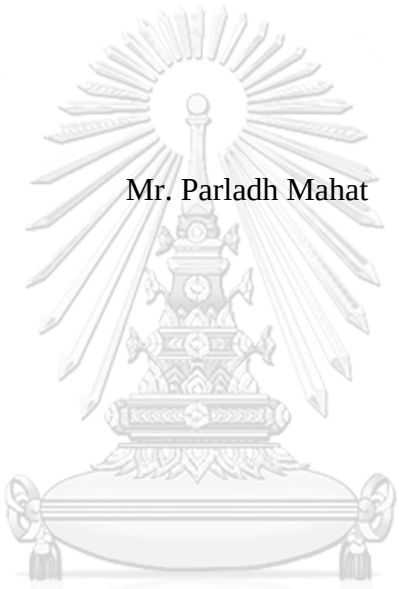
DRIVERS AND CONSTRAINTS OF CONVERSION TO ORGANIC FARMING IN THE KINGDOM OF BHUTAN

Mr. Parladh Mahat



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ปัจจัยการขับเคลื่อนและข้อจำกัดในการปรับเปลี่ยนไปสู่เกษตรอินทรีย์ของราชอาณาจักรภูฏาน

นายพาลัดห์ มหัต

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต
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Thesis Title	DRIVERS AND CONSTRAINTS OF CONVERSION TO ORGANIC FARMING IN THE KINGDOM OF BHUTAN
By	Mr. Parladh Mahat
Field of Study	Environment Development and Sustainability
Thesis Advisor	Sayamol Charoenratana, Ph.D.
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พาลัดห์ มหัต : ปัจจัยการขับเคลื่อนและข้อจำกัดในการปรับเปลี่ยนไปสู่เกษตรอินทรีย์ของราชอาณาจักรภูฏาน (DRIVERS AND CONSTRAINTS OF CONVERSION TO ORGANIC FARMING IN THE KINGDOM OF BHUTAN) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: ดร. ศยามล เจริญรัตน์, อ.ที่ปรึกษาวิทยานิพนธ์ร่วม: อ. ดร. ธัญศิภรณ์ จันทร์หอม, 115 หน้า.

เกษตรอินทรีย์นับเป็นหนึ่งในกระบวนการของระบบเกษตรกรรมที่มุ่งเน้นการอนุรักษ์สิ่งแวดล้อมเพื่อเพิ่มผลผลิตทางการเษตร เพิ่มรายได้ครัวเรือนของเกษตรกรรายย่อย ขจัดความยากจนและส่งเสริมความเป็นอยู่ที่ดีงานวิจัยนี้มีวัตถุประสงค์เพื่อศึกษาปัจจัยผลักดัน และข้อจำกัดของการเปลี่ยนจากการเพาะปลูกแบบเกษตรอินทรีย์ในครัวเรือนทั้งที่ได้รับการรับรอง และไม่ได้รับการรับรองให้เป็นการทำเกษตรกรรมในระบบเกษตรอินทรีย์ และเพื่อจัดทำข้อเสนอแนะเชิงนโยบายให้แก่ภาครัฐบาล และหน่วยงานอื่นๆ ที่เกี่ยวข้อง งานวิจัยนี้ได้ดำเนินการสำรวจความคิดเห็นโดยใช้แบบสอบถามของกลุ่มเกษตรกรรายย่อย จำนวน 146 คน ซึ่งแบ่งเป็นเกษตรกรที่การเพาะปลูกได้รับการรับรองเป็นเกษตรอินทรีย์ จำนวน 47 คน และเกษตรกรที่การเพาะปลูกยังไม่ได้รับการรับรองให้เป็นเกษตรอินทรีย์ จำนวน 99 คน ที่เมืองกาซา ประเทศภูฏาน ในเดือนตุลาคม พ.ศ. 2560 ข้อมูลจากการสำรวจความคิดเห็นถูกนำไปวิเคราะห์ทางสถิติพรรณนา และการจัดลำดับความสำคัญในทัศนคติของกลุ่มประชากรต่อปัจจัยผลักดัน และข้อจำกัดของการเปลี่ยนเป็นระบบเกษตรอินทรีย์ ผลการศึกษาแสดงให้เห็นว่า กลุ่มเกษตรกรที่การเพาะปลูกได้รับการรับรอง และไม่ได้รับการรับรองให้เป็นเกษตรอินทรีย์ต่างแสดงความคิดเห็นว่า ความตื่นตัวทางสิ่งแวดล้อม ประโยชน์ต่อสุขภาพ ประโยชน์ทางเศรษฐกิจและการจ้างงาน และประโยชน์ด้านการศึกษา เป็นปัจจัยที่ผลักดันให้เกิดการเปลี่ยนเป็นระบบเกษตรอินทรีย์ ในขณะที่ปัญหาผลิตภาพการผลิตต่ำ ปัจจัยทางการตลาด การศึกษา การวิจัย เศรษฐกิจ และการเงิน จัดเป็นข้อจำกัดต่อการเปลี่ยนระบบเกษตรกรรมเป็นเกษตรอินทรีย์ ด้วยเหตุนี้หน่วยงานภาครัฐของรัฐบาลประเทศภูฏาน หน่วยงานภาคอื่น ๆ ที่เกี่ยวข้อง และกลุ่มเกษตรกรจึงมีบทบาทสำคัญต่อการเปลี่ยนระบบเกษตรกรรมของประเทศให้เป็นเกษตรอินทรีย์ โดยรัฐบาลควรดำเนินการให้ข้อมูลเกี่ยวกับระบบเกษตรอินทรีย์ ให้การรับรองผลิตภัณฑ์ พร้อมพัฒนาศักยภาพการเพาะปลูกของกลุ่มเกษตรกรที่ยังไม่ได้การรับรองให้เป็นเกษตรอินทรีย์ และดำเนินการสร้างความร่วมมือ และสนับนสนุนการวิจัยและพัฒนา สร้างการขยายตัวของตลาดในการรองรับผลผลิต การสนับสนุนเชิงนโยบาย และการพัฒนาระบบสาธารณูปโภคพื้นฐานที่เกี่ยวข้องกับระบบเกษตรอินทรีย์ให้แก่กลุ่มเกษตรกรที่ได้รับการรับรอง ในขณะที่หน่วยงานอื่นๆ ที่เกี่ยวข้องควรสนับสนุนการเปลี่ยนระบบเกษตรกรรมของกลุ่มเกษตรกรที่ยังไม่ได้รับการรับรองให้เป็นเกษตรอินทรีย์ โดยดำเนินการสนับสนุนด้านการศึกษา การฝึกอบรม และสร้างความร่วมมือกับหน่วยงานวิจัยต่างๆ ที่ดำเนินการวิจัย และพัฒนาโครงการระบบเกษตรอินทรีย์ นอกจากนั้นการให้ความสำคัญกับการพัฒนาให้เกษตรกรที่ไม่ได้รับรองให้เป็นเกษตรอินทรีย์ โดยการรวมกลุ่มเกษตรกร การสร้างความร่วมมือและจัดตั้งกลุ่มสมาคมเกษตรกรเพื่อร่วมกันดำเนินการในส่วนที่เกี่ยวข้องกับระบบเกษตรอินทรีย์ ในขณะที่กลุ่มเกษตรกรที่ได้รับการรองรับให้เป็นเกษตรอินทรีย์ควรดำเนินการเพิ่มความหลากหลายของผลิตภัณฑ์จากระบบเกษตรอินทรีย์ ดำเนินการเพาะปลูกด้วยกระบวนการทางเกษตรอินทรย์ที่มีความเหมาะสม อีกทั้งยังสามารถเข้ารับการอบรมระยะสั้นที่เกี่ยวข้องกับระบบเกษตรอินทรีย์เพิ่มเติมได้อีกด้วย

สาขาวิชา สิ่งแวดล้อม การพัฒนา และความยั่งยืน ลายมือชื่อนิสิต .....

ปีการศึกษา 2560 ลายมือชื่อ อ.ที่ปรึกษาหลัก .....

ลายมือชื่อ อ.ที่ปรึกษาร่วม .....

5987553320 : MAJOR ENVIRONMENT DEVELOPMENT AND SUSTAINABILITY
KEYWORDS: ORGANIC / FARMING / SMALL SCALE FARMERS / CONSTRAINTS / GASA / BHUTAN

PARLADH MAHAT: DRIVERS AND CONSTRAINTS OF CONVERSION TO ORGANIC FARMING IN THE KINGDOM OF BHUTAN. ADVISOR: SAYAMOL CHAROENRATANA, Ph.D., CO-ADVISOR: TANSIPHORN JANHOM, Ph.D., 115 pp.

Organic farming is one of the several approaches towards environmental conservation and aims to increase agricultural production and household income for small-scale farmers to enable them to come out of poverty and improve livelihood. The objective is to investigate the key drivers and constraints in conversion to organic farming for domestic organic certified and non-certified but organic farmers and provide policy recommendation to government and relevant agency. The survey data of 146 respondents comprising of certified organic (n=47) and non-certified (n=99) were collected from Gasa district of Bhutan during the month of October 2017. The data analysis includes the use of descriptive statistics and the study recognize the drivers and constraints in conversion to organic farming according to the ranked order of importance by the farmers.The respondents were also asked to prioritize the factors, drivers and constraints for organic practices. The result suggests that both the certified and non-certified but organic farmers has identified environmental awareness, health benefits, economic benefits, education and employment benefits as the predominant drivers for organic production. The constraints experienced by both the groups include low productivity, market aspects, education and research aspects and economic and financial aspects. To promote organic farming the Bhutanese government, non-governmental organization and farmers has significant role to play. The government should support non-certified farmers through information and awareness, product certification, capacity building and formation of groups and cooperatives and support the certified farmers through research & development, market intensification, policy support and infrastructure development. The non-governmental organization should support non-certified farmers through adult education, training program and input supply and certified farmers through implementation of projects, agricultural shows and provide linkages with research institutions. The non-certified farmers are highly recommended to form groups, cooperatives and associations, self-organize in terms of farm machineries and tools and labors and carry out off farm activities. The certified farmers should diversify products, choose better cropping practices and techniques and attend short-term courses.

Field of Study:	Environment Development and Sustainability	Student's Signature	.....
		Advisor's Signature	.....
Academic Year:	2017	Co-Advisor's Signature	.....

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LIST OF ABBREVIATIONS

ADAO	Assistant District Agriculture Officer
AEO	Agriculture Extension Agent
BAFRA	Bhutan Agriculture Food Regulatory Authority
BAOWE	Bhutan Association of Women Entrepreneurs
BDBL	Bhutan Development Bank Limited
BOCS	Bhutan Organic Certification System
CA	Conventional Agriculture
CF	Conventional Farming
EPA	Environmental Protection Agency
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GMO	Genetically Modified Organism
GOI	Government of India
GNHC	Gross National Happiness Commission
GRF	Government Reserve Forest
IFOAM	International Federation of Organic Agriculture Movements
IPM	Integrated Pest Management
MOAF	Ministry of Agriculture and Forest
NFOFB	National Framework for Organic Farming Bhutan
NOP	National Organic Program

NSB	National Statistical Bureau
OF	Organic Farming
REDCL	Rural Enterprise Development Corporation Limited
RNR	Renewal Natural Resource

CHAPTER I
INTRODUCTION

1.1 Background and Important of the study

Bhutan is an agrarian country where majority (56.7%) of its population are dependent on agriculture for livelihood and agriculture contributes 16.77 % of the total economy by Gross Domestic Product (NSB, 2016). The country has only about 2.93% of the total cultivable land and majority (70.46%) is under forest cover (Tenzin, n.d). Agriculture is largely traditional in nature and farmers has small land holding of an average 0.8 hectares per capita per person and is constrained by factors such as rugged terrain, steep slopes and low farm mechanization, low production and low inputs (Tobgay, 2005). Other challenges include land fragmentation, human-wild life conflicts, labor shortages, poor water management technologies and 'open burning'.

The government has given top priority for the agricultural development in terms of policy and financial support since the start of first Five Year Plan in 1960's. The research centers were established in five strategic locations and RNR centers in Blocks to support the farmers through research and development and by providing technical backstop. The government has been supporting farmers in the form of supply of free or subsidized seeds and seedlings, farm machineries and tools, irrigations schemes and technical support. Further, in the Seventh plan (1992-1997), the government adapted policies towards "Sustainable Development and Environmental Conservation"(GNHC, upload 2017) and Integrated Pest Management strategy was adapted to reduce the use, safe handling and imports of pesticides (Tenzin, n.d). All this support contributes towards agricultural development in the country and to reduce human drudgery in agriculture.

The agriculture practice in the country is divided into four groups such as traditional farming, conventional farming, and non-certified organic farming and domestically certified organic farming. The traditional farming involves the use of intensive indigenous knowledge and natural resources, neglects the use of agro-

chemicals and is very similar to organic practices. Organic farming (OF) involves farming without using ‘synthetic agro-chemicals’ and involves no international organic certification but operated in compliance with organic principles. The domestic organic certification involves local certification by Bhutan Agriculture and Food Regulatory Authority (BAFRA) under the Ministry of Agriculture and Forest (MOAF). While, the conventional farming (CF) involves the use of chemical fertilizers and pesticides and the use of food additives and growth hormones.

In traditional farming, farmers mainly raise livestock with agriculture and practices hunting and gathering of food (wild collections). Animals are raise for manure, tillage and dairy products and human power are used for field preparations such as ploughing, harvesting and transportation. Traditional agriculture also involves ‘shifting cultivation’ and ‘open burning’ and is not a reliable source of farming due to low productivity (Kinley, 2017).

This study provides insight into the drivers and constraints for conversion to organic farming (OF) between the domestic organic certified and non-certified but organic farmers and this is important because it helps us to identify the key motivating factors and challenges of the farmers and provide appropriate policy measures to promote organic farming (OF) in future. In order to meet the demand of growing population, the government is compelled to introduce new crop varieties, fruits plants as well as improve the local varieties through cross breeding that are resilience against harsh weather and outbreak of pests and diseases.

In the process of transaction to modern agriculture the Ministry of Agriculture (MOA) has imported and distributed chemical fertilizers and insecticides, seeds, farm machineries and tools and provided irrigation schemes either free off costs or at subsidized rate to increase income, poverty reduction and environmental conservation (Kobayashi, Chhetri, & Fukamachi, 2015). When the use of agro-chemicals were in rise the government declared to the world of going fully organic in Rio+20 submit in 2012 (Redaktion., 2012). This is due to several negative consequences of conventional agriculture (CA) such as loss of biodiversity, increase pollutions (air, water & soil), soil degradation and falling of yields, low income for farmers, health and environment

concerns (NFOFB, 2007). However, the statistic shows that only 2.24% of the households in the country apply plant protection chemicals and the majority (97.76%) of the households do not use. The limited use is due to unavailability of the chemicals, unaffordable and because they are aware of the benefits of organic farming (RNR statistic, 2013).

Organic farming not only produces organic food but also protect the natural environment, promotes better health, increase income for small-scale farmers and contribute towards sustainable development. OF improves soil fertility due to use of organic matters such as manure, composts, dung and green leaf and better cropping practices (inter cropping and mix cropping) and not necessarily by use of external inputs. OF in general avoids the use of synthetic agro-chemicals, 'growth regulators', 'livestock feed additives', and rely on locally available resources as well as 'biological control of pests and diseases' (NFOFB, 2007)

To boost OF, the royal government initiated several acts and policies under the Ministry of Agriculture and Forest (MOAF). Out of several policies and acts, the National Framework for Organic Farming Bhutan (NFOFB), 2007 and National Organic Program (NOP), 2007 are first step towards OF development. Despite policy and acts, the growth of organic farming is gradual and the country has less than 10% of the land under OF production (Neuhoff, Tashi, Rahmann, & Denich, 2014). The gradual growth is attributed to lack of technical support (Lampkin, 1990), early stages of research and development (Neuhoff et al., 2014) and lack of fund to support OF development.

The then Prime Minister has made major announcement during the Rio+20 Sustainable Development submit and proclaimed to become the first country in the world to be 100% organic (IFOAM, 2012). However, the country has just 13,265 hectares of organically managed land as of 2015 which includes 6315 hectares of wild collections and 6950 hectares of agricultural land with total organic growers of 2680 and its contribution to world organic agriculture is just 1.3% (IFOAM, 2017). The country has only one organic exporter named 'Bio-Bhutan' and one organic research and development center in Yusipang, Thimphu. However, the interviewed experts are

of the view that majority of land is “organic-by-default” as farmers neglects the use of ‘synthetic agro-chemicals’ and they strongly argues that it would be easier for the country to go fully organic. Bhutan has national organic standards but have no certification system and is certified by external agency. However, the government has initiated Bhutan organic domestic assurance system since 2015 and in-country certification and inspection are done by BAFRA and involves “zero cost” (Appachanda, 2014).

Despite importance, the research in the country is very limited as most of the studies has been conducted in developed countries and the factors identified may not apply to developing countries. For instance, the subsidies were main reason for farmers conversion in Czech Republic (Urban, 2012), Germany, Norway, Finland, Switzerland, Denmark, and Austria (Lampkin & Padel, 1994). Other motivating factors includes health (Veisi, Carolan, & Alipour, 2017), access to market, consumers demand, policy support and willingness of consumers to pay (Lampkin & Padel, 1994) and environmental reason (Vlahović, Puškarić, & Šojić, 2015). Whereas, in developing countries farmers lack incentives, consumers lack awareness, labor shortages, lack of plant protection materials as well as lack clarity in policy (Tashi & Wangchuk, 2016). The agricultural development is also hamper by external factors such as climate change, water scarcity and reduce in arable land (UNEP-UNCTAD, 2008). The water scarcity in developing countries is due to lack of water storage facilities, poor irrigation management and climate change. The climate change leads to ‘agro-ecological changes’ and reduce income for farmers and increase social conflicts due to water scarcity. Other predominant challenges includes melting of glaciers (Bajracharya, Mool, & Shrestha, 2007), reduce of snow cover as well as species losses, delay in monsoon rain and increase in outbreak of pests and diseases. Climate change also leads to reduce in yields for major crops like maize, wheat and rice in tropical as well as temperate regions. The rise in global temperature by 4 degree Celsius or more with increase in demand for food poses risks for food security worldwide (IPCC, 2014) and there must be other compelling reasons due to which farmers are quite reluctant to take up OF. This reluctance of the farmers calls for investigation on the drivers and constraints for farmers conversion to OF at individual household level. To meet this,

the study conducted quantitative survey with domestic organic certified farmers and non-certified but organically producing farmers, qualitative interview with different stakeholders of agriculture sectors and the study recorded and studied the field observation.

1.2 Research objectives

- To investigate the drivers and constraints in conversion to organic farming by the farmers of Gasa district.
- To provide policy recommendation to government or relevant agency to promote organic farming in Bhutan.

1.3 Research questions

- What are the main drivers and constraints in conversion to organic farming?
- What are the appropriate measures to promote organic farming in Bhutan?

1.4 Scopes of the study

1.4.1 Area

The study was conducted in Gasa district of the Himalayan Kingdom of Bhutan covering Khatae and Khamaed blocks. The district was selected as case study area because it was declared as the first organic district since 2004 and the farmers their practice organic commercial farming and as well as subsistence farming. The district consists of four blocks namely Khatae, Khamaed, and Laya & Lunana. Lunana and Laya are the two farthest blocks, the residents of these two blocks mainly depend on livestock such as yak and sheep for livelihood, and agriculture activities is mostly practiced in Khamaed and Khatoe blocks. The district was declared as organic due to the following scope and potentials:

- Firstly, it is a bottom up proposal, whereby the farmer's has requested for organic declaration
- Secondly, due to the pristine environment or forest coverage as whole of the district falls under protected area (Jigme Dorji Wangchuk National Park)

- Due to health benefits (personal health and family health and animal welfare)
- The negligible use of the 'synthetic agro-chemicals'.
- Finally, large number of farmers (186 households) were engaged in organic farming (Holistic Development through Organic Agriculture *in Gasa: Bhutan*, 2016).

The district is the smallest among twenty (20) district in the country. The total area is 3081.77 sq.km with a population of 2970. The elevation in the district ranges from 1500-4500 meter above sea level. The district has a vision to be center for OF and eco-tourism and make "Good to Great Gasa" (Administration, 2018). The district is good representation for the country due to full conversion to OF and has undergone transaction from traditional to conventional and then to organic. The district has both domestic certified and non-certified but organic farmers. The farmers in the district has inherited agriculture since generation and majority of the populace are agriculturalists and provides an opportunity to analysis the pattern of shift, its driving forces as well as constraints involved in conversion process.

Figure 1: Map of Bhutan showing Gasa district

Source: Google

CHAPTER II
LITERATURE REVIEW

2.1 What is 'Organic farming'? (Definition)

"Organic farming (OF) is a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators and livestock feed additions. To the maximum extent feasible, OF systems rely on crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes and aspects of biological pest control to maintain soil productivity and tilth, to supply plant nutrients and to control insects, weeds and other pests" (Lampkin, 1990).

