Changing Landscape of Food Production in Western Bhutan

Adaptation of Peasant Farmers in an Era of Organic Agriculture

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March 2016

Acknowledgements

The opportunity to travel to Bhutan came as an unexpected gift. My academic advisors, Professor Katsue Fukamachi and Professor Shozo Shibata, had previously traveled to Bhutan in hopes of establishing a relationship where a collaborative research project could take place. It was they who entrusted me with the responsibility of nurturing that relationship. Without them, the ensuing gratitude that follows could not have been written and bound with a dissertation. Because of them, I began this collaborative journey, which I hope I will have the opportunity to continue building upon and cultivating throughout my lifetime.

First and foremost, I am grateful to my teachers and colleagues at Kyoto University: Mrs. Kamaga, along with the academic and administrative staff at the Graduate School of Global Environmental Studies, and to all of my colleagues who were in the Landscape Ecology and Planning laboratory and the Environmental Design laboratory.

The largest motivation for this work came from the deep respect and gratitude I have for the people I was fortunate enough to meet and interact with in Bhutan. This study was made possible through the generous support of the Royal University of Bhutan, College of Natural Resources (CNR). The foundations for this collaborative partnership were established and initiated thanks to the leadership of the (now previous) Director General Dorji Wangchuk, current D.G. Dr. Phub Dorji, and the Dean of Research, Dr. D.B. Gurung, along with the many faculty and staff members at CNR who supported my objectives. Throughout my subsequent journeys and stays at CNR, I received a lot of guidance and the warmest support from all the faculty and staff members, along with the members of the greater CNR community. Most important is Dr. Rekha Chhetri, who had to bear the burden of being my research partner. After a few meals and a few bumpy rides to villages to conduct fieldwork, she quickly became not just a wonderful research partner, but a true friend. Her unyielding encouragement and guidance was the greatest gift I received throughout the course of my doctorate studies.

In the course of my fieldwork in Bhutan, I was extremely fortunate to make many good friends, whose support I was able to rely on, both on and off the field. A particular thank you goes to Karma Penjore, in Paro, for being a guide and teacher, for introducing me to the organic project in Haa, and for the unfailing patience with which he received all of my questions; Sonam Zangpo, for the warmest of welcomes he and his family always gave me, no matter what kind of request I had; Suraj and Devica Chhetri and their extended family, for making me feel like I always hade a place to go home to; Tanka Maya, for her comradely and constant support; Pema Wangdi and all at the RUB headquarters for their support through all my visits; Kinley Dorji and his family, for the warm welcome they gave me and my professor during our visit to Haa; Naori Maeda, Drupchu and all those I shared a roof with at CNR, for their friendship; Lahkden at the Bank of Bhutan for his problem solving skills; Mr. Yuichi Tomiyasu; and Mr. Kenichi Sasaki and the RNR RDC Wengkhar Team, for welcoming me and guiding me through an invaluable excursion to eastern Bhutan. Extended thanks go to Dr. Thinley at the Thimphu hospital; Dorji Dhradhul at the MoAF Marketing Division; Rinzin Dorji at PPD office; and last but not least, Dr. Yoshiro Imaeda and Mihoko Watanabe, for always expanding my knowledge of Bhutan.

The household survey conducted for this work was made possible through the diligent support I received from DAOs in each *dzongkhag*, the AEOs, as well as the many students and friends who volunteered to help as enumerators. Here, I would like to acknowledge them by name. In **Gasa:** Tshering N Penjore (DAO), his wonderful wife, his daughter Kinley Gyem, and his nephew Ngawang Tobgay; AEO Tshultrim Dorji, Tshering Samdrup, Singye Wangchuk, and Chewang Gyaltshen; LEO Nima Gyeltshen, Tshewant Tashi, and Yeshi Wangdi. In **Paro:** AEO Gem Dorji; CNR students Neeta Rai, Janga Bahadur Gaylal, Kencho Rinzin, Sonam Choki, Pemo, Yadu Kumar, Sonam Choden, and Chali Maya Bhattarai; and Pema, the guesthouse caretaker at the College of Education. In **Wangdue:** Extension Officers in Kazhi, Jigme Lhamo and Santa Bir Tamang; CNR students Rinchen Wangchuk, Ugyen Gyeltshen, and Tshering Norbu; Extension Officers in Phobjikha, Yeshi Wangdi, Singye Namgyel, Jigme Lhamo, and Bhum Beb Sulba; Extension Officers in Dangchu, Sangay Wangdi and Dawa Tshering. Last but not least, in **Haa**, I want to ackowledge and thank Tenzin Thinley, for helping me with translation and enumeration for surveys, despite the sudden request.

When I returned from Bhutan, I realized that I not only gained a new community there, but I also became part of an extended network of people in Japan, particularly at Kyoto University. They are the people who have nurtured and expanded the legacy of those who first carried seeds of friendship from Japan to Bhutan; they are the people whose footsteps I now follow. I am particularly grateful to the Kyoto University Bhutan Friendship Program, for making it possible for me to invite Dr. Rekha Chhetri to Japan, in February 2014. This visit allowed me to give back at least a little of what I have received from Bhutan and to contribute to the mutual learning process that was critical to the success of my time in Bhutan.

Throughout the whole course of my graduate school career, the Research Institute for Humanity and Nature has supported, expanded and encouraged me. In particular, I would like to acknowledge Professor Kenichi Abe and Steven McGreevy.

Finally, I give thanks my family for their endless support and encouragement, particularly when it was most difficult, and my friends, particularly the Yamada family, Crystal Uchino, Takanori Oishi, and Hart Feuer who did not let me doubt my abilities. There are many others, some whose names I do not even know, whose presence and help I know I am grateful for.

Abstract

Bhutan's announcement to become the first 100% organic nation in the world was yet another confirmation of its progressive approach towards development. Referred to as 'living GNH', the government-led effort to support small-scale agro-ecologically sustainable farming methods came at a time of growing global recognition of its importance. Bhutan has attracted a great deal of interest, despite the fact that very little is known about the implementation of the policy. Reports and studies on the topic have predominantly reflected the government's perspective, without sufficient consideration given to how the peasant farmer communities have been responding and adapting to such government-led initiatives.

Throughout the last half-century, the Bhutanese government has been encouraging a transition from subsistence level agriculture to increased market oriented food production. India and Japan have played a particularly large role in supporting this modernization process. In order to get a better view of the transitions taking place in agricultural practices, this study placed the government led emphasis on organic agriculture within the larger narrative of agricultural modernization, rather than contextualizing Bhutan as an organic country by default.

A structured household questionnaire survey was conducted in three different districts within western Bhutan, as well as extensive formal and informal interviews with civil servants, researchers, community leaders and peasant farmers from January to March, and September to November of 2014. Large regional variations were assessed, reflecting the different adaptations or resistance to government provisions of new technologies (including synthetic fertilizer, improved seed varieties, and livestock). Variations were linked to various factors, such as degree of market integration.

Major findings include large regional differences found in the perceptions of organic agriculture. Organic agriculture was viewed as being closely linked to methods of soil fertility management. This study elucidates how, despite assumptions that have been made about an overall decline, the tradition of forest leaf litter access and utilization was being largely sustained or strengthened. Moreover, it was being sustained alongside the implementation of external synthetic inputs to respond to greater market incentives. Government policies, however, were limiting agricultural practices by restricting forest access and subsequent resource use. This illuminated how the emergence of agriculture as a modern sector, as distinct from the forestry sector, is providing contradictions that do not reflect the peasant mode of food production, possibly restricting manifestation of 'organic' as merely an option for economic activity, instead of a coordinated and 'wholistic' mode of production.

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AEO	Agricultural Extension Officers
AMC	Agricultural Machinery Centre
BAFRA	Bhutan Agriculture and Food Regulatory Authority
BOCS	Bhutan Organic Certification System
BS	Base saturation
BTN	Bhutanese Ngultrum
C	Carbon
CNR	College of Natural Resources
DAO	District (or *Dzonkhag*) Agricultural Officer
DoA	Department of Agriculture
DSC	Druk Seed Corporation
EU	European Union
FAO	Food and Agricultural Organization of the United Nations
FiBL	Research Institute of Organic Agriculture
FYM	Farm Yard Manure
FYP	Five-year development plan
GDP	Gross Domestic Product
GNH	Gross National Happiness
GNHC	Gross National Happiness Commission
GMO	Genetically Modified Organisms
ha	Hectare
HH	Households
IFOAM	International Federation of Organic Agriculture Movements
IPM	Integrated Pest Management
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
K	Potassium
MAFF	Ministry of Agriculture Forestry and Fisheries (Japan)
masl	Meters above sea level
MoAF	Ministry of Agriculture and Forests
MoP	Muriate of Potash
MT	Metric Ton
N	Nitrogen
NASEPP	National Agriculture Seed and Plant Production Program
NFOFB	National Framework for Organic Farming in Bhutan
NGO	Non Governmental Organization
NOP	National Organic Program
NOSB	National Organic Standards of Bhutan
NPPC	National Plant Protection Centre
NSB	National Statistics Bureau
NSC	National Seed Centre

NSSC	National Soil Science Center
Nu	Ngultrum (Bhutanese currency)
NWFP	Non-Wood Forest Products
OP	Open Pollinated
P	Phosphorus
PPC	Plant Protection Chemicals
PPD	Policy and Planning Division
PGS	Participatory Guarantee System
RDC	Research and Development Centre
RGoB	Royal Government of Bhutan
RNR	Renewable Natural Resources [sector]
RUB	Royal University of Bhutan
SAARC	South Asian Association for Regional Cooperation
SDC	Swiss Agency for Development and Cooperation
SFM	Soil Fertility Management
SNV	Netherlands Development Organization
SSP	Single Super Phosphate
UK	United Kingdom
UNDP	United Nations Development Programme
WFP	World Food Programme

Chapter 1 Introduction and Justification for Research

1.1 Research Background

Bhutan's developmental paradigm has often been hailed by advocates of alternative development. The country's recent pledge to become 100% organic seen as the latest monumental departure from mainstream industrialization. What might be billed as preposterous for most countries fits squarely with Bhutan's now-famous concept of Gross National Happiness (GNH)[1], which sanctifies good governance, culturally-rooted socio-economic development, and environmental conservation (GNH Centre, 2015). As the only country in the world that has chosen to be wholly organic, Bhutan is looked up to as a "light house" (Willer & Lernoud, 2015), guiding the rest of the world towards a better future, founded on socio-ecological as well as spiritual well-being. Bhutan's conscious efforts to synthesize lessons and avoid mistakes committed elsewhere in the world have been viewed as lessons offered for "late 'starters' and early 'stoppers' in the game of sustainable development" (Gupta & Ura, 1990).

The initiative to emphasize organic as a national mandate can be understood as an extension of Bhutan's unique deontology, made evident by how the interest in implementing organic agriculture has been explained as an embodiment of GNH, or "living GNH", as former Prime Minister Jingmy Thinley Dorji described it in his speech at the United Nations Conference on Sustainable Development (also known as the Rio+20 Summit) (S. Tashi, 2015; Thinley, 2012).

Organic agriculture is understood informally as a system of food production and consumption that takes into consideration the impact it has on the health of the people who are both producing and consuming the product as well as the environment within which it is grown and processed. To policy-makers, in turn, organic agriculture represents a technocratic framework for organizing agriculture and food that can be instrumentalised into concrete rules and practices that allow for marketing and certification (Scialabba, 2000). One main drive for developing countries to produce organic food and fibers is to tap into market opportunities in developed nations; but it is also for economic self-reliance, finding alternatives to decreased access to agricultural inputs, natural resource conservation, food

[1] Gross National Happiness (GNH) a phrase coined in 1972 by Bhutan's Fourth King.

self-sufficiency and rural social development (Scialabba, 2000). As such, the discourse of organic agriculture has been embraced by the Royal Government of Bhutan (RGoB) as an ideological platform and means for actuating its alternative development goals, nominally represented by 1) national food security, 2) conservation of natural resources, 3) environmentally sustainable production and increase of rural incomes, and 4) social and regional equity (UN ESCAP, 2002). Because the implementation of organic policy is embedded in this much larger developmental landscape, it is important to not only study the existence of the policy as such, but rather to study *through* it by assessing the extent to which agricultural practices and mentality are keeping pace with official narratives in Bhutan. Of particular importance are the various expressions of adaptation, or even resistance, to such official, government-led initiatives reflected in the peasant farming communities on the ground.

