Cost per kg of processing cost			57.96	

The processed products are sold individually at different price per unit (provided in table 27). At processor' level, there is a value addition with net profit percentage of 18.28. From the sales, 95.69% accounts for sale of flour, which is flour for making Khuli or Puda; and packed flour. Other small percentage account for sale of Hentey by the processors, for which only 30% of the sale value is accounted as portion of buckwheat in Hentey, as Hentey has many other ingredients.

Table 27: Sales of sweet buckwheat products by processors

Products	Quantity (Kg)	Rate (Nu.)	Amount (Nu.)	
Khuli (pcs)	2,000.00	20.00	40,000.00	3.52
Flour for making khuli/keptang	7,860.00	115.00	903,900.00	79.65
Buckwheat flour (pkts)	1,300.00	140.00	182,000.00	16.04
Hentey	500.00	60.00	9,000.00	0.79
Total revenue generated			1,134,900.00	100.00
Net profit			207,502.48	
Net profit on sales			18.28	

5.8 Economic of Sweet Buckwheat at Exporters Level

At exporters level there was only one exporter. The exporter purchased around 20,000 kg of buckwheat and exported to Japan in the year 2019. As exporters maintained confidentiality for the export costs for the earlier years, the procurement and processing cost for export was indicated for the year 2019 which is tabulated in table 28.

Table 28: Cost of purchase at exported level

Particulars	**Quantity (Kgs)**	**Rate/kg (Nu.)**	**Amount (Nu.)**
Purchase	20,000	55	1,100,000
other cost			407,077
export cost			290,271
total cost			1,797,348

The exporter exported at Nu.140 per kilogram of processed buckwheat to Japan fetching the average profit of 36% as shown in table 29.

Table 29: Profit percentage to exporter for export of sweet buckwheat

Particulars	**Quantity (Kgs)**	**Rate / Kg (Nu.)**	**Amount**
Sales	20,000	140	2,800,000
Profit margin			1,002,652
Profit percentage			36%

5.9 Value Addition across Sweet Buckwheat Value Chain

In terms of value addition on sales of grains and seeds at producer's level, the sweet buckwheat production cost is Nu. 38.59/Kg and grains / seeds were sold at Nu. 54.45, which give profit percentage of 27.13 per Kg to producers. In case of retailers, the cost is 109.96 and flour is sold at an average price of Nu. 129, giving profit percentage of 14.76. Similarly, it is 18.28% at processor's level and 36% at exporter's level as shown in figure 5.

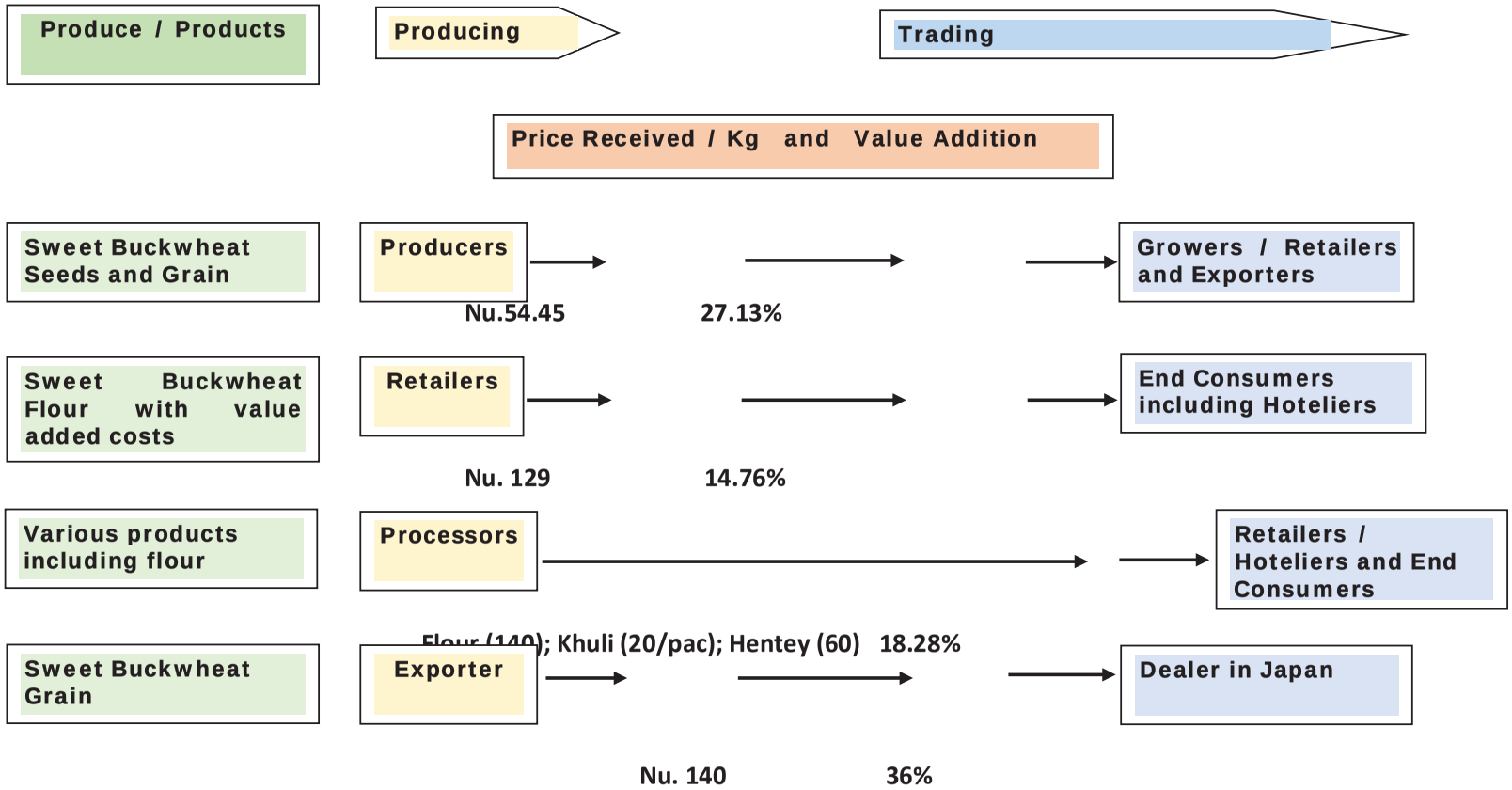

Figure 5: Value chain addition across sweet buckwheat value chain

6. Value Chain Costs Analysis for Bitter Buckwheat

6.1 Scale of Production

The production of bitter buckwheat by sampled population last year (2018) was 59,608 kilograms within a harvested area of 118.31 acres, and from cultivated area of 140.33 acres giving productivity of 503.83 Kg/acre. Out of total cultivated area, 22.02 acres was reported as damaged before harvest by wild animals (table 30). The seed rate is 40.44 Kgs per acre of cultivated area.

Table 30: Production area, production and seed rate of bitter buckwheat from the surveyed households

Particulars	**Quantity**	**Quantity**
Area under cultivation	14033 decimals	140.33 acres
Area under harvest	11831 decimals	118.31 acres
Crop damage area before harvest	2202 decimals	22.02 acres
Production and productivity of bitter buckwheat	59608 kgs	503.83 Kg/acre
Total Seeds Used and Seed Rate per Acre	5676 Kg	40.44 Kg / acre

6.2 Economics on Scale of Production at producer's level

The cost information collected from field survey includes different factor cost incurred by the farmers, which are for land preparations, manuring, weeding and self-employment cost in terms of time spent and its opportunity cost calculated at nominal local rate of labour availability. From total seeds used, 98.56% is own seeds reserved by the farmers and 0.19% was purchased from other growers. The average price of seeds purchased last year was Nu. 50.29/Kg. The cost of production per 1 Kg of bitter buckwheat grain is Nu. 37.63. The cost of production is dominated by labour cost (81.31%), followed by seed cost (10.73%) and smaller percentages for others as presented in table 31. The production cost per acre of cultivated area is Nu. 18,960.

Seed cost	Amount / Acre (Nu.)	Percentage
Seeds Owned	2,004.45	98.56%
Seeds Purchased	29.39	0.19%
Total seed cost	2,033.84	10.73%
Labour cost	15,415.52	81.31%
Power tiller hire charges	1,257.55	6.63%
Chemical fertilizer	249.92	1.32%
Pesticides	2.92	0.02%
Total production cost per acre	18,959.75	100.00%
Production quantity in acre	503.83	
Cost of production per kg	37.63	

Table 31: Cost of production for bitter buckwheat per acre and per Kg

As there were no difference in pattern for use of labour for cultivation of sweet and bitter buckwheat, the labour costs were added up for both and analysed for acre of cultivation. Therefore, as already mentioned for sweet buckwheat, for bitter as well, the total labour cost for one acre cultivation is Nu. 15,416. Highest labour intake was for guarding wild animals (40%) followed by 21% for harvesting and 18% on thrashing amongst the significant ones.

In addition to direct production costs, other costs such as processing and marketing are also incurred by producer. Though the cost are not very significant, table 32 on next page reflects that it incurred Nu. 2.16 as processing cost for 1 kg of grain at the producer's level. Highest costs amongst all is for traditional grinding labour intake (68.55%), and by grinding cost using machines (25.64%).

Table 32: Processing, sales and distribution cost at producers' level

Particulars	Cost/acre (Nu.)	% on total cost
Grinding cost (machine)	279.29	25.64%
Labour cost of traditional grinding	746.69	68.55%
Transportation	28.15	2.58%
Marketing cost	35.13	3.23%
Total other cost	1,089	100%
Production per acre	503.83	
Cost per Kg of Grain	2.16	

6.3 Value Additions and Sales Revenue from Bitter Buckwheat to Producers

Looking at the usage of bitter buckwheat for various purposes by the households, highest percentage of produce (grains) was used for making flour (49% of total produce); followed by direct sales of seeds and grains (18%); stock preserved for next season (15%); making beverages for self-consumption (12%); feeding animals (5%) and used for religious purposes (1%) as shown in table 33.

Table 33: Purposes for which the bitter buckwheat was used by the HHs by the quantity

Particulars	Quantity (Kgs)	Percentage
Direct sales of seed and whole grains	10,570.40	18%
Used for flour making	28959	49%
Stock preserved for next season	8736	15%
Used for making beverages for consumption	7400	12%
Used religious purpose	845	1%
Used for animal feeds	3098	5%
Total	59608	100%

6.3.1 Income generation for farmers from sales of seed, grains and flour

From the total produce, 277 kg of seeds and 745 kg whole grains were sold to other growers and 9,548 kg grains was sold to retailers and processor. The seed and whole grains were sold at an average price of Nu. 54.54 per kg to the buyer. The processed flour was sold at Nu.100 per kg. As mentioned in earlier section, only 18% of total produce was sold as seeds and whole grains to the growers. From total revenue generated from these sales, highest revenue (80.14%) was from sale of grains to retailers, processors and exporters and 8.57%

by sale to growers as seeds and grains. The revenue from sale of flour by the producers accounts for 11.28% (table 34).

Table 34: Sales of seed, whole grains and flour and % weightage

Particulars	Quantity (Kgs)	Rate (Nu.)	Amount (Nu.)	% of Revenue
Sales of seed	277.00	54.54	15,108.82	2.32
Sales of whole grain to growers	745.00	54.54	40,635.62	6.25
Sale of grains to others (retailers, processors and exporters)	9548.40	54.54	520,812.35	80.14
Sales of flour	733.00	100.00	73,300.00	11.28
Total quantity sold	11,303.40		649,856.79	100.00

6.3.2 Estimated revenue from other usage of bitter buckwheat in the households

Bitter buckwheat is used for various purpose by the households. On monetising bitter buckwheat used by the surveyed households, highest revenue accounts for the flour consumed (62.22%); followed by stock preserved for next season (16.44%); used for making beverages (13.92%); fed to animals (5.83%) and used for religious purposes (1.59%) as shown in table 35. The total estimated revenue is Nu. 2,591,105.46, which is used in subsequent section to estimate economic benefit to the households.

Table 35: Monetised usage of bitter buckwheat by the households

Other benefits monetized	Quantity (Kgs)	Rate (Nu.)	Amount (Nu.)	% of total
Stock preserved for next season	8,736.40	54.54	476,522.24	17.60
Used for making beverages for consumption	7,399.82	54.54	403,619.21	14.91
Used religious purpose	844.90	54.54	46,084.62	1.70
Flour consumed	16122.00	100	1,612,197.00	59.55
Fed to animals	3098	54.54	168,978.75	6.24
Total probable revenue from sweet buckwheat			2,707,401.81	100.00

6.4 Economic benefits from sale and usage of bitter buckwheat

Analysis on flour produced and marketed by the households revealed that 49% of the total produce (grains) was used by the households to make flour and 16,854.97 Kgs flour was made wherein the conversion rate from grains was 58%. From total flour produced, 96% was consumed by the households and only 4% was marketed (table 36).

Table 36: Quantity and percentage of flour used for self-consumption and marketed by the producers

Particulars	Quantity (kgs)	Percentage
Grain used for conversion into flour	28,958.98	49% of total produce
Flour produced (conversion of whole grain to flour)	16,854.97	58% conversion rate
Flour used for self-consumption	16,121.97	96%
Quantity of flour sold	733.00	4%

In terms of economic benefits to the households in monetary terms, 80.64% benefits is from usage by the households for self-consumption (including little fed to animals) and 19.36% account for benefits from sales. Analysis showed that each household have an economic benefits of Nu. 13,012.63 per annum from bitter buckwheat (table 37). Analysis on total economic benefit to households per acre of cultivated area amounts to Nu. 28,377 for bitter buckwheat, which is value addition by 1.42 in terms of ratio and 29.35 in terms of percentage (table 38).

Table 37: Economic benefits of bitter buckwheat in monetary value per household

Particulars	Amount (Nu.)	%
Cash benefits from sales of grains and seeds (Nu.)	649,856.79	19.36
Benefits from usage of bitter buckwheat (Nu.)	2,707,401.81	80.64
Total Benefits (Nu.)	3,357,258.60	100.00
Total households growing bitter buckwheat	258	
Total economic benefits per households per year (Nu.)	13,012.63	

Table 38: Economic benefits of bitter buckwheat in monetary value per acre

Net economic benefits	**unit**	**per acre**
Cost of production per acre of bitter buckwheat	Nu.	20,046.73
Total benefits (monetary and others from bitter buckwheat	Nu.	28,376.79
Net economic profit from bitter buckwheat per kg of productions	Nu.	8,330.06
Ratio of benefits to cost		1.42

6.5 Economics at Retailers Level for bitter buckwheat

Similar to sweet buckwheat, bitter buckwheat is also purchased, value added and sold by retailers. While maximum costs is for purchase (87.71% of total costs), there is also significant costs for labour as self-employment or hired (6.98%). With all costs at retailer's level, though retailers purchase flour at the rate of Nu. 105, with value addition, the costs amount to Nu. 119.72 per Kg of flour (table 39).

Table 39: Cost analysis of bitter buckwheat at retailer's level

Particulars	Quantity(kg)	Rate (Nu)	Amount(Nu)	%
Purchase of bitter buckwheat	4,435.00	105.00	465,675.00	87.71
Damage	202.00	105.00	21,210.00	3.99
Labor cost			6,283.45	1.18

Self-employment cost			30,801.00	5.80
Transportation cost			2,654.70	0.50
Local conveyance			4,321.94	0.81
Total cost			**530,946.10**	100.00
Cost per kg			119.72	

6.6 Sales revenue to retailers from sales of bitter buckwheat

The retailer sold at an average price of Nu.130.79 per kg. The quantity sold was 4233 kg last year. The profit percentage of bitter buckwheat to retailers is 8.46. The sales volume and revenue are provided in table 40.

Table 40: Sales revenue and profit percentage to the retailers

Sales of bitter buckwheat			
Bitter buckwheat sold	Quantity (Kg)	Rate (Nu.)	Amount (Nu.)
Sales of bitter buckwheat	4,233.00	130.79	553,641.13
Profit per kg of bitter buckwheat			22,695.03
Profit Percentage			8.46%

6.7 Economics at Processors Level

The purchase, processing and sales of bitter buckwheat at processor level is computed considering all relevant cost including purchase, overheads and labour cost associated with processing of different varieties of products made from bitter buckwheat. As processors purchased from other producers as well (not necessarily from producers from surveyed areas), the average purchase rate was Nu. 53.7/Kg of grain. The total quantity purchased was 13000 kg wherein 550 kg is reported to have been damaged. Out of 12450 kg processed, 7850 kg of flour was obtained (table 41). Amongst the costs incurred, 91.81% was for purchase and remaining 8.19% for collection and processing. Within collection and processing, transportation account for 53.92% of the cost; followed by labour cost (27.82%); inputs (8.01%); rental (4.15 %); interests (4.03%) and taxes (2.07%). With value addition, the cost amount to Nu. 60.9 per Kg of flour at processor's level.

Table 41: Cost analysis of bitter buckwheat at processor level

Value chain analysis of processor	Quantity(Kg)	Rate (Nu.)	Amount (Nu.)	%
Purchase cost	13,000.0	53.7	697,666.7	
Damage	100.0	53.7	5,366.7	
Pilferages	450.0	53.7	24,150.0	
A. Total cost of purchase	91.81% of total cost		**727,183.3**	
Processed	12,450.0	53.7	668,150.0	
Flour obtained	7,850.0		-	
Processing			-	
Labour cost			18,038.6	27.82
Input cost			5,191.0	8.01
Transportation			34,956.6	53.92
Rental expenses			2,689.7	4.15
Taxes			1,344.8	2.07

Interest cost			2,614.8	4.03
B. Total processing cost	8.19% of total cost		**64,835.5**	100
Total Costs (A+B)			**792,018.8**	
Cost per kg of processing cost			60.9	

Varieties of products are prepared from bitter buckwheat flour. The products are sold at different prices based on the cost of production, quantity of raw materials used and market value of such products. The net profit generated from sales of all varieties of products gives the processor a value addition of 29%. Amongst all products, highest revenue (59.93%) is generated by sale of flour of 1 Kgs packages for making Khuli / Puda; followed by sale of flour of 1 kgs packets at different price (16.21%) and others as listed in table 42.

Table 42: Sales of bitter buckwheat products by processors

Processed products bitter buckwheat				
Products	Quantity(Kg)	Rate	Amount	
Khuli (pcs)	3,500	20	70,000	6.24
Cake (kg)	25	250	6,250	0.56
Buckwheat flour (Pkts)	1,300	140	182,000	16.21
Liquor (bottles)	1,500	50	75,000	6.68
Donuts (kg)	25	250	6,250	0.56
Buckwheat noodles	1,300	80	104,000	9.27
Cookies (kg)	25	250	6,250	0.56
Flour khuli/Puda (pkt of one kg)	5,850	115	672,750	59.93
Total revenue generated from sales			1,122,500	100
Net profit			330,481	
Net Profit on sales at processor level			29	

6.8 Economics of Bitter buckwheat at exporter level

There is only one exporter of Sweet Buckwheat and Bitter buckwheat is not exported.

6.9 Value Addition across Bitter Buckwheat Value Chain

For bitter buckwheat, the cost of production is Nu. 37.67/Kg and grains are sold at Nu. 54.54/Kg to retailers and processors, giving profit percentage of 30.93. At retailer's level, with purchased and overheads cost, it is produced at Nu. 119.72 / Kg and sold at Nu. 130.79 / Kg, giving profit of 8.46%. Similarly, the value addition at processor's level is 29% and bitter buckwheat is not exported.

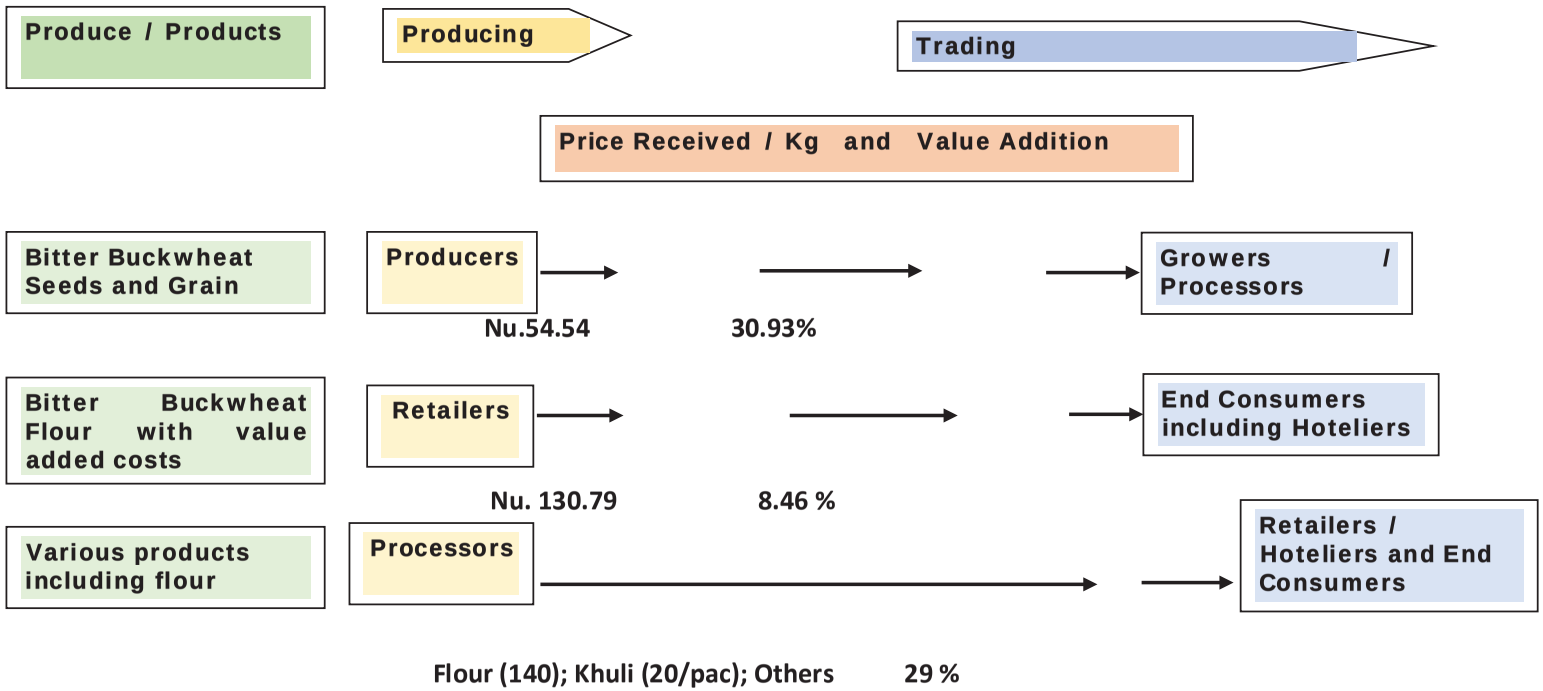

Figure 6: Value Chain Addition across Bitter Buckwheat Value Chain

7. The Value Chain Mapping

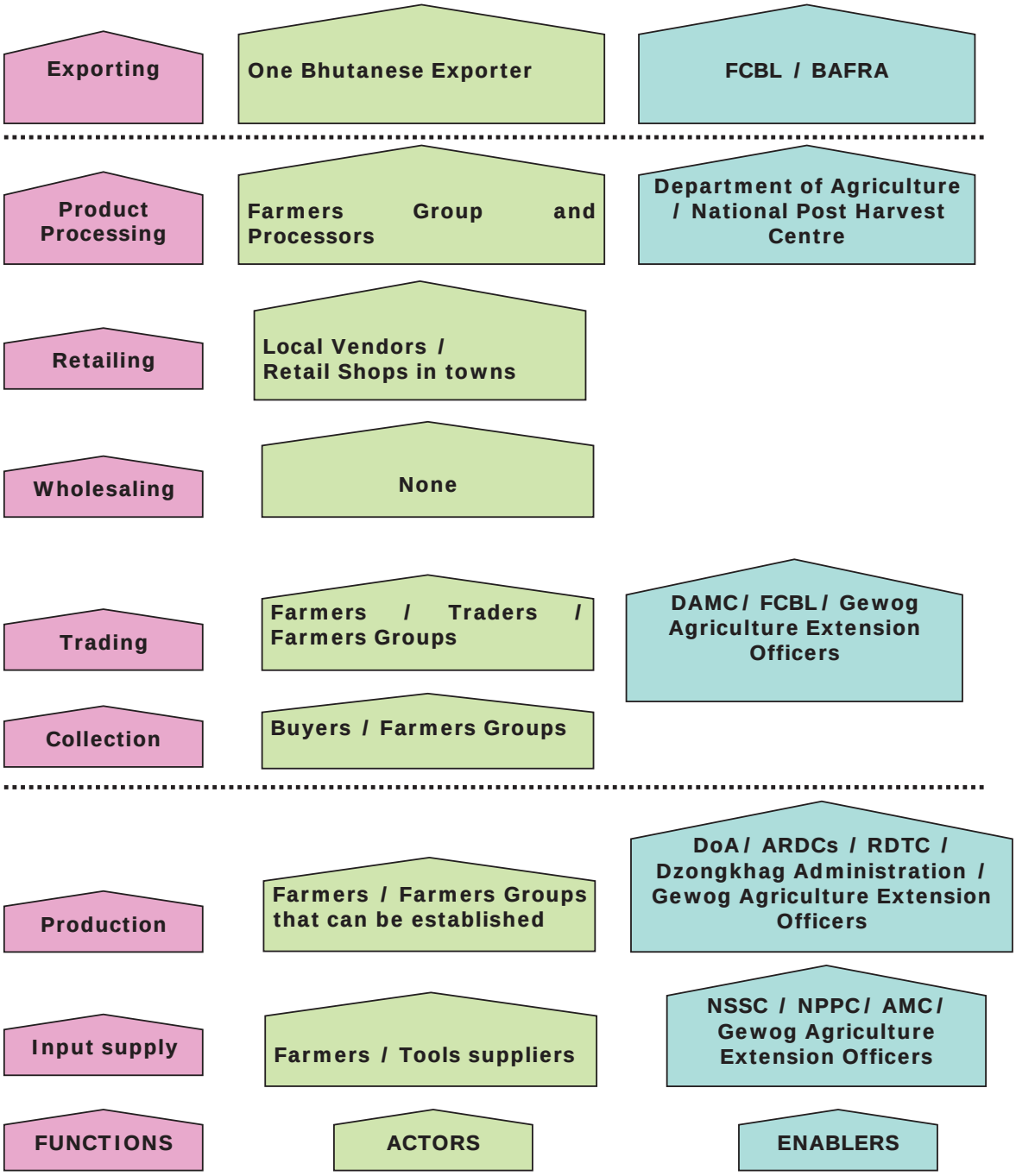

Figure 7: Value chain mapping for buckwheat in Bhutan

8. COMMON ISSUES

8.1 Programme Coordination for Buckwheat under Department of Agriculture

The **National Organic Flagship Program** (2018 – 2023) will be implemented in 20 Dzongkhags covering crops (such as rice, maize, buckwheat, quinoa, asparagus, ginger, turmeric, cardamom and legumes) and also focussed on honey, egg, trout, hard cheese (*chugo)*, matsutake, amla, chirata, pipla and bamboo shoot. In addition, the traditional fruits, vegetables, herbs and minor cereals will be also included. At present the focus of the program is to enhance the technical capacity of the stakeholders and to put in place an enabling environment. With regards to Buckwheat, the program will identify clusters for organic buckwheat production and support producers with supply of organic seeds.

The **National Organic Programme** (NOP) under Research and Development Centre, Yusipang is the focal agency for coordinating and implementing activities of organic agriculture in Bhutan, aimed at attaining food self-sufficiency with safe, healthy, nutritious food diversity. The NOP is thus another agency that can support Organic Buckwheat production in the country.

To support National Organic Flagship Program, the **National Soil Service Centre** is in the process to procure and supply organic fertilizer to the Dzongkhags and Centres, which is another supporting agency for organic buckwheat production.

8.2 Learning and Spill Over

Learning better techniques of cultivation, production, harvesting, processing, packaging and sales helps the value chain partners to reduce cost significantly. Learning and spill over includes cost factors like improvement of labour efficiency, procedure that increase the uses of farm tools and equipment, and more efficient labour productivity through better scheduling. This can happen by sharing knowledge and skills amongst the producers from various buckwheat cultivating Dzongkhags. The process of learning spill overs also come from Dzongkhag Agriculture office in the form of formal technical guidance.

Productions, sales and processing of buckwheat in Bhutan is traditional. However, buckwheat is cultivated mostly for self-consumption. Very little surplus are sold in the market. The best practices and better techniques are shared informally within the industry. Therefore, there is no additional cost incurred for training, development and enhanced productivity. The appropriate learning platform for knowledge sharing has not taken as yet.

8.3 Location Disadvantage

Since buckwheat are grown in different Dzongkhags, transportation form a part of important component cost. Processors and one exporter of buckwheat are located in Bumthang and Thimphu where growers are spread in different Dzongkhags. There are some locational disadvantages due to which all the value chain actors have to bear additional cost on transportation of their produce, especially for processor at Thimphu as compared to Bumthang. The study found that most of the costs at processor's level was for transportation of grain to the processing units.

8.4 Market Linkages

Market for buckwheat in Bhutan are mostly informal. Whatever little excess production is sold to retailer at farm gate price. As per the focussed group discussion, buyers directly buy the grains from producers. There is also export to Japan, the quantity of which is increasing over the years. At present Buckwheat is mostly used for home consumptions. From individual interview of the producers, it was found that 86.7% of the producers do not market buckwheat (table 43 on next page). Few that market, indicated mostly selling locally in the village itself, where buyers come and pick it. Since buckwheat are produced primarily for self-consumption, at present the volume is not very attractive for large scale linkages across the value chain.

Table 43: Usual markets for selling buckwheat (grain and flour) for the producers

Markets	Count and %	Dzongkhags				Total
		Haa	B/thang	Trongsa	S/jongkhar	
Local buyers in villages	Count	0	6	0	29	35
	% of Total	0.0%	1.6%	0.0%	7.6%	9.1%
Buyers from outside	Count	0	0	0	12	12
	% of Total	0.0%	0.0%	0.0%	3.1%	3.1%
Shops / Markets in Gewog itself	Count	0	0	0	1	1
	% of Total	0.0%	0.0%	0.0%	0.3%	0.3%
Shops /markets in Dzongkhag area	Count	3	2	0	0	5
	% of Total	0.8%	0.5%	0.0%	0.0%	1.3%
Vegetable Vendors in the markets	Count	0	1	0	0	1
	% of Total	0.0%	0.3%	0.0%	0.0%	0.3%
Farmers groups / processors	Count	0	1	0	0	1
	% of Total	0.0%	0.3%	0.0%	0.0%	0.3%
Did not market any	Count	102	82	90	58	332
	% of Total	26.6%	21.4%	23.5%	15.1%	86.7%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0

Learnt from the retailers in Bumthang, it is mostly the producers that bring buckwheat flour to the retailers when they visit market for the shopping. For retailers in Thimphu, they get from Bumthang, Trongsa, Dawakha (Paro), Wangdue and Dagana. The producers from these areas bring the flour along with other agricultural goods for sale in Thimphu centenary farmers market. The retailers mentioned that it is not easily available as and when required because the producers and vendors are not properly linked in terms of demand and supply. As end consumers for retailers shop like 8 Eleven and Lhatshog Shop, the buyers are high end hotels like Hotel Taj, Le Meriden, Six Sense and other end consumers. Most of these retail shops including the B-CooP shop avail flour from Sonam Chithuen Rangshing Tshogpa (processing group at Bumthang).

The existing informal market is presented in figure 8, wherein the retailers, processors and exporters collect grain or flour directly from the producers for onward markets.

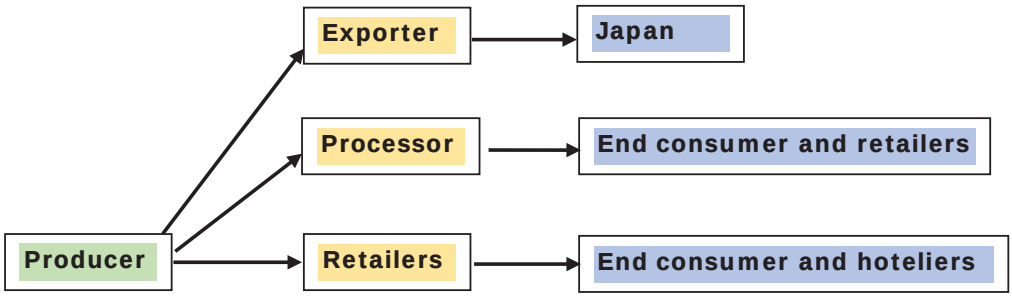

Figure 8: Existing market linkages for buckwheat

The Sonam Chithuen Rangshing Tshogpa from Chamkar, Bumthang (registered farmers group) procures buckwheat from within the neighbouring Gewogs like Chumey and Chokhor. The group chairperson orders and picks the produce directly from the farmers in these Gewog. As of now, demand are met from these Gewogs for bitter buckwheat. For sweet buckwheat, they procure from Gomdar Gewog under Samdrupjongkhar Dzongkhag and Trongsa Dzongkhag. From both Dzongkhag, chairperson picks the produces himself.

For hoteliers, some hotels have regular sellers (producers) in different Gewogs. For example, Village Lodge in Bumthang gets from one producer. Rinchenling Lodge gets flour from another one producer. Wandicholing Resort brings from Tang and Dekyil Guesthouse buy from Chamkhar processing unit. The farmers also on their own bring to their hotels. For hotels, tourists are major consumers for buckwheat products followed by national during special occasions (meeting / workshops).

8.5 Overall demand analysis of both varieties of buckwheat

The demand and supply gap analysis is done taking into consideration total seeds, whole grains and floor sold by producers to retailers and processors. The grain is converted into floor at around 55% conversion rate, (which means double the kilogram in floor will gives quantity of wholegrain). The total purchased by all value chain actors are added to determine the total aggregate demand. Similarly, the total supply by producer either in whole grain form or floor from is added to arrive at total supply and hence the demand and supply gap is determined. Based on the analysis only 31% of the total demand is met by the producers from the surveyed population wherein 69% of the demand is met from other areas (table 44). It is to be noted that all buckwheat cultivating households from four Dzongkhags were not interviewed as it was sample survey. The gap of 69% therefore were met from other buckwheat growing Dzongkhags or even contributed by those households not interviewed in the survey area. Therefore even if the farmers increase the scale production, there will be market for sales of their produce as the demand from retailers and exporter is increasing over the years.

Table 44: Demand Supply Analysis for the Buckwheat

Particulars	**Sweet (Kgs)**	**Bitter (Kgs)**	**Total**
Purchased by Retailers (flour but converted into grain)	22,120.00	8870	30,990.00
Purchased by Processor (grains)	16,000.00	13000	29,000.00
Buckwheat purchased by exporter (grain)	20,000.00	0	20,000.00
Total demand of grains in Kgs	58,120.00	21,870.00	79,990.00
Sold by producers as seeds and grains	11,489.93	10,570.40	22,060.33
Flour sold by producer (converted into Kgs of Grains)	1,360.42	1466	2,826.42
Total supply of grains in Kgs	12,850.35	12,036.40	24,886.75
Demand Supply Gap	45,269.65	9,833.60	55,103.25
Percentage of demand supply gap			69%

Gathered from focus group discussion, the demand for buckwheat is increasing over the years as mentioned by producers from Bumthang and Trongsa but producers from Haa and Samdrupjongkhar said it is constant over the years.

The retailers (in Thimphu) mentioned that the demand for buckwheat flour has been increasing as consumers buying buckwheat flour has been increasing over the years. The processor group in Bumthang mentioned that demands are annually increasing. One reason could be changing eating habits of people who are now more health conscious as it has nutritional value. Demands are also increasing from hoteliers. The tourists do not order for buckwheat products like khuli and Puda but the hoteliers keep it in their menu. For example, hoteliers serve khuli in the breakfast and Puda in either lunch or dinner.

8.6 Trends in Buckwheat Cultivation Area

The trends in buckwheat cultivation over the last five years revealed that for 48.6% HHs the area under cultivation has been decreasing over the years; 25.6% said it is constant; and 24.8% HHs mentioned it to be increasing (table 45).

Table 45: Trends in Cultivation Area of Buckwheat in last five years

Trends	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
Increased	Count	14	16	7	58	95
	% of Total	3.7%	4.2%	1.8%	15.1%	24.8%
Decreased	Count	62	55	58	11	186
	% of Total	16.2%	14.4%	15.1%	2.9%	48.6%
Constant	Count	26	19	24	29	98
	% of Total	6.8%	5.0%	6.3%	7.6%	25.6%
Don't know	Count	3	0	1	0	4
	% of Total	0.8%	0.0%	0.3%	0.0%	1.0%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

The decreasing area under cultivation was indicated for bitter buckwheat by 21.7% HHs; for sweet buckwheat by 29.5% HHs and for both variety by 47.8% HHs (table 46).

Table 46: Buckwheat type for which cultivation area decreased over last five was indicated by the households

Buckwheat Type	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
Bitter Buckwheat	Count	13	7	63	0	83
	% of Total	3.4%	1.8%	16.4%	0.0%	21.7%
Sweet Buckwheat	Count	7	5	4	97	113
	% of Total	1.8%	1.3%	1.0%	25.3%	29.5%
Both type	Count	82	78	22	1	183
	% of Total	21.4%	20.4%	5.7%	0.3%	47.8%
Don't know	Count	3	0	1	0	4
	% of Total	0.8%	0.0%	0.3%	0.0%	1.0%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

Looking at the reasons for decreasing area under cultivation, it was mentioned to be wild animals destroying crops by 39.4% HHs; manpower shortage for 26.9% households; changing food habit as staple food by 17% HHs; changing cropping pattern by 15.1% HHs and other reasons for other smaller percentages of households (table 47).

Table 47: Reasons for Area Decreased over the Years for Buckwheat Cultivation

Reasons	Count and %	Dzongkhags				Total
		Haa	B/thang	Trongsa	S/jongkhar	
Changing cropping pattern	Count	45	4	7	2	58
	% of Total	11.7%	1.0%	1.8%	0.5%	15.1%
Changing food habit	Count	23	21	17	4	65
	% of Total	6.0%	5.5%	4.4%	1.0%	17.0%
Manpower shortage	Count	40	20	36	7	103
	% of Total	10.4%	5.2%	9.4%	1.8%	26.9%
No markets for Buckwheat	Count	61	3	4	3	71
	% of Total	15.9%	0.8%	1.0%	0.8%	18.5%
Marginal land holdings	Count	1	12	14	1	28
	% of Total	0.3%	3.1%	3.7%	0.3%	7.3%
Pest and diseases	Count	19	2	2	0	23
	% of Total	5.0%	0.5%	0.5%	0.0%	6.0%
Wild animals problem	Count	44	50	52	5	151
	% of Total	11.5%	13.1%	13.6%	1.3%	39.4%
Not applicable	Count	19	18	17	69	123
	% of Total	5.0%	4.7%	4.4%	18.0%	32.1%
Don't know	Count	15	17	12	18	62
	% of Total	3.9%	4.4%	3.1%	4.7%	16.2%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

9. Challenges and Opportunities

9.1 Challenges

While significant percentage of total produce is sold as seeds and grains (23% of sweet buckwheat and 18% of bitter buckwheat), the flour produced and sold by the households are extremely small in quantity (5% of sweet buckwheat flour and 4% of bitter buckwheat flour), making it a weak value chain across other actors.

Though there is 27.13% value addition for sweet buckwheat and 30.93% for bitter buckwheat grains sold at producer's level, the cost of production is high owing to high labour intake mainly for guarding the crop from wild animals (40% of total labour engaged each for both varieties) and costs for seeds (around 18% each for both varieties - though are reserved by producer themselves). The cost of production are also high owing to labour engagement for land preparation and for harvesting (18% and 21% of total labour intake respectively)

As post-harvest processing and marketing, maximum costs has incurred for grinding grain to convert to flour, using traditional grinders which is labour intensive (69% each for both varieties out of total labour engaged for processing and marketing).

Owing to small scale of production, the economic benefits to the households from buckwheat farming (monetising self-consumed and marketed) is very small at present (Nu. 9,058.81 for sweet buckwheat producers and Nu. 13,012.63 for bitter buckwheat producers per annum). The total economic benefits per acre of cultivated area for sweet buckwheat accounts for Nu. 24568, and for bitter buckwheat, it is Nu. 28377, which is not a significant amount when compared with cost of production per acre.

The study observed that despite the demand for buckwheat flour increasing in the retail markets domestically and despite the export of sweet buckwheat grain increasing over the years, the scale of production is small and area under cultivated is indicated to be decreasing over the years. The national statistics also shows decreasing area under harvest and decreasing production volume since 2011 till 2017 (8377 MT to 3480MT in 2017) and also decrease in yield (794 Kg / acre in 2011 to 598 Kg/ acre in 2017).

Except for one processing group and few retailers as vegetable vendors that sell buckwheat flour at Bumthang, the retail business is limited, though good numbers are available in Thimphu. Likewise, except for processor at Bumthang, that makes good quantity of flour as compared to other products, the processors are limited in numbers, to have backward linkage to boost scale of production at producer's level.

There are weak institutional linkages for spill over effect for exchange and sharing of knowledge on best practices. The market linkages are not well established wherein it is the buyers usually visiting the producers to buy grains or flour. The locational disadvantage owing to producers being in various Dzongkhags and very few processors at hand have added high transportation costs on the part of the processors.

Analysis from individual interview with producers revealed several challenges associated with buckwheat farming. Amongst all, crop destruction by wild animals remain significant for 78.5% households; labour shortage for 47.1% HHs; no markets for produce as mentioned by 31.1% HHs; and other problems as listed in the table 48.

Table 48: Challenges Associated with Buckwheat Farming as mentioned by Producers

Challenges	Count and %	Dzongkhags				Total
		Haa	B/thang	Trongsa	S/jongkhar	
Labour shortage	Count	65	29	32	51	177
	% of Total	17.3%	7.7%	8.5%	13.6%	47.1%
Marginal land holdings	Count	1	18	10	3	32
	% of Total	0.3%	4.8%	2.7%	0.8%	8.5%
Poor soil fertility	Count	3	1	0	2	6
	% of Total	0.8%	0.3%	0.0%	0.5%	1.6%
Pests, diseases and weeds	Count	47	5	3	11	66
	% of Total	12.5%	1.3%	0.8%	2.9%	17.6%
Damage by wild animals	Count	74	80	82	59	295
	% of Total	19.7%	21.3%	21.8%	15.7%	78.5%
Lack irrigation facilities	Count	10	0	0	0	10
	% of Total	2.7%	0.0%	0.0%	0.0%	2.7%
Insufficient seeds	Count	5	0	6	0	11
	% of Total	1.3%	0.0%	1.6%	0.0%	2.9%
No markets for the produce	Count	93	0	3	21	117
	% of Total	24.7%	0.0%	0.8%	5.6%	31.1%
Don't know	Count	1	0	1	9	11
	% of Total	0.3%	0.0%	0.3%	2.4%	2.9%
Total	Count	103	88	88	97	376
	% of Total	27.4%	23.4%	23.4%	25.8%	100.0%

Gathered from FGD, crop damage by wild animals was mostly mentioned as the major problem in buckwheat farming. For retailers in Bumthang and Samdrupjongkhar, the flour has to be kept for longer duration before end consumers buy it, as they reported having less numbers of end consumers. However, Thimphu retailers had no challenges in marketing buckwheat flour as the demand has been increasing. For processors, the challenge is meeting the demand for the flour with increasing demand from the retailers in Thimphu. The buckwheat group (processor) in Bumthang mentioned that there are no significant differences in marketing the products of both sweet and bitter buckwheat. Also, there are no problems in marketing the produce. Demands are high in the markets both within and outside the Dzongkhag.

9.2 Opportunities

The study shows that despite high cost of production, opportunity exists to increase value addition at producer's level for both varieties with measures to be supported and adopted to have slightly large scale farming with minimised labour intake for guarding, harvesting and grinding.

Though at present buckwheat is mostly cultivated for self-consumption, opportunity exists for increasing the scale of production with increasing trends in demand from retailers and with increasing quantity of export for sweet buckwheat that will ultimately increase the economic benefits to the households from more sales rather than just self-consumption.

Despite small scale of buckwheat flour and other products being marketed, the value addition at retailer's level (14.76% for sweet buckwheat and 8.46% for bitter buckwheat); at processor's level (18.28% for sweet buckwheat and 29% for bitter buckwheat); and at exporter level (36% for sweet buckwheat) shows that there is opportunity to enhance the value addition across all actors including the producers with increased scale of production.

Opportunities exists to organise few more numbers of processing groups across the country that can cater to the increasing demand of flour and grains from retailers and exporter and also have backward linkages with the producers who will be encouraged to increase the scale of production.

As the scale of production increases, opportunities also exists for the processors for product diversification through exposure and capacity building for making other products such as packed pancakes, noodles, pasta, mixed packed food with Quinoa, organic buckwheat cream, vegan buckwheat and husk pillow amongst others.

As National Flagship Program will identify pockets for organic buckwheat cultivation and will also support the producers with supply of seeds, opportunity exists for the producers to avail support from the program to produce organic buckwheat, which with Brand Bhutan will fetch higher margins to the producers.

10. Recommendations

10.1 Short-term Interventions

- As the study revealed that the economic benefits and value addition can be increased at all levels of actors across the chain with increased scale of production, there is need to make producers aware on the possibilities to increase value addition and economic benefits if scale of production is increased. To this effect, supports are required to minimise the cost of production at producer's level, mainly to minimise labour engagement for night guarding and harvesting by means of supporting electric fencing and small machineries for harvesting. At the same, as the productivity has been decreasing over the years, it is suggested that good quality seeds and organic fertilizers are supported; and knowledge on good practices for the cultivation are imparted to the producers.
- It is suggested to organise farmers into the buckwheat processing groups with measures to support with processing facilities and technologies (small processing units, packaging materials, technology on processing with machineries mainly for grinding to make flour and gunny bags for storage) and proper packaging of flour into packets of several sizes. With establishment of processing groups, it will slowly have backward linkage to the producers, encouraging increased scale of production and creating proper linkages with producers and retailers domestically.
- With support provided to increase the scale of production and establish few more numbers of processor groups, and as demand from retailers and exporter is increasing, suggestion is to bring together the processors, retailers and exporters so that formal market linkages are created. As only one exporter exports sweet buckwheat to Japan, exploration of other export markets and identification of more exporters will add value to buckwheat value chain.

10.2 Long-term Interventions

- Generally, groups of producers and processors lack basic knowledge on costing, concept of selling products in the markets, entrepreneurial skill and business knowledge. As long-term strategy, there is need to educate producer groups and processors on business skills, use of ICT for market linkages and entrepreneurship development so that they are able to understand market dynamics and business perspectives.
- Another long-term strategy is to explore market demand for other products in domestic and export markets and provide support to processing groups for products diversification as per the market demand.
- Research and development is suggested as long-term strategy to increase productivity with good varieties of seeds and to increase commercial production. Further research is also suggested to identify health benefits of buckwheat to expand domestic markets and penetrate into export markets.

11. ANNEXURE

Table 1: Count and Percent of the Respondents distributed by the Gewogs and the Dzongkhags

Gewogs	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
Samar	Count	31	0	0	0	31
	% of Total	8.1%	0.0%	0.0%	0.0%	8.1%
Gakiling	Count	26	0	0	0	26
	% of Total	6.8%	0.0%	0.0%	0.0%	6.8%
Sombay	Count	48	0	0	0	48
	% of Total	12.5%	0.0%	0.0%	0.0%	12.5%
Tang	Count	0	30	0	0	30
	% of Total	0.0%	7.8%	0.0%	0.0%	7.8%
Chhoekhor	Count	0	30	0	0	30
	% of Total	0.0%	7.8%	0.0%	0.0%	7.8%
Chume	Count	0	30	0	0	30
	% of Total	0.0%	7.8%	0.0%	0.0%	7.8%
Nubi	Count	0	0	30	0	30
	% of Total	0.0%	0.0%	7.8%	0.0%	7.8%
Dragteng	Count	0	0	31	0	31
	% of Total	0.0%	0.0%	8.1%	0.0%	8.1%
Korphu	Count	0	0	29	0	29
	% of Total	0.0%	0.0%	7.6%	0.0%	7.6%
Serthi	Count	0	0	0	34	34
	% of Total	0.0%	0.0%	0.0%	8.9%	8.9%
Lauri	Count	0	0	0	30	30
	% of Total	0.0%	0.0%	0.0%	7.8%	7.8%
Gomdar	Count	0	0	0	34	34
	% of Total	0.0%	0.0%	0.0%	8.9%	8.9%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

Table 2: Persons Regularly Involved in Agriculture by the Dzongkhags

Persons Involved	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
One person	Count	19	3	8	25	55
	% of Total	5.0%	0.8%	2.1%	6.5%	14.4%
Two persons	Count	64	34	32	40	170
	% of Total	16.7%	8.9%	8.4%	10.4%	44.4%
Three persons	Count	16	30	27	22	95
	% of Total	4.2%	7.8%	7.0%	5.7%	24.8%
Four persons	Count	5	16	17	11	49
	% of Total	1.3%	4.2%	4.4%	2.9%	12.8%
Five	Count	1	4	3	0	8

persons	% of Total	0.3%	1.0%	0.8%	0.0%	2.1%
> five persons	Count	0	3	3	0	6
	% of Total	0.0%	0.8%	0.8%	0.0%	1.6%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

Table 3: Women regularly involved in Buckwheat Farming by the Dzongkhags

Women Involved	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
One person	Count	75	43	43	67	228
	% of Total	19.6%	11.2%	11.2%	17.5%	59.5%
Two persons	Count	23	42	33	26	124
	% of Total	6.0%	11.0%	8.6%	6.8%	32.4%
Three persons	Count	2	5	12	2	21
	% of Total	0.5%	1.3%	3.1%	0.5%	5.5%
Four persons	Count	0	0	0	1	1
	% of Total	0.0%	0.0%	0.0%	0.3%	0.3%
None	Count	5	0	2	2	9
	% of Total	1.3%	0.0%	0.5%	0.5%	2.3%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

Table 4: Youths Regularly Involved in Buckwheat Farming

Youths Involved	Count and %	Dzongkhags				Total
		Haa	Bumthang	Trongsa	S/jongkhar	
One person	Count	11	9	5	7	32
	% of Total	2.9%	2.3%	1.3%	1.8%	8.4%
Two persons	Count	7	1	3	1	12
	% of Total	1.8%	0.3%	0.8%	0.3%	3.1%
None	Count	87	80	82	90	339
	% of Total	22.7%	20.9%	21.4%	23.5%	88.5%
Total	Count	105	90	90	98	383
	% of Total	27.4%	23.5%	23.5%	25.6%	100.0%

Table 5: Number of Persons regularly engaged in Buckwheat retail Business

Persons	Count and %	Dzongkhag				Total
		Bumthang	Trongsa	S/jongkhar	Thimphu	
One person	Count	4	1	4	8	17
	% of Total	13.8%	3.4%	13.8%	27.6%	58.6%
Two persons	Count	9	0	1	1	11
	% of Total	31.0%	0.0%	3.4%	3.4%	37.9%
Four persons	Count	0	0	0	1	1
	% of Total	0.0%	0.0%	0.0%	3.4%	3.4%
Total	Count	13	1	5	10	29
	% of Total	44.8%	3.4%	17.2%	34.5%	100.0%

Table 6: Number of Women regularly engaged in Buckwheat retail Business

Women	Count and %	Dzongkhag				Total
		Bumthang	Trongsa	S/jongkhar	Thimphu	
One person	Count	11	1	5	8	25
	% of Total	37.9%	3.4%	17.2%	27.6%	86.2%
Two persons	Count	2	0	0	1	3
	% of Total	6.9%	0.0%	0.0%	3.4%	10.3%
None	Count	0	0	0	1	1
	% of Total	0.0%	0.0%	0.0%	3.4%	3.4%
Total	Count	13	1	5	10	29
	% of Total	44.8%	3.4%	17.2%	34.5%	100.0%

Table 7: Number of Youths regularly engaged in Buckwheat retail Business

Youth	Count and %	Dzongkhag				Total
		Bumthang	Trongsa	S/jongkhar	Thimphu	
One person	Count	1	0	0	1	2
	% of Total	3.4%	0.0%	0.0%	3.4%	6.9%
Two persons	Count	0	0	0	1	1
	% of Total	0.0%	0.0%	0.0%	3.4%	3.4%
None	Count	12	1	5	8	26
	% of Total	41.4%	3.4%	17.2%	27.6%	89.7%
Total	Count	13	1	5	10	29
	% of Total	44.8%	3.4%	17.2%	34.5%	100.0%

Funded by Food Security & Agriculture Productivity Project (Work Bank)