OF meets the objectives of 'sustainable farming' because it creates several benefits for the present as well as for the future generations without compromising the environment and make best use of the locally available resources and better practices. In this regard, Lampkin, has pointed that "OF can be defined as approach to agriculture where the aim is to create integrated, humane, environmentally and economically sustainable agricultural production system". As eco-friendly system, it integrates the biological, cultural and natural inputs as well as focus on biological control of pests and diseases and provides various ecosystem services that have use as well as none use values (Reid, 2005).

The study has indicated that OF is gaining popularity in Europe mainly due to factors such as policy issues, farmer's behavior, increase in consumers demand and due to 'willingness of the consumers to pay' (Lampkin & Padel, 1994). The study also shows that OF gained popularity since 1980's from several section of societies like policy makers, farmers, consumers, environmentalists and institutions and this section of the society are actively involved in regulating as well as in developing policies and its implementation to support OF development (Stolze & Lampkin, 2009).

Several studies to understand the motivating as well as challenging factor for farmer's conversion to OF were conducted in the past. However, most of the studies were conducted in developed countries and very less in developing countries and the

factors identified differs. Previous studies shows that the major factors for conversion are local and regional climate, market, policy, and soil and farmers behavior. The literature review hereafter will provide the key factors that act as drivers and the constraints for conversion to OF and find out the similarities and differences in the piece of literatures.

Like in most of the countries around the world, OF was initiated in Bhutan with the formal launched of NOP since 2007 and is still in early stage of development. The government has developed national organic standards but no certification system and is certified by external agency. The certification is not only costly but also time consumption due to lengthy process and the small-scale farmers cannot enter the market. However, the government have initiated innovative approach such as domestic organic certification system to provide access to market as well as empowering farmers and involves “zero costs” but the certification is recognize only in local market and not internationally.

2.2 Drivers of organic farming

OF is ‘environmentally friendly’ approach and researchers view this form of agriculture as the possible solution to CA (N. Scialabba, 2000). Based on the review of the literature the study identified four major factors such as environmental awareness, health benefits, economic benefits and education and employment benefits. The focus of the study is primarily on the environmental, social and economic aspects of the OF because the government, policy makers and the farmers are not aware of those benefits. The social factors is elaborated to overcome the traditional belief that agriculture is undertaken by farmers living in rural communities and show that OF provides better health, education and employment opportunities for youths in developing countries in rural areas. The grouping of the factors into four is also base on conceptual framework modified for this study. Under four major drivers, there are several indicators or elaborated variables and is discussed below.

2.2.1 Environmental awareness

The environmental awareness consists of four variables such as preservation or conservation of environment, protecting biodiversity, improving soil fertility and reduce pollutions and this are the motivating reasons for farmers conversion to OF.

Environmental awareness play a vital role because it invokes people to preserve, protect and nurture the environment and contribute to sustainable development. Through awareness, we are educating people the value of natural environment and the collective efforts needed to solve the environmental problems. The environmental awareness is spread through group learning, workshops, seminars, environmental publication, books and brochures. Some of the pressing environmental issues that need immediate attention today includes deforestation, water shortages, land degradation, climate change and loss of biodiversity. Due to higher environmental awareness and advocacy, people are more likely to operate their farm in environmentally friendly ways, as they are not only concerned with soil fertility but also soil protection and reducing of soil erosion. The study has indicated that environmental commitment is major factor influencing conversion to OF (Mzoughi, 2011).

2.2.1.1 Preservation/conservation of environment

The preservation of the natural environment is vital as it helps in maintaining 'community sustainability' because nature provides us with various "ecosystem service" that have both use and non-use value and supports life on earth (Reid, 2005). Amongst various eco-system services the 'support services' which includes 'biological control of pests and diseases', pollination, nutrient management as well as carbon sequestration is vital to enhance food security and hunger reduction.

Many studies have suggested that people living in rural area are highly vulnerable to environmental degradation because they are fully dependent on insecure ecosystem and any effect on environment will reduce their income and reduce them to poverty (Setboonsarng, 2006). The environment are preserved through strong laws, rules and regulation such as Convention on Biological Diversity and minimizing the use of chemical fertilizers and pesticides and reduction in use of fossil fuels.

Conventional farming (CF) involves use of chemicals and pesticides and this has negative effect on soil health and environment.

2.2.1.2 Protect biodiversity (flora and fauna)

The biodiversity refers to varieties of life on earth such as plants, birds, fishes and animals, which are in life forms and are interdependent for food and shelter. As defined in Convention of Biological Diversity the biodiversity is "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which the area part; this includes diversity within the species, between species and of ecosystems". The biodiversity or variability in species richness depends on factors such as the climate condition, altitude, soil and the presence of other species. The study shows wide ranges of biodiversity available in "economically poor countries" and the biodiversity has both direct and indirect use as well as non-use values (Koziell, 2001).

The expansion of agricultural land to meet the demand of growing population, pollutions, climate change and environmental degradation are some of the reasons for loss of biodiversity. Other reason includes the use of chemical fertilizers and pesticides that is why OF bans on the use the synthetic agro-chemicals. Arjen has stated that OF reduces use of pesticides and chemical fertilizers and this not only help increase species richness but also reduces soil erosion, reduces fossil fuel uses as well as greenhouse gas emissions and enhance soil fertility. Some of the strategies to protect biodiversity includes declaration of protected areas, biological corridors, 'heritage forest' and strict laws and regulations and among many strategies OF is also one of them. Protecting biodiversity is way to improve agricultural productivity and profitability and to protect the earth concepts for selling of organic products.

The studies shows that OF has higher species richness as compared to CF because of none use of chemical fertilizers and pesticides and mixed farming practices (Bengtsson, Ahnström, & WEIBULL, 2005) and see review (Hole et al., 2005). The species richness were, as high as 30% and the predatory insects, birds and plants responded positively in OF, whereas, the non-predatory insects and pests did not.

2.2.1.3 Improving soil fertility

"The nation that destroys its soil, destroys itself" (Roosevelt, n.d). This shows the important of soil in agricultural production. Soil plays important role in organic farming and the soil fertility in OF can be improved through the use of organic matters such as composts, leguminous plants, animal manures and better cropping practices (crop rotation & inter cropping). The soil can be protected through minimum or no tillage, contour cultivation, mulching, cover crops and agroforestry (Kilcher, 2007) and crop rotation. The crop rotation not only help improve soil fertility but also reduce the problems of pests, weeds and diseases (Watson, Atkinson, Gosling, Jackson, & Rayns, 2002).

The studies shows that OF has higher soil organic matter as compared to CF. The organic management not only increases the 'soil organic carbon' but also 'total nitrogen' as well as 'particulate organic matter-carbon', 'particulate organic matter-nitrogen' and IL-N (Illinois Soil N Test-N) (Marriott & Wander, 2006). The organic matter therefore conserves soil and help increase water penetration as well as reduce soil erosions, improve nitrogen cycle (Pimentel, 2006) and protect water supply.

2.2.1.4 Reduce environmental pollutions (air, water and soil)

The use of chemical fertilizers and pesticides leads to water contamination and is a serious threat to aquatic plants and animals, and human health. However, the OF bans on the use of 'synthetic agro-chemicals' due to which the risk of environmental pollutions (air, water and soil) is minimal (Nejadkoorki, 2012).

OF involves the use of locally available resources such as composts, manure, green manure, leaf litters and better cropping practices (crop rotations & mixed farming) and careful management of the nutrients and this helps to reduce the nitrate oxides emissions which is one of the main source of greenhouse gas emissions. The air pollution in OF is reduced not only from 'low carbon footprint' and low use of fossil fuel but also because of none spray of chemical fertilizers and pesticides.

Similarly, the soil pollutions in OF is reduced by abandoning the use of synthetic agro-chemicals and proper nutrient management. The proper nutrient management not only help reduce soil erosion but also reduces nutrient losses and increase soil biodiversity. The study has pointed that the productions of mineral fertilizers and its application requires greater energy use and if all the agriculture system were managed organically then it would help reduce greenhouse gas emissions by 20% to 10% approximately because of the low energy use (Niggli, Fließbach, Hepperly, & Scialabba, 2009). We can conclude that OF is environmentally friendly practice and reduces pollutions, increases farmer's income and contributes to sustainable development. While, the air, water and soil pollutions is high in CA due to use of chemical fertilizers and pesticides, high fossil fuel uses, heavy metals as well as discharge of water from animal and plants farming.

2.2.2 Economic benefits

The world has witnessed the rapid growth of organic farming due to increase in consumers' awareness and increase in demand, market access with high premium price and policy support. Today there are 179 countries practicing OF and the worldwide market for the organic food and drinks is rapidly growing and has reach US $ 81.6 billion in 2015 as compared to US $ 80 billion in 2014 (IFOAM, 2017). The major organic market are in Europe and North America where over 90% of organic products are sold, while, the market in developing countries are still immature. The economic benefits consists of several elaborated factors as indicated below:

2.2.2.1 Reducing external inputs costs

The organic farmers need not buy 'unnatural' external inputs such as chemical fertilizers, pesticides, and insecticides, which they have experienced in CF and they often have to avail credit from financial institutions, government agency or private individuals (rich farmers) but availing of credit is challenging due to lack of collateral security. The farmers reduces the external input costs by avoiding the use of synthetic agro-chemicals that have negative effect on human health and environment and focuses on the sustainable use of locally available resources (van Elzakker & Eyhorn, 2010).

The farmers also enter an agreement with the non-governmental organization (NGO's) and private farms and manage their farms as per the national organic standards.

The price for agricultural products are mutually agreed and the private company or farms supports farmers in the form of technical assistance, marketing, farm inputs, product certification as well as production (Pattanapant & Shivakoti, 2009);(Niemeyer & Lombard, 2003). This is win-win situation for both the farmers and private company or farms. The study also shows that the expenditures on fertilizers and sprays are lower in OF (Lampkin & Padel, 1994), lower fossil energy use and the 'depreciation of machinery' might be lower due to reduction in use of fertilizers as well as spraying applications. However, the machinery costs may be higher due to mechanical weeding and tillage (Nieberg, 2000).

2.2.2.2 Increasing farmers income with high premium price

Several case studies and survey has shown that farmers are able to increase their income after conversion to OF (Bacon, 2005);(Gibbon & Bolwig, 2007) and are able to achieve financial security due to reduce in costs of production, increase in productivity as well as access to market and higher premium price.

The increase in farmers income is not only due to reduction in external inputs costs, but also due to improve in both quality and quantity of agricultural produce, access to market, higher premium prices and through product diversification. The higher premium price for organic products are more relevant in developed countries as compared to developing countries due to access to market, willingness of the consumers to pay and due to improved quality and quantity of organic products.

The higher premium price and the higher quality products and increase in customer demand motivate farmers to convert to OF. The study shows that, the premium price for organic products ranges from 10% to 300% and the farmers get an estimated of 44-50% of this premium price and this helps in poverty reductions for poor farmers in developing countries (Setboonsarng, 2006). Some of the successful organic projects for the small-scale farmers from around the world are the success of organic cotton from Benin, Senegal, Uganda, Tanzania and Zimbabwe. The organic cotton help

generate higher income with high premium prices, reduces health problems and reduces debt for the farmers. The study indicated that the organic cotton producers receive as high as 20% higher price when compared to conventional producers (Ferrigno et al., 2005) and this encourages farmers conversion to organic production. However, the premium price is determined by the factors such as supply and demand and if supply exceeds demand, the premium price falls and vice versa.

2.2.2.3 Subsidies for organic production

The subsidies are provided in OF to encourage farmers to undertake risks, increase agriculture productions, generate employment opportunities and increase investment. Subsidies in agriculture includes inputs like fertilizers, credit, irrigation schemes as well as electricity lower than the market price (Gulati & Sharma, 1995). Other form of subsidies include supply of seeds and seedlings, tools and machineries and tax holiday. According to Krishna, 1967 as cited by (Gulati & Sharma, 1995), the subsidies on farm inputs are preferred because the farmers can directly benefit from the government expenditure based on the proportions of the inputs they use. The subsidies help to regulate the raising price of the food and other raw materials, which would have adverse effects on poor people in developing countries.

The direct financial subsidies is key motivating factor for farmers' conversion to OF in developed countries. For instance, subsidies were provided to the farmers of Czech Republic (Jánský & Živělová, 2007), Switzerland, Germany, Norway, Finland, Denmark, Sweden and Austria (Lampkin & Padel, 1994). Due to the subsidies, Switzerland saw drastic increase in organic farms from 800 to 5000 within just ten years (1990-1999). The study in Ireland that analyzed 252 answers from the Irish organic producers has also concluded that organic subsidies was main reason for conversion (McCarthy, O'Reilly, O'Sullivan, & Guerin, 2007). However, other factors such as consumers' awareness and concerns about the healthy food as well as growth of super markets has increased OA productions (Niggli, 2000).

2.2.2.4 Contribution to sustainable development and poverty reduction

According to “Brundtland Commission”, report sustainable development is defined as the development that “meets the needs of the present without compromising the ability of the future generations to meet their own needs” (WCED Report, 1987). The sustainable agriculture must be “capable of maintaining its productivity and usefulness to society indefinitely. Such an agriculture must use farming systems that conserve resources, protect the environment, produce efficiently, compete commercially, and enhance the quality of life for farmers and society overall” (Ikerd, 1993). OF contributes to sustainable development and poverty reduction and is evident from the feasibility study conducted in Ethiopia where the author found that chemical farming was 40.6% costly than OF (Devi, Kumar, & Deboch, 2007). This shows that OF is not only cheaper as compared to chemical farming but involves less risks, increase income and promotes local economy. Further, the study shows that to achieve sustainable development the focus should be on the use of locally available resources such as vermin composts, bio-fertilizers, bio-pesticides, backyard manure, composts and poultry manure. OF in general is beneficial to poor farmers as it help reduce external input costs, increases income, improve health and environmental conservation and provides better employment opportunities.

The modern agriculture due to use of chemical fertilizers and pesticides has increased agriculture productions and contributed to economic growth but this form of agriculture leads to environmental degradation, loss of biodiversity, soil degradation with falling of yields and effect on human health and is regarded as unsustainable. While, OF significantly contributes to sustainable development mainly due to nonuse of chemical fertilizers and pesticides (Kilcher, 2007); (N. E.-H. Scialabba & Müller-Lindenlauf, 2010), product diversifications as well as relying on locally available materials. For example, for sustainable development farmers of organic coconut cooperatives in Cuba focus on crop diversification rather than just growing coconuts. They grow wide varieties of cash crops like honey, grapes fruits and other crops like maize, sweet potatoes, yams, beans, and vegetables (Kilcher, 2007).

2.2.3 Social benefits

We select some parts of the quality of life to identify the social benefits such as health, education and employment opportunities that influence the farmer's decision to convert to OF. According to the data from IFOAM, 2017 there were 2.4 million producers in the world in 2015 and a rise of 0.4 million producers as compared to 1999. India has the highest number of producer (585,200), followed by Ethiopia (203,602) and then Mexico in 2015. The world total organic land has increased by almost five times and stood at 50.9 million hectors in 2015 as compared to 11 million hectares in 1999.

2.2.3.1 Health benefits

- Individual health and family health

The studies shows that health effects (individual health & family health) and environmental concerns because of use of 'synthetic agro-chemicals' is the key reasons for conversion to OF (Carambas, 2005); Hutranuwatr and Hutranuwatr 2004 as cited by (Pattanapant & Shivakoti, 2009). The use of 'synthetic agro-chemicals' are inseparable in CA and this has individual health effects (farmers), family health (woman and children) and consumers' health effects. For instance, it leads to 'miscarriages and birth defects' for women (Najafabadi, 2014), acute exposure to pesticides leads to 'burning of eyes', skin & liver effects and neurological effects (WHO, 1990). Other negative effects includes paralysis of legs and hand, headache, dizziness, vomiting, diarrhea, chest pain, coma and even death (Norkaew, 2009). Due to the negative effect of pesticides, ninety-eight pesticides are restricted for use on crops in Thailand, making it one of the largest pesticides banned in Asia. Although the ban has been impose, the study shows that the pesticides are still high in demand due to its effectiveness to control pests and diseases (Panuwet et al., 2008). For example, Chiang Mai province in Thailand was reported by Ministry of Public Health in 1997 as one among the top ten province with high patients due to use of synthetic agro-chemicals. The farmers in the province have converted to OF due to health issues and personal reasons such as increasing income (Sununtapongsak, 2006 as cited by (Pattanapant & Shivakoti, 2009).

The study found that children in Thailand between the age 4-15 years were highly vulnerable to pesticides exposure due to use of farm land as their play ground when compared to children in developed country like United States (Panuwet et al., 2009); (Panuwet et al., 2009b). The assessment found that the Thai children's have 'urinary metabolic level' almost two times as high as children in US.

The inappropriate use of the pesticides leading to human health effects such as death are reported even in developed country like United States and on an average 23 death are reported yearly due to pesticides ingestions (Langley & Mort, 2012) and more catastrophic effects due to use of pesticides are reported in India. The studies claims that "every 30 minutes a farmer in India commits suicide" and the report by Center for Human Right and Global Justice (CHRGJ) indicated that the sale of genetically modified seeds is one of the reason for increasing suicides among rural farmers (Malone, 2008). The farmers suffers debts due to rising price of pesticides, use of genetically modified crops, drought and harvest failure and take away their life by consuming the pesticides that they went into debt.

- Enhance food quality

There has been increase in demand for 'food safety' and healthy food because of the socioeconomic development and increasing consumer's awareness on the importance of organic products and the negative effects of CA on human health and environment. The studies have indicated that the key factors for increase organic production is due to increasing demand for 'food safety' and 'food security' because of the use of 'synthetic agro-chemicals' in modern farming system (Pattanapant & Shivakoti, 2009). Moreover, the farmers produced food for family consumptions and the surplus sold in the market. The farmers want to ensure that the food is safe for self-consumption and for sale. This type of farmers are not only concerned about individual and family health but also the health of the customers and the natural environment.

To promote the food quality and food safety OF follows strict standards such as organic certification and the soil, water and products are tested against heavy metal contaminant, pesticides, residues and antibiotics and even the use of GMO is banned.

Studies have indicated that organic food has low chemical residues (Baker, Benbrook, III, & Benbrook, 2002) and ‘lower nitrate concentration’ (Williams, 2002), ‘higher antioxidant activities’ and ‘lower concentrations of toxic metals’ such as cadmium (Cd) and pesticides metal, higher vitamin C & E and phosphorous and lower pesticides as compared to conventional farming system (Barański et al., 2014). In generally OF shows positive health benefits due to use of locally available resource and increase nutrients through product diversification, crop rotation, green manure and growing of leguminous plants. This not only increase soil fertility but also the crop quality, quantity and organic food ‘tastes better’ than conventional food.

2.2.3.2 Employment and education benefits

- Contribute to better education opportunities for family members

Conversion to OF not only leads to environmental improvement and strengthening communities but it also enables farmers to provide better education as well as health opportunities to family member and poverty reduction due to high income provided by OF (UNEP-UNCTAD, 2008); (van Elzakker & Eyhorn, 2010). For example, the famers in Kenya where not only able to send their children to school but also provide better health care and food security for the family as well as improved their living standards (Omari, 2015). The OF association also provided support in the form of training and education opportunities for the children coming from poor families in primary and secondary schools. It is not only the children that benefitted from the education programs but also the famers because they were provided with medical expenses and ‘health care insurance’ (Qiao, Halberg, Vaheesan, & Scott, 2016).

The study also shows that organic factories in Kenya also provided higher education opportunities for bright and poor children and encouraged them to undertake agriculture and engineering studies, and after their graduation provided with employment opportunities in organic tea factories. The factories also provided scholarship program to the employee whereby they could upgrade their expertise (Mulili, 2011) as cited by (Nyabuto, 2015). This clearly shows that OF contribute

towards better education of the family members and the farmers are motivated to convert to organic practices.

- Provide employment opportunities

Unemployment is a growing concern in developing countries as large number of youths are unemployed. OF is labor intensive and provides higher employment opportunities in rural areas. The higher labor requirement is mainly due to organic way of productions such as hand weeding, preparatory tillage, management of pests and diseases and due to low farm mechanizations (production, harvesting and transportation). The hand weeding alone requires more than 50 percent of labors (Shrestha et al., 2006). For example, sugar sector in India is one of the key employment-generating sector employing over 7.5 percent of the rural populations (GOI, 2004). The organic sugar cultivation requires even more labor by 16.90% as compared to conventional sugar cultivation thereby increasing employment opportunities.

The survey conducted in Wuyuan, China also shows the increase in labor requirement as over 60% of the households involved in organic tea production employed women as farm labor (Qiao et al., 2016). Similarly, women were offered off-farm employment opportunities such as farm inspectors in OA bodies in Asia (Setboonsarng, 2006). In general, OF is labor intensive and its requires higher labor as compared to CF and the labor shortages in rural areas in developing countries is a hindrance to OF development. OF provides higher employment opportunities in the rural areas as the family members are fully employed and external labors both skilled and unskilled are hired. Thus, the higher employment opportunities with higher income encourages farmers conversion to OF.

2.3 Constraints of organic farming

The key constraints or challenges for farmers' conversion to OF is classified into four groups namely low productivity, market aspects, education and research aspects and economic and financial aspects. This grouping is based on the literature review and conceptual framework that has been developed for this study. Under four

major constraints there are several elaborated variables or indicators as discussed below.

2.3.1 Low productivity

The demand for organic products has increased due to increase in consumers' awareness, 'willingness of the consumers to pay', health and environmental concerns. However, study shows that the yields in OF is lower than CA (Mäder et al., 2002) due to which concerns are raised on additional land requirement to produce the same volume of agricultural products as produced by the CA and this may lead to loss of biodiversity and environmental degradation.

The lower productivity in OF is attributed to poor soil fertility, poor weeds, pests and diseases control, limited options to increase nutrient status in soil & organic way of productions that neglects the use of the chemical fertilizers, pesticides and the genetically modified seeds and relying heavily on traditional knowledge & local seed varieties (Kirchmann, Bergström, Kätterer, Andrén, & Andersson, 2009). Other factors includes poor seeds varieties, low farm machineries and techniques, labor shortages, poor infrastructures and inefficient management (Neuhoff et al., 2014). According to Bergstrom et al., 2008, the low productivity in developing countries are also due to lack of access to chemical fertilizers and lack of water management technologies

The comprehensive meta-analysis using 66 past studies found that organic yields were 25% lower than conventional yields and the study further indicated that the yield difference between developed and developing countries declined by more than half with 43% for developing country and just 20% for developed country (Seufert, Ramankutty, & Foley, 2012). However, some studies has indicated that the yield difference is on an average 19.2% in OF as compared to CA under the better management practices. The better management practices includes crop diversification and specifically multi cropping practices as well as crop rotations and this help to drastically reduce the yield differences (9±4% and 8±5% respectively) but only under OF practices (Ponisio et al., 2015).

However, the yield differences is highly controversial with some studies indicating higher yields in OF than CF (Badgley et al., 2007); (Panneerselvam, Halberg, & Lockie, 2013), whereas, some shows lower (Seufert et al., 2012); (De Ponti, Rijk, & Van Ittersum, 2012); (Kniss, Savage, & Jabbour, 2016). Therefore, we can conclude that the yield difference between two farming systems are dependent on the regions, crop types and management practices.

2.3.1.1 Lack of effective weeds control

The weeds, pests and disease control issues is the major challenges for organic as well as conventional farmers (Tashi, 2016). The weeds compete with plants for light, water, space and nutrients and it compromises crop quality and yields. While, some study has indicated that weeds, pests and disease problems is more severe in CF as compared to OF due to mono cropping practices (Crowder, Northfield, Strand, & Snyder, 2010) and OF encourages products diversification such as multi cropping and crop rotation as this not only help increase agricultural productivity but also reduces the risks of crop failures. The agricultural experts pointed that weeds, pests and diseases issues is severe in the developing countries due to lack of bio-pesticides, lack of education of farmers, lack of research and development as well as poor management techniques. The study shows that weeds alone is responsible for estimated global yield lost by 34 % (Oerke, 2006), the yield losses for stable crop like corn ranges from 4-76% (Teasdale & Cavigelli, 2010) and the rice yields losses in Bhutan is as high as 50% (Tshewang, Dendup, Tshering, & Kristiansen, 2017). The weeds management is labor intensive due to high labor requirement and labor shortages is a serious concern in developing countries. To control weeds farmers' practices several techniques such as crop rotation, hay mulching, hand weeding and tillage and the other methods includes intercropping & competitive cultivar but weeds is still reported as major problem for organic farmers. The commonly practiced technique such as hand weeding is labor intensive as well as ineffective and other technique such as flooding of fields is not feasible due to water scarcity in most of the regions.

2.3.1.2 Lack of effective pests and disease control

On top of the weeds infestation farmers also faces problems of pests and diseases control. The pests and diseases attacks vegetables and compromises both vegetable quality and quantity. The total yield losses due to animal pests is 18% and the pathogens losses is 16% (Oerke, 2006). Poor management of insect pests and diseases has been identified as challenging factor as it reduces the yields (Kirchmann et al., 2009); (Tashi, 2016). The outbreak of insect pests such as armyworm was reported in Bhutan in 2013 which "eats everything green" and even the organic farmers were compelled to use pesticides and chemicals to prevent the crops from total losses (McCrae-Hokenson, 2014). Similarly, the outbreak of armyworms in South Africa, Zambia, Zimbabwe and Malawi causing serious economic losses and threatening food security was reported in 2017.

The outbreak of pests and disease is due to lack of bio-pesticides, poor plants health, poor pests and disease management and lack of improved seeds varieties. Further, the wide spread of pests and diseases in Bhutan is also due to religious believe such as killing of sentient being is consider sinful act and farmers neglects the use of 'synthetic agro-chemicals' and due to poor plant protection materials. To control pests and disease farmers mainly integrate cultural practices (mixed cropping, crop isolation, crop rotation and changing sowing and planting timing), mechanical practices (mulching, tillage), biological control (use of natural enemies) as well as chemical control (use of fixed coppers, hydrated lime and lime sulfur) (Folnovic, 2016).

2.3.1.3 Labor intensive (labor shortages)

OF is labor intensive as compared to CF and the higher labor requirement is mainly due to hand weeding, biological management of pests and disease, low farm mechanization (transportation & harvesting) and due to better cropping practices such as inter cropping, crop rotation, mixed cropping. OF requires over 15% labors as compared to CF (Pimentel, Hepperly, Hanson, Douds, & Seidel, 2005) and the higher labor requirement are meet by employing family members and hiring of both skilled

and unskilled external labors. The skilled work force such as managers were employed for product certification, inspection, and record keeping.

The higher labor requirement in OF is a hindrance for agricultural development as labor shortages are reported in developing countries due to rural migration. The increase in labor requirement leads to increase in labor costs due to which labor costs in OF is 7 to 13% higher than CF (Crowder & Reganold, 2015) and farmers cannot afford to operate their farm organically. The study indicates that maize production alone required 50% labor for weeds control (Shrestha et al., 2006 as cited by (Tshewang et al., 2017) and growing labor shortages affects agriculture productions. The economist like Sean Rickard of World watch Institute, 2017 argues that labor cost is most expensive for organic farmers and the organic food is 50% more expensive than conventional food.

2.3.2 Market aspects

2.3.2.1 Lack of access to market & market information

The access to market is important for the farmers or producers to increase agricultural production, increase income and poverty reduction. Despite access to market, the market information are equally important, as it would encourage farmers to diversify their products, increase productions and encourage investment. However, the developing countries lack access to market as compared to developed countries. In the absence of the market and market information on price, supply and demand trends farmers' sell their products to middlemen or traders. The study in Sub-Saharan Africa found that only 43% of the farmers in developing countries has access to market within two hour's drive by road and the physical access to market was even more difficult. Further, the study estimated that 75% of the farmers has to travel more than four hours to reach the nearest market (Smale, Byerlee, & Jayne, 2013). This clearly shows that access to market in developing countries is a major challenge for agriculture development. The lack of access to market is due to low agriculture production, higher transportation costs and lower consumers demand and difficulty to meet quality and quantity. The growth of super markets and convenient stores brings products closer to

consumers' but this development too is likely to affect small-scale farmers, as they cannot compete with wealthy farmers in terms of agricultural quality and quantity and faces difficulty is meeting the organic standards.

2.3.2.2 Ineffective transport facility

The ineffective transport facilities in developing countries may affect the adoption of organic farming. The developing countries lack access to road connectivity in rural areas thereby hindering agricultural productions, access to market and linkages between farmers or producers and the consumers. In the absence of effective transport facilities farmers resort to small production, less investment and uses human power to transport which is laborious and perishable vegetable are damaged before reaching the market end. The lack of transportation facilities was reported by the study conducted in India (Rani & Reddy, 2013). This shows that there is some communality between developing countries and thus transport facilities should be affordable, safe, efficient and reliable.

2.3.3 Education & research aspects

2.3.3.1 Lack of education of farmers & less research

OF is 'knowledge intensive' as it involves the use of traditional knowledge with modern science and technology, whereas, the CF is 'chemical intensive' as well as 'capital intensive' (Giovannucci, 2005). The researcher are of the view that those farmers who extensively practice CF using chemical fertilizers and pesticides would take longer duration to convert to OF. Therefore, capacity building of the farmers through training programs, workshops and seminars are important for OF development. Even if the farmers lack education, they can learn through training and exchange programs. Since OF involves the use of traditional knowledge which is similar to organic agriculture practices many people believe that farmers can easily practice OF but the researchers are of the view that farmers must be educated (Kleemann, 2011). They need to be educated in several aspects such as certification process, processing, market information and transportation. The studies has pointed that, the lack of education of the farmers is one of the constraints for OF development as the

conventional farmers lack knowledge on principles of organic agriculture and practices (Tovignan & Nuppenau, 2004). Many example on lack of education of the farmers once they convert to OF are taken from southeastern China (Jiangxi) province and some of the problems they encounter were how to enhance their knowledge on OF, developing production techniques to improve soil fertility, pests and diseases management and how to integrate animal husbandry with agriculture (Giovannucci, 2005).

Moreover, several studies have indicated that the research on OF is less as compared to CF (De Ponti et al., 2012); (Tuck et al., 2014). There are wide research on modern agriculture and this has increased agricultural productions but at the costs of loss of biodiversity, effect on animal and human health, effect on productive land and soil degradation (Gibbs et al., 2010). Therefore, higher investment in research, infrastructure development and improved technologies and water storage facilities would help increase agriculture productions and poverty reductions.

2.3.3.2 Lack of access to organic inputs (seeds)

The organic farmers must use organic seeds in order to keep organic certification and the use of genetically modified seeds are strictly restricted. Organic seeds have several benefits such as resistance against pests and diseases; perform better during harsh weather such as droughts and increase quality and quantity of agricultural produces. The organic farmers face shortages of organic seeds, farm equipment's, bio-pesticides and other inputs because of the market being small and not profitable (Hanson, Dismukes, Chambers, Greene, & Kremen, 2004) and the seed system is dominated by a small number of chemical and bio technology companies with no interest in OF development. The farmers are interested to produce organic seeds for commercial purposes but they lack training, infrastructure (seed production facilities), economic opportunities and organic seeds is costly to produce (Zystro, 2016). Beside organic seeds, farmers also face problems due to lack of vermin composts, farmyard manure and organic manure.

2.3.4 Economic and financial aspects

2.3.4.1 Costly certification and inspection

OF is unique form of agriculture practice when compared to CF as it abides by strict principles such as organic certification and farmers must obtain them to sale organic produces. OF can be widely classified into two different system such as “certified production with premium price” for sale in developed countries and “non-certified organic production” for domestic market. However, several studies has indicated that certification is costly (Nandi, Bokelmanna, Nithya, & Dias, 2015); (Jacobsen, 2002); (Sterrett, Groover, Taylor, & Mundy, 2005). The certification, inspection and accreditation are complex and is problem for small-scale farmers (Kilcher, 2007) because it need infrastructures for monitoring as well as documenting of the producers and farmers cannot afford. Certification is not only costly but time consuming and involves lengthy process and farmers lack time (Marsh, Zoumenou, Cotton, & Hashem, 2017). For instance, farmers in California chose to deregister their farm due to regulatory challenges such as paper work, record keeping and costly certification. Other challenges includes production issues, marketing issues, price and management issues (Sierra, Klonsky, Strochlic, Brodt, & Molinar, 2008). Another study conducted in Western Virginia in US indicated that farmers were mainly concerned with two different types of costs such as certification costs and the potential increase in the costs of approved inputs. The certification is not only costly but did not benefit the small-scale farmers due to lack of reliable market and tedious paper works. The study in northern Nicaragua by (Beuchelt & Zeller, 2011) among the conventional, organic and organic fair-trade coffee producers found that despite the higher ‘farm-gate price’ of certified coffee as compared to conventional coffee, the certified coffee producer were below ‘absolute poverty line’ when compared to conventional coffee producers due to low productivity. The costly certification and inspection, tedious paper works, lengthy time and regulatory issues are extra burden for the farmers and they choose not to practice OF. However, the farmers can reduce the costly certification through group certification or participatory guarantee schemes and innovative practices such as “zero-cost certification”.

2.3.4.2 Lack of access to credit facilities

The access to credit is very important to promote OF and lack of which farmers cannot increase investment, improve technologies as well as increase productivity. It is the responsibility of the financial institutions and the government agency to provide agricultural credits and in the rural areas by the rural banks. However, several studies has pointed that, the organic farmers lack access to credit facilities as compared to conventional farmers due to limited guarantee. In the absence of the formal credit the farmers has limited option that to avail informal credits with higher interest rate and they also use their off-farm income to support agricultural activities (Tovignan & Nuppenau, 2004); (Veisi et al., 2017). The organic farmers lack access to credit because of lack of guarantee like property and fixed employment (FAO, 2015). Further, the agriculture market is inconstant and the farmers faces difficulty to recover the initial investment thereby reducing them to hunger and poverty. The study conducted in India between bank customers and non-bank customers found that the households having access to credit where doing farming activities more efficiently than those households with limited access to credit facilities (Laha, A. 2007). Further, the study conducted in Serbia shows that banks were not suited to provide credit (loan) to farmers due to lack of knowledge on agriculture sector and absence of 'risk assessment capacity'. They consider investment in agriculture as highly risky business and charge higher interest rates with low maturity period making loan unattractive (Ljumovic, Viduka, & Cvijanovic, 2015).

CHAPTER III
RESEARCH METHODOLOGY

This study used both quantitative and qualitative methods. The quantitative survey was conducted with domestic organic certified and non-certified but organic farmers and qualitative survey with different stakeholders of agriculture sector. The data was collected in Bhutan.

3.1 Study area

The study was conducted in Gasa district in the Kingdom of Bhutan covering Khatae and Khamaed blocks. Gasa was declared as the first organic district since 2004 and the farmers there practice organic commercial farming as well as subsistence farming. Khatae is the smallest block among the four blocks and consists of 59 households with an estimated area of 326 sq. km spread over five sub-blocks. The block has 22 villages with small population of 510 and has dry land of 118.94 hectares for cultivation (Administration, 2018). The block has the first organic registered group, named “Rangshin Sanam Detshen” (local name) or “Organic Agriculture Group”. The group has 51 members and mainly produces organic potato, garlic and carrot. The group has been certification by BAFRA under MOAF in accordance with Bhutan Organic Certification System (BOCS) Guidelines 2013. The agricultural produce and soil tests were conducted both within and outside the country. The soil samples were tested in Soil and Plant Analytical Laboratory (SPAL) in Semtokha for heavy metal contaminants and soil sample test were conducted in Central Laboratory Thai, Bangkok for pesticides residues (T. Dorji, 2016). The local certification is valid for one year and is renewed annually if it meets the minimum requirement as per the BOCS Guidelines 2013. This is the first of its kind in the country and involves ‘zero-cost certification’. The certification involves zero cost for the farmers because the government supports the expenses and civil servant are involved in certification. However, only three products from Khatae block were certified locally.

The Khamaed block has an area of 149 sq.km and falls in warm temperate zone with an altitude ranging from 1800- 2600 meter above sea level. The block has 26

villages with a population of 722 and has total dry land of 61.45 hectares and wet land of 118.84 hectares for cultivation (Administration, 2018). The farmers cultivate wide varieties of non-certified but organic vegetables such as radish, cabbage, cauliflower, chili, carrot and potato and cereal crops like rice, wheat, millet and buck wheat. The vegetables are cultivated for sales and the cereal crops are mainly for family consumption.

The district serves as a good representation of Bhutan due to full conversion to OF and this enables us to understand how they change and why they change, while, the rest of the districts are just thinking to change. The district has same farming pattern such as the shift from traditional to conventional and then to organic and rests of the districts has the choice between going organic or not to be organic. The district also have similar characteristics such as the traditional agriculture has pass down from one generation to another and some of the agriculture activities initiated in this district are very similar to rest of the districts. The district focuses on 'high value low volume' products for local and national market, facilitates in construction of market infrastructure (market shed, sale counter & farm shops), support in fencing (electrical and alarm fencing), technical support to farmers and supply inputs (free seeds and seedlings), training, product certification and encourages formation of groups and cooperatives.

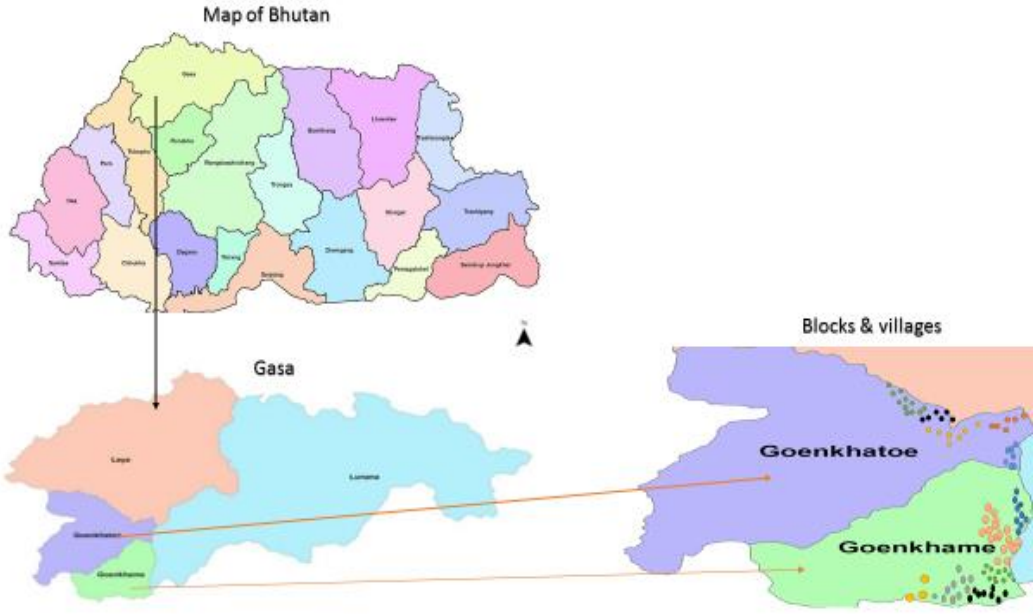

Figure 2: Map of Blocks and villages (study area)

Source: modified from http://www.gasa.gov.bt/dzongkhag-map

3.2 Research design

3.2.1 Data collection methods

For the data collection, the literature were extensively reviewed to explore and understand the relevant factors that influence farmers' conversion to OF as well as factor that serves as constraints and this has been used as a primary source for collecting primary data. The survey questionnaire were developed to collect data through face-to-face interview with the author and the field observation was recorded and studied to understand the farming system. The expert interviews was conducted with different stakeholders of agriculture sectors both formally and informally to gather supplementary information. The questions on the drivers and constraints for conversion to OF, access, market and production, technical support and strategies to promote OF were discussed with agricultural experts during the semi-structured interviews. The nine experts consisting of three governmental officials, four local government officials

and two members of organic group were interviewed. The interviews were conducted mostly in interviewees' residence so that they could speak freely on the topic.

3.2.2 Sampling size

The purposive sampling technique has been chosen because of the small sample size of the households in the study area and the lists of households was obtained from Khatae and Khamaed block administration under Gasa district and other reliable sources. The list provided by the administration and other relevant sources revealed 101 households with 26 villages under Khamaed block and 59 households with 22 villages under Khatae block (Block administration, 2017). The survey data were collected from 146 households comprising of certified farmer (n=47) from Khatae block and non-certified but organic farmers (n=99) from Khamaed block in the ratio of 1:2 (Table 1).

Table 1: Households in the study area

Name of the blocks	**Total households**	**Households surveyed**	**Total villages**	**Villages surveyed**
Khamaed	101	99	26	22
Khatae	59	47	22	17
Total	160	146	48	39

3.2.3 Data analysis

The primary data collected from farmers through survey questionnaire were analyzed using SPSS (Statistical Package for the Social Science). Analysis also included descriptive statistics such as frequency, percentage, mean and standard deviation and this study identified the drivers and constraints factors for conversion to OF according to the ranked order of importance by the farmers (Safiullah, 2015). The factors were ranked based on mean value and standard deviation. The variables identified from the literature review and included in the questionnaire were measured using five point Liker scale with (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree and (5) strongly agree to measure the responses of the questionnaires. Based on this results, the mean value were classified into three groups such as: ‘very important’ group represented by the mean value of higher than 4; ‘important’ group with a mean value ranging from 3 to 4; and the ‘least important’ group represented by the mean value of lower than 3 (Veisi et al., 2017). The respondents were also asked to prioritize the factors, the drivers and constraints for conversion to OF. The supplementary information collected from the experts were analyzed using descriptive analysis tool and simple summary and quotations are provided.

3.3 Conceptual framework

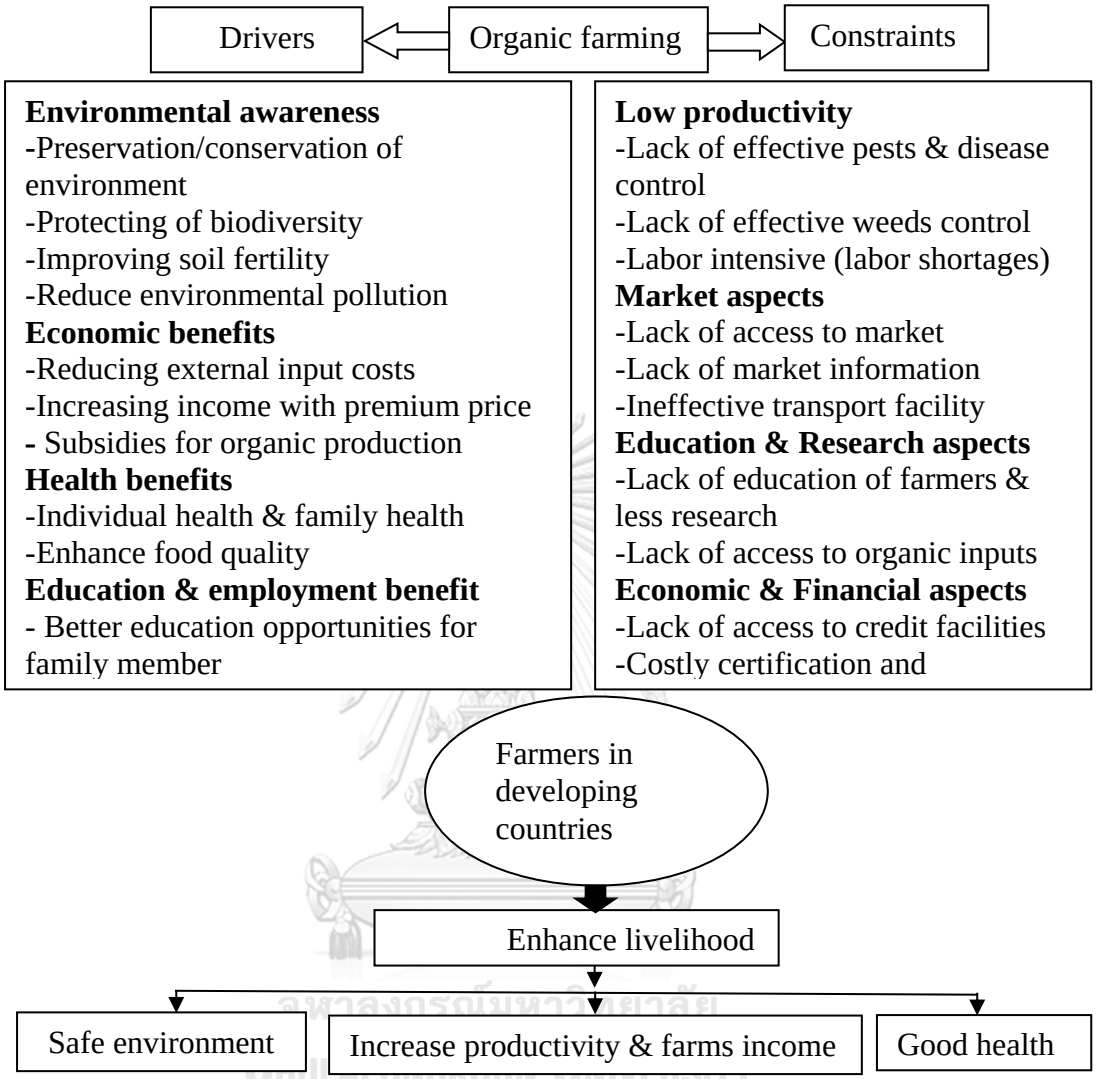

Figure 3: Conceptual framework for organic farming

The conceptual framework for this study has been developed to understand the drivers and constraints in conversion to OF. The drivers and constraints along with several variables that are included in the framework they are identified from the literature review. Based on the conceptual framework the key drivers for conversion to OF are environmental awareness, economic benefits, health benefits and education and employment benefits, whereas, the key constraints includes low productivity, market aspects, education and research aspects and economic and financial aspects. To promote OF the government and the relevant agencies has to overcome the barriers and support

the drivers through proper interventions. If the government and relevant stakeholders are able to reduce the barriers than the farmers in the developing countries will be able to improve their livelihood. The improving of livelihood also mean safe environment, good health for individual and family members and increase in agricultural productivity and farm income and this would motivate farmers to convert to OF.

CHAPTER IV
RESULTS

This chapter presents the farming practices in Bhutan obtained from reports, publications and interviews and the research results (originality of the research).

4.1 Background of farming system

The agriculture practice in the country has changed from subsistence based to market oriented production. The contribution of agriculture to Gross Domestic Product (GDP) has declined from 56% in 1980's to 16.77 % in 2014 due to the growth of other lucrative sectors such as construction and manufacturing, energy, transports and communication sectors that has not only generated higher employment and income earning opportunities but also encouraged rural urban migration and created labor shortages (NSB, 2016).

The farmers owns small and marginal land and the farming households are widely scattered from one another in the small villages consisting of fewer households ranging from five households in villages to over thirty households on average. The farming practices in the country is difficult and labor intensive due to rugged terrain, steep slopes, and low farm mechanization and also because of land fragmentation.

The farming systems in the country mainly includes wet land and dry land. Tseri (shifting cultivation) was another widely practiced farming practice in east as well as east central regions but has been banned and the tseri land has been converted to dry land and private forest (K. D. Dorji, 2008). Farmers integrate crops and livestock and mainly raise animals for ploughing, dairy products and manure. Every farming households has livestock's and farmers in high altitude raise yaks and sheep's for dairy products and ploughing, while in lower altitude cow, pigs and hens are popular. The farming households especially woman collects dry leaf litter from the community forest and the nearby forest and use as bedding for animals and when decomposed used as manure.

Bhutan has an estimated operational dryland holding of 52,219.01 hectares out of which 20,751.87 hectares were left fallow. The estimated wetland (cultivated area) including those wetland leased by growers is 21,470.59 hectares of which 2590.8 hectares were left fallow (MOAF, 2016). Farmers grow wide varieties of crops and vegetables such as maize, buckwheat, wheat and millet and potato in dry land and rice in wet land up to 2600 meters above sea level. Other vegetables such as turnip, radish, beans, pea and cabbage and potato are also cultivated in wet land. The farmers mainly practices double cropping, crop rotation (rice with either wheat or potato) and invest on farm machineries and other tools to increase crop production. The high value vegetables such as chili, carrot, garlic, and ginger and wide varieties of fruit plants such as apple, mandarin, mango, jackfruits, peach and passion fruits is grown in the country not only for self-consumptions but also for export. Mandarin from lower altitude and apples from higher altitude are the major cash crops sold within and outside the country. The statistic shows that 6,160 metric tons of apple were sold within and outside the country (87% locally and 13% exported) and 36,721 metric tons of mandarin were marketed (73% locally and 27% exported) (MOAF, 2016). Other spices such as cardamom and ginger and legumes & pulses like mung bean and razama bean are cultivated. The crops such as maize and paddy are mainly for self-consumption and potato for sales within and outside the country.

4.2 Types of farming practices in Bhutan

The farming practice in the country is divided into four different types such as traditional farming, conventional farming, domestic organic certified farming and non-certified organic farming. The traditional farming involves the intensive use of indigenous knowledge and natural resources and neglects the use of ‘synthetic agro-chemicals’. OF involves farming without using ‘synthetic agro-chemicals’, food additives and involves no international organic certification but operated in compliance with organic principles. The domestic organic certified farming involves certification by BAFRA and follows organic principles and non-certified but organic farming involves no certification. While, the conventional farming (CF) involves the use of chemical fertilizers and pesticides and the use of food additives and growth hormones. The commonly used fertilizers in the country includes urea, superphosphate and

Monoammonium phosphate (see appendix: d) and agro-chemicals such as cypermethrin, mancozeb and metribuzin. The study by NOP shows that four districts such as Paro, Punakha, Thimphu and Wangdue uses most agro-chemicals for farming practices, while, Gasa and Samdrup Jongkhar districts do not use any agro-chemicals (Katwal, 2016).

4.2.1 Traditional farming

The traditional farming system mainly focus on self-subsistence rather than market oriented productions and involves 'nomadic herding' raising of livestock with crops, practices hunting and gathering of food (wild collections) and the farming system is less efficient. The farmers owned land for cultivation and uses locally available resources such as manure, composts, dung and dry leaf litters (Gyambo, 2017) and depends on 'human and animal power'. Animal power are used for tillage and human power for clearing bushes, grass and preparing fields such as ploughing, hand weeding, harvesting and transportation. Whatever produced in traditional agriculture is for self-consumption and some for exchange with goods like salt, fuel, tea and other essential items (Young, 1991). The traditional agriculture uses local seeds varieties that the farmers produces themselves as well as borrow from other farmers. Traditional agriculture too is labor intensive and involves low production. The large labors are required for manual weeding, preparatory tillage, sowing, harvesting and transportation. Traditional agriculture involves lack of access to information and poor irrigation schemes such as earthen irrigation due to lack of techniques and involves poor water storage system. The farmers share information verbally and informally during the public meeting, village gathering as well as personal exchanges (Dorji, 2017). Other challenges includes lack of technical support, poor soil conditions, lack of trust in traditional agriculture and low income for growers and traditional farming is unsustainable (ADAO, 2017). However, the majority of the experts and farmers indicated that traditional agriculture supports the local environment due to use of locally available resources and farming practices. On the other hand, agricultural experts indicated that in traditional agriculture farmers practices 'shifting cultivation' and 'open burning' that is environmentally harmful and economically not feasible as it leads to soil erosion, pollutions (air/water) and effects on water shed management (Interview,

2017). In general, traditional agriculture involves low productivity, poor soil condition, poor seed varieties, lack of plant protection materials and lack of farm machineries due to which government has to explore for alternative agricultural practice to increase production, poverty reduction and income generation.

4.2.2 Conventional farming

The government has distributed better crop varieties and inorganic inputs such as fertilizers & plant protecting chemicals (K. D. Dorji, 2008) and provides support in the form of farm machineries and tools, irrigation schemes and others to increase agricultural production, poverty reduction, income generation and environmental conservations (MOAF, 2013). However, the chemical fertilizers and pesticides are not easily available due to strict regulation imposed by the government and farmers rather prefer to use locally available resources like manure, composts, green manure and dry leaf litter as well as local seed varieties. The CF in the country is largely 'small scale subsistence based' which involves little or no use of chemicals and pesticides (Kobayashi et al., 2015). The statistic shows that just 2.24% of the households in the country applied plant protection chemicals and the overwhelming majority (97.76%) of the households do not apply. This is because large farmers (61.4%) feels that chemical fertilizers are not necessary, 13.4% of the farmers feel that its unavailable, unaffordable and statistic also shows that 16.9% of the households in the country are aware of organic farming (RNR statistic 2012-2013). Some of the chemical fertilizers distributed in the country includes insecticides, fungicides, rodenticides, herbicides and acaricides (RNR statistic 2012, MOAF). However, there are concerns being raise on the use of 'synthetic agro-chemicals' although limited in quantity due to health and environmental effects. Thus, the government has to explore for 'alternative' agriculture such as OF that is environmentally friendly practice and contributes to sustainable development.

4.2.3 Domestic organic certified farming

Although the policy of organic farming was launched since, 2007 (Duba, Ghimiray, & Gurung, 2008) the growth is very gradual and Bhutan has less than 10% of the land under organic agriculture productions (Neuhoff et al., 2014). The gradual

growth can be attributed to lack of technical support (Lampkin, 1990), early stages of research & development (Neuhoff et al., 2014) and lack of fund to support OF development. For instance, the budget allocated for OF development of US $ 550,000 during the 10th Five Year Plan (2008-2013) was relatively lower as compared to budget allocated for cash crop such as citrus promotion of US $ 900,000 (GNHC, 2013).

The then Prime Minister has made major announcement during Rio+20 Sustainable Development submit and proclaimed to become the world first 100% organic country by 2020 (Redaktion., 2012). However, the government lack statistic and officials records on OF development to determine the success of NOP in the country until 2012. Nevertheless, the study shows that OF has spread in all twenty districts by 2013 (Tashi, 2016) but the country still lacks district vise statistics on volume of produce, sales & income generated.

The government has initiated Bhutan organic domestic assurance system since 2015 and in country certification is issued by BAFRA under MOA. Currently, the authority has certified one organic group named “Rangshin Sanam Detshen” (local term) or “Organic Agriculture Group” and the group consists of 51 members with a total of 16.19 hectares of organically managed land (ADAO, 2017). The domestic organic representation is just 0.021% of the households in the country. This group mainly produces certified vegetables such as potato, garlic and carrot and the locally certified products is directly contracted by farmers group to high-end hotels in Thimphu and Paro districts. However, the demand and price for organic produces in the local market is limited due to easy availability of imported vegetables and food grains at cheaper price. There is also lack of statistics on the organic produce and sales both within and outside the country as the record keeping is still in early stages.

The OF development in the country is not only supported by NOP and Department of Agricultural and Marketing Cooperatives (DAMC) under the MOA but also by several other important stakeholders such as NGO’s, farmers groups and cooperatives, institutions and private companies (Bio-Bhutan). The OF programs has been extended to ‘green schools’ in the country and organic ‘community’ and ‘pilot activities’ are initiated by NOP in-collaboration with district agriculture sector.

Currently, among twenty districts only two districts has been declared organic, Gasa in the northwest and Samdrup Jongkhar in the south of the country since 2004 and 2010 respectively (ADAO, 2017). These districts are the leading districts in OF and focuses on large-scale commercial production.

4.2.4 Non-certified but organic farming

The interviewed experts are of the view that vast majority of the land is consider as "organic-by-default" because the farmers neglect the use of 'synthetic agro-chemical', rely on locally available resources and involves no certification. Being largely organic by default farmers and experts argues that it would be easier for the country to go fully organic (ADAO, 2017). The overwhelming majority (97.76%) of the households are farming organically without using plant protection chemicals (Agriculture statistic, 2012-2013) but are not certified.

The products from non-certified but organic farms includes ginger powder, amla juice, turmeric powder, ginger tea and herbal tea (Gyamtsho, 2014) and paddy, barley and medicinal plants (both wild and domesticated) are exported by Bio-Bhutan. These products are exported to neighboring country like India and Bangladesh. The red rice are exported to UK, USA and Germany (Duba et al., 2008). Although red rice is not certified the experts stated that it's grown organically and are exported.

The non-certified but organic products are also supplied to school agriculture program within the community and are sold in local market in and around the country. The non-certified but organic products are consider equally healthy and safe for consumption and farmers prefer not to certify their products.

4.3 Research results

4.3.1 Social and demographic description of respondents

Several socio-demographic data on the farm size, cultivation areas, and income were collected from the certified farmers and non-certified but organic farmers as they are exploratory variables that serves as drivers or constraints for conversion to OF. Out of 146 respondents, majority of them were female (69.18%) (n= 101) and the remaining

were male (30.82%) (n= 45), and among the two groups the non-certified farmers top the list (67.81%) (n=99)(see table 2). The majority (76.03%) of respondents were under the age category of 31-59 years. The other group include older farmers (60 and above) and younger population were relatively lesser representing (13.7%) and (10.27%) respectively. This added extra point in collection good information, since the older respondents is said to have better farming experience and good information.

Table 2: Number of respondents by sex and age

Personal Information	**Frequency/Percentage (organic certified farmers)**	**Frequency/Percentage (non-certified farmers)**	**Total**
Male	15 (10.27%)	30 (20.55%)	45 (30.82%)
Female	32 (21.92%)	69 (47.26%)	101 (69.18%)
Total	47 (32.19%)	99 (67.81%)	146 (100%)
Age-Category			
18-30	6 (4.11%)	9 (6.16%)	15 (10.27%)
31-59	38 (26.03%)	73 (50%)	111 (76.03%)
>60	3 (2.05%)	17 (11.65%)	20 (13.7%)

4.3.2 Education index of farmers & farmlands

The large majority of farmers were illiterate (78.08%) (n= 114), 3.42% (n=5) of the farmers fall under non-formal education category, 15.75% (n=23) of the farmers got primary education, 2.05% (n=3) have high school and less than one percent (0.68%) (n=1) of the respondent got university degree and falls under non-certified category (see table 3 & figure 4). The respondents were from the diverse educational background and provided with the valid information on the farming system in the country.

Table 3: Education of the respondents

Education	**Frequency/Percentage (organic certified farmers)**	**Frequency/Percentage (non-certified farmers)**	**Total**
Illiterate	27 (18.49%)	87 (59.59%)	114 (78.08%)
NFE	4 (2.74%)	1 (0.68%)	5 (3.42%)
Pry education	15 (10.27%)	8 (5.48%)	23 (15.75%)
High School	2 (1.37%)	1 (0.68%)	3 (2.055%)
University	0 0	1 (0.68%)	1 (0.68%)
Total	47 (32.19%)	99 (67.81%)	146 (100%)

The figure below shows the education level of the certified and non-certified farmers.

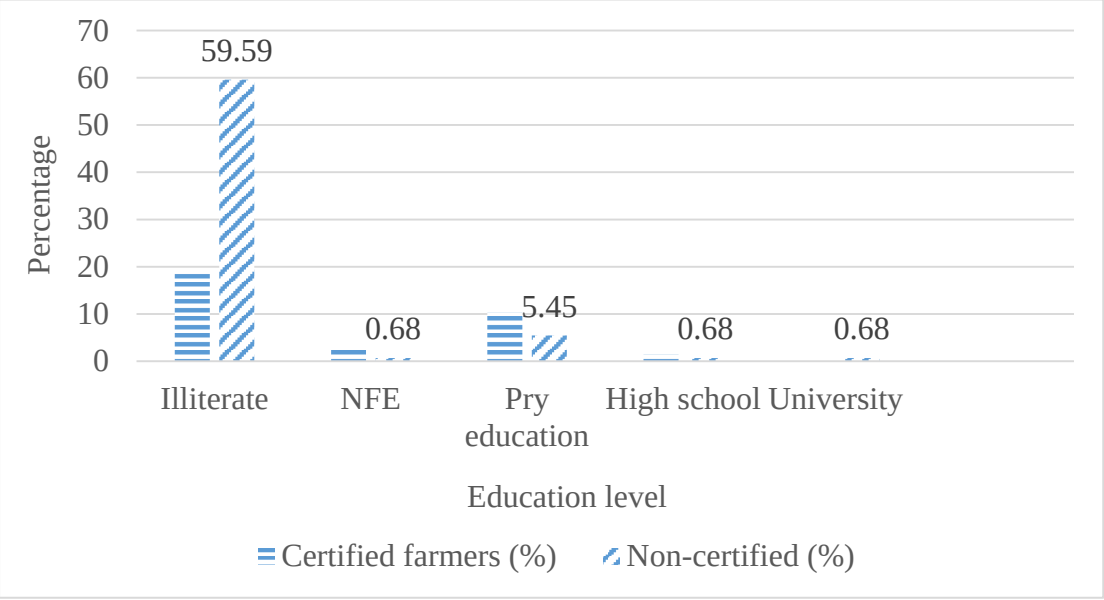

Figure 4: Percentage of respondents with different level of education.

The respondents has 0.83 hectares of land per households and family size of 4.3 person per households. The total cultivable land in the study area is 121.79 hectares (both dry and wetland) and belongs to the family. Regarding the domestic organic certification, 36.87% of the farmers has obtained organic group certification since 2016 and the rest were not certified.

Zomina village, Gasa district

Damzi village, Gasa district

Gayza village, Gasa district

Khailo village, Gasa district

Figure 5: Small land holding of farmers

The respondents were from the farming community and agriculture is their main source of livelihood. Farmers mainly sold vegetables in local market and boarding school in the community and the market in capital city, Thimphu. The respondents have good knowledge and experience on the local environment and the changes that were taking place in the farming system due to long-term agriculture practices.

Completion of paddy harvesting & vegetable promotion in progress,

Chili promotion by Aum Zam & family, 2017

Mr. Dori (middle), Aum Tshewang & Mr. Gyeltshen (Tshogpa), 2017

Paddy thrashing at Bartsha village, 2017

Figure 6: Farming settlement & farmers at work

The figure below shows the agriculture practices in the country that is largely traditional in nature and involves the use of 'human power'. The human power is use for field preparation, clearing of the bushes, plantation, harvesting and transportation.

Mrs. Zeko Dem of Khailo village, 2017

Mr. Kencho Wangdi & his wife, 2017

Nim Dem, Pem, and Tshewang Tobgay & Damcho of Khailo village during paddy harvesting 2017

Aum Sangay & Mr. Penjor during paddy harvesting, 2017

Figure 7: Paddy harvesting in progress

4.3.3 General perceptions of farmers

This study also collected data on farmers' source of information, income, familiarity with OF and policy awareness, willingness to continue farming organically or not and their experience on OF. The result shows that, the farmers' has chosen three main sources of information. They are government officials (78.29%), neighbors (15.07%) and radio (2.53%) (See figure 8).

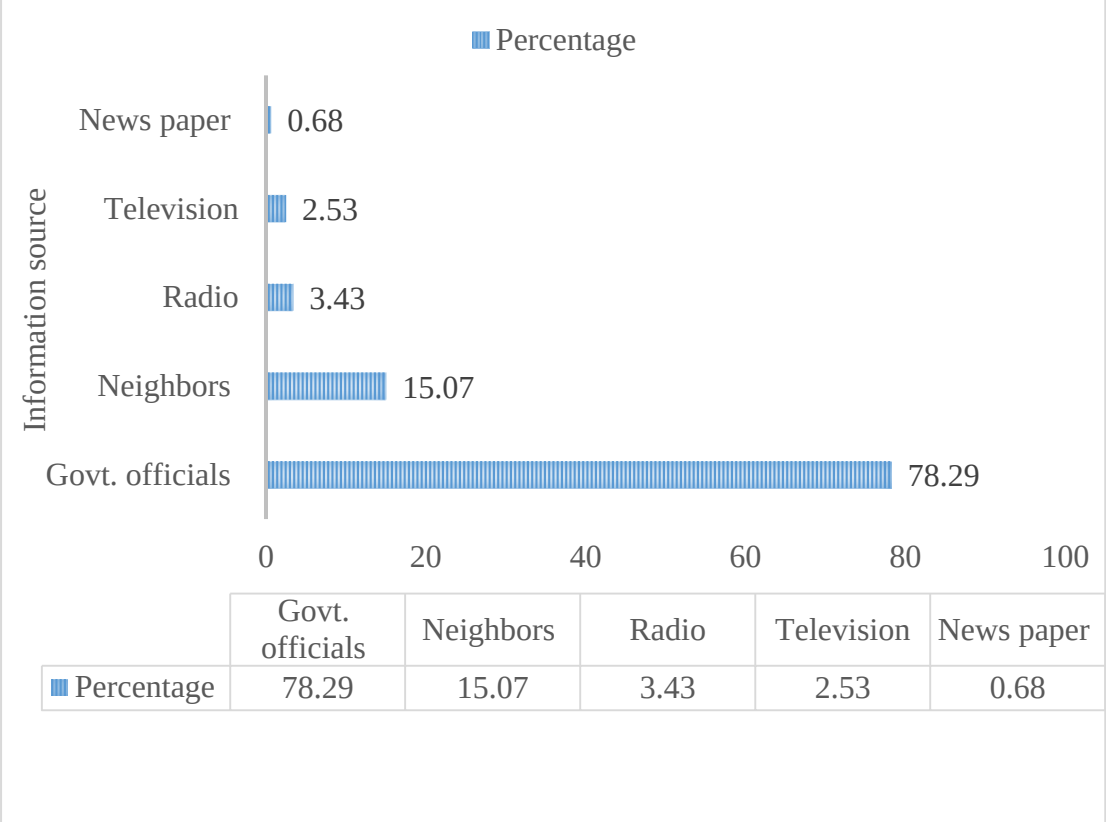

Figure 8: Information sources of organic farmers

The data on the different types of vegetables and crops cultivated in two blocks and their contribution to annual household income where collected from the farmers. The study found that the widely grown crops and vegetables were potato (99.31%), wheat (94.51%), garlic (91.77%), barley (82.87%), paddy (67.12%), carrot (54.79%), chili (46.56%), cabbage (41.09%), and beans (15.06%). Paddy is cultivated only in Khamaed and 2.023 hectares of trail paddy cultivation is initiated in Khatae block. Potato was the top grown cash crop with annual income of US $ 12,012.28 or Nu.

772750 in Khatae block and US $ 16,768.31 or Nu. 1075705 in Khamaed block, followed by Garlic (Allium sativum) with annual income of US $ 10,219.81 or Nu.657440 in Khatae and US $ 10,275.15 or Nu. 661,000 in Khamaed block (Nu 100=US $ 64.33) (see figure 9).

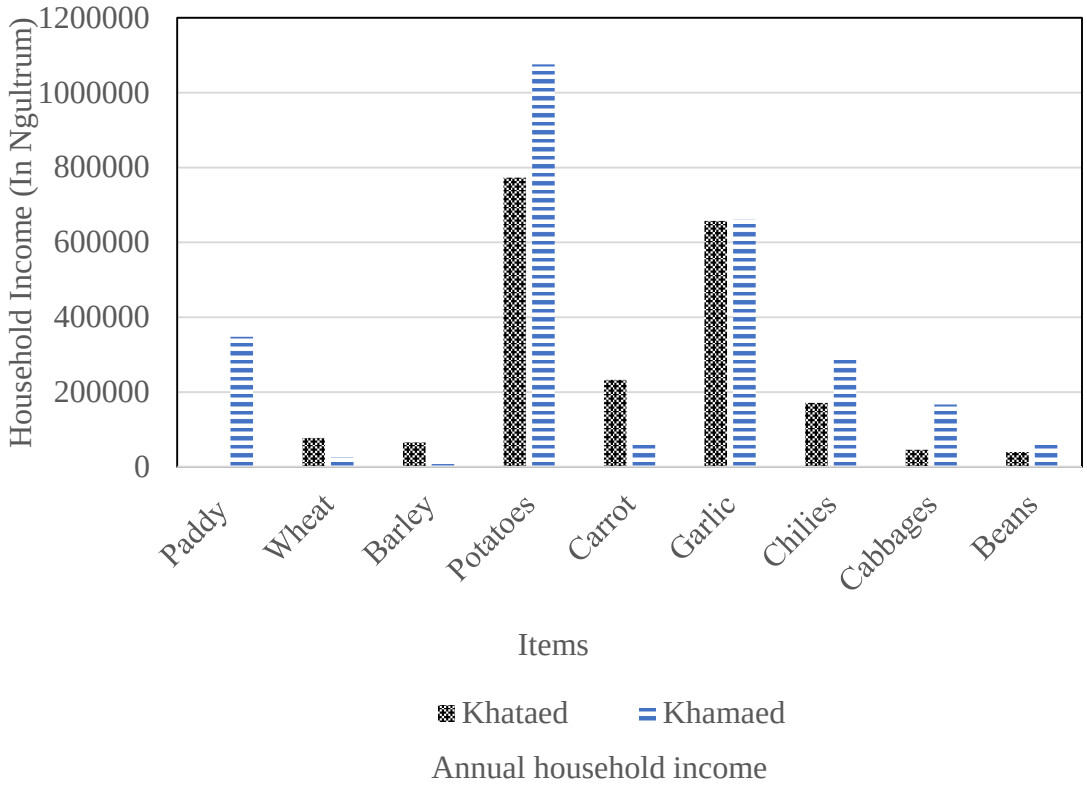

Figure 9: Income of the respondents for sale of organic products

4.3.3.1 Overall perceptions of farmers (certified & non-certified)

The respondents were asked about their familiarity on OF, ‘Do you know about OF?’ 100 % (n=146) stated that they are familiar with OF although they have very limited knowledge on the principle of organic farming.

To the question, ‘Are you aware of the National Organic Policy?’ majority (81.51%) of the respondents said they are aware of the policy, however, 18.49% stated that they are not (see table 4).

When asked about their intension to continue farming organically, the overwhelming majority of respondents (99.31%) (n=145) stated that they would continue farming organically and only one (0.69%) express his intention of not continuing farming organically.

To the question, 'Do you think Bhutan should promote OF?' overwhelming majority (99.31%) of the farmers stated that government should promote OF throughout the country, while, one respondent (0.69%) stated 'don't know'. The farmers opinion are similar to that of the agricultural experts who argues that government should promote OF and publish yearly statistic on the volume of produces, sale and income generation.

The respondents were asked their opinion on the importance of organic farming. The vast majority (93.15%) of the respondent indicated that OF is 'very important', whereas, 6.85% of the respondent stated it 'important' and none of the respondents stated 'not important' (see table 4).

When asked about their experience in OF, (76.72%) (n=112) stated that they were farming organically over ten years, (11.64%) stated farming between 6-10 years, and another (11.64%) are farming between 1-5 years and none below one year. This shows that OF in Gasa district is as old as National Organic Program in the country.

4.3.3.2 Perceptions of certified farmers

The result shows that 100% (n=47) of the certified farmers are familiar with OF as they have been farming organically for long time and is expected to know. The survey result also illustrates that 100% of the farmers are familiar with National Organic Policy (NOP) and all of them (100%) intend to continue farming organically. This result shows that the certified farmers' were well informed on organic farming and this is because of the dissemination of information by NOP and other relevant agencies.

When asked about the promotion of organic farming in the country (100%) of the respondents stated that government should promote OF due to several positive benefits such as health issues, economic and environmental benefits. When asked on

the importance of organic farming (97.87%) (n=46) of the certified farmers stated ‘very important’, (2.13%) (n=1) stated its ‘important’ and none of the respondents stated ‘not important’.

To the question on their experiences in OF, (78.72%) (n=37) of the certified farmers stated that they have been farming organically over ten years, (2.13%) (n=1) over 6-10 years and (19.15%) (n=9) has been farming over 1-5 years and none of them were below one year.

4.3.3.3 Perceptions of non-certified but organic farmers

The survey result shows that 100% (n=99) of the non-certified farmers are familiar with OF although their understanding was limited to none use of ‘synthetic agro-chemicals’. The non-certified farmers were also asked on the familiarity with National Organic Policy (NOP), where (72.73%) (n=72) stated that they are familiar, while the rests (27.27%) (n=27) stated that they were not. This is because of the lack of education of the farmers, different experiences and lack of clarity in policy.

To the question on continuing farming organically, overwhelming majority (98.99%) (n=98) stated that they want to continue farming organically, while, the rest (1.01%) stated not to farm organically. The same (98.99%) (n=98) of the respondents stated that the government should promote OF throughout the country and just (1.01%) stated ‘don’t know’. This shows that the perceptions of both the groups of farmers are very same.

The non-certified farmers’ were asked on the importance of organic farming and majority (90%) (n=90.91%) stated ‘very important’ and (9.09%) (n=9) stated ‘important’ and none of them stated ‘not important’. This clearly shows that farmers have good knowledge on the importance of organic farming and government should support the non-certified farmers through product certification.

Table 4: Perceptions of farmers

Perception of farmers	General perceptions			Certified farmers			Non-certified farmers		
	Yes	**No**	**Don't know**	**Yes**	**No**	**Don't know**	**Yes**	**No**	**Don't know**
Familiar with organic farming	146 (100 %)	0 0	0 0	47 (100 %)	0 0	0 0	99 (100 %)	0 0	0 0
Familiar with NOP	119 (81.51%)	27 18.49%	0 0	47 (100 %)	0 0	0 0	72 (72.73%)	27 (27.27%	0 0
Continue farming organically	145 (99.31%)	1 (0.69%)	0 0	47 (100 %)	0 0	0 0	98 (98.99%)	1 (1.01 %)	0 0
Promote organic farming	145 (99.31%)	0 0	1 (0.69%)	47 (100 %)	0 0	0 0	98 (98.99%)	0 0	1 1.01%
Importance of organic farming	Very important	Important	Not important	Very important	Important	Not important	Very important	Important	Not important
	136 (93.15%)	10 (6.85%)	0 0	46 (97.87 %)	1 (2.13 %)	0 0	90 (90.91%)	9 (9.09 %)	0 0
Started farming organically	Years				Years				Years			
	< 1	1-5	6-10	>10	< 1	1-5	6-10	>10	< 1	1-5	6-10	>10
	0 0	17 11.6%	17 11.6%	112 76.7%	0 0	9 19.1%	1 2.13%	37 78.72%	0 0	8 8.08%	16 16.1%	75 75.7%

4.3.4 Result on drivers for conversion to organic farming

To identify the drivers that influences farmers' conversion to OF, eleven variables were selected from the literature review and they are group into four key factors. This result is based on the ranked order of importance and the importance of the various factors are ranked by measuring mean value and standard deviation (see table 5). The farmers were asked to rank the factors in the scale of (1) strongly disagree (2) disagree (3) neither agree nor disagree (4) agree and (5) strongly agree. Based on these result, the mean value were classified into three groups such as: 'very important' group represented by the mean value of higher than 4; 'important' group with mean value ranging from 3 to 4, and the 'least important' group with mean value of lower than 3.

4.3.4.1 Result on drivers from combined ranking

The mean score from the combined ranking for certified organic and non-certified but organic farmers ranges from 3.3869 to 4.077. The combined ranking by the farmers represented the mean value of higher then four for two factors: 'environmental awareness', and 'health benefits'. The farmers ranked 'important' for two factors such as 'economic benefits' and 'education & employment benefits' and none of the factors were ranked least important.

The combined ranking has identified factor 1 'environmental awareness' that consists of four motivating reasons 'improve soil fertility', 'protect biodiversity', 'reduce pollutions' and 'preservation/conservation of environment' mean score (4.077) as 'very important' factor for conversion to OF and is supported by the maximum number of the respondents. The farmers were aware of the importance of environmental preservation/conservation and are concerned with the negative effects of CF that uses pesticides and chemicals.

Factor named 'Health benefits' with mean score 4.0034 which consists of two variables such as 'improve personal health and family health' and 'help enhance food quality' is another very important factor for conversion to OF as the difference between two factors is very small.

The respondents ranked the factor ‘economic benefits’ mean score 3.8127 that consists of variables such as ‘increase in income’, ‘reduces external input costs’ and ‘provision of subsidies’ as important factor for organic production.

The factor ‘education and employment benefits’ is another important factor for farmers’ conversion to organic practices. OF help increase education opportunities for family members and provides higher employment opportunities.

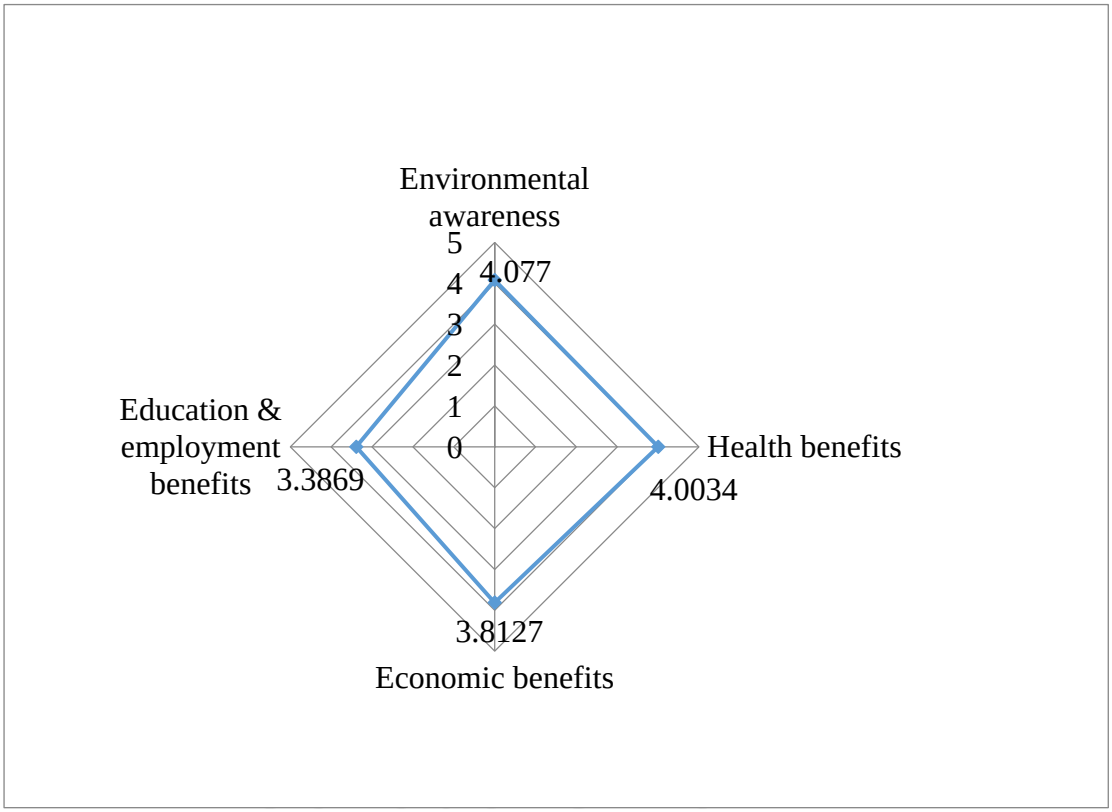

Figure 10: Drivers for conversion to organic farming

The radar shows the factors on four aspects (environmental awareness, health benefits, economic benefits and education and employment benefits) and shows them radically. Each of the four aspects of the conversion to organic production form their own axes and the blue line simply connects all the aspects. The scale on the radar ranges from 0-5 and value of each aspects is depicted by the dot. In the radar we find that environmental awareness has highest value (4.077), followed by health benefit (4.0034) and then economic benefits (3.8127) and education and employment benefits has the

lowest value (3.3869). This shows that environmental awareness and health benefits are very important factor for farmers conversion to OF and economic benefits and education and employment benefits are important factors.

4.3.4.2 Result on drivers from the certified farmers

The result from the certified farmers (n=47) of Khatae block shows that the farmers has ranked ‘health benefits’ mean value (4.0319) as ‘very important’ factor and ‘environmental awareness’ with mean score (3.9934) as ‘important’ factor. However, the difference between factor 1 and 2 is very small and both the factors are predominant factors for conversion to OF (see table 5).

The certified farmers has identified ‘economic benefits’ with mean score (3.8014) as another important factor. The mean score of factor 1, 2 and 3 are very close and the economic benefits is still a significant factor in organic production.

Finally, the respondents ranked ‘education and employment benefits’ mean score (3.4362) as an important factor. However, there is wide gap between the mean score of factors 3 and 4. This shows that OF help provide better education and employment benefits for family members. The organic farmer’s witnessed increase in employment opportunities, as woman were actively involved in organic productions and marketing but its contribution to education is negligible now because of small production and lack of access to market.

Table 5: Ranking of drivers for conversion to organic farming

Variables	Combined ranking		Certified organic farmers		Non-certified farmers	
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
I decided to convert to organic farming because of …						
Factor 1 Environmental awareness	4.077	0.501	3.9934	0.4365	4.0378	0.5367
Factor 2 Health benefits	4.0034	0.4875	4.0319	0.5165	3.9898	0.4703
Factor 3 Economic benefits	3.8127	0.5420	3.8014	0.6685	3.8169	0.4698
Factor 4 Education & employment benefits	3.3869	0.6436	3.4362	0.7149	3.3636	0.6067

- Ranked order of importance: > 4 mean very important

  3-4 mean important

  < 3 mean least important

4.3.4.3 Result on drivers from the non-certified farmers

The data from the non-certified farmers (n=99) of Khamaed block illustrates that they have identified ‘environmental awareness’ mean score (4.0378) as ‘very important’ factor as compared to other factors. The respondents has ranked ‘health benefits’ with mean score (3.9898) as ‘important’ factor. However, the mean score between two factors are negligible and both are significant factors (see table 5). The farmers has chosen environmental awareness as very important factor due to spread of information and awareness, strict laws, rules and regulations and because of the constitutional mandates of every citizen to preserve, promote and conserve environment.

The non-certified farmers ranked ‘economic benefits’ with mean value (3.8169) as an important factor and this ranking in order is very similar to the ranking by the certified farmers. This shows that both the groups of farmers’ view economic benefits as important factor in conversion to OF and are able to generate some income from the sales of vegetables.

The farmers identified ‘education and employment benefits’ mean score (3.3636) as another important factor and has been identified by certified farmers too. This shows that the views of both the groups of farmers are uniform and they have realized the importance of education for holistic agriculture development and in improving the livelihood of the family members.

The result shows that the general data is similar from the non-certified data because the number of respondents is two times higher as compared to certified farmers. The majority (n=99) of the respondents were not certified because the certification is costly, difficult to avail and farmers feel that certification is not important.

4.3.5 Results on constraints for conversion to organic farming

To identify the constraints for farmers' conversion to OF, we selected ten variables from the literature review and group them into four key factors. We analyzed the constraints for conversion to OF in two steps: Firstly, based on the ranked order of importance by the farmers and factors are ranked by measuring mean scores and standard deviations. Secondly, based on the result the mean value were classified into three groups such as 'most challenging', 'challenging' and 'least challenging'. The most challenging group was represented by the mean value of higher than 4; 'challenging' group with mean value ranging between 3 to 4; and the 'least challenging' group represented by the mean value of lower than 3 (see table 6).

4.3.5.1 Result on constraints from combined ranking

The result from the combined ranking represented mean value of higher then four for one factor 'low productivity'. The farmers identified three factors with mean score ranging from three to four such as; 'market aspects', 'education and research aspects', and 'economic and financial aspects' as the 'challenging' factors. While, none of the factors were identified as the least challenging factor.

The factor low productivity with mean value (4.340) is the most challenging factor as compared to other factors. The low productivity in OF is due to reasons such as ineffective pests and diseases control, weeds control and labor shortages. Both the certified and non-certified but organic farmers (100%) of them rated pests, weeds and disease as a major problem in OF.

As expected, market aspects with mean value (3.688) is one of the challenging factor for farmers' conversion to organic production. The surveyed villages (both certified and non-certified) lack access to market, poor rural connectivity and lack market information on price, supply and demand trends.

The factor education and research aspects mean value (3.496) is identified as the challenging factor by the farmers for conversion to OF and there is overwhelming respond from the experts who stated that raising of awareness, training and workshop

would enhance the skills of the farmers and the infrastructure development would support OF development.

The factor named, economic and financial aspects mean score 3.236 which consists of two variables such as lack of access to credit and costly certification and inspection is another challenging factor for farmers conversion to organic production. The farmers lack access to credit and certification is costly.

Based on the combined result from the certified and non-certified farmers we can conclude that the most challenging factor for farmers conversion to OF is low productivity and the rest of the factors such as market aspects, education and research aspects and economic and financial aspects are challenging factors.

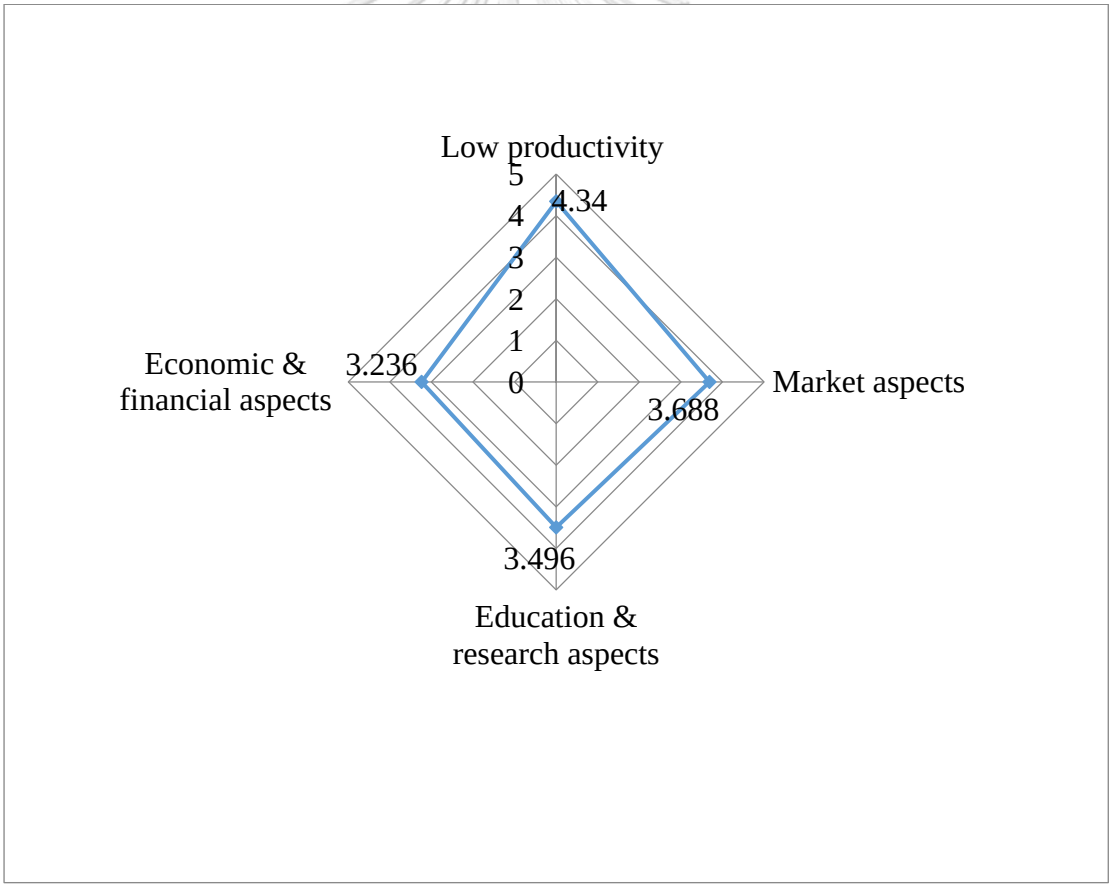

Figure 11: Constraints for conversion to organic farming

The radar shows the factors for conversion to OF in four aspects such as low productivity, market aspects, and education and research aspects and economic & financial aspects and shows them radically. Each of the four aspects for conversion to OF forms their own axes and the blue line simply connects all aspects. The scale on the radar ranges from 0-5 and value of each of the aspects is illustrated by dot. In the radar the low productivity has highest value (4.340), followed by market aspects (3.688), then education and research aspects (3.496) and economic and financial aspects has the lowest value (3.236). The result from the radar shows that low productivity is the most challenging factor for organic productions and the rests of the factors are challenging factors.

4.3.5.2 Result on constraints from certified farmers

The result on constraints from the certified farmers (n=47) shows that the respondents has identified ‘low productivity’ with mean score (4.2837) as the ‘most challenging’ factor in conversion to OF.

The respondents ranked ‘education and research aspects’ mean score (3.5532) as the challenging factor based on their experience, age and education differences. The difference in mean score between factor 1 and 3 is very wide but still the two factors are the top challenging factors for organic production.

The certified farmers ranked ‘market aspects’ with mean value (3.2766) as the challenging factor in conversion to OF. The farmers lack access to market due to small products from the isolated pockets of production and this add on cost and business viability is limited.

Finally, the ‘economic and financial aspects’ with mean score (3.1064) is another challenging factor and has the lowest mean value in the table (see table 6). This shows that the farmers lack access to credit and though they were certified locally, they still view certification as costly. The study found that only three products were certified locally and none of the products has international certification. This factor is the fourth challenging factor for certified farmers in organic production.

Table 6: Ranking of constraints for conversion to organic farming

Variables	Combined ranking		Certified organic farmers		Non-certified farmers	
	Mean	Std.dev	Mean	Std.dev	Mean	Std.dev
Conversion to organic farming because of …						
Factor 1 Low productivity	4.340	0.564	4.2837	0.6390	4.367	0.5224
Factor 2 Market aspects	3.688	0.611	3.2766	1.0094	3.8838	0.4963
Factor 3 Education & research aspects	3.496	0.708	3.5532	0.9493	3.4697	0.6253
Factor 4 Economic and financial aspects	3.236	0.808	3.1064	2.9646	3.1651	0.6886

- Ranked order of importance: > 4 mean most challenging
  3-4 mean challenging
  < 3 mean least challenging

4.3.5.3 Result on constraints from non-certified farmers

The non-certified but organic farmers also ranked ‘low productivity’ with mean score (4.367) as the most challenging factor for conversion to OF. This shows that low productivity is a barrier for both certified and non-certified farmers.

The respondents ranked market aspects with mean value (3.8838) as challenging factor for organic production. The farmers lack access to local, national and regional market due to which they could not increase productions, income and poverty reduction. The non-certified farmers lack access to market due to poor rural connectivity, low productions and lack of certification.

The farmers ranked ‘education and research aspects’ mean value (3.4697) as another challenging factor for OF. The majority (59.59%) (n=87) of the non-certified farmers were illiterate and lack knowledge on organic certification, grading and marketing. This shows that even the non-certified farmers has realized the significance of education and research activities in OF development.

The ‘economic and financial aspects’ with mean score (3.1651) is a challenging factor. This shows that both groups of farmers lack access to credit facilities and certification is costly. The local certification has only benefitted handful of farmers and majority (n=99) could not avail as this form of certification has been initiated recently and government has to bear all the expenses for products testing in laboratories both within and outside the country. The domestic certification though involve ‘zero cost’ for the farmers, it incurred expenses for the government due to products and soil testing for heavy metal contaminants, pesticides and chemicals residues.

The result shows that the ranking of constraints by non-certified but organic farmers for conversion to organic practices is similar to the general data this is because the farmers has been operating organically for over a decade and has first-hand experience and the ratio of the certified to non-certified farmers is 1:2. However, we can conclude that the certified farmers enjoy slight advantages over non-certified farmers as they could directly contract their products to high-end hotels.

CHAPTER V
DISCUSSION

This chapter discusses on the social/demographic characteristic of the farmers of Gasa district, their general perceptions and drivers and constraints in conversion to organic farming.

5.1 Socio-demographic characteristics of Gasa farmers

The survey questionnaire through face-to-face interview of this study was attended by the majority of farmers (76.03%) representing the age category 31-59 years and among them 50% were non-certified but organic farmers and rest the certified farmers (26.03%). This result shows that they are economically active and productive citizens and non-certified but organic farmers dominated the study area. The older farmer (above 60 years) were (13.7%) and among them (11.65%) were non-certified farmers, and younger farmers (18-30) years were relatively less (10.27%) and among them (6.16%) were non-certified farmers and the rest were certified farmers (4.11%). This shows that age plays insignificant role in conversion to OF. This finding is inconsistent with previous studies that concluded that the organic farmers were relatively young and educated as compared to conventional farmers (Niemeyer & Lombard, 2003). The result also shows the social trends of rural migration, labor shortages in rural areas as younger population between 18-30 years migrate to towns and cities in search of better employment opportunities and senior citizen are back in the villages.

The gender distribution of the respondents' shows that majority of the farmers were female (69.18 %) and among them (21.92%) were certified farmers and the rest (47.26%) are non-certified farmers and the male were relatively less (30.82%) (n=45). This indicates that the farming in the study area is dominated by women and reflects the gendered division of labor as majority of the respondents were women mostly involved in paddy harvesting and man were involved in off farm activities such as preparation for Royal Highlander Festival in Laya block, Gasa district. This result also depicts women as caring, nurturing and committed to the environment and is easier for

them to understand OF as they are concern about taking care of family health, food safety and environment. The agriculture land needs care, soil protection and efficient water resources management and women voluntarily work to restore land & halt "environmental destruction" (Jackson, 1993). This study found that women has high potential in OF based on their high involvement in organic agriculture practices.

Education level of the respondents in the study area was low. Among the farmers, large majority (78.08%) were illiterate, out of which (59.59%) were non-certified farmers and the rest (18.49%) were certified farmers, 15.75% (n=23) had primary education and majority (10.27%) of them were certified farmers, 3.43% (n=5) had Non-Formal Education, 2.05% (n=3) has high school and less than one percent (0.68%) has bachelor degree. The finding on education is inconsistent with previous study which stated that organic farmers were young and educated as compared to conventional farmers (Mccann, Sullivan, Erickson, & De Young, 1997) and other studies, see review (Padel, 2001). This study shows that education plays insignificant influence in conversion to OF and is in line with the studies conducted in Nepal (Karki, Schleenbecker, & Hamm, 2011). These is encouraging result for developing countries that has large number of illiterate farmers and the lack of education is not going to hold them back from adopting OF. However, due to lack of education the farmers may face difficulty in product certification and inspections, record keeping and availing information provided by various sources such as newspapers, journals, books and publications and reduces employment opportunities.

The average family size and the farm size in the study area were relatively small. The farmers has family size of 4.3 members and average land holding (both dry and wet land) was 0.83 hectares for domestic organic certified and non-certified but organic farmers. This study found that family and farm size does not influence farmers' conversion to OF.

5.2 General perceptions of the surveyed farmers

The surveyed farmers have mainly chosen three main sources of information such as governmental official (78.29%), neighbors (15.07%), and radio (2.53%) through which they could gather information and has influenced them to practice OF. The finding of this study contradicts with previous studies (Niemeyer & Lombard, 2003) where the author pointed that books, farmers own education and conversation among organic farmers were the main source of information. However, the respondents rated low for television (2.53%) and newspaper (0.68%) because majority of the farmers are illiterate and they can hardly read and write and there is lack of cable television (visual media) services in the study area. The results shows an important role played by NOP and district agriculture sector in dissemination of information and awareness based on high rating for information from government officials.

The survey result found that farmers cultivated wide varieties of vegetables not only for family consumption but for sales and this has provided them with higher income and increase nutrient contents in diet. While, the cereal crops such as paddy, wheat and barley were mainly cultivated for self-consumption. The survey result illustrates that the overwhelming majority (99.31%) of the respondents cultivated potato, followed by garlic (91.77%) and other cereal crops. Further, it was found that maximum household income were from the sale of potato and garlic in two blocks (see figure 9).

The finding of this study shows that 100 % (n=146) of both certified farmers (n=47) and non-certified farmers (n=99) are familiar with OF although their definition was limited to none use of chemical fertilizers and pesticides. This according to experts is due to dissemination of the information by NOP, district agriculture sector and other important stakeholders in the form of seminars, workshops, training and study tours for the farmers and those involved in OF and because the study area was identified as trail organic community since 2004.

We were interested to know whether the respondents intend to continue farming organically because the government does not compel farmers nor does it provides direct

subsidies (financial support) and is undertaken voluntarily by the farmers. The study found that 100 % (n=47) of the certified farmers intend to continue farming organically and similarly the overwhelming majority (98.99%) (n=98) of the non-certified farmers are willing to continue operate their farm organically due to health, environmental and economic reasons. The only (1.01%) (n=1) of non-certified farmer intended not to farm organically and this make no difference for conversion to OF. Therefore, the government should support non-certified farmers through product certification and formation of groups and cooperatives.

The result shows that 100% of the certified farmers view that the government should promote OF throughout the country and almost equal (98.99%) (n=98) of the non-certified farmers shares the same opinion. This according to the respondents is because promotion of organic farming would enable the poor farmers to come out of poverty, increase income and improve health. This clearly shows that the perceptions of both the groups of farmers are very positive and very strong. This view is also echoed by the interviewed experts who stated that, "Bhutan has high potential due to surrounding environment, people don't use much chemicals and pesticides as compared to developed countries and government should promote OF" (ADAO, 2017).

Based on the above facts, this study found that both certified and non-certified farmers strongly belief that OF is 'very important' and is supported by maximum number of the respondents in each group. From the survey result, we found that (97.87%) of the certified farmers and majority (90.91%) of the non-certified farmers' supports this view and none of the farmers in both groups stated that OF is 'not important'.

Similarly, the majority of the farmers in both the groups has been farming organically for long time. For instance, (75.76%) (n= 75) of the non-certified farmers and (78.72%) (n=37) of the certified farmers has been practicing OF over a decade and none of the farmers in both the groups is farming for less than one year.

The only difference between the two groups is on familiarity with National Organic Policy. The result found that 100% of the certified farmers were familiar with

policy, while, only (72.73%) of the non-certified farmers are aware of the policy and the rest (27.27%) do not know. This is due to the lack of the education of the farmers, lack of strict implementation and monitoring by the government and lack of clarity in policy.

Though they are two different groups they have same holistic perceptions toward OF development and from the result, we can conclude that it is increasingly gaining popularity and the government and important stakeholders should provide relevant support.

5.3. Farmers' drivers in conversion to organic farming

The combined result for this study found four key drivers for farmers conversion to OF and they are 'environmental awareness', 'health benefits', 'economic benefits' and 'education & employment benefits'. Interestingly, these factors are similar to the findings in Iran where the author identified economic motivations, health and safety concerns and environmental issues as the major factor for organic productions, while social as well as ethical motives was identified as minor factors (Veisi et al., 2017).

'Environmental awareness' with combined mean value (4.077) is very important factor for farmers conversion to OF as they are wholly dependent on fragile ecosystem for livelihood and their actions directly influences nature. Awareness encourages farmers to preserve, protect, nurture, and promote sustainable development. Due to environmental awareness and advocacy, farmers are most likely to operate their farm in environmentally friendly way thereby enhancing soil fertility, reducing pollutions, protecting biodiversity and preservation/conservation of environment. As to the survey, environmental preservation, protecting biodiversity, reducing pollutions and improving soil fertility are important variable raised by farmers. This shows that there is awareness and on the other hand, we need OF to enhance eco-system. The Bhutanese government and farmers have sustainable mind and to promote OF we need sustainability. Farmers are aware of importance of soil fertility as it is key to improve OF. However, soil fertility measures is going to be challenging for the agricultural sector as the government has to invest more on research and development culture. The

environmental awareness is advantage for the policy because based on the performance everything supports OF. The interviewed experts pointed that awareness is vital as the farmers can learn better farming practices thereby reducing negative impacts on environment.

'Health benefit' with mean value (4.0034) is another important factor motivating farmers' conversion to OF and this has been found by previous studies in Iran (Veisi et al., 2017), in Bangladesh by (Sarker & Itohara, 2008), in France by (Latruffe, Bougherara, & Sainte-Beuve, 2012) and in Thailand by (Pornpratansombat, Bauer, & Boland, 2011). The use of synthetic agro-chemicals has effect on individual health, family health and consumers' health. The surveyed farmers are not only concerned about individual and family health but also consumers' health and environmental effects. They are equally concerned with high pesticides content in imported vegetables from bordering town in India and aims to produce 'healthy products' not only for family consumptions but also for sale. These types of farmers show higher possibility for conversion to OF thereby increasing food safety, security and nutrient content. The survey result found that both the groups of farmers' uses ecological sound practices such as crop rotation, inter cropping and locally available resources and integrated pest management to improve the food quality and food safety and focuses on product diversifications. The farmers also avoid using toxic chemicals and practices vegetables and crops diversification. The interviewed experts pointed that in a developing countries where large number of farmers are illiterate the best possible solution to reduce the health risks due to the use of 'synthetic agro-chemicals' is to permanently ban. This they strongly argues would be possible in developing country like Bhutan because of its limited use, strict regulations and due to non-authorization of the private firms to import and distribute freely.

Not surprisingly 'economic benefit' is another important factor for farmers conversion to OF. Farmers are most likely to convert to organic production if they get economic benefits. The economic benefits motivating farmers' conversion to organic production was confirmed by previous study conducted in Iran (Veisi et al., 2017) and in Bangladesh (Sarker & Itohara, 2008). The survey result found that farmers in the study area generated income through product diversification, increasing both quality

and quantity, relying on locally available resources and better cropping practices thereby reducing external inputs costs and the government provided subsidies in the forms of supply of farm machineries and tools, seeds and seedlings. Based on this result, we might have high competition in organic production in future and this would help poverty reductions, increase income, provide higher education and employment opportunities and boost economy. However, due to economic motivations it may lead to increase in deforestation and loss of biodiversity in developing countries.

Factor named ‘education and employment benefits’ is another important factor for conversion to organic production, as has been found for small-scale farmers in Asia (Qiao et al., 2016) and by other study (van Elzakker & Eyhorn, 2010). The survey result found that large majority (69.18%) of the farmers experience increase in employment opportunities in rural areas, as women were actively involved in organic productions. The household members were gainfully engaged in agriculture production and the temporary labors where hire from within the community during plantation and harvesting season thereby providing seasonal employment opportunities. However, the interviewed experts and farmers stated that the contribution of organic farming to family education is negligible now due to small production, market issues and because education is provided free off costs by the government. However, the surveyed farmers and interviewed experts strongly argues that the increase in investment in OF, increase in production, access to market with high premium price will definitely complement on education, improve livelihood and provide higher employment opportunities in rural areas.

5.4 Comparative study on farmer’s drivers for conversion to organic farming

The comparative study between the domestic organic certified farmers and non-certified but organic farmers found that the ranking of the factors for conversion to OF slightly differs between two groups. The certified farmers has identified ‘health benefits’ as ‘very important’ factor for conversion to OF, while, the non-certified farmers has identified this as an ‘important’ factor. However, the mean score difference between two groups are very close. The view differs, as it is human tendency to produce safe and healthy products not only for sale but also for family consumptions. Farmers

have to consume what they produce and surplus sold in the market. The consumers believe that organic products taste better and are healthier than inorganic products due to nonuse of chemical fertilizers and pesticides. The certified farmers has to build consumers trust and confidence in their products and health risks in modern agriculture due to intensive use of pesticides in food and water contamination is also a matter of concern for certified farmers. The health is wealth and healthy farmers are most likely to contribute towards OF development. The certified farmers has prioritized 'health benefits' due to high level of dissemination of the information and awareness through training, workshops, seminars and study tour and because of their experiences in OF.

Interestingly, the non-certified farmers ranked 'environmental awareness' as 'very important' factor, while, the certified farmers identified this as important factor. However, the mean score difference between two groups are very negligible. This shows the high level of environmental awareness and advocacy among the farmers and slightly the non-certified but organic farmers were more concern about the surrounding environment and are equally concern with the use of pesticides and insecticides in agriculture. The personal communication with non-certified but organic farmers and certified farmers found that they have neglected the use of synthetic agro-chemicals, uses organic materials (composts, manure and leaf litters), plant native plants and avoid poaching of animals and adapted better cropping practices. This shows that there is awareness and on the other hand whole of the district falls under the protected area and there are strict laws, rules and regulation for environmental preservation and protection.

This study found that both the groups has identified 'economic benefits' as an important factors for conversion to OF. As stated by the previous study that the key driving force behind the commercial production of vegetables is due to the improvement of marketing system, although much need to be done for effective and efficient marketing of the agricultural produce (Tobgay, 2005). The farmers started to grow wide varieties of vegetables for sales and this has enabled them to generate some income to support households. This factor is most likely to increase organic productions in future and improve both quality and quantity and improve family health.

The respondents also identified education and employment benefits as an important factor because conversion to OF has provided higher employment opportunities for woman and family members and is most likely to provide higher education opportunities in future. The ranking is based on the perceptions of the farmers for bright future thereby reducing unemployment issues, poverty reduction and reducing inequality in the society.

5.5 Comparative analysis on the constraints for conversion to organic farming

Aside from drivers, this study also identified constraints for farmers' conversion to OF and classified them into three groups such as: 'most challenging', 'challenging' and 'least challenging'. This study found four key constraints for conversion to OF. The factor 'low productivity' that consists of three reasons such as 'ineffective organic pests and disease control', 'weeds control', and 'labor shortage'. The factor 'market aspects' consist of three variable such as 'lack of access to market', 'ineffective transport facilities' and 'labor intensive'. Another factor, 'education & research aspects' which reflects on the 'lack of education of farmers' and 'less organic research' and 'lack of access to organic inputs' is challenging factor. The factor named, 'economic and financial aspects' consists of two variables: 'lack of access to credit' and 'costly certification and inspection' is another challenging factor for conversion to OF. The factors identified in this study is similar to the factors identified in India by the previous study where the author found 'production barriers', 'marketing barriers', 'technical-managerial barriers' and 'economic and financial barriers' (Nandi et al., 2015).

The comparative analysis of the constraints between two groups found that 'low productivity' with combined mean value (4.340) is 'most challenging' factor for farmers' conversion to organic production. The survey result found that both the certified and non-certified but organic farmers has experience the reduction in yields in agriculture. The large majority (67.80%)(n=99) of the farmers' has experience the reduction in yields for cash crops like potato, cereal crops like rice and vegetables and are worried as it threatens food security and hunger reduction. This they attributed to poor management of pests and diseases, weeds control and labor shortages. Unlike conventional farmers who depends on herbicides to eliminate weeds and chemicals to

control pests and disease, farmers in the study area rely on biological control of pests and diseases (natural enemies), hand weeding, animal grazing and better cropping practices (crop rotation and inter cropping). The survey result also found that farmers uses indigenous knowledge such as preparation of solutions by mixing cow dung and urine, garlic paste and wild peepers, and sprays on vegetables and crops. The interviewed experts confirmed the reduction of yields in agriculture and stated that training are provided to farmers on seed selection, pests and disease control and electrical fencing were also provided to reduce crop damages by wild animals. Despite several methods used to control pests, weeds and diseases 100% of the respondents indicated that they are still major problems and methods use in OF is ineffective. This factor has negative effect on environmental factor because additional land may be required to produce same volume as produced by CA to meet the demand of the growing population and this may lead to deforestation, loss of biodiversity and government in developing countries have to invest more in research culture and better technologies to increase productions. However, the developing countries lack research and development budget and this is a limitation for OF development.

The factor “market aspect” with combined mean value (3.688) is challenging factor for both certified and non-certified farmers. However, the ranking of this factor differs between the two groups. The certified farmers has ranked this as third challenging factor, while, the non-certified farmers identified as second challenging factor (see table 6). The market problems is more relevant in developing countries as compared to developed country. The view differs between two groups because of the age difference and the certified products were directly contracted to high-end hotels and fetch higher price as compared to non-certified but organic products. The certified farmers were provided with transport facilities to directly market their products to high-end hotels in Thimphu and Paro districts. While, the non-certified farmers lack transports and marketing support. The result shows that the certified farmers has advantage over non-certified farmers but the demand is very low. In the absence of market, farmers sell to middle man or supply to school agriculture program. This finding is confirmed by the previous study in Sub-Saharan Africa, where the author found that the farmers in developing countries were deprived of market (Smale et al.,

2013) and the lack of transport facility was found in India (Rani & Reddy, 2013). The interviewed experts confirm the result and they stated that ‘market, access and production’ is the key focus of the MOA. The market constraints in study area is due to wide gap between production area and market, low productions, poor rural connectivity, lack of market information and lack of consumer awareness. The good environment alone cannot promote OF if we do not have good market. Thus, the government should increase investment in infrastructures such as transport facilities, rural connectivity (farm roads), market infrastructure (market sheds & sales counter) and support product certification for non-certified farmers.

The factor named, ‘education & research aspects’ mean value (3.496) is identified as challenging factor by both certified and non-certified farmers. However, the ranking of the factor differs between the two groups this is because of the difference in the perception of the farmers, experiences and attitude. The organic certified farmers has ranked this as second challenging factor, while, the non-certified farmers has ranked as third challenging factor. The survey result found that majority (78.08%) of the farmers were illiterate and they lack knowledge on certification, grading, processing and marketing. The interviewed experts and respondents strongly argues that the capacity building of farmers through training, workshops and seminars is vital as they firmly belief that even if the farmers lack education they can learn through training, workshop and exchange program. The research in the country too is limited and this according to experts is due to budget constraints and lack of technical support. The survey result found that farmers also lack organic inputs such as bio-fertilizers, bio-pesticides and composts (vermin composts) due to lack of education, training and technical support. This result supports the finding of previous study that showed the lack of knowledge of conventional farmers on organic principles and less organic research (Tovignan & Nuppenau, 2004); (De Ponti et al., 2012) and lack of organic inputs (Hanson et al., 2004). Thus, the government has to focus on adult education through non-formal education programs, invest more on research culture and infrastructure development (seeds production facilities) and capacity building of farmers for preparation of bio-fertilizers, bio-pesticides and nutrient management.

The factor ‘economic and financial aspects’ with combined mean value (3.236) which consists of two elaborated variables such as lack of access to credit and costly certification and inspection is another challenging factor identified by both certified and non-certified farmers. Although the government agency and financial institution provide credit, the process is lengthy and time consuming and the interest rate differs. Even with 4% interest rate offer by Rural Enterprise Development Corporation Limited (REDCL) none of the surveyed farmers have availed the credits due to fear of not being able to repay the loans. The survey result found that only three products for forty seven (n=47) respondents were certified locally and the majority (n=99) of the farmers were not certified. The local certification has benefitted only small number of farmers and certification system is limitation for majority. Therefore, the interviewed experts and farmers strongly argues that the government should support certification for non-certified farmers. The finding of this study is consistent with the previous study which showed that the organic farmers lack access to credit because of lack of ‘collateral security’ (FAO, 2015) and the certification is costly (Vlahović et al., 2015); (Niemeyer & Lombard, 2003); (Soltani, Azadi, Mahmoudi, & Witlox, 2014). This result confirms that both the groups of farmers and stakeholder strongly agrees that certification is costly and farmers lack credit facilities due to high interest rate. Thus, the government should provide interest free credit for those farmers willing to operate their farm organically and encourage them to form groups and cooperatives.

Based on the comparative result between certified organic and non-certified but organic farmers we can conclude that low productivity, market aspects, education and research aspects and economic and financial aspects are the key challenges for organic production.

CHAPTER VI
CONCLUSION & RECOMMENDATIONS

6.1 Policy framework

The policy framework would help in decision-making and to guide a more detailed or comprehensive policies for OF development in the country. The framework below guides what need to be prioritized and how the policies be communicated to achieve the long-term goal and the role of important stakeholders. From the study, we found three groups of people to support OF. They are government, NGO's, and farmers' and they have significant role to play.

The framework below shows the three stages of policy recommendations (priority 1, 2 and 3) and the role of important stakeholders such as government, non-governmental organizations (NGO's) and farmers in promotion of organic farming. Based on the framework the key drivers for conversion to organic production are environmental awareness, health benefits, and economic benefits and education and employment benefits. While, the major constraints includes low productivity, market aspects, education & research aspects and economic & financial aspects.

The framework illustrates that to overcome the barriers and to enhance opportunities the activities or intervention be prioritized based on their significance or relevance and the government should play the lead role, followed by NGO's and the farmers (both certified and non-certified). The first priority help achieve the long-term goal of going fully organic and is the most important tasks that the government or important stakeholders has to undertake at the moment and give those tasks more attention and time. The first priority is also more robust and sustainable approach but demands high investment and commitment from the government, experts and other stakeholders. While, the second and third priorities are important activities and complements on first priorities.

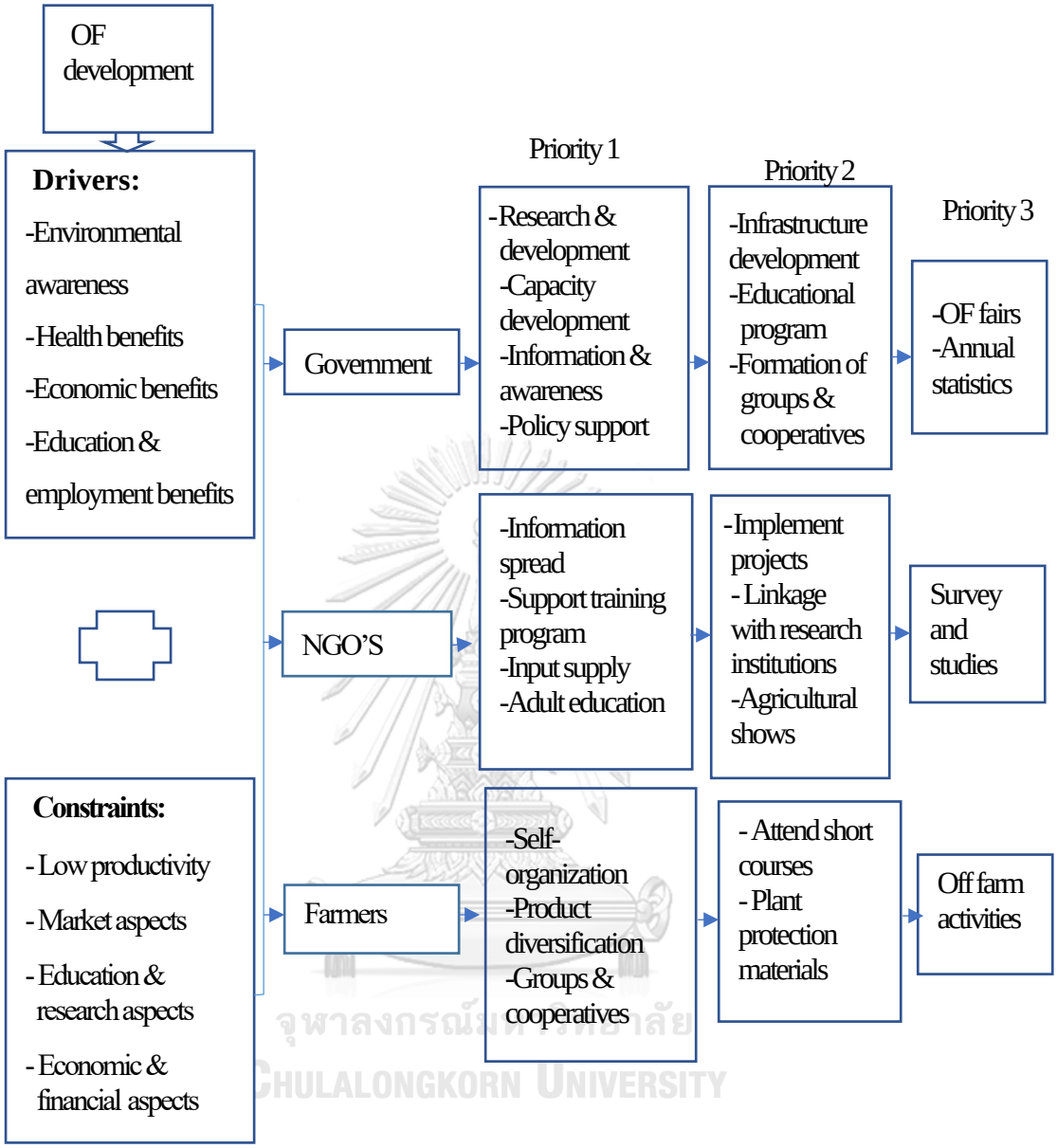

Figure 12: Policy framework for organic farming

Based on the framework the government should give first priority to research and development, capacity building of the farmers and those involved in OF, provide adequate information and awareness and policy support. The government should give second priority to infrastructure development (storage facilities & sales counter), educate farmers on health, environmental and social benefits of organic farming, and encourage farmers to form groups and cooperatives and supply agricultural inputs

(seeds, seedlings & farm machineries) either freely or highly subsidized. Finally, government should initiate district vise agricultural fairs and publish annual statistic on the volume of organic produces, sales and income generation.

The NGO's should also prioritize activities, their first priority should be in spreading information on pressing environmental issues and several benefits of organic farming, support training programs and supply agricultural inputs and provide adult education through non-formal education program so that the farmers are able to read, write and practice OF. These activities would complement on the activities undertaken by the government and would have wider coverage and higher positive implication. The second priority of NGO's should be to implement projects (small irrigation schemes), provide farmers linkage with research institutions and initiate agricultural shows (exhibition & competition). Finally, the NGO's should undertake survey and research activities to understand the actual need and aspiration of the farmers and support the government and farming communities.

The farmers should firstly organize themselves (self-organization) in terms of finance, farm machineries and tools, and labors, form groups and cooperatives and focus on product diversification because this not only help increase income but also reduce the risks of main crop failure, poverty reduction, nutrient content and boost economy. Secondly, the farmers should take short term courses on agricultural production, management, marketing and record keeping, and invest more on plant protection materials. Finally, the farmers should focus on off farm activities such as small business or establishment, carpentry and mansion works that can help earn some cash to support households and improve livelihood.

6.2 Recommendation to non-certified farmers

6.2.1 Government

The Royal Government of Bhutan aims to promote OF as way of life among Bhutanese farmers and aspires to become fully organic by 2020. However, the growth is gradual and farmers faces several constraints in conversion process and this demands attention from the government, NGO's, farmers and other important stakeholders. Without the strong support and coordination from the government and other important stakeholders the success of organic farming is uncertain. Therefore, some of the activities that the government should undertake to support the non-certified farmers are as follows:

6.2.1.1 Information and awareness

The ministry should provide adequate information and awareness on the several benefits (environmental, social & economic benefits) of organic farming and in the process inform farmers on the harmful effect of CA due to use of chemical fertilizers and pesticides. The non-certified farmers also lack policy awareness and the government should provide awareness through seminars, workshops, training and media campaigns. The ministry should also initiate more 'organic community' and 'trail activities' to educate and encourage farmers to practice OF.

6.2.1.2 Product certification

The government should strongly support the non-certified farmers for domestic certification as well as provide financial support for international certification. Although the farmers produces organically, they could not certify as they lack knowledge on certification process and is costly. Due to the lack of certification they could not enter market, increase productions, increase income and poverty reductions. However, the farmers can reduce the costly certifications through formation of groups and cooperatives and avail certification through participatory guarantee schemes.

6.2.1.3 Capacity building

OF is ‘knowledge-intensive’ as compared to CF which is chemical as well as ‘capital intensive’ and farmers should be educated and their skills developed. Therefore, capacity building of the farmers and those involved in OF is vital and be enhanced through training, study tours and workshop. The capacity-building program should focus on product diversification, nutrient management, plant protections and preparation of bio-pesticides and bio-fertilizers as well as seed selections to address the issues of low productivity due to weeds, pests and diseases and to improve soil fertility.

6.2.1.4 Encourage formation of groups and cooperatives

The government should strongly encourage farmers to form groups and cooperative as it encourages active participation among members and improve several situations in terms of income, poverty reduction, food security and environmental protections. It would also promote self-help system and reduce dependence on external aids and compete in terms of production and marketing and contribute towards community development. The government should support formation of groups and cooperatives through training, seminars, workshops, exposure trips or educational program and technical support.

6.2.1.5 Supply of inputs

The government should continuously provide support for agricultural inputs such as construction and renovation of irrigation schemes, supply of farm machineries and tools such as power tillers, rice hullers, and rice thresher and make easy availability of organic seeds, bio-fertilizers and bio-pesticides through commission agents or agriculture extension agents at affordable price. This would help reduce labor shortage issues, pests and disease issues and abandon the use of pesticides and insecticides.

6.2.2 Non-governmental organization

The NGO's plays significant role in rural development and in improving the livelihood of farmers as they understand their problems as well as the needs and aspiration. The NGO's also enjoy good reputation and trust from the government and the donor agencies and it would be easier for them to implement projects and other developmental activities.

6.2.2.1 Adult education

The NGO's should focus on adult education through non-formal education program (NFE) so that the farmers are able to read, write and practice OF. The NFE program is most likely to enhance their skills, expand knowledge on better organic practices, and improve livelihood of farmers.

6.2.2.2 Dissemination of information

The NGO's should provide information on the pressing environmental issues as well as several benefits of organic farming to change the way of thinking and attitude of the farmers. The medium use can be through posters, audio-visuals, displays and pictures and media campaigns. The dissemination of information would help in preservation of environment, protecting biodiversity and motivate farmers to operate their farm organically.

6.2.2.3 Support training program & input supply

The NGO's should also support various training program for agricultural development, skills enhancement and capacity building of the farmers in several aspects such as preparation of bio-fertilizers and bio-pesticides, nutrient management and control of pests and diseases. The NGO's should also support through supply of inputs such as seeds and seedlings, farm machineries (especially for transportation and harvesting) and high yielding crop varieties as well as educate farmers to use machinery effectively and efficiently and increase productivity.

6.2.3 Non-certified farmers

6.2.3.1 Formation of groups, cooperatives and associations

The non-certified farmers are highly recommended to form groups, cooperatives and association such as farmers' market association, fruits and vegetable production associations to produce large volume of agricultural products, maintain high quality and jointly appear in the international market, as it would help reduce production costs, transportation and costly certification. Through formation of groups and cooperatives, the farmers can avail credits from financial institutions and governmental agencies and buy mechanical harvesters, power tillers and tractors for ploughing and transportation of agricultural produces. They can even hire farm machineries and tools from agriculture machinery center (AMC) at reasonable price and avail free training on operation and maintenance of farm machineries. This would help reduce drudgery in agricultural practices and reduce labor costs.

6.2.3.2 Farmers should organize themselves (self-organization)

The farmers should organize themselves (self-organization) in terms of finance and farm machineries and tools. The farmers in rural areas in developing countries faces labor shortages and can be minimized through strategies such as 'paying better for the labors' and investing more on farm mechanization especially in harvesting and transportation. This would help reduce dependence on government, increase productions, and reduce labor shortages issues as well as reduce fallow land.

6.2.3.3. Off-farm activities

The farmers should undertake off-farm activities as it would help generate wealth, reduce poverty, create employment and reduce dependence on single source of income from agriculture, which is often unpredictable due to uncertainties such as harsh weather (drought, flood and famine) and climatic conditions. The off-farm works such as small scale business, carpentry and masons requires few skills and litter investment and help reduce inequalities.

6.2.3.4 Natural resources management

The farmers are highly dependent on the natural resources for day-to-day activities and should focus on water catchment protection, protecting biodiversity and land use management. The effective management of natural resources would help increase agriculture production, poverty reduction and improve health and wellbeing.

6.3 Recommendation to certified farmers

6.3.1 Government

6.3.1.1 Research & development

The organic research in the country is very limited and the government should invest more on research and development culture despite budget constraints. The research priority based on the findings of this study should be on (1) weeds, pests and disease control (II) improving soil fertility (III) innovative technologies and practices to reduce the labor shortages (IV) improve seeds varieties (V) improve plant protection techniques to increase agriculture productions, income generation and poverty reduction and (VI) preparation of bio-fertilizers and bio-pesticides. The research should be based on participatory approach unlike in conventional agriculture which is top-down approach and all key stakeholders such as farmers, NGO's, institutions, farmers groups and cooperatives, private organizations and local government should be actively involved as this would promote sense of ownership, encourage greater participation and increase learning opportunities.

6.3.1.2 Market intensification

The other strategy could be market intensification as access to market is very limited in the countries. The market for organic products only exists in centenary farmers market in capital city, Thimphu. The demand in the domestic market is very limited due to stiff competition from 'organic by-default' and conventional products and easy availability of fruits, vegetables and cereal crops from bordering town in India at relatively cheaper price as compared to organic products. The access to market is limited due to low volume of agriculture produce, inefficient transport facilities, lack

of consumer's awareness, and relatively higher price for organic produces due to labor shortages. Therefore, the access to market should be strengthen through better transport facilities, formation of farmer's groups and cooperatives and media campaigns. The government should improve rural connectivity through construction of new farm roads and providing public transport services (bus services). There is also need to develop direct market linkage to institutions and high-end hotels, as this would provide higher income for the farmers as well as improve market efficiency and increase productions.

6.3.1.3 Policy support

Another promising strategy to promote OF is through policy support, as this would provide organic certified farmer's access to several components that they cannot avail. This could be in the form of access to credit (loans) and crop insurance schemes, land lease (GRF land) and educational programs. Although agricultural credits is provided by the financial institution and government agency such as Bhutan Development Bank Limited (BDBL) and Rural Enterprise Development Corporation Limited (REDCL) the interest rate differs and is often high. Even with 4% interest rate offered by REDCL, farmers are unable to repay their loan. The government should therefore provide interest free credit to those farmers practicing OF. The bad weather such as monsoon rain, snowfall, frost, drought, and wild animals affects the agriculture produces and in turn, the crop insurance is vital. The government and insurance company should come up with crop insurance schemes so that the farmers have cash even during bad times. This would encourage the farmers to promote agriculture and reduce the risk of crop failures. It is evident from the study that farmers have small land holding to practice agricultural activities and the government should support farmers through government reserved forest (GRF) land lease but currently the land lease procedure is lengthy and time consuming and takes over one year or more. These procedures should be simplified and made farmers friendly and the approving authority should be decentralize to district administration or district land lease committee, as it would reduce turnaround time (TAT). The government should incorporate studies on OF in education program from the pre-primary to university so that students can learn, practice and appreciate OF and field visit and workshops within and outside the country should be coordinated. The School Agriculture Program (SAP) is good initiative and

should be strengthen in all ‘green schools’ across the country and inter school OF fairs has to be initiated to promote agriculture and student should be encouraged to undertake farming activities after graduation.

6.3.1.4 Infrastructure development

The government should focus on infrastructure development such as construction of godowns and cold storage facilities, warehouse, farm shops and RNR sales counter in rural areas, towns and along the highway to make optimum use of the cereal crops and perishable goods (fruits and vegetables) and to increase income for rural farmers. The agricultural infrastructures should be handed over to farmers groups and cooperatives for operation and future maintenance. The market infrastructure should be connected with market information and develop through advancement of information and technology (IT) and the timely and accurate market information can be disseminated through radio, mobile application and television.

6.3.1.5 Organic farm website

The government should support to create organic farm website to market the products and provide additional information. The website should provide detail map and locations, contact information’s, history of the products and list of collaborating agency if any and identify key partners such as farmer’s market associations, restaurants, community leaders and grocery shops.

6.3.2 Non-governmental organization

6.3.2.1 Implementation of projects

The NGO’s should undertake developmental activities or project such as small irrigation schemes, organic vegetable promotions, cash crop development and infrastructure development as it would complement on the activities undertaken by the MOA and help uplift the backward communities and enable them to come out of poverty, increase production and increase income.

6.3.2.2 Provide linkages with research institutes

The NGO's should provide direct linkage between the research institutions and farmers as the research institutions would be able to provide technical support and advices during the outbreak of pests and diseases and provide timely information on technologies, better practices and strategies to enhance production. This would help built strong trust and confidence between the farmers and research institutions and would reduce crop yield losses.

6.3.2.3 Conduct agricultural shows

The NGO's should also conduct agricultural shows and in the shows, the agricultural competitions on produces from the farmers should be included. This would not only motivate farmers to increase productions but also help promotion or marketing of the organic products and increase income.

6.3.2.4 Field survey and studies

The NGO's should carry out field survey and research activities to support the farming communities and government as they have the expertise and direct linkage with the public. Through survey studies the NGO's can understand the actual need and aspirations of the certified farmer's and based on the findings they will be able to provide proper intervention to the farmers and the government. Their expertise and linkage would greatly help promote OF and improve livelihood of rural farmers.

6.3.3 Certified farmers

The interviewed experts indicated the lack of support from the farmers and other relevant stakeholders due to which the OF programs could not be implemented. Therefore, there is need of strong collaboration and support from the farmers and their understanding on OF will greatly influence in creating appropriate organic programs.

6.3.3.1 Product diversification

The certified farmers should diversify their products not only to increase income but also to reduce the risks of crop failure, reduce pests and disease issues and increase production. The farmers' should introduce new products such as honey bees, matsutake mushrooms, ginger propagation and high yielding fruit varieties or create new business model to take advantage of the new opportunities. The product diversification would gainfully employ the farmers as different crops and vegetables has different plantation, sowing and harvesting season and provides income year round. The wide varieties of products would enables farmers to increase income and this would motivate them to practice OF.

6.3.3.2 Choose better cropping practices & techniques

The certified farmers should opt for crop varieties, fruits and vegetables that are adapted to local environmental conditions (temperature, pests and disease & nutrient supply). They should choose better cropping practices and techniques such as mixed cropping, crop rotation, green manuring and cover crop, promote natural enemies, change planting timing and spacing and diversify products so that the pests and diseases and crop failure can be minimized.

6.3.3.3 Short term courses

The certified farmers should take up short term courses on organic kitchen gardening, community living, natural building, marketing, management, record keeping and invest more on plant protection materials to reduce the crop losses due to weeds, pests and disease issues.

6.3.3.4 Investing in existing products

Investing in existing products or commercial activities that has help organic growth is idle for income generation. However, the farmers has to provide value added products though certification, grading, canning and preservation of products and develop customer's relationships. The customer relationship should be developed through loyalty cards, coupon and farm tours.

6.4 Conclusion

The study conducted in Gasa district of Bhutan through face to face interview with domestic organic certified and non-certified but organic farmers and semi structured interview with several important stakeholders of agriculture sector used ranked order of importance to identify the major drivers and constraints for conversion to organic farming. This study depicts that overwhelming majority (93.15%) of the surveyed farmers view OF as 'very important' and majority of them (76.72%) has been farming organically over a decade.

The farmers mainly integrated agriculture with livestock for dairy products, ploughing and manure. Women mostly collected dry leaf litters from the community forest or nearby forest to use as bedding for animals and when decomposed use as manure. Regarding the domestic certification, 36.87% of the farmers has obtained since 2016 and the rest of the farmers were not certified. However, 100% of the surveyed farmers which comprises of certified farmers (n=47) and non-certified but organic farmers (n=99) are practicing OF and has neglected the use of chemical fertilizers and pesticides. The respondents has started to cultivate wide varieties of vegetables such as broccoli, carrot, garlic and chili and other vegetables after conversion to OF and this has help increase income.

This study found that both certified and non-certified but organic farmers has identified four key drivers for conversion to OF. They are environmental awareness, health benefits, economic benefits, and education & employment benefits. This finding is very similar to the study in Iran and this shows that there may be some communality between developing countries. Aside from motivating factors, this study also identified

key constraints for conversion to organic practices. The result shows that both certified and non-certified farmers has pointed out low productivity, market aspects, education and research aspects and economic and financial aspects as the major constraints for organic productions and are strongly supported by the interviewed experts. This result shows that though they are two different groups their approach towards OF development and identification of drivers and constraints are uniform. This shows the high level of spread of information and awareness, experience and positive attitudes of farmers.

Although agriculture development in the country is hamper by above constraints and other geographical factors such as rugged terrain and steep slopes, the agriculture is changing from subsistence based to market-oriented productions. The use of chemical fertilizers and pesticides are limited in the country due to strict regulations, limited access and high costs and farmers mostly prefer to use locally available resources and better techniques such as crop rotation, inter cropping and mixed farming and biological control of pests and diseases.

The finding of this study shows that under the current circumstances, the large majority (99.31%) of the farmers intend to continue farming organically due to health benefits, environmental benefits and economic benefits. The perceptions of both the certified and non-certified but organic farmers in general is very strong and very positive and this may be the reason why they strongly support promotion of organic farming throughout the country. However, with the current pace of organic farming development, the interviewed experts and farmers are quite skeptical of going 100% organic by 2020 or in near future.

The OF development is also affected by the factors such as climate change, water scarcity and reduce in arable land and this factors need to be investigated and addressed. However, to promote OF in the country there is need of strong collaboration and coordination by the department of agriculture and other important stakeholders such as government, NGO’s and farmers.

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APPENDIX

APPENDIX A: SURVEY QUESTIONNAIRE FOR THE FARMERS

Questionnaire on (Title): Drivers and Constraints of Conversion to Organic Farming in the Kingdom of Bhutan

Objectives:

1. To investigate the drivers and constraints in conversion to organic farming by the farmers of Gasa district
2. To provide the policy recommendation to government or relevant agency to promote organic farming in Bhutan

Questionnaire

General Information:

I **.Background of the respondent**

Name of the respondents: ……

Household identification no:……..Date of interview: ……

1.3. Gender: ☐ Male ☐ Female

1.4. How old are you? ……

1.5 No. of people living in the household……

1.6 Village…… Block…… District …….

1.7. Education level: (educational level) trick

1. ☐ NFE 2. ☐ Primary 3. ☐ High School

4. ☐ Degree 5. ☐ Master/ PhD: 6. ☐ None

Section Two – Farming characteristics

2.1 Do you know about organic farming? If yes, what it is?

……

……

2.2 Do you practice organic farming?

1. Yes ☐ 2. No ☐

II. Land use

2.3 Table 1: Land under cultivation, based on the following different land types?

Types of land	Acre (acre)	Cultivated area (acre)
Wet land		
Dry land		
Forest land		
Others		

III. Crops grown & household Income

3.1. Table 2: Different types of crops grown /acre & Income from sales

Crops grown	Area (acre)	Productivity kg/area	Organic production	Income Nu
Paddy				
Wheat				
Barley				
Buckwheat				

IV. Vegetables grown & household Income

4.1. Table 3: Different types of vegetables grown/acre

Vegetables grown	Area (acre)	Productivity kg/area	Organic production	Income Nu
Potatoes				
Carrot				
Garlic				
Chilies				
Cabbage				
Beans				

4.2 Where do you usually sale the vegetables?

1. ☐ Farmer's market 2. ☐ Wholesale 3. ☐ Contract to buyer 4. ☐ On farm retail. 5. ☐ Contract to hoteliers 6. ☐ Others (specify)…….

4.3 Who you' are your customers?.....

V. Lists of motivating factors for conversion to organic farming (Table 4)

5.1. Do you agree with the following reasons that are necessary to encourage farmers to convert to organic farming? Please rate in the scale of 1-5

Motivating factors	1= Strongly disagree	2= Disagree	3= Neither agree nor disagree	4= Agree	5 = Strongly Agree
Environmental conservation enhance					
Help protect biodiversity					
Help improve soil fertility					
Help reduce pollution (air/water/soil)					
Reduce external input costs					
Help increase income					
Provision of subsidies					
Help improve personal health & family health					
Enhances food quality					
Contributes to education (family education)					
Provides employment opportunities					
Other (specify)					

5.2. Could you please rank all or at least five most important factors for you (Rank in the scale of 1-10)-Table 5

Motivating factors	Ranking (1-10)
Environmental conservation enhances	
Help protect biodiversity	
Help improve soil fertility	
Help reduce environmental pollutions	
Help reduce external input costs	
Help increase income	
Provision of subsidies (Tax holiday/farm machineries)	
Help improve individual & family health	
Enhance food quality	
Contribute to education of family members	
Provides employment opportunities	
Other (specify)…….	

VI. List of constraints for conversion to organic farming (Table 6)

6.1. Do you agree with the following reason which serves as constraints for conversion to organic farming? Please rate in the scale of 1-5

Constraints factors	1= Strongly disagree	2= Disagree	3= Neither agree nor disagree	4= Agree	5= Strongly Agree
Decrease in productivity					
Ineffective organic weeds control					
Ineffective organic pest & disease control					
Increase labor intensive					
Costly certification & inspection					
Lack of access to market					
Lack of access to credit facilities					
Lack of access to organic seeds					
Inefficient transport facilities					
Lack of education of farmers & less organic research					
Other (specify)					

6.2. Could you please rank all or at least 5 most constraints for you, in the scale of 1-10? (Table 7)

Constraints factors	Ranking 1-10
Decrease in productivity	
Ineffective organic weeds control	
Ineffective organic pest & disease control	
Labor intensive	
Costly certification & inspection	
Lack of access to market	
Lack of access to credit facilities	
Lack of access to organic seeds	
Inefficient transportation facilities	
Lack of education of farmers & less organic research	
Others (specify)……..	

VII. What appropriate measures would help to promote Organic Agriculture in Bhutan? (Please rank 1-7)

1. Capacity building (training) ☐
2. Access to market and market information ☐
3. Research & development ☐
4. Availability of seeds and other organic inputs ☐
5. Information & awareness ☐
6. Infrastructure development ☐
7. Policy support (credit & crop insurance/land lease/subsidies) ☐
8. Others ……

VIII. Soil fertility (Table 8)

8.1 How do you maintain soil health? 1.☐ Crop rotation 2.☐ Green manure/cover crop 3.☐ Compost 4.☐ Others
8.2 Have you noticed any change in soil characteristics after conversion to organic farming? Yes ☐ No ☐ Reasons ..……
8.3 If yes could you please describe the changes

IX. Employment & labor opportunities (Table 9)

After conversion to OF	No change	Increase	Decrease
Employment opportunities			
Education opportunities for family members			
Labor wages			
Labor requirement (male and female)			

X. Crop Management

10.1 Do you face weed management problem? ☐ Yes ☐ No

10.2 What weed control methods do you use? 1. ☐ Crop rotation 2. ☐ Hand weeding 3. ☐ Livestock grazing 4. ☐ Mechanical weeding 5. ☐ Use herbicides 5. ☐ Delayed seedling 6. ☐ Others (specify)……..

10.3 How do you rate the effectiveness of weeds management program: ☐excellent ☐satisfactory ☐ needs improvement

10.4 Do you face pest and disease problem? ☐ Yes ☐ No

10.5 What are your pests? ☐Rodents (rat, mice & squirrels) ☐ insect's ☐ birds ☐ Other animals (specify)……

10.6 What are the strategies you use to control pests and disease from crop damages? 1. ☐ Crop rotation 2. ☐ Timing of planting 3. ☐ Hand picking 4. ☐ Set traps 5. ☐ Insect's repellents 6. ☐ Animal repellents 7. ☐ Plant spacing 8. ☐ Others (specify)……..

10.7 Did you experience falling of yields in organic farming? ☐ Yes ☐ No

10.8 What according to your experience could be the main reasons for falling of yields? (Give minimum of three reasons).

1. ……..

2. ……

3. ……..

XI. Transportation

11.1 Do you face problems in transporting organic products? ☐Yes ☐No

11.2 What type of transportation do you use? 1. ☐ Self 2. ☐ Buyer 3 ☐ Others (specify)……

XII. NOP related

12.1 Are you aware of NOP (National Organic Program) policy of Bhutan?

☐ Yes ☐ No

12.2 When did you hear about the NOP policy of Bhutan?

……. Year

XIII. Organic farming (General)

13.1 When did you start practicing organic farming? …….

13.2. From where did you hear about Organic farming? Tick the most appropriate from the box-Table 12

☐ Radio	☐ Neighbors	☐ Government officials	☐ TV	☐ NGO's
☐ News papers	☐ University	☐ Other organic farmers	☐ Others	

14.3 In your opinion, how important is organic farming?

1.☐ Very important 2. ☐ Important 3.☐ Not important

14.4 Do you want to continue farming orginacally ?

1. ☐ Yes 2. ☐ No

14.5 Why? Reason

……

…….……

14.6. Do you think Bhutan should promote organic agriculture? Tick and state the reasons?

1. ☐ Yes 2. ☐ No 3.☐ Don't know

14.7 Why do you think Bhutan should promote organic farming?

……..

……..

14.8. What is the problem in traditional and conventional farming?

……

……..

14.8 Do you have any comments on organic farming that we might have missed?

……

……..

APPENDIX B: SEMI STRUCTURED INTERVIEW QUESTIONNAIRE FOR EXPERTS

Interview questionnaire target at District Agriculture Officers/ADAO, Local Government Officials & Agriculture Extension Officers & other experts.

Questionnaire on (Title): Drivers and Constraints of Conversion to Organic Farming in the Kingdom of Bhutan

Objectives:

1. To investigate the drivers and constraints in conversion to organic farming by the farmers of Gasa district
2. To provide the policy recommendation to government or relevant agency to promote organic farming in Bhutan

Semi-structure Questionnaire

1. Please describe how the district agriculture sector facilitates organic agriculture activities in rural areas? Why do the district agriculture sector do in that specific way?

   ……
   ……

2. Is the district agriculture sector adequately financed for the promotion of organic agriculture? Why?

   ……
   ……...

3. How often does the district agriculture sector or block administration provides organic agriculture awareness and training program to the farmers? What are they?

   ……
   ……
   ……

4. Do you believe that our farmers are adequately informed on organic agriculture policies and processes? Why?

   ……
   ……..

5. According to your experience, what are the main drivers for conversion to organic agriculture? Could you please explain?

   ……
   ……

6. According to your experience, what are the main challenges for conversion to organic agriculture? Could you please explain?

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   ……

7. Is the farmers who are willing to convert to organic agriculture provided with economic or tax incentives by the government? Why?

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   ……...

8. What are the strategies that need high priority to promote organic agriculture in the country?

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   ……

9. Does the district agriculture sector maintain records on organic agriculture and measure the success and degree of achievement of NOP? How?

   ……
   ……

10. To which extend can the organic agriculture policies be called successful? Why or why not?

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    …….....

11. What is the total cultivated land under organic agriculture in your district?

    …….

12. What is the total number of organic producers in your district and the income generated from the sale of organic products in last one year?

    ……
    …….....

13. Are there change in types of crops and vegetables production before and after conversion to organic farming?

    ……
    …….

14. Did you witness the use of pesticides and chemicals before conversion to OF? What were the common pesticides and chemical in use?

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    …….

15. Could you please explain the implementation of Pesticides Act of Bhutan, 2000?

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    ……..

16. What role do you play in pesticides & chemicals use by the farmers? How to monitor the farmers?

    ……
    …….

17. How much pesticides has been imported in the country and Gasa in particular in last five years?

    ……
    ……...

18. Why the government has to stop the use of the pesticides in the country?

    ……
    ……....

19. What is your view on organic access, production and marketing in the country?

    ……

20. How would you best describe the current organic agriculture activities in your district?

    ……

    ……

21. Do you believe that the government has done enough to promote organic agriculture? Yes or no? How?

    ……

    ……

22. Do you believe that Bhutan should promote organic agriculture? Why?

    ……

    ……...

23. What are some of the problems in traditional and conventional agriculture?

    ……

    ……

24. Do you have any comments and suggestions on organic agriculture that we might have missed?

    ……

    ……

APPENDIX C: DISTRIBUTION OF PLANT PROTECTION CHEMICALS BY DISTRICTS (KG, OR LITERS)

District	2011-2012	2012-2013	2013-2014	2014-2015	Total
Bumthang	420.35	511.95	441.89	571.01	2247.87
Chhukha	414.75	156.90	209.80	6952.74	7895.59
Dagana	62.07	7.30	652.93	9152.70	10085.03
Haa	661.25	784.67	731.32	566.56	3164.85
Lhuentse	9.00	1111.00	120.55	14543.20	15783.85
Mongar	319.10	1405.00	1262.34	10498.10	13858.04
Paro	6185.91	6806.15	6944.80	185173.25	209651.56
Pemagatshel	34.00	4.00	50.00	0.00	129.15
Punakha	88.80	242.80	170.60	70198.75	70769.88
S/jongkhar	0.00	0.00	0.00	0.00	20.00
Samtse	108.00	19.50	108.70	4140.61	4664.63
Sarpang	24.40	164.82	270.10	5214.25	5953.47
Thimphu	8924.63	7440.18	6907.15	42260.14	75107.5
Trashigang	268.00	623.30	1054.02	21021.30	23433.54
T/yangtse	17.70	8.00	472.65	76600.59	77100.94
Trongsa	67.85	45.20	165.66	17198.80	17547.71
Tsirang	104.25	95.50	188.05	19387.35	19853.15
Wangdue	3258.88	4657.20	4824.40	55690.43	71358.94
Zhemgang	122.30	16.20	0.00	5053.32	5193.82
Total	21191.24	22855.87	24574.96	548810.10	633819

Source: NPPC, MOAF

APPENDIX D: FERTILIZERS IMPORTED QUANTITY AND VALUE (2014-2016)

Name of fertilizer	2015		2016	
	Value (NU)	Quantity (kg)	Quantity (kg)	Value (Nu)
Ammonia, anhydrous	2,928,00	224,787	7,020	526,500
Ammonium nitrate	650	24,742	10	11,744
Ammonium sulphate	0	0	42	29,228
Calcium ammonium nitrate	0.5	400	0	0
Urea	0	0	2,935,152	44,477,938
Urea and ammonium nitrate solutions	0	0	0	0
Superphosphate	2,888,950	75,268,868	1,771,750	47,164,850
Potassium chloride	422.5	58,529	417	101,40
Potassium sulphate	5.5	2,974	126	28,915
Ammonium phosphate	0.5	640	0	0
Monoammonium phosphate	0	0	1,001	45,510
Other nitrogen & phosphorus compounds	0	0	112	21,497
NPK complex <=10kg	0	0	5	736
Potassium nitrate	20.5	39,907	93	144,312

Source: BTS, DRC

APPENDIX E: LISTS OF INTERVIEWEES

Particular	**Affiliation**	**Position**	**Remarks**
Representatives from agriculture sector	District Agriculture Sector	ADAO & AEO	Responsible for agriculture planning, implementation & monitoring of plan & ad-hoc activities .
Representatives from Local Government	Local government	Elected leaders	Responsible for planning, implementation & monitoring of planned & ad-hoc activities at local level .
Representatives from Organic group	Rangshin Sanam Detsen	Group Chairman & member	Responsible for functioning of Organic group, conduct of general assembly & actor between the group and agriculture sector.

VITA

Born on 21 September 1987 in Tsirang district of the Kingdom of Bhutan. I attend government school far from the village and after completion of high school in Zhemgang district, I was enrolled in Sherubtse College, Bhutan that is affiliated to Delhi University and graduated in BA in Literature in 2008. After graduation, I join the Department of Local Governance under the Ministry of Home and Cultural Affairs and served as Block Development Officer with effect from May 10, 2010 to 29 July 2016. After six year of active service, I was enrolled in Environment, Development and Sustainability (EDS) Program at Graduate School of Chulalongkorn University, Bangkok, Thailand.