1.2 Literature Review: The Context of Organic Agriculture Policy in Bhutan

Numerous academic articles and government reports have been written concerning Bhutan's agricultural traditions and government-led initiatives. While documents are referenced throughout my thesis, I will introduce representative studies that emphasize the significance of my research.

Representing the government's narrative, Sonam Tobgay from the Agricultural Marketing Services of the Ministry of Agriculture in Forests (MoAF) has written extensively on Bhutan`s general agricultural transitions, including a comprehensive report summarizing factors that are contributing to and limiting agricultural diversification (Tobgay, 2005). His perspectives are largely oriented towards increased commercialization of agriculture, describing how incentives and the ability of farmers to diversify are dependent on physical access to markets, access to information and credit, as well as farm inputs ranging from labor, fertilizer, and water, which cash crops inevitably require more of (Tobgay, 2005). In 2008, Tobgay and McCullough at Cornell University published an broad exploration of the trends in the commercialization of smallholder farming, further highlighting road access as a major constraint to market participation (Tobgay & McCullough, 2008).

In contrast, Walter Roder, an agronomist who has been studying the Bhutanese agriculture and pastoral systems since 1973 and a resident of Bhutan, has been affiliated with the Agriculture Research Centre Yusipang, the Renewable Natural Resources Research Center Jakar, Bumthang, as well as the International Potato Center over the years, has

published extensively on a wide rang of issues surrounding the changing renewable natural resource use traditions from a more critical academic perspective. Topics he has covered include nutrient cycling and forest leaf litter use, (Walter Roder, 1990; Walter Roder, Dorji, & Gratzer, 2003), shifting cultivation practices in eastern regions (W. Roder, Calvert, & Dorji, 1992), cattle grazing and fodder production (Walter Roder, 2002), and the introduction and popularization of Bhutan's most important cash crop: the potato (Walter Roder, 2004; Walter Roder, Nidup, & Chhetri, 2008).

From international organizations, the Food and Agricultural Organization of the United Nations (FAO) reports have also provided comprehensive analysis of Bhutan's agricultural sector (Christensen, Feliccia, & Gulliver, 2012). A joint publication between the MoAF and ICIMOD[2] provides a thorough outline of the Renewable Natural Resources (RNR) sector of Bhutan, with emphasis on agriculture and livestock. Expectedly, however, these reports are largely founded on government statistics, which tend to align itself with official characterizations and outlook of the Bhutanese state, which does not serve as a reflection of the idiosyncratic realities and struggles experienced by the Bhutanese people.

Because the organic initiative is still in its early stages, public interest has largely outpaced academic research. Much of the initial coverage of Bhutan's policies has been reported in news media and magazine articles (most notably Barclay, 2012; Confino, 2014; Geiling, 2015; Paul, 2015; Vidal & Kelly, 2013). More rigorous research about Bhutan's focus on organic agriculture is, however, steadily emerging. Most recently, Sonam Tashi, a lecturer at the College of Natural Resources (CNR), Royal University of Bhutan (RUB), conducted his PhD abroad on the topic of organic agriculture in Bhutan. His study revolved around an extensive analysis of rice yields comparing 'organic' and 'conventional' farms throughout all twenty *dzongkhags* (districts[3]) in Bhutan. He concluded that organic agriculture is in no way inferior in agronomic terms to conventional agricultural practices in Bhutan (S. Tashi, 2015, p. 114). Tashi as well as many others both in- and outside Bhutan, who have discussed the prospects of Bhutan becoming 100% organic, have argued that, though ambitious, the pledge is achievable, given how the country is already "organic by default' (Barclay, 2012; Dosch, 2011; Duba, Ghimiray, Gurung, & Wengkhar, 2008;

[2] International Center for Integrated Mountain Development.

[3] *Dzongkhag* (pronounced zonka) means 'districts' in the national Dzongkha language. *Dzong*, is a fortress where religious and government activities take place. Each district has a *Dzong* as its administrative headquarters.

Ghimiray, 2013; Gurung, 2008; S. Tashi, 2015). The term 'by default' implies the absence of opposition or lack of an alternative, or lack of conscious choice and positive action (Oxford English Dictionary, 2015). Bhutan's diversifying and intensifying agricultural sector, as implied by Tobgay, suggests how passive implementation of organic conditions should not be assumed, much less implied. As a consequence, cavalier assessments of Bhutan's organic readiness by virtue of peasant farmers' small-scale, relative isolation and limited access to external inputs cannot be sustained. In fact, as later explained in Chapter 3 to justify my focus on three study sites in western Bhutan, regional variations in how agriculture is being practiced suggest that any monolithic transition to organic will be challenged by the diverse local conditions.

In a predominantly Buddhist country that teaches the importance of understanding that change is the only constant, the urbanizing population and the expansion of market capitalism are significant factors leading to new priorities, alternatives, and limitations in the rural areas. As an extension of government efforts to expand agricultural production and commodification, the diversification of market opportunity organic produce is expected to provide is treated as an incentive that would help retain the population in rural communities (Dosch, 2011; Gurung, 2008). On the one hand, there are those who describe Bhutan as being largely organic by default or a modern adaptation of "traditional practices" in agriculture (Dosch, 2011); on the other hand, government reports and manuals on organic agriculture, as well as studies done in Bhutan, all describe and place considerable importance on the "transition" from conventional to organic agriculture (Duba et al., 2008; NOP, 2012; S. Tashi, 2015). The co-evolution of the agricultural and socio-economic system, which has been embraced as a natural progression, has not yet led to such a strong dichotomy as conventional vs. organic. In countries where organic agriculture as a concept and method has taken root, it was adopted out of necessity, to provide an alternative to the often debilitating and divisive standards that modern agriculture technologies enforced on peasants and on the land their survival depended upon. Farmers theorized and conceptualized a holistic expression of agriculture that would be beneficial as an alternative to what is popularly termed "conventional agriculture". In Bhutan, where such binding technologies have not yet taken root (or the roots are still very shallow), the terms "conventional" and "organic" must be used carefully, as such concepts are often based on a completely different premise.

Subsistence farming practices that have been observed in Bhutan have been described

as expressions of organic agriculture as they prioritize sustaining "the health of soils, ecosystems and people", relying on "ecological processes, biodiversity and cycles adopted to local conditions, rather than the use of inputs with adverse effects" (IFOAM, 2015)[4]. However, it would be a gross simplification and a negation of the tremendous and complex and ongoing impacts of modernization, if the diverse expressions of agriculture that have been adopted in Bhutan were boxed into the framework of 'organic' agriculture. If nothing else, the current diversity defies any clear differentiation. For example, some reports have celebrated Bhutan as having "the world's fastest growing organic sector" (IFOAM, 2013), while others calculate that it plays a marginal role, with less than 10% of the agricultural area under organic agricultural production (Neuhoff, Tashi, Rahmann, & Denich, 2014). Not only are such descriptions questionable representations of reality, but perhaps more importantly, they are dangerous in that they inculcate the classic dualism: organic versus non-organic, or peasant versus capitalist farmer, veering us away from understanding the dynamic and heterogeneous realities of *how* people are farming on the ground.

Simple categorizations distract attention from the unfolding challenges, patterns of struggle, progress, and newly emerging identities within the farming population. In this way, such simplification may even limit the effectiveness of efforts to understand, much less support, the establishment of a productive, ecologically sound, agricultural sector.

1.3 Research Questions and Objective of Study

The objective of this study is to better understand the ways in which agricultural practices in Bhutan are transitioning through an assessment of the local encounter with, and the embeddedness of, the policy on organic agriculture. As mentioned, literature about agriculture in Bhutan has been written predominantly from the government`s perspective. Particular emphasis will therefore be placed on the ways in which the government's official narrative of organic agriculture is being adapted within the peasant farmer communities on

[4] The International Federation of Organic Agriculture Movements (IFOAM) is an entity representing over 100 country member organizations around the world. Their norms "provide the foundation for the organic movement, and they include: the IFOAM Principles, the Standards and guidelines for certification agencies and firms" (Obach, 2015 in Freyer & Bingen, 2015). According IFOAM, the full definition of organic agriculture is "a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and good quality of life for all involved" (IFOAM, 2015).

the ground.

The three research questions that were used to guide my work are outlined below; each will be the focus of one chapter.

A. How does the emphasis placed on organic agriculture fit into the ongoing processes of agricultural modernization and development in Bhutan?
B. How is organic agriculture being discussed in Bhutan; and how is the relationship to organic agriculture different between the peasant farmers and the government?
C. How has the organic policy influenced how farming is practiced traditionally; and how has it influenced the ways peasant farmers relate to their surrounding landscape?

1.4 Definition of terms

Key terms and concepts referred to in this study could be cause for confusion or controversy if not defined clearly. Below is a brief description of three major terms I have used in this study.

Organic agriculture: The national standards adopted in Bhutan adhere to norms established by IFOAM (as defined above), and Codex Alimentarius Guidelines for production, processing, labeling and marketing. According to the National Organic Standards of Bhutan (NOSB), published in 2011, organic agriculture is defined as *"a system of farm design and management to create an ecosystem, which can achieve sustainable productivity without the use of artificial external inputs such as synthetic chemical fertilizers and pesticides"* (MoAF, 2011). As outlined by the aforementioned international guidelines, organic standards in Bhutan also encourage the use of local species and varieties of seed, planting material, animals well adapted to local conditions, and livestock feed composed essentially of locally procured organic ingredients. The use of genetically modified organisms (GMO) is prohibited. According to NOSB, 'traditional' agricultural practices, relying on mixed-crop-livestock farming methods, without the use of chemical inputs, and not conflicting with organic norms, are also incorporated in the national standards. The certainty of definition implied in the NOSB, as will be revealed in more detail in this study, belies the fluidity in practice between 'traditional' and 'organic'.

Peasant farmer: There exist long and complex histories behind the term "peasant" or "peasantry", reflecting a vast and heterogeneous category of people throughout the world. Historical definitions have referred to peasant lifestyles to represent inadequate productivity, profits, and levels of wealth, a subordinated social group. In some contexts, such categorizations still remain. This study uses the term "peasant farmer" to refer to individuals and groups who are not only interested in the production of simple commodities to accumulate profit (often referred to as farmer, as contrast to peasant), but whose activities also revolve around placing the family farm as the basic multi-functional unit of social organization, with land husbandry and animal rearing as the main means of livelihood, embedded in the way of life of small rural communities (Edelman, 2013).

Modernization: For the purpose of this study, 'modernization' refers to the increasing dependence on scientific knowledge and technological solutions, often linked to processes based on linear and standardized solutions that are aimed at cost minimization and increased production. This often leads to specialization of production. Such transitions are often characterized by increased penetration of and embeddedness within market capitalism and the globalized economy.

1.5 Introduction to the Structure of the Thesis

The critical contribution of this work lies in the identification of local perceptions and knowledge of the farming community. Instead of operating from an artificially static point of departure in the form of organic standards, this study uses organic agriculture as a reference point for evaluating the changing expressions of agriculture and the adaptive capacities of peasant farmers in the process of modernization. The message here is that while organic agriculture is nominally the law of the land, it should not become the exclusive, or even the dominant lens through which diverse processes of agricultural development in Bhutan are understood. Through analysis into the constellations of practice that Bhutanese farmers work with and innovate from, this study will show that the pledge to organic agriculture did not set Bhutan upon a linear track leading to widespread certification, but rather initiated what will be a drawn out process of consolidating a set of ideals and practices that compromise between the diverse realities of farming on the ground and international recognition.

To begin, first Chapter 2 introduces Bhutan in a contemporary context. This is followed

by an introduction to the field study sites in Chapter 3, alongside methodologies employed to conduct this study. Chapter 4 involves the first research question and assesses organic agriculture within the historical context of agricultural modernization. Chapter 5 highlights major findings from the household questionnaire survey, to introduce how peasant farmer communities are perceiving and reacting to government-led efforts towards increased agricultural commercialization. Practices making use of locally available organic resources are what people refer to when mentioning how organic agriculture is an extension of 'traditional', or what is commonly referred to as 'natural', farming within Bhutan. While taking advantage of these resources for the promotion of organic agriculture, such labor-intensive practices are often assumed to be disappearing, due to the increasing availability of synthetic[5] fertilizers and decreasing labor within the villages. Little is known, however, about *how* it is changing in relation to both the modernizing processes of centralized resource management on the part of the government and the introduction of alternative technologies (synthetic fertilizer). Chapter 6 hones in on the particular tradition of soil fertility management found within Bhutan to substantiate findings highlighted in Chapter 5, and to provide a further look into the regional variations within western Bhutan. Chapter 7 synthetizes the preceding chapters before the conclusion in Chapter 8.

[5] Following the MoAF's example, the term 'synthetic' will be used in this thesis, as synonymous to 'inorganic' or 'chemical'.

Chapter 2 Geographical Background and Contemporary Trends in Bhutan's Agriculture Sector

2.1 Introduction

This chapter provides an introduction to contemporary trends and the general socio-geographic background of Bhutan as a country, based on the most recent statistics and studies available.

Bhutan is a country located in the Eastern Himalaya mountain range. Its area is 38,394 km^2, which is slightly larger than that of Taiwan, and slightly smaller than Switzerland. Bordering Bhutan to the north is the Autonomous Region of Tibet, China, with the Indian states of Sikkim to the west, Arunachal Pradesh to the east, and Assam and West Bengal, to the south (Figure 2.1). Topographies ranging from altitudes of below 200 meters above sea level (masl) to peaks over 7,500 masl (with the highest peak in Bhutan, Jhomo Lhari, at 7,314 masl) are compressed within a latitudinal distance slightly greater than 150 km.

Generally, the people of Bhutan are divided into three ethnic groups. Those who live in the east are known as the Sharchops; those who inhabit the southern areas are predominantly Lhotshampa of Nepalese origin, who arrived towards the end of the 19th century (Imaeda, 2003); the Ngalungas (commonly referred to as Drukpas) have historically been the ruling elites, inhabiting the western regions. The most dominant languages are *dzongkha,* Bhutan`s national language, which is the standard tongue used by the Ngalags; *sharchop* spoken by the Scharchops, and Nepali spoken by the Lhotshampa. Within each region there are many distinct sub-groups (Bisht, 2012; Sinha, 2001). Some people say a different language or dialect can be found in every valley in Bhutan. Documented languages range from more than ten (Imaeda, 2000) to as many as 23 (Rizal, 2015). This variety in discrete life worlds, expressed through such linguistic and ethnographic diversity, is a reflection of a complex landscape, supporting a wealth of lifestyles and survival techniques.

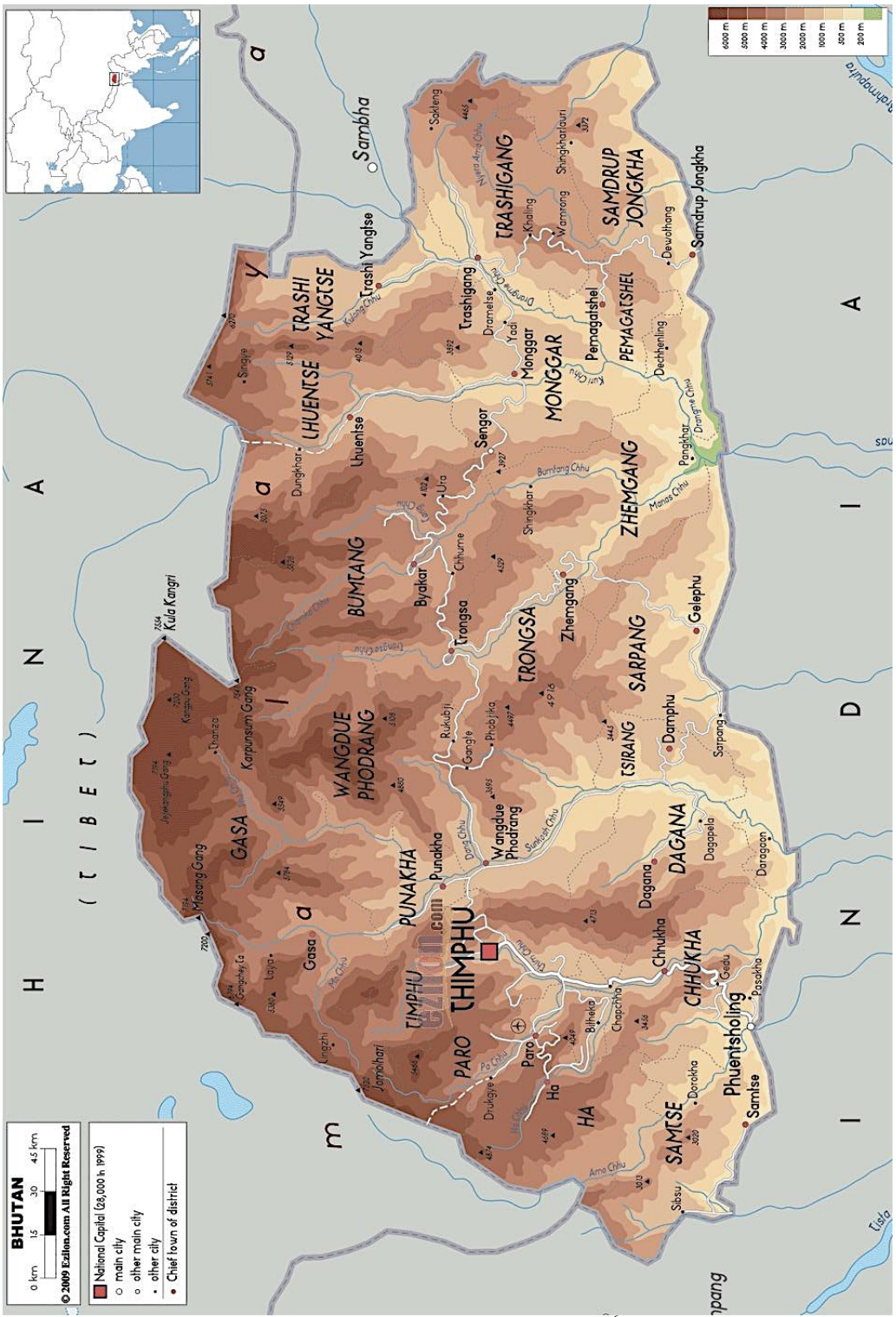


Figure 2.1 Physical map of Bhutan[6]

[6] Map sourced from (ezilon.com, 2009)

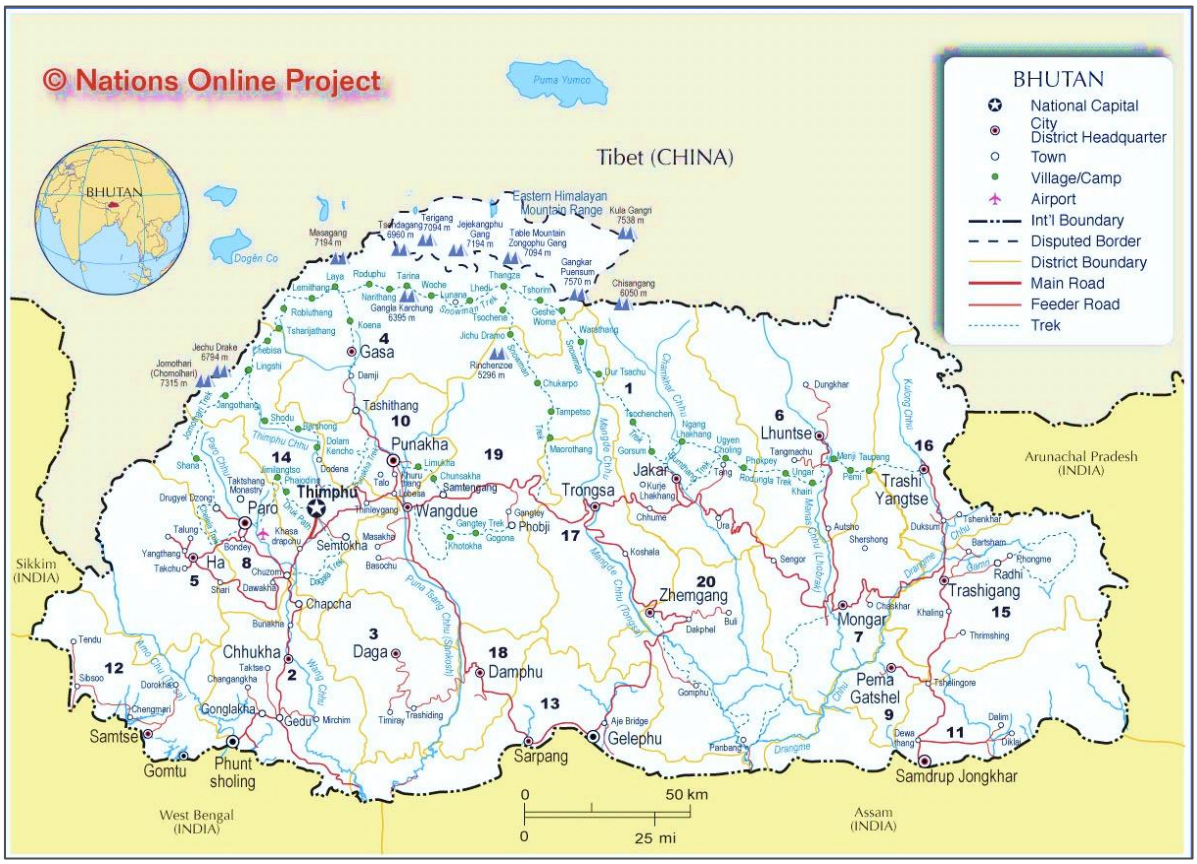


Figure 2.2 Map of Bhutan with major roads[7]

2.2 Geographic and Climatic Characteristics

2.2.1 Climate

The climate ranges from wet sub-tropical in the lower altitudes in the south (100~600 masl), to dry temperate in the mid-hill regions (2,600~3,600 masl), to alpine along the Himalayan mountain range (3,600~7,300 masl). Like the countries surrounding it, Bhutan is affected by the monsoons, creating distinct wet (mid-April to late September) and dry seasons (December through mid-April). Annual precipitation varies widely, however, depending on location and elevation. Meteorological data is very limited overall; but in the temperate mid-hill regions, where this study was based, yearly precipitation averages around 1,000 ml (NSB, 2014)[8].

[7] Map sourced from the Nations Online Project (2015).
[8] In the capital, Thimphu, the winter months (December through February) are very dry with almost no precipitation. Starting in March, average rainfall is 20 ml/month and increases thereafter to a high of 220 ml in August. Total annual rainfall is nearly 650 ml (NSB, 2014).

2.2.2 Land Use and Land Cover

According to the Bhutanese government's most recent RNR statistics data, 80.9% of the country is considered forest area, with 70.5% under tree cover. Glaciers cover 7% of the surface area in Bhutan, feeding four major river systems: the Drangme Chhu, the Puna Tsang Chhu, the Wang Chhu, and the Amo Chhu, all eventually flowing into the Brahmaputra River in India. Cultivated agricultural land lies along these rivers, covering only 2.9% of the land in Bhutan, corresponding to 1,125.5 km^2 (112,550 ha) (PPD, 2015).

Below is a breakdown of agricultural land use area by type (Table 2.1).

Table 2.1 Agricultural land use in Bhutan

Type	Hectares (ha)	Percent of total agricultural land
Wet land	31,911	28.4%
Dry land	68,255	60.8%
Apple and citrus orchard	9,088	6.5%
Cardamom and areca nut plantation	4,799	4.1%

2.2.3 Agro-Ecological Zones

Bhutan`s agricultural systems reflect the country`s extensive geo-climatic diversity. It`s divided into six major agro-ecological zones coexisting in close proximity to one another, corresponding to their respective altitudinal ranges and distinct climatic conditions (Table 2.2).

In the north, above 3,000 masl, there are transhumant Yak herders who traditionally subside on yogurt, butter, cheese and yak meat; but in their high altitude fields they also cultivate their own wheat, barley and turnips[9]. Many in the mid-hill regions of Bhutan, such as in Wangdi Phodrang (which will be referred to as Wangdue in this study), Bumthang and Haa, practice transhumant agro-pastoralism[10] (Moktan et al., 2008; Namgay, Millar, Black, & Samdup, 2013). Large herds of cattle and yaks are taken to grazing lands, called *tsamdrog,* in

[9] Transhumant pastoralism is characterized by seasonal migration between cooler highlands during the summer months and warmer lowlands during winter months. This is a cyclical migration between the same two locations where people would have permanent camps or houses, around which small scale cultivation of grains and vegetables may be practiced (O'Neil, 2011).

[10] Peasant farmers in Haa and Bumthang often owned rice fields or fruit orchards in the warmer regions. These lands would be leased out to local residents for sharecropping since the family members were not there year round (According to an interview with a Farmer in Haa, 2014 and Phuntsho, 2013).

neighboring districts in lower altitudes for the winter months[11].

Beside settled crop cultivation, a number of extensive cultivation practices are also observed. The *pangshing* are grass fallow systems (most prevalent in Bumthang), where the top soil is dug dried and piled with pine needles, then ignited and burned for several hours (W. Roder et al., 1992). Another land use practice, known as *tseri,* is a bush fallow system, which resembles slash, and burn agriculture found throughout tropical and subtropical Asia (Kerkhoff & Sharma, 2006). Trees and shrubs are cut during the dry season and burned shortly before planting (W. Roder et al., 1992; Upadhyay, 1995).

Table 2.2 Major agro-ecological zones in Bhutan[12]

Agro-Ecological Zone	Altitude (masl)	Temperature (C^o)			Rainfall (mm /year)	Farming Systems, Major Crops and Produce
		Monthly Max	Monthly Mean	Annual mean		
Alpine	3,600 ~4,600	12.0	-0.9	5.5	<650	Semi-nomadic, yak herding, dairy production, barley, buckwheat, mustard and vegetables.
Cool Temperate	2,600 ~3,600	22.3	0.1	9.9	650 ~850	Yak, cattle, sheep, horses, dairy production, upland rice, barley, wheat, potatoes, buckwheat, mustard and veg.
Warm temperate	1800 ~2600	26.3	0.1	12.5	850 ~1,200	Rice on irrigated land, double cropping with wheat and mustard, barley and potatoes on dryland, temperate fruit trees and vegetables.
Dry Sub-Tropical	1200 ~1800	28.7	3.0	17.2	850 ~1,200	Maize, rice, millet, pulses, fruit trees, vegetables, wild lemon grass.
Humid Sub-Tropical	600 ~1200	33	4.6	19.5	1,200 ~2,500	Irrigated rice rotated with mustard, wheat, pulses and vegetables, tropical fruit trees.
Wet Subtropical	150 ~600	34.6	11.6	23.6	2,500 ~5,500	Humid areas with irrigated rice, rotated with mustard, wheat, pulses and vegetables, tropical fruit trees.

[11] This would be done by a family member or a hired individual in the community.
[12] Source: Compiled by author based on RNR Research Strategy and Plan Document, MoA, 1992 in Ghimiray (2013) and the World Food Programme (WFP, 2015).

2.3 Population Demographics and Emerging Social Issues

The total estimated population of Bhutan is 745,153 (2014). The median age of the population in 2005 was 22.3 years old. The natural population growth rate is 1.3%, with the highest population growth rates concentrated in the mid-hill regions of western Bhutan (NSB, 2014).

According to the most recent government RNR statistics published by the Statistical Coordination Section of the Policy and Planning Division (PPD), 62.0% of the population are said to be engaged in agricultural activities; according to government statistics, women make up a slightly larger proportion (53.3%) of that number (PPD, 2015). Under occupational categories, the largest percentage is employed as family workers in agriculture (39.5%) (GNHC, 2013).

In 2005, 70% of the population was living in rural areas. While the average family size is 4.6, the range up to as many as 19 persons per household. The mid-hill regions of western Bhutan, where Paro, Punakha, Thimphu and Wangdue are located, is considered the cultural-political center of the country (Sinha, 2001). And with the rapidly urbanizing Thimphu *Dzongkhag* accounting for 16% of the population (NSB, 2014), Bhutan is considered one of the fastest urbanizing countries in the world.

During the last decade, Bhutan's economy has been growing at an average rate of 8% per annum. This exceptional performance, however, is being fueled primarily by investments from the government along with a high reliance on foreign aid, particularly in the hydropower sector. Limited economic diversification is resulting in substantial youth unemployment in the urban centers: 9.5% for men and 11.6% for women (K. E. Dorji, 2013; GNHC, 2013). While agriculture is seen as an important sector where future investments are needed, a stigma associated with farming in the rural areas discourages college-educated youth from returning to their villages. They remain in the city, and many are left unemployed, while depopulation continues accelerating in rural regions. Strict forest conservation policies are also often seen as a cause for the out-migration of the rural population (Phuntsho, 2013).

2.4 Contemporary Trends in Agriculture in Bhutan

2.4.1 Major Crop Production

The 2015 RNR statistics, reports how in Bhutan's growing economy, agriculture represents 3.9% of the gross domestic product[13] (PPD, 2015). By area, maize, followed by rice, are reported as the country's two most widely cultivated crops. By weight, rice, maize, and potatoes are the most significant, with potatoes being Bhutan's most important cash crop (Figure 2.3). Today, rice is the most widely consumed staple. Maize is most widely cultivated in the eastern regions. According to one report, only two decades ago buckwheat was the staple food in Bhutan until initiatives from the Netherland Partnership Program, alongside the FAO, selected and promoted rice as the preferred commodity (Bhutan - literature review, 2014 quoting the World Food Program 2008).

Today, the area of wetland per household, used for rice production, averages 0.32 ha in high-, 0.27 ha in medium-, and 0.77 ha in low-altitude zones (Shrestha, 2004). Given the small average landholdings, intensification becomes the potential choice for increasing yield. While Bhutan has increased its average production from1.53 to 2.3 MT ha^{-1}, the increase in food production has not kept pace with the population growth rate (Ghaley & Christiansen, 2010). Furthermore, wildlife damage, caused by deer and wild boar in the mid-hill regions and elephants in the south, is of increasing concern for the rural communities. As a preventative measure, the government started to distribute free electric fencing. As of May 2015, the Department of Agriculture (DoA) constructed 364 km of electric fencing[14] (PPD, 2015).

2.4.2 Trade and Markets

Beginning in 1961, the government of Bhutan began setting five year development plans (FYP). The 2015 statistical report reviews three major objectives set by the MoAF for the 11th, and most recent, FYP (2013-2018): its economic objective is the enhancement of food and nutritional security, and accelerated RNR sector growth; its social objective is increasing the sustainability of rural livelihood; and its environmental objective is promoting sustainable management and utilization of natural resources (PPD, 2015). Such priorities

[13] The RNR sector as a whole represents 16.18% (of which the livestock sector represents 2.42% and the forestry sector represents 1.62%) (PPD, 2015).
[14] Of the 364km of electric fencing, 3.0km were reportedly placed in Gasa, 4.0km in Paro and 10.1km in Wangdue. These three *dzongkhags* have proportionally less wire fencing than the rest of Bhutan.

show the importance placed on rural development and the RNR sector. The particular emphasis in agriculture can be seen as a response to the substantial trade deficit in the agriculture sector. According to the statistical report, in 2014, exports were 2,542.433 million BTN[15], while imports were 6,776.806 million BTN. The major commodities exported are potatoes (40.4% by volume, 27.1% by value), followed by oranges (31.8% by volume, 21.3% by value). Other exported commodities include wheat flour, apples, and vegetables (including spices and oilseeds), in order of volume[16]. The major commodities imported are rice, highest by both volume (44.9%) and value (26%), followed by wheat (13.2% by volume, 6.1% by value), oils, fats, dairy products (4.4% by volume, 18.4% by value) and vegetables (4.4% by volume, 6.1% by value). Additional products imported include sugar, salt, potatoes, beef, and fish[17].

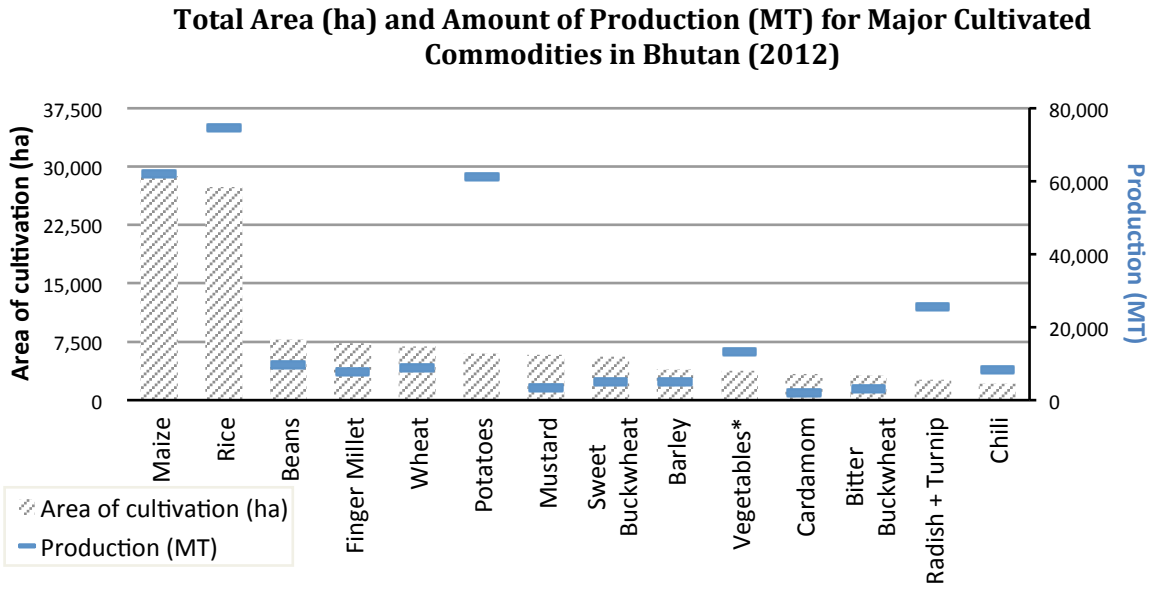


Figure 2.3 Amount (blue line) and total area of cultivation (bar) for major agricultural commodities in Bhutan[18]

[15] 2,542.433 million Bhutan Ngultrum (BTN) is equivalent to 38.481 million US Dollar (USD) or 4,629.170 million Japanese Yen (JPY) (46.29 億円) and 6,776.806 million BTN is equivalent to 102.571 USD or 12,339.000 JPY (123.34 億円) (conversion rate of 1 USD = 66.07 Nu, 100 JPY = 54.92 Nu) (Using OANDA Rates for December 27, 2015).

[16] Vegetables, spices and oilseeds in Bhutan made up 5.1% by volume and 4.6% by value in 2014 (PPD, 2015).

[17] Volume calculations based on total volume at 176,599 MT.

[18] Compiled based on RNR census data 2013 (PPD, 2013).

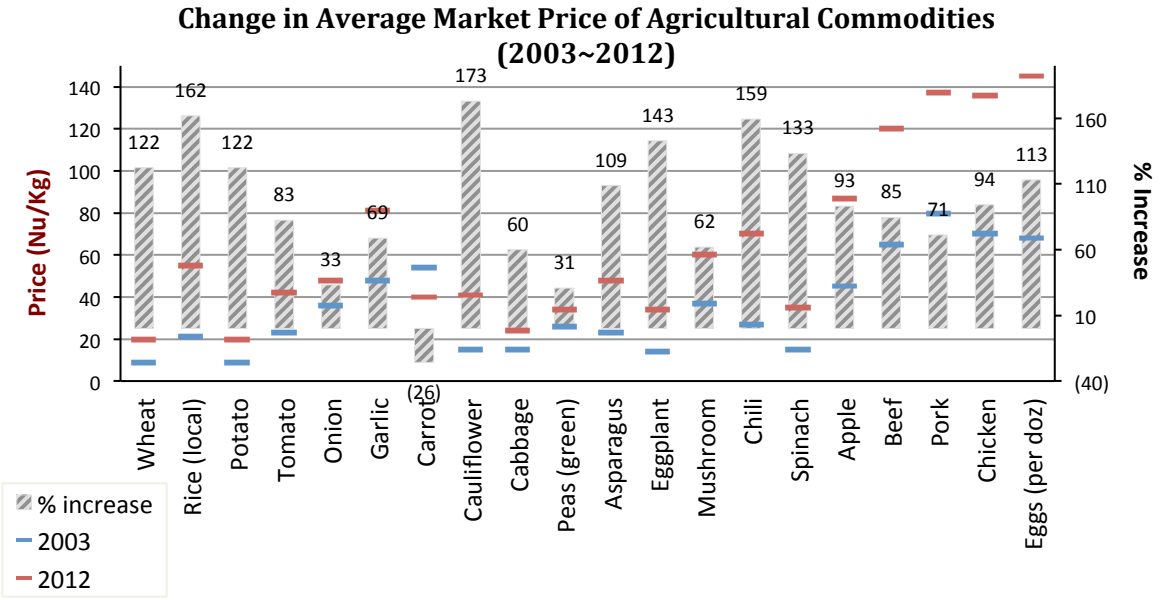


Figure 2.4 Change in average market prices of major agricultural commodities in Bhutan (2003~2013) (% increase marked with bar)

As shown in Figure 2.4, the overall average market price for agricultural commodities has been increasing. Commodity prices for basic food items (such as sugar, salt, powdered milk, and tea, all consumed on a daily basis) as well as day to day amenities and services (such as school uniforms, cellphones, and televisions) have also increased, leading to pressure within rural households to obtain additional sources of cash income. Present day circumstances are leading to a need for greater cash income. This has led to higher pressure for farmers to increase agricultural production.

2.4.3 Soil Fertility and Land Use Systems

The potential for increasing agricultural production depends largely on soil fertility. Inherent soil fertility and soil fertility management (SFM) practices are therefore inextricably related. In the absence of good SFM, poor inherent fertility will continue to be a problem. The soil in Bhutan is known to be poor. Major concerns are a low pH, nitrogen, and phosphate status, alongside an imbalanced base nutrition profile. A nationwide SFM survey was conducted in 1999 ~ 2000 to evaluate the 'low productivity of land and unsustainable SFM practices' (K. D. Dorji, 2008). From a total of 376 soil samples collected and analyzed, it was found that the total organic carbon levels are adequate, however total nitrogen levels

are low or very low, which leads to favorable C : N ratios (<19). Available phosphorus (P) and potassium (K) are also low. The low available P is of greater concern, as the most common soil parent materials are generally rich in K. Percent base saturation (BS%) and the imbalance found between exchangeable cations were also reported as a concern. BS% and total exchangeable cations were low or very low in most of the soil across the country. The low to very low exchangeable calcium (Ca) and magnesium (Mg) levels, as compared to predominately moderate to high levels of exchangeable K are reflected in unfavorable Mg : K and Ca : K ratios, possibly indicating a Mg deficit (K. D. Dorji, 2008).

Farmyard Manure, or FYM, is "a varying mixture of animal manure, urine, bedding material, fodder residues and other components." It is the most common form of organic fertilizer applied in the mid-hill regions of the Himalayan mountain range (SSMP, 2007). The report by K.D. Dorji summarizes how a decreasing use of FYM and/or absence or inadequate P fertilizer applications could further deteriorate the soil P status, while increasing and maintaining soil organic content will help delay P and K depletion. In Bhutan, forest plots for the production and collection of leaf litter are known as *sokshing* (*sok* meaning leaf and *shing* meaning tree in the *dzongkhag* language)[22]. Such forest plots have been managed locally by individual households and by communities as a source of leaf litter and fodder for generations.

While existing SFM practices using leaf litter and animal manure may have been "organic by default", achieving a more "productive or proactive organic" to increase opportunities for income generation will inevitably require additional fertilizer and soil structuring materials. The impetus for synthetic fertilizer and soil amendments would be high under unfavorable soil conditions. While farming in Bhutan, which has largely been categorized as "low-external input based" subsistence farming, may easily meet the certification standards for organic agriculture, the trend towards increasing food production goes against the rationale that it is easy to transition from "organic by default" to "productive organic". Proactive intervention to improve the existing soil condition is therefore of utmost importance if Bhutan is going to achieve nationwide adoption of organic agriculture.

[22]The term *sokshing* is also used interchangeably to mean a physical resource, the forest plot, as well as a local resource management institution and tenurial system (S. Wangchuk, 2005). What is implied by the term is therefore dependent on the context in which it is used. For the purpose of this study, the term will be used only to imply the forest plots, which have been accessed predominantly for the collection of leaf litter and firewood, both indispensible ingredients that support rural livelihoods.

2.5 Status on Organic Agriculture

In 1999, Bhutan set a vision of economic development for itself based on the production of "high value/low volume products that place the nation in the vanguard of technological advance and innovation. Bhutanese high value products, some of which will be based upon the sustainable exploitation of the nation's rich biodiversity, will have a world market and will be recognized as the products of one of the least polluted and least contaminated countries to be found anywhere on earth" (P. C. RGoB, 1999a). The vision continues, by defining several areas in which Bhutan is believed to have a comparative advantage. Through niche sectors, such as hydropower, natural resource mining (ferrosilicon and calcium carbide), and tourism, there has been a distinct consciousness to create an image of a 'clean' environment that Bhutan seeks to benefit from, an image that will project out into the world at large and insinuate "sophistication and of a unique civilization". It is in this context that "organically produced agricultural products", were first mentioned, suggested as an activity worth pursuing (P. C. RGoB, 1999b).

In the process of formulating Nation Framework for Organic Farming (NFOFB), starting in 2002, a team of people from Bhutan visited Australia, India, and Japan, in 2003, to study organic markets, legislation, standards and certifications, potential products, and regulatory requirements for international markets, etc. (Duba et al., 2008).

In 2006, the National Organic Program (NOP) was established. The definition for organic agriculture, adopted by the Department of Agriculture, was

> "an approach in agriculture with the aim to create integrated, humane, environmentally and economically sustainable agriculture systems, which maximize the use of renewable resources and the management of ecological and biological processes and interactions, so as to provide an acceptable level of crop, livestock and human nutrition, protection from pests and diseases, and an appropriate return to human and other resources applied".

This definition takes the ethical approach originally framed by the IFOAM Principles[23] expanding the definition beyond simply increased production. This both makes an effort to align with the realities faced by peasant farmers and surrounding ecosystem, as well as the expectation of the larger international community. Arguably, the establishment of ideals

[23] There are four IFOAM Principles: Principle of Health (healthy soil, plants, animals, humans = a healthy planet), Ecology (emulating and sustaining natural systems), Fairness (equity, respect and justice for all living things), and Care (for the generations to come) (IFOAM, 2016).

(represented by local standards and definitions) and international legitimacy (through working closely with IFOAM, and a declaration by the Prime Minister himself on the world stage, notably at the Rio+20 conference) were prioritized as a way to construct a sense of inevitability moving forward. In this sense, there was a proportionally greater strategic political focus with long-term prospects, rather than a practical one.

In 2007, Bhutan officially launched the NFOFB. The mission and vision for the framework along with the NOP was to develop and promote organic farming and environmentally friendly farming systems as a way of life, and to produce high quality and safe food, both for domestic and export markets (DoA, 2006).

The NOP is assisted by a technical working group comprised of 14 specialists from MoAF, plus one representative from the private sector. So far, the group does not have any members from academia. The technical working group was established in 2010, and as stipulated by the NFOFB, it is mandated to appraise, decide and review policies and issues that may have national implications (Duba et al., 2008; S. Tashi, 2015).

Meanwhile, Gasa *dzongkhag* in the northwest were designated as organic districts in 2004 (RNR RDC Bajo, 2012). In Samdrup Jongkhar, located in the southeast (refer to Figure 2.1 or 2.2), was also designated organic with the commencement of an initiative led by the Lhomon Society, a private organization led by Dzongsar Jamyang Khyentse Rinpoche, to establish a model for a GNH-based development in 2010 (Samdrup Jongkhar Initiative, 2010). Activities have mainly revolved around organic agriculture, appropriate technology and waste reduction among other topics. In 2006, one of the country's five RNR Research Development Centers (RNR RDC) located in Yusipang, Thimphu, was mandated to conduct research exclusively on organic farming (Rai, 2014; S. Tashi, 2015).

By all accounts, the stage was being set for Prime Minister Jigmi Y. Thinley to present his grand speech at the Rio+20 United Nations Conference on Sustainable Development in 2012. This catapulted Bhutan into a star in the worldwide organic movement. The national organic standards of Bhutan were established in 2011, adhering to the basic standards established by IFOAM and Codex Alimentarium Guidelines for production, processing, labeling and marketing. Statistics on organic agricultural activities did not exist for Bhutan in the 2011 annual report, "The World of Organic Agriculture", published by the Research Institute of Organic Agriculture (FiBL) and IFOAM (Weidmann, Kilcher, & Garibay, 2011);

and only starting from 2012 were wild harvests reported as representing organic products in Bhutan (Willer & Kilcher, 2012). In 2013, Bhutan's reported total share of organic agriculture was 4.1% of its total area of cultivation[25], which made it among the highest within the Asian countries[26] (Willer, Lernoud, & Kilcher, 2013). In the most recent report in 2015, the number was decreased to 1.3%[27] (Willer & Lernoud, 2015). Bhutan is classified under countries with a national standard, but without a national legislation. The 2014 statistical report highlighted Bhutan's cautious approach, stating that "following the much-reported announcement by the Bhutanese Prime Minister at Rio+20…the Minister of Agriculture has had to refute press reports of Bhutan going 100 percent organic by 2020", reiterating that hard set targets have not yet been set (Willer & Lernoud, 2014). In spite of some backtracking, in the most recent 2015 report, however, Bhutan was referred to as a 'lighthouse', placing it as a stalwart source of inspiration as the only country that has chosen to be wholly organic (Willer & Lernoud, 2015).

In pro-organic worldwide forums, any ambivalence in policy within Bhutan was concealed by an optimistic pretense. From March 5th to 8th 2014, Bhutan co-hosted the "IFOAM Conference on Organic and Ecological Agriculture in Mountain Ecosystems", together with IFOAM, the Millennium Institute, and Navdanya,[28] from which the Thimphu Declaration was issued. On October 2014, at the 18th Organic World Congress at Istanbul, the Minister of Agriculture reiterated Bhutan's commitment towards organic agriculture, reporting that the target "may be closer to reach than earlier thought" (Willer & Lernoud, 2015).

In 2014, the NOP was upgraded from a project to a division level status, strengthening its capacity to conduct activities. Initial efforts have focused less on the challenging task of conversion, and more on the registration and up-scaling pre-existing practices for improved productivity using organic methods. One incentive it is using is the establishment of organic as a national brand, and promoting the use of the national organic mark "Bhutan Organic" on all registered products grown that comply with domestic standards. Cooperative organizing

[25] The 4.1% in the 2013 report corresponded to 20,995 ha (Willer, Lernoud, & Kilcher, 2013).
[26] The 2013 report was based on data from 2011 (Willer et al., 2013).
[27] The 2015 report was based on data from 2013. The 1.3% corresponds to 6,726 ha (of which 3,024 ha is organic cereal production and 77 ha is organic vegetable production) (Willer & Lernoud, 2015).
[28] Navdanya is a network of seed keepers and organic producers spread across 17 states in India, led by Dr. Vandana Shiva. More information is available at http://www.navdanya.org (last accessed in January, 2016).

has proven difficult in many regions without clear economic gains (T. Penjore, 2014). For example, there are plans in Gasa to establish a Participatory Guarantee System (PGS), a relatively simple form of certification based on mutual monitoring at the local level; in spite of this, peasant farmers were hesitant because of the lack of an assured market.

The Ministry of Agriculture and Forests of Bhutan officially established the Bhutan Organic Certification System (BOCS) in January 2013, for both the domestic and export markets. However, the certification process has not yet been put into practice. According to the guidelines, Organic Agriculture is defined according to the National Organic Standards of Bhutan, and certification will be provided after trained inspectors from the Bhutan Agriculture and Food Regulatory Authority (BAFRA) examine the farms.

Collaboration with external certification bodies has allowed private producers to obtain certifications as well. In 2005, under the support of NOP, the Social Forestry Division, UNDP, Helvetas and the Swiss Agency for Development and Cooperation (SDC) Bhutan, a private company called BioBhutan[29], producing lemongrass oil products, was able to receive organic certification through INDORCERT, an internationally recognized certification agency in India (Yangzom, Krug, Tshomo, & Setboonsarng, 2008).

2.6 Summary

This chapter outlined geographical as well as the diverse socio-cultural as well as the ecological context of Bhutan as a nation, and outlined the current issues and trends in its agriculture sector. Particular emphasis was given to the development and current status of the organic policy. The chapter showed the government's priorities surrounding increasing food self-sufficiency, leading to higher pressure for farmers to increase agricultural production on the one hand, while on the other hand, promoting the adoption of organic farming practices that require that certain agrochemicals and synthetic fertilizers be avoided. While this is by no means contradictory, given the poor inherent soil fertility conditions throughout Bhutan, farmers cannot be expected to easily embrace the modern concept of 'organic' agriculture. Overall, the disconnect between ideology and official discourse in Bhutan and the practical realities of implementing the policy in various milieu was highlighted. While the top-down

[29] Bio Bhutan is a private enterprise established in 2005, with the support of the Swiss development agency, Helvetas. They develop, manufacture, and market natural and organic certified products, notably lemongrass oil, ginger, turmeric and honey, working with cooperatives, community forest management, and women's groups, (n/a, 2014).

commitment in Bhutan has been lauded in the international community, this has deflected critical observation away from the extent to which the 100% organic policy is receiving support from domestic stakeholders at the scale and pace implied in Bhutan's various international pronouncements.

Chapter 3 Methodology

3.1 Introduction

This study was initiated in an attempt to deconstruct Bhutan`s government led narrative of agriculture, in order to understand how the emphasis placed on organic farming is perceived by peasant farmers on the ground, and how it may be influencing existing forms of agriculture in its many adaptive processes.

The study was conducted as a collaboration between the Kyoto University Graduate School of Global Environmental Studies and the College of Natural Resources, Royal University of Bhutan.

The methodologies applied were not confined to any single discipline. The data collected is based on both quantitative and mixed qualitative methods, including unstructured (open) and semi-structured interviews. Targeted archival research was conducted as well as a review of literature in peer-reviewed journals and popular media on topics concerning agriculture and natural resource use. The literature reviewed was drawn from studies conducted throughout the Himalayan mountain range as well as different continents, based on topics of relevance.

Quantitative research methods were employed to complement and improve the reliability and content of the qualitative data collected. In this chapter, a description of the selected field study sites are outlined followed by the three methods that were adapted and used for this study.

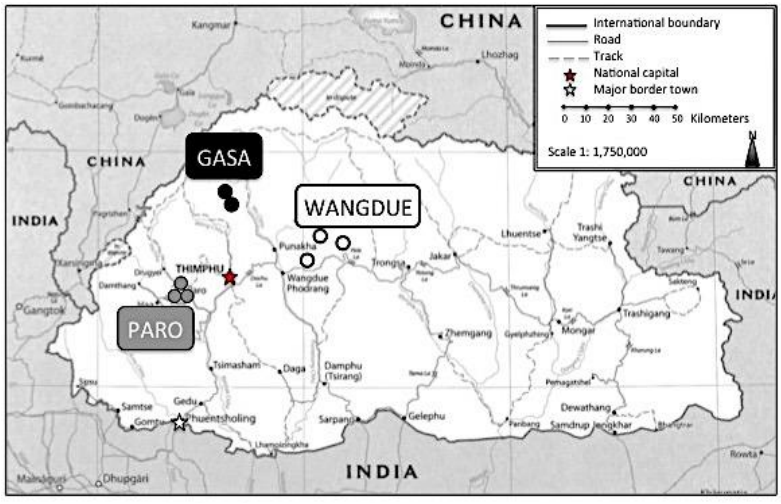


Figure 3.1 Map showing relative locations of field study sites

3.2 Research Sites

Dzongkhag (pronounced zonka) means 'districts' in the national *Dzongkha* language. Three *dzonkhags* within western Bhutan were selected as field research sites.

3.2.1 Criterion for Selection

As introduced in the previous chapter, political and economic incentives to develop have been greater in western Bhutan, putting it at the forefront of agricultural transition. This is due to the greater accessibility to larger markets, both domestically, through the capital city of Thimphu (marked with a red star in Figure 3.1), and internationally, through Phuntsholing (marked with a white star in Figure 3.1), the largest border town for trade with India. The three *dzongkhags* represent different socio-economic and agro-ecological conditions within Bhutan`s mid-hill temperate region (2000~3000 masl); their relative locations can be seen in Figure 3.1. Since market accessibility is a key factor in development, all selected sites are within one day's travel in a vehicle to a major market outlet, and to the capital city of Thimphu.

In order to assess how the emphasis on organic agriculture is influencing changes in traditional agricultural practices, and how *dzongkhags* differ in their awareness, Gasa, a *dzongkhag* formally designated as an organic agriculture pilot district, was selected.

The use and distribution of plant protection chemicals (PPC) is one reflection of the changes being experienced in the agricultural sector in Bhutan, and an important factor when considering Bhutan's transition into organic agriculture. PPC are available in all *dzongkhags* except for Gasa, since it is officially recognized as an organic district. Over the last five years (2009~2014), a total of 21.7 MT of PPC were distributed throughout Bhutan. On average, Thimphu *Dzongkhag* received the highest amount (38.3%), followed by Paro (26.5%), and Wangdue (17.5%). Less than 20% of the total was used among the farmers residing throughout the rest of the country (PPD, 2015). Paro and Wangdue are therefore particularly important *dzongkhags* to consider when trying to understand the modernization of agriculture in Bhutan.

Within each *dzongkhag*, communities actively involved in agriculture were identified by the *Dzongkhag* (or District) Agriculture Officer (DAO), then three were randomly selected (Figure 3.1). Within each community, households were randomly selected using mixed purposive sampling, so the number of households accounted for more than 50% in each community. Overall, a total of 147 households were surveyed; further description of the

surveyed communities is elaborated in Appendix II. Briefly, characteristics of the three *dzongkhag* are as follows:

Table 3.1 Surveyed communities within the three *dzongkhags*

Dzongkhag	*Geog*	*Chiog*	Village	HH[30]	SURVEYED HH	% of total HH
GASA	Khame	Jabaysa		20	8	60.0
		Khailog		15	10	
	Khatoe	Baychhu		15	12	
PARO	Lungnyi	Bondey	Bondey	34	14	60.7
		Gatana		27	17	
		Pangbisa		23	20	
WANGDUE	Dangchhu	Tashidingkha		13	13	58.8
	Kazhi	Bjaktey	Tsetoechu	7	1	
			Bjaktey	40	14	
	Phobji	Gungphey (52 HH)	Gungphey (2 other Villages)	20	19	

GASA

Located in the extreme northwest corner of the country, the entire *dzongkhag* lies within Jigme Dorji National Park. Gasa was initially part of Punakha *Dzongkhag* (the old capital), but became its own *dzongkhag* in 1992, with four *geogs*. This study surveyed three communities within the two *geogs* (Khatoe and Khamae) located in Gasa`s lower temperate region. The total population is 3,462 (in 2011), while the literacy rate among young women is 20.1% (NSB, 2011).

In this study Gasa was of particular interest because, in 2004, it was selected as Bhutan's first organic pilot district by the Royal Government of Bhutan's Ministry of Agriculture and Forests. According to a report on the organic outreach program published by the RNR RDC Bajo office, the decision to become an organic district came from grass-roots initiatives. It was then endorsed and supported by the government through the provision of inputs, capacity building, and infrastructural development related to organic agriculture for both community members and extension staff (RNR RDC Bajo, 2012). Communities must therefore comply with regulations of limited synthetic fertilizer and pesticide use as defined by the National Organic Standards of Bhutan (NOSB). According to the DAO of Gasa, a watchdog system was put in place to have community members mutually reinforce the

[30] HH is used as an abbreviation for households.

organic standards. A motorable road leading to urban markets outside the *dzongkhag* was only completed in 2011. Through government encouragement and improved access, the number of households cultivating vegetables for the market are increasing, even though the closest market is 27 km away, in Punakha.

The sites surveyed in Gasa are Jabaysa and Khailog *Chiwogs* in Khamae *Geog*, and Baychu *Chiwog* in Khatoe *Geog*. They are located in altitudes ranging from 2,175 to 2,800 masl. Of the two *geogs*, only Khamae practices wetland rice cultivation, which is considered the main crop, followed by wheat, barley, buckwheat, and mustard. In Khatoe, the major crops include upland rice, wheat and barley, all of which would be primarily for household consumption. Potatoes are cultivated on a relatively large scale in both *geogs* (RNR RDC Bajo, 2013).

PARO

Considered one of the most productive and prosperous *dzongkhags* in the country, due to its fertile land and easy accessibility from the capital city of Thimphu, Paro is known as one of the best rice-producing regions in the country. One of the communities surveyed is where Keiji Nishioka, considered the father of modern agriculture in Bhutan today (T. C. Dorji & Penjore, 2011), established his experimental farm in 1964, followed by the Agricultural Machine Center in 1983. Nishioka served in Bhutan for 28 years as a JICA agricultural specialist, under the Colombo Plan.

Paro is a rapidly urbanizing region with a population of approximately 40,000 (in 2010). The nation's first international airport was built here, bringing early infrastructure development and tourists into the area. With an airport, Paro now has the advantage of being easily accessible by both land and air, while the ensuing development, since the 1980's, has made it one of the most prosperous *dzongkhags* in the country.

Sites surveyed in Paro were Bondey Village in Bondey, Gatana, and Pangbisa *Chiwogs*. All three sites are located between 2,250 and 2,840 masl. Agricultural production is mainly based on wetland rice cultivation, while other crops grown in the area include wheat, potatoes, and apples, the latter mostly grown for export.

Table 3.2 Comparison between the three *dzongkhags* based on government statistics[31]

***Dzongkhag* (District)**	**GASA**	**PARO**	**WANGDUE**
Geography and Climate			
1. Region	Northwestern / Rural	Western / Rural, Semi-urban	West-central / Rural
2. Area (km^2)	3,075	1,251	3,920
3. Elevation (range of surveyed area (masl))	2175~2360	2250~2840	2200~3000
4. Mean annual temperature (C) (Range Min~Max)	11.3 (-2~19)	15.2 (-3~25)	22.5 (4~30)
5. Annual rainfall (mm) (2010)	2,241	801	1,099
6. Distance from capital city	98km (Gasa town)	54km (Pato town)	134km (Phobjikha)
7. Built up area (ha)	8	384	171
Demographics			
8. Human population (2011)	3,462	40,490	40,200
9. Human population density (2014)	1.1	34.0	9.4
10. Farming population (% of total)	55%	31%	43%
Agriculture			
11. Agro ecological zone	Cool temperate	Warm temperate	Cool temperate
12. Organic Policy	Designated organic	Not designated	Not designated
13. Cultivation area (km^2)	Total area: 5	Total area: 63	Total area: 59
14. Average land holding size per household (ha)	0.56	1.17	0.93
15. Land use type (%) [Wet : Dry : Orchard]	27 : 73 : 0	28 : 56 : 16	71 : 29 : 0
Forests			
16. Forest Area (km^2)	807	762	2,560
17. Forest cover (%)	26.3	60.9	65.3
Blue Pine Forest (km^2)	0	221	17
Broadleaf Forest (km^2)	111	7	1243
Fir Forest (km^2)	406	127	30
Mixed Conifer Forest (km^2)	290	405	1098
18. No. of Community Forests (CF)	7	25	67
19. Area under CF status (ha)	452	3,970	4,981
20. CF member households (%)	25.0	21.5	41.5
21. Area under Private forest (ha)	2.8	14.6	0
22. Major species in the *sokshing*	*Quercus* spps.	*Pinus* spps.	Mixed *Quercus* & *Pinus*

[31] Table compiled by author, based on data in the RGoB's RNR statistics (2015), as well as information recovered through personal interviews with civil servants.

WANGDUE

Wangdue is the largest *dzongkhag* in Bhutan, so the geographic variation within the district is particularly large. The altitude of the surveyed areas ranges from 2,200 to 3,000 masl. Of the 15 *geogs*, three were chosen, namely Dangchu, Kazhi and Phobjikha for field study sites. Phobjikha is a valley that is famous as the winter roosting place for the endangered black-necked cranes that migrate from the Tibetan Plateau. Some communities within Phobjikha Valley still maintain their traditions as transhumance pastoralists. Phobjikha is where commercial potato production was first introduced; it is now the main cash crop and the main income source for the majority of peasant farmers. Phobjikha has the largest average area of potato cultivation in the country (0.99 ha/household) (Walter Roder et al., 2008), Although wetland rice cultivation is common along the two major rivers (Dangchu and Puna Tsang Chu), for the purpose of this study, focus is placed on the dry land agro-systems where potato cultivation is most common.

The Puna Tsang Chhu Hydroelectricity Projects have created employment and expanded market opportunities. The nearest urban center is Bajo Town, located 64 km from Phobjikha.

3.3 Materials & Methods

Three methodological approaches were employed:

Method A: A household questionnaire survey

Method B: Unstructured and semi-structured interviews

Method C: Archival research and literature review

The informants I selected for interviews represent a wide range of specializations within the Ministry of Agriculture and Forestry (MoAF) within the Royal Government of Bhutan, in addition to private business owners, heads of agricultural cooperatives, as well as the farmers themselves. A list and brief explanation of the main parties interviewed can be found in Appendix IV. Although some informants played a larger role than others, 41 persons were directly interviewed, while 147 families were involved in the questionnaire survey, as well as interviewed, when time and opportunity allowed. As questionnaires were administered under the premise that the participants will remain anonymous, their names will not be mentioned in the study.

In the process of establishing research opportunities and expanding my network of acquaintances, I sometimes had opportunities to become acquainted with places that were

unanticipated. For example, I was able to explore Haa, Tshirang, and the Eastern Provinces while interviewing and observing the work that a JICA senior volunteer was participating in.

In research dealing with the subject of development and modernization, there exists a dynamic of power that one must stay conscious of between the researcher and those being researched, as well as between the various research assistants who are supporting one`s research (Crewe & Harrison, 1998, p. 113). The topic of the study may also insinuate a partiality towards one method of farming over another. In light of the challenges of conducting fieldwork in a foreign country where I did not speak the local language, it is important to briefly describe the ways in which I conducted myself.

How trust was established. On every occasion, when I was out in the field I made a conscious effort to wear formal clothing, which in Bhutan is the *kira* and *tego*. I was accompanied to each farming household by local extensions officers who informed the participants of our arrival beforehand. Rather than a researcher, I presented myself as a student, in order to minimize the hierarchical gap that exists between the extension officers, the peasant farmers, and myself. As all the extension agents were former graduates of CNR, it was helpful to be accompanied by Dr. Rekha Chhetri, my research partner in the field, since requests for assistance could be made more officially through her. For every field visit, casual gifts of *doma*[32] and candies were brought for the informants to enjoy during the administering of the questionnaire survey, which in some cases took as long as one hour to fill out. Informants were not given any monetary compensation.

3.3.1 **Method A:** Household Questionnaire Survey

The questionnaire survey was conducted with the assistance of regional extension agents, as well as students from the College of Natural Resources, Royal University of Bhutan. The survey took place from January to March, in October, and again from September to December of 2014.

The questionnaire survey included open-ended and close-ended questions, focusing largely on the socio-economic foundation of each household, their perception of organic agriculture, and changes in agricultural practices (contents of the survey can be found in Appendix III). The changing patterns of forest leaf litter collection over the last decade and formal as well as informal seed systems were given particular attention as influential factors

[32] Betel nut, often taken with lime wrapped with pepper leaf.

that shape agricultural practices in Bhutan today. Interviews were conducted in order to cross check as well as add to information collected through the questionnaire survey.

In the rural communities, all of the questionnaires took place at the household of the interviewee, or in a central location where the villagers could gather. Enumerators were used to maximize the number of households surveyed in the region in one given visit. Enumerators included local extension officers and students from CNR who were fluent in the regional dialects.

To minimize variability in data collection, the household surveys predominantly included multiple-choice questions. In order to catch any additional details that may have been provided by the informant, there was always a section in the questionnaire for elaborations. Enumerators were encouraged to write down any additional details that may have been voiced by the informant. Redundant and triangulated questions were asked in order to catch any contradictions that may arise in the informants` answers.

Depending on the method of surveying, I went around with only one assistant to conduct the survey, and whenever possible I tried to ask for further details. If surveys were administered collectively at one location, I continually moved around among all the enumerators to make sure the surveys were administered properly and opportunities were not missed to collect any extra details.

Once the questionnaires were filled, they were reviewed in the presence of the enumerators so as to make sure I could flag and get clarifications for any inconsistent, suspicious, or illegible data. After each site, notes were kept of any additional questions that should be added in the next site, or any common misunderstandings in how the questions were posed that could be improved upon. Follow-up questions were planned, but interviews could not be conducted as my third visit to Bhutan was denied.

3.3.2 **Method B:** Unstructured and Semi-structured Interviews

Methods for selecting informants varied, based on the data intended to be gathered. A list of individuals interviewed can be found in Appendix IV.

Government Offices, Civil servants, Offices of Development aid Organizations:

Unstructured interviews were conducted with government workers and researchers in within sectors of the Ministry of Agriculture and Forests: the NOP, Research Centers in Bajo and Yusipang, the National Seed Center (NSC), the PPD, and the Marketing Division.

Government offices were revisited in order to gather and maintain updates on the

newest trends and information. Offices include the NOP, the National Soils Service Center (NSSC), the National Plant Protection Center (NPPC), the Ministry of Agriculture's Department of Agricultural Marketing and Cooperatives, Policy and PPD, the Green Public Procurement (GPP) Bhutan office, and the SNV (Netherlands Development Organization).

Peasant Farmers:

Semi-structured interviews were conducted during the questionnaire survey, as clarification questions that needed attention would emerge.

Japanese Nationals Working in Bhutan:

With specific interest in the Japanese government's contribution to the "modernization of agriculture in Bhutan", interviews were conducted with farmers who worked with Nishioka. A visit was made to the Agricultural Machinery Center in Paro, where a museum dedicated to Nishioka has been newly established, commemorating fifty years since he first arrived in Bhutan.

To better understand how JICA continues to be directly involved in the agricultural sector in Bhutan, a visit was made to the RNR RDC Wengkhar, in Mongar, where a Senior Horticultural Specialist under JICA, Yuichi Tomiyasu has been working for the last fourteen years. I joined Tomiyasu and interviewed him while on a tour around eastern Bhutan (Trashigang, Pemagatsel, and Samdrup Jongkhar); field visits were made to farmsteads that were taking part in agricultural projects led by JICA. An interview was also conducted in Japan with Katsuhiko Nishikawa, a JICA senior volunteer, who worked with the National Seed Center between 2006 and 2008, then called the Druk Seed Corporation (DSC).

Reactive Interviews and Follow-ups

Emails and google hangout/skype/facebook messenger tools were used to ask any follow up questions that arose, prompted by inconsistencies in the data or questions about emerging patterns or uncertainties in the analysis.

3.3.3 **Method C:** Archival Research and Literature Review

The archival research can be separated into four categories: internal government reports, internal media portrayals of agriculture in local newspapers (mainly Kuensel), external (international) portrayals of Bhutan, and local journals. Historical documents are

mainly published accounts of British India's diplomatic relationship with Bhutan from the 19th century (Eden, 1865), as well as accounts of the first geographical expeditions to Bhutan from the United States (Karan, 1967). Local journal publications comprised RNR publications, including RNR annual reports, department/center pamphlets, and CNR Bachelor students' un-published dissertations.

3.3.4 Data Analysis

Documentation was done using Microsoft Excel. Statistical analysis was done using Microsoft excel and SPSS Statistical Software.

3.4 Strengths and Limitations of Study

This study was not a comprehensive analysis of all that is happening across Bhutan, but intended as an instrumental case study. The intention was to employ a comparative approach to discover empirical relationships between communities that are located within one day's travel distance from the capital city of Thimphu to generate further hypothesis. Limitations in the methodology include restraints stemming from the relatively short duration of time spent in the field conducting qualitative research to enable deeper insights on the observed heterogeneity. Crosschecking survey results through revisiting every community several times under different conditions would have been ideal. Logistical limitations required that the questionnaire survey and interviews be conducted within a period of one to three days. While an attempt was made to personally interact with each respondent being interviewed, the limited time given to conduct the household survey required that multiple surveys be collected at the same time, with the help of many enumerators. For this reason, I was not able to talk with every respondent, much less visit every farmhouse. This limited my ability to analyze the relationships between family or community members, or between people and their surrounding environments, something that can only be obtained through casual interactions on the farm. The survey was conducted during the dry season, when peasant households have the most free time. However, this limited direct field observations to the fall and winter seasons, which confines my understanding of agricultural practices to the harvesting and pre-planting or off-seasons, and not the planting and growing seasons.

Communication was also limited, as the only shared language spoken between the peasant farmers and myself was English, which many did not speak. The majority of peasant farmers only spoke a dialect of *dzongkha* or a different language. While a translator fluent in

the regional dialect or language was employed, communication was inevitably limited compared to that with the civil servants who all spoke fluent English. Opportunities to communicate with the few peasant farmers who did speak English were highly valued. Limited perspectives that do not necessarily represent all peasant farmers in any given community, or an understanding that is biased towards the government's understanding of any given condition, needed to be considered.

3.5 Summary

Three methodological approaches were employed in three selected research sites in western Bhutan. Considerations given in conducting the field research and limitations of the study were described. The following chapters will introduce the findings, starting with the macro, historical perspective of agricultural modernization, followed by a regional comparison focus on how government policies are being resisted, modified, and readjusted by peasant farmers in the three different *dzongkhags*. From regional comparisons, focus will be given to the more specific topic of soil fertility management.

Chapter 4 Agricultural Modernization: Transition of Agriculture and Organic Farming

4.1 Introduction

In eastern Bhutan, peasant farmers used to refer to Agricultural Extension Officers (AEO) as *Khi-babu*. *Khi* means 'fertilizer' or 'dung' in the sarchogpa language and *babu* means 'father' or 'sir' in many languages used throughout the Himalayan region. Synthetic fertilizers used to be referred to as *Zhungka-Khi*, which literally translates into 'government fertilizer'. Similarly, in western Bhutan, synthetic fertilizers have been informally called *Jaga lue* in the *dzongkha* language, which literally means 'Indian fertilizer'. Today, AEOs are referred to more generally as *Sonam-babu* in the east and *Sonam lopen* in the west (*sonam* meaning agriculture, *lopen* meaning teacher). Such common names are very telling of the relationship peasant farmers had and still have with the government and with their neighbor, India, as well as with the various forms of fertilizers and pesticides they were provided, a reflection of how agricultural modernization was being initiated within Bhutan.

This chapter concentrates on the first research question: how the emphasis placed on organic agriculture fits within the larger context of agricultural modernization and development within Bhutan, by focusing on how the agricultural sector was conceived, and the ways in which emphasis was placed and replaced upon it over the last half century. As in much of the rest of the world, in Bhutan the primary concern was on the various means of intensifying production. Increasing production efficiently can be defined by the conditions under which agricultural inputs, particularly seeds, fertilizers, and PPC, are selected and utilized. As such, in this chapter emphasis will be placed on the distribution and utilization of inputs and, in trying to provide for what its citizens need, on how the government's paternalistic policies also impose multiple risks, as policies are reactive to the various activities which revolve around yield as its utmost priority.

4.2 A Look Into the Past: Traditions of Food Procurement

Kunzang Choden, a celebrated author in Bhutan, has written extensively about traditional lifestyles and the culture surrounding food. According to Choden (2008), there is very limited information available on past agricultural practices. She has written various accounts of life as it existed in the past in Bhutan, describing how self-reliance at community

and household levels was expressed as inevitable factors given the isolation of the communities (Priesner, 1999). With the Land Act of 1979, he government passed a law limiting each household's landholding to less than five acres. Although scarce, there are accessible documents and narratives, including memoirs by Choden herself, who was born in 1952, which provide us with ethnographic insight into her childhood. Being from a wealthy family in Bumthang (central Bhutan), her stories cannot be taken to be illustrative of perspectives found throughout Bhutan, but it does provide us with valuable insight into what life was like before markets were prevalent and how food was sourced and celebrated.

The following is an excerpt from one of Choden's memoirs, a description of *Losar* (*Lo gsar*), the Bhutanese New Year's celebration. She carefully describes the highly involved preparations for the grand event that ensued (Choden, 2007):

> Vegetables, mainly radish and turnip, were preserved in buckwheat straw and husks. Others had been shredded or cut and sundried. Pears from two particular trees, which had been harvested in November, only after it had a good dose of frost, were preserved in earthen jars and kept fresh for the Losar. Peaches and pears were sundried and stored. As early as the 7th month of the Bhutanese calendar, our family's merchants would go to the seven-day annual trade fair at Talung Tshongdu (Lho Rta lung tshong 'dus), close to the lake Yamdrok (Yar 'drog) in Tibet. Fine brick tea, rock salt, borax[33], and sheep pelts were imported and set aside for Losar. The sheep pelts were an important food item in the old days. The wool was removed from the pelts and processed into thread. The hides could be made into different recipes and eaten as delicacies. While legs of mutton, wind-dried and preserved in the frigid Tibetan temperatures, had been traded against rice, chili, brown sugar, madder[34], hand woven fabrics and handmade Bhutanese paper. These goods were fastidiously carried over the high ice and snowbound passes, a journey of several days into the Tibetan trading centers. Although some rice was taken as far as Lhasa to be exchanged for special items, most of the rice was actually exchanged at Tsampa (Mtshams pa), a small settlement at the northernmost part of the Choekhor (Chos 'khor) valley of Bumthang. The merchandise from Tibet was carried back to Ogyen Choling by porters, mules and yaks. Candies and biscuits from India—the nearest border towns were Khorasar in West Bengal and Godama in Assam—added variety to the displays. Weeks before Losar, the family's yaks and pack mules had carried many measures of rice, pulses and cereals from our estates in sub-tropical Kurtoe, east of Bumthang in today's Lhuentse district. Depending upon the harvest from year to year, as many as twenty or as few as five to six porters would be required to carry the more fragile and perishable goods like fruits and vegetables on their backs and trek through treacherous terrain for two to three days to reach Ogyen Choling.

Choden goes on to describe how, today, the food items that were cultivated, gathered, bartered, and traded over an entire year in the past can now be found in markets throughout the year.

[33] A mineral also known as sodium borate. Its use here is not yet clear to the author.
[34] A plant used for red dye.

What is important here is the description of the extensive network of commodity trading that existed in the past. Brick tea, rock salt, and mutton were imported from Tibet, and traded for rice, chili, and brown sugar, among other gathered and handcrafted items from Bhutan. Also significant is how rice, beans (pulses), cereals, and fruits and vegetables were carried by porters from the sub-tropical regions to where they were wintering in Ogyen Choling. As such, it is important to realize that the transition within Bhutan is not from subsistence farming to commercial agriculture, but part of a more fundamental shift in food procurement and consumption patterns.

4.3 Fathers of Agricultural Modernization: Bhutan's Relationship with Japan

Bhutan is said to have commenced its efforts towards modernization under the reign of the third king, Jigme Dorji Wangchuck (March 30, 1952 ~ July 21 1972). It was around the time described by Kunzang Choden, that Sasuke Nakao, a botanist and professor from Osaka Prefectural University, was invited to the Kingdom of Bhutan, as the first official visitor from Japan. In the documentation of his five month long travels through Bhutan in 1958, he recalls a conversation he had with the king. The Third King, who had a keen interest in horticulture and vegetable production, was particularly concerned with the future of food production in Bhutan, and he mentioned to Nakao about how "importing synthetic fertilizers is probably our best option..." But Nakao disagreed. "You do not want to run the risk of having to rely on a foreign country for your fertilizers. It is better that you plant nitrogen fixing plants in your rice fields during the off seasons"; he promised to send the King milk vetch seeds, which could also be useful as fodder (Nakao, 2011)[36]. Nakao's visit marked the beginning of the very intimate relationship Bhutan and Japan have enjoyed ever since. Nakao was Keiji Nishioka's teacher; the man who is today celebrated as the father of modern agriculture in Bhutan. It was Nakao's visit to Bhutan that led him to recommend that Nishioka go to Bhutan and assist in agricultural development (T. C. Dorji & Penjore, 2011; FAO, 1994). Nishioka was only the first of many who have subsequently left their footprints on the soil of Bhutan.

4.3.1 Dasho Nishioka

While line planting of rice in order to increase weeding efficiency did not take root when it was first introduced by Nishioka, the power tiller, also introduced by Nishioka, is

[36] Translation from original Japanese text by Mai Kobayashi. Published in (Kobayashi, Chhetri, & Fukamachi, 2015).

celebrated in murals on the walls of private houses, and is, today, an indispensible part of Bhutan`s agricultural landscape. A packet of Chinese cabbage, bearing the name "Kyoto No. 1," is another reflection of Nishioka's legacy (See Appendix V for vegetable varieties that have been released for general cultivation). Nishioka's vegetables became widely known when they were served at the biannual national assembly meeting, held in Paro, in May of 1976. To his delight, both ministers and agricultural department officers who visited his farm asked if they could take some seeds back with them as gifts. According to Nishioka, the most popular seeds were those already familiar to the Bhutanese people: daikon (radish) and *hakusai* (Chinese cabbage). It was soon after this that scientific research on vegetable production was initiated in 1978, with the launching of the FAO/DANIDA Vegetable Seed Production Project (K. Wangchuk, Pradhan, & Chime, 1990).

A taxi driver in Paro told me how he routinely borrows a harvesting machine from the Agriculture Machinery Center (AMC) to harvest the Japanese variety of rice (No. 11) he plants, and has no problem using the machine, even though the rice is not planted in rows.

The year 2014 marked the 50th anniversary of Nishioka's arrival to Bhutan, and hence JICA's partnership with Bhutan. In those 50 years, much machinery and many tools, seeds, and many farming techniques have been imported from Japan, following Nishioka's influence. An extensive network of agricultural roads is about to be completed with funds from Japan. The learning and collaboration between Bhutan and Japan continues.

4.3.2 Tomiyasu, the Father in the East

To get a better idea of how agricultural development is taking place under foreign developmental assistance today, extended interviews were conducted with Yuichi Tomiyasu, who is working as a JICA senior expert on horticultural research and development, based in RNR RDC Wengkhar, in Mongar *Dzongkhag* at the time this study was conducted. The research and development center in Wenglhar is in charge of agricultural development in western Bhutan. Though he does not like to be compared with Nishioka, Tomiyasu has also made considerable contributions in agricultural development, particularly with perennial fruit production for eastern Bhutan. Tomiyasu arrived in Bhutan in 2000, after spending 20 years in Nepal as a horticultural specialist. During the initial months of my stay in February 2014, Tomiyasu was awarded the First Class "National Order of Merit" from the King of Bhutan, for his distinguished and meritorious service to the state of Bhutan. Most of the initial developmental efforts in agriculture were focused in western Bhutan; it was Tomiyasu who

was central in bringing commodity focused agriculture to the east, where there were not even any telephones when he first arrived. One of the first things he did was submit a proposal for funding from Japan for approximately 700 million yen[37], in order to build farm roads. Construction began in 2004.

4.3.3 Seeds from Japan: New and Improved Varieties

Seed production has been emphasized since the first five-year development plan (1961-1966). The initial introduction of seed varieties was limited to the distribution of seeds brought in from India. Between 1964 and 1992, many varieties of seeds from Japan were popularized by Dasho Nishioka, including the Tokinashi daikon, Miyashige daikon, Minowase daikon, Usui peas, Tetsu Kabuto pumpkin, and Chinese cabbage (known as 'Kyoto 1' in Bhutan today).

Despite the introduction of improved seed varieties from Japan, vegetable production in Bhutan remained limited. When Katsuhiko Nishikawa arrived in Paro, in March 2006, as a JICA senior volunteer at DSC, he noticed the high dependence on imported vegetables from India and felt the enormous potential for meeting the expanding domestic demand for fresh vegetables. Aside from the limited seed stock he found at DSC, he found that numerous complaints were being filed regarding the low germination rates of the domestically multiplied seeds as well as those procured from India that were being procured and sold by DSC. Nishikawa had just retired from his job at Takii Seed Company. He was the person taking seed orders from Nishioka in the late 1960's, and it was through this interaction that he first started becoming interested in Bhutan. Using his years of experience working for a large seed company, he streamlined and consolidated seed imports; and he was shocked to find that Bhutan not only was not using hybrid seeds, but had banned their use. Some of the reasons included the high upfront cost and high demand of resources, plus the worry that foreign seed companies would sell lower grade seeds to small countries like Bhutan. Convinced that their benefits outweighed any disadvantages, Nishikawa convinced the MoAF to give him permission to import hybrid seeds, which was granted without requirements for trial rearing. Given that hybrid characteristics are seen most prominently in the brassica species, and they are valued within Bhutanese society, Nishikawa decided to start with the import of cabbage, cauliflower and broccoli, later expanding to carrot, watermelon, squash (Nishikawa, 2014,

[37] Amounting to 5.7 million USD and 380 million BTN (approximation based on rates on December 6th, 2015).

2015).

4.4 Bhutan's Green Revolution: its Relationship with India

Going back to the 1950s, despite Sasuke Nakao's suggestion in 1958, the government of Bhutan initiated the import of synthetic fertilizers and pesticides from India, in order to expand their efforts to increase food production. While the porous borders between India, China, and Bhutan make it very difficult to accurately estimate what technologies were available when and to whom, synthetic fertilizers and pesticides are said to have been available in Bhutan since the early 1960s. As the names *Zhungka-khi* and *Jaga lue* suggest, synthetic fertilizers were synonymous with government aid and with India, the nation that fully funded all of Bhutan's first developmental efforts, starting with the establishment of the first FYP in 1961[38].

Bhutan's diplomatic relationship with India can be traced back to when India gained her independence in 1947, after which the Treaty of Friendship Between the Government of India and the Government of Bhutan was signed on August 8th, 1949. This led to the formal recognition of Bhutan as an independent country[39]. The treaty led to India's subsequent support in providing the foundation and framework for Bhutan's infrastructural development in the areas of transportation, communication, education, health care, and agriculture, which formed the basis of the first FYP in 1961. The Department of Animal Husbandry and the Department of Agriculture were established under the first FYP. Under instruction from India, a number of model agricultural farms, seed multiplication farms, agricultural research stations, along with extension agents were established (RGoB, 1966).

Perhaps most symbolic was the completion, in 1961, of Bhutan`s first motorable road, connecting Thimphu, the capital, with Phuntsholing, the closest border town with India. This shortened what used to be an eight-day expedition to just one day[40]. Nakao describes this momentous event with some remorse, as the opening of Bhutan, connecting this small,

[38] Significant also is the initiation of the land tenure system in 1961, when "the Maharaja restricted individual ownership of land to 30 acres" (Karan, 1967). This led to almost all peