



Status of Field Crops Diversity in Dewathang & Orong Gewogs

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About SJI

The Samdrup Jongkhar Initiative (SJI) is a community-based organization that operates under the auspices of the Lhomon Society; a registered Civil Society Organization (CSO) in Bhutan. SJI promotes the principles of Gross National Happiness (GNH) in harmony with Government goals at a grassroots level. SJI upholds trust and confidence, valuing and enhancing local potential through partnership with local government and government institutions.

1. Organic Agriculture

We work for a wholly organic agriculture by rescuing traditional practices and enhancing best organic agriculture practices through training, awareness raising and expert support to the local community.

2. Zero Waste

We work for a behavioral change in relation to waste management by introducing and cultivating awareness on sustainable practices. We aim at zero waste society by reducing waste at the source.

3. Menchari GNH Model Village

We work to build genuine GNH villages by implementing the holistic and sustainable practices that constitute the core of SJI in two initial projects: the currently isolated and destitute community of Menchari, Samdrup Jongkhar district, and a new SJI|GNH Village to accommodate SJI's central office, current and projected activities.

4. Lhomon Education

We work for an authentic GNH-based education by developing exploratory thematic units at Chokyi Gyatso Institute, some of which are mindfulness and value-based education that can be replicated nationwide. We work for an education that empowers and reverse contemporary knowledge and traditional wisdom by embedding self-reflexive education components in our initiatives.

5. Youth Engagement

We actively work to provide training and local opportunities for youth by introducing and supporting initiatives that enhance self-confidence and entrepreneurship, thus empowering new generations to find purpose and dignity in labor.

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1. Introduction

Agro-biodiversity continues to serve as the source of livelihood for local communities in the different agro-ecosystems such as the dry lands, high elevation areas and low-lying humid tropical areas (Martini, *et al.*, 2008). In Bhutan where subsistence farming is still dominant, agro-biodiversity plays a pivotal role for meeting household food security and poverty alleviation (Katwal, *et al.*, 2015). In the Bhutanese self-sustaining, integrated and subsistence agricultural production system, agro-biodiversity is the cornerstone for household food security and livelihood. Bhutanese farmers continue to cultivate many traditional crops and varieties and preserve their seeds using their own seed selection criteria which help in the conservation of on-farm agro-biodiversity.

Generally, Bhutanese farming system and diet is dominated by nine important cereals (*Dru-na-gu*) which are the main source of energy and nutrition (NBC, 2016). The nine different cereals or *Dru-na-gu* are also essential for religious rituals (*rimdos*) and annual religious ceremony (*loche*) that are integral part of the culture and tradition of the Bhutanese people (Lhendup, 2008).

Considering the important role of on-farm agro-biodiversity, GEF-UNDP Small Grants Programme, Bhutan has funded the Samdrupjongkhar Initiative (SJI) in 2016 for three year project to assess and document baseline data of local agrobiodiversity, empower community and farmers' capacity to conserve and sustainable use of local agrobiodiversity.

In this document the status of field crops diversity, crop production issues and challenges faced by farmers are summarized in this report. Further, some of the interventions initiated and challenge faced by the SJI for crop rehabilitation, conservation and utilization programs are also discussed.

1.1 Objectives of the Study

- i. To document and understand the status of field crops diversity in Dewathang and Orong Gewogs.
- ii. To understand the challenges faced by the farming communities in crop production.
- iii. To source and promote relevant interventions to address challenges faced by farmers in crop production and conservation.

1.2 Study Method

For this study we collected the primary data through farmers of different villages using structured questionnaire. From 310 households in two Gewogs, we surveyed sample of 131 households. Secondary data was sourced from different reports of the Department of Agriculture (DoA). Data collected through the survey was analyzed using Microsoft Excel 2013.

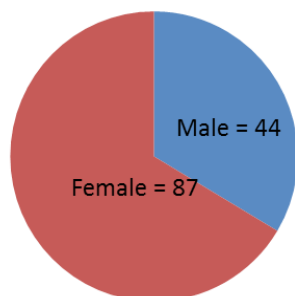
1.3 Demographic profile of Study Site

There are 870 households in Dewathang and Orong Gewogs and from the total households 131 households were surveyed for this study. The numbers of households surveyed in each Chewogs are presented in Table 1. Of the total 131 respondents 87 were female and 44 by male (Fig.1)

Table 1. Number of Respondents by Gewog and Chewogs

Gewogs	Chewogs	Number of Respondents
Dewathang	Bangtsho	13
	Martang	24
	Domphu	14
	Rekhey	23
Orong	Mencheri	17
	Philuma	40
Total		131

Fig. 1. Number of Male and Female respondents (N= 131)



2. Status of Field Crops Diversity in Dewathang and Orong Gewogs

Dewathang and Orong Gewogs largely fall under the dry and wet sub-tropical agro-ecology. Farmers of two Gewogs have grown different cereals crops since time immemorial. The concept of *Drun-na-gu* (nine cereals) is part of Bhutanese culture and tradition. Traditional crops and varieties have been selected and sustainability preserved by farmers to meet their needs. The major field crops cultivated in the two Gewogs are rice, maize, wheat, barley, buckwheat, millets, oilseeds, grain legumes and some underutilized crops species. Farmers mostly practice subsistence farming and continue to grow different crops and varieties in their farms to meet their household food security and livelihood. To understand the extent of cultivation of the field crops, number of households cultivating the field crops 20 years before and now was compared to see the percent change in crop diversity. The data indicates that except for maize, the extent of cultivation of field crops has declined (Table 2). The overall decline in cultivation of field crops compared to 20 years before is 27%. The highest percentage of households who have discontinued the cultivation is for wheat and barley.

Table 2. Extent of cultivation of field crops cultivation 20 years before and now, 2017

Crops	Local terms (Sharchop) for crops	Number of farmers cultivating major Field Crops		Percent Change
		Before 20 Years (N=131)	Now (N=131)	
Rice	<i>Bara</i>	83	32	61
Maize	<i>Ashom</i>	112	122	-9
Wheat	<i>Bong</i>	25	3	88
Barley	<i>Femong</i>	26	7	73
Buckwheat (Bitter & Sweet)	<i>Khala/Brema/ Guntshung</i>	86	49	43
Millet	<i>Kongpu</i>	98	66	33
Oil seeds	<i>Memboo</i>	87	38	56
Under Utilized Crops (Amaranth)	<i>Lhasamo</i>	109	105	4
Grain Legumes	<i>Oray</i>	130	129	1
Total		756	551	27

Amongst the field crops, maize and rice are the main crops cultivated by the farming communities of these two Gewogs. Maximum numbers of households cultivate maize for their own consumption. The main reasons for the increase in the number of households cultivating maize are attributable to maize being a staple food, its good adaptation in the dry land rainfed farming system of both the Gewogs, and availability of seed of good varieties promoted by the Department of Agriculture (DoA) of Bhutan.

Rice is also the main staple in some Chewogs of Dewathang and Orong Gewogs. This study found that farmers cultivate irrigated rice and upland rice. This study showed that the household cultivating rice in the Dewathang and Orong Gewogs have decreased by 61 % over the past twenty years.



Upland rice referred locally as (Sh)Pangbara is a slowly declining in the Gewogs. Currently there are three varieties of Upland rice varieties cultivated by the farmers which are Sambara, Zerbar and Khetsala bar. The reasons for decline of upland rice cultivation are attributed to legislation on the banning of Tsheri (slash and burn system) wild animals attack and labour shortage.

Bong (Wheat) is one of the components of *dru-na-gu*. Wheat flour is used for making *tormas* (idols or images of local deities). Cultivation of this crop is drastically declined mainly due to lack of farm labour. The extent of *Phemong* (barley) cultivation has also significantly declined. According to the farmers, such decline is attributed to the change in the food consumption pattern as rice is preferred over wheat and barley.

Farmers cultivate sweet and bitter buckwheat. Sweet buckwheat is called *Brema* (sh) or *Guntshung* (sh) while bitter buckwheat is called *Khala*(sh). Buckwheat is consumed in the form of cooked *Bokpe* (dough) and *Putu* (noodles).

Amongst the oilseed crops, *Memba* (mustard) is most popular. Farmers of Dewathang and Orong Gewogs grow two types of mustards locally known as *Memba serbu* (yellow seed color) and *Memba tshalu* (red seed colour). Mustards are mainly grown by

the farming communities for the extraction of oil for the household consumptions. Mustard is the major source cooking oil. According to the respondents, the primary challenge faced for mustard cultivation is the lack of suitable oil expellers.

Different types of millets are cultivated by the farmers. The finger millets are commonly called as *Kongpu(Sh)*. Millets are grown to meet the supplementary dietary requirements. It is consumed in the form of cooked dough made from its flour. It is also used for brewing Bangchang and Ara (local alcoholic drinks) .



Comparing to other cereals, majority of the farmers continue to cultivate this crop in remote areas and in marginal lands. There are two types of finger millet grown by farmers in Dewathang and Orong. They are compact and loose type. According to the respondents, these millets are less prone to damage by wild the animals and infestation by pest and diseases.

Yangra (Fox-tail millet) literally means the essence of prosperity or being precious. This is because foxtail millet is ready for harvest during the food lean season. Some varieties of this crop helps to address household food needs during the lean season. Farming communities of Dewathang and Orong Gewogs cultivate five varieties of foxtail millet, namely Khang Yangra, Danishampi Yangra, Rongshong Yangra, Yangra Changlu and Pusoktang/Busum Yangra. This study revealed that cultivation of all five varieties has declined compared to the past twenty years.

The Little Millet or Common Millet is quite a popular crop in the study site named as *Chera*. Two varieties of little millet cultivated are *Chera Balingbu* and *Chera Tshalu*. Farmers grow little millet mainly for household consumption and according to their local belief, the little millet is bad to make offering during religious ceremony and other special events.

Amaranths-There are two types of amaranth varieties grown by the farming communities which are *Lhasomo* and *Sharang mo*. Lhasamo are of two types, *Lhasmo Tsalu* and Lhasamo Balingbu (red and white varieties). Amaranth is grown in very small quantities in small patches of land by almost all the household. It is consumed in the form roasted snacks with tea. It is also used for making local brews called *Changkoey/Nagpa*.



Grain Legumes- Different types of grain legumes and pulses are cultivated by the farming communities of Dewathang and Orong Gewogs. Grain legumes are mostly grown on dryland, however, it can be grown

in wetland and kitchen gardens. Most farmers grow traditional varieties and maintain their own seeds. Farmers mentioned that they cultivate grain legumes for food, as source of income, and for maintaining soil fertility. Compared to other cereals, there is also very little change in the extent of grain legume cultivation 20 years before and now (Table 2). Traditional varieties of beans are listed in Table 4. Brokchey oray is the most common beans grown by the farmers in the locality while Ngangshing ore is the least cultivated variety.

Beside the beans, farmers also cultivate pulses. The pulses cultivated are mostly the varieties of *Vigna* species which are locally known as Gagpu Changlu, Gagpu Tshalu, Gagpu Yanglu and Gagpu Singay. In addition, farmers also grow Soybean and Peas in small areas. Soybean is grown to make traditional fermented soya cheese.

Table 3. Varieties of rice, maize, millets and amaranth cultivated at the study site

Varieties ↓	Crops							
	Rice	Maize	Wheat &Barley	Foxtail Millet	Little Millet	Buckwheat	Oilseed	Amaranth
	Sam Bara	Yangtsepa Ashom	Bong	Khang Yangra	Chera Balingbu	Brema/ Guntshung	Memba Serbu	Sharang Mo
	Zerbara	Betpai Ashom	Phemong	Dani Shampi Yangra	Chera Tshalu	Khalla	Memba Tshalu	Lhasa Mo Tshalu
	Khetshala Bara	Barma Ashom		Rongshong Yangra				Lhasamo Balingbu
	Bhur Kamja	Baipo Ashom		Yangra Changlu				
	Khangma Maap	Zetpo Ashom		Pusoktang Yangra/Busung				
		Baipo-zetpo Ashom		Ngera Yangra				

Table 4 . Types and traditional varieties of grain legumes.

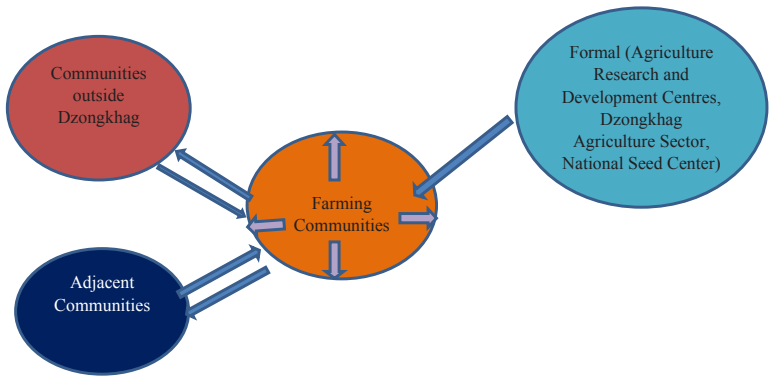
Type	Local variety Name
Climber	Brok`chey oray, Ngangshing oray, Martshala oray, Pengkulung oray, Wangchelingpa oray. Pheshanpu oray, Ney-nga oray, Jog oray
Dwarf	Choktor oray and Brokchey oray

Other less popular or underutilized crop popularly cultivated by the communities are *Perilla* or locally known as known as Nam. Unlike other crops, Nam is adapted to various elevation and climatic conditions. It is used as ingredient to prepare traditional Bhutanese tea and Ezey (Pickle). There are two types of *Perilla*, namely Nam balungbin (white perilla) and Nam changlu (black perilla).

3. Seed Flow Pathways at the Study Sites

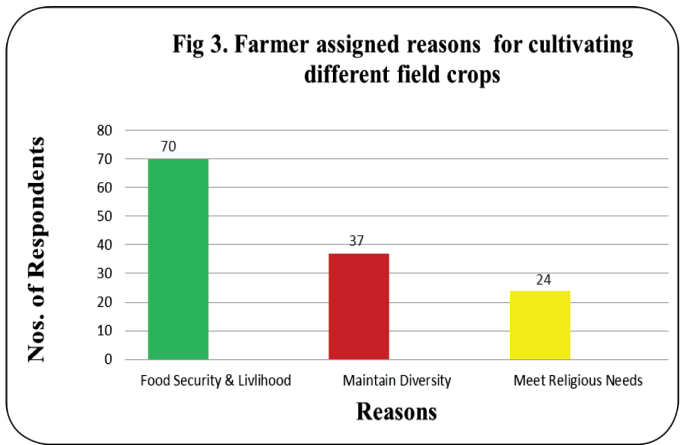
The community has a well-established and sustainable seed system. The seed requirement of the community for all field crops is met through their traditional seed system. The seed flow pathways of the community is presented in Fig. 2.

Fig 2 . Seed flow diagram prepared by respondents



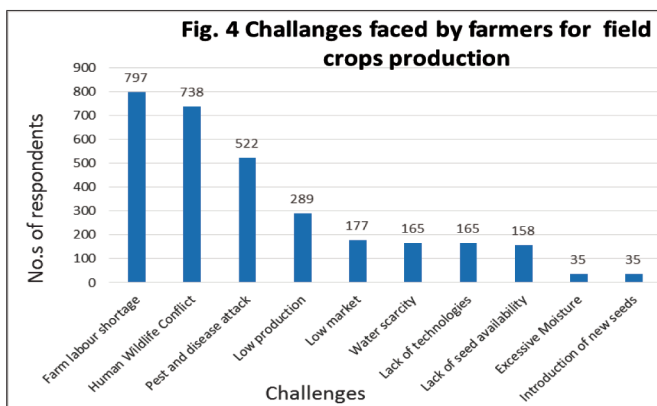
4. Reason for cultivating different Crops

Farmers cultivate different field crops for three main purposes which are: to meet their household food security; to cope against crop failures through on-farm crop diversity and, to meet their religious and cultural needs (Fig. 3).



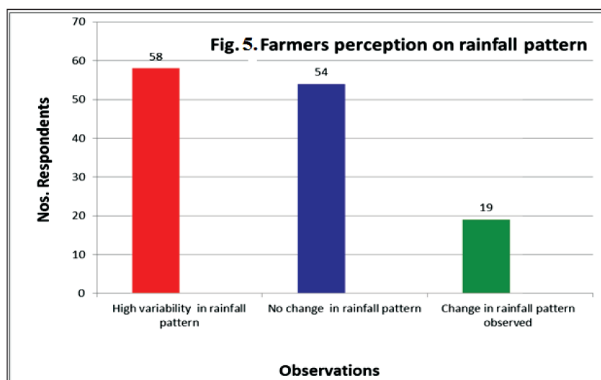
5. Challenges faced by Farmers in Field Crops Cultivation

During this study respondents were asked to list and rank crop production challenges faced by them for individual crop. The challenges were ranked based on the frequency for all crops. The three most pressing production constraints are shortage of farm labour, human wild life conflict and pest and disease infestations (Fig. 4)



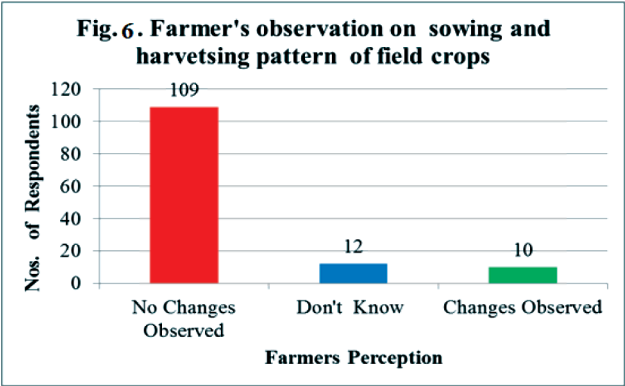
6. Farmers Perceptions on Local Climate

During the survey respondents were asked their perception of climate change. Farmers considered rainfall as the most important parameter of climate which affects their livelihood. About 58% of the respondents felt that rainfall pattern was uncertain while 54% felt that there was no change (Fig.5).



Farmers' Perception on Changes in Sowing and Harvesting of Field Crops

Time of sowing and harvesting are good indicators of change in micro-climate. To assess farmer's perception on the change in climate at the local level, farmers were asked if they observed the change in sowing and harvesting dates of field crops. Majority of the respondents reported that they did not observe the change in sowing and harvesting dates of field crops in their locality (Fig. 6)



Interventions and Achievements for Rehabilitation of Cereal Crops and Varieties by SJI

The work on rehabilitation of traditional crops and varieties was conceptualized in 2012. The rehabilitation of traditional crops was first started with six lead farmers in Dewathang Gewog. In 2012, project



formulation team from the International Fund for Agriculture Development (IFAD) visited SJI office and recommended SJI to collaborate with the Agriculture Research and Development Center (ARDC) Wengkhar for the development and rehabilitation works on Field Crops. Following this visit SJI started collaboration with relevant government institutions.

In 2015, SJI approached the Global Environmental Facility (GEF), UNDP, Bhutan, and submitted a project proposal on the rehabilitation of traditional crops and varieties. Based on the project proposal, GEF provided the funding support from 2016.

Some of the important interventions on crop rehabilitation and development initiated by SJI are:

- i. Conducted first stakeholder consultation meeting engaging 93 farmers from Dewathang and Orong Gewogs, officials from the National Biodiversity Center (NBC), Agriculture Research and Development Center (ARDC), Wengkhar, Dzongkhag Agriculture Sector and Navdanya (an Indian Non- Governmental Organization working on seed sovereignty) to create awareness and advocacy on agro-biodiversity conservation for food security.
- ii. Training of 16 lead farmers on Good Agricultural Practices and Organic Farming with support from ARDC Wengkhar and CARLEP Project.
- iii. Two rounds of advocacy and awareness on importance of agro-biodiversity conservation and utilization in the two Gewogs were done. This was later extended to Gomdar Gewog.
- iv. Initiated land development to start rice cultivation using Systems Rice Intensification (SRI) on 24 acres of fallow land at Lauri Gewog with fund support of Austrian Coordination Office. The interventions included development of water tank, solar fencing and land terracing.

- v. Initiated land management at Philuma Chewog for improving soil conservation and soil fertility management. This work was supported by Orong Gewog Administration.
- vi. Seeds of different rice varieties and Quinoa was sourced from ARDC Wengkhar by SJI and distributed to interested farmers
- vii. Established market outlets for sale of traditional cereals at Samdrupjongkhar Thromde. The space has been supported by Samdrupjongkhar Thromde at 50% rental discount.
- viii. Conducted study visit for 12 farmers of two Gewogs to NBC, Gomdar Community Seed Banks, Phuntshothang Community Seed Bank, Buli Community Seed Bank and other relevant agencies with fund support of GEF Small Grant Project.
- ix. As a part of capacity building, three SJI staff and two farmers visited the local community based crop rehabilitation programs in Nepal.
- x. Constructed community seed bank at Dewathang to facilitate seed storage, exchange and distribution.
- xi. Formed seed keepers and seed growers group from two Gewogs. This group has 37 members.
- xii. Trained 398 farmers on Organic seed production on vegetables and cereals, composting, and preparation and application of bio-pesticide with technical support from Navdanya.
- xiii. Trained 15 female farmers on product development and diversification of traditional crops with fund support from GEF. The technical support for this was provided by the regional office of the National Post Harvest Center, Pemagatshel.

7. Lessons Learnt and Way Forward

SJI is the first non-governmental initiative on community based on-farm conservation in Bhutan. This study and field experiences has revealed that on-farm field crops diversity continues to play an important role for ensuring household food security and livelihood. Growing of different crops and varieties that can adapt well under marginal environment continues to be the only sustainable coping strategy of farmers against potential risks of crop failures. The findings revealed that except for maize, the extent of cultivation of traditional crops and varieties have declined over the past 20 years. The report also revealed that the farmer's awareness and understanding on the potential impacts of climate change on agriculture is very poor.

8. Some of the important challenges for In-situ conservation are;

- i. Making conservation programs and actions more sustainable and remunerative to farmers
- ii. Low yield of traditional crops make farmers vulnerable to crop displacement by improved varieties and commercial crops
- iii. Value addition and marketing of traditional crops and their products for income generation needs to be developed and up-scaled
- iv. Managing pest and diseases in a sustainable manner without the use of agro-chemicals
- v. Declining interest of youth in farming that causes increasing shortage of farm labour
- vi. Limited fund and technical capacity to up-scale in-situ conservation programs
- vii. Limited understanding of communities on the value of on-farm agro-biodiversity
- viii. Inability to link agro- biodiversity to other important

enterprises like agro-tourism, organic production

- ix. Crops damage by wild animals and birds when programs are started with few farmers
- x. Mainstreaming the CSO lead program on agro-biodiversity with government agencies for recognition and support.

9. Way Forward

- i. Focus on product development, diversification and marketing to sustain farmers livelihood through income generation
- ii. Explore and promote labour saving devices to address women farmers' drudgery in cultivating and managing different crops
- iii. Focusing interventions on women farmers who are the real custodians of seed
- xi. Develop and support youth focused enterprises that promotes On-farm agro-biodiversity conservation and utilization by linking agro- biodiversity to other important enterprises like agro-tourism, organic seed production and production of organic fertilizers
- iv. Develop more participatory and voluntary approaches for agro-biodiversity conservation through a long term community visioning and participation
- v. Mainstream the community based agro-biodiversity programs with the National Bio-diversity Center, Dzongkhag Agriculture Sector and Research and Development Centers for technical support
- vi. Focus on Organic Seed production and sale to contribute to the national organic agenda
- vii. Initiate proper documentation, explore and scope further fund support to upscale the community led initiatives on In-situ conservation.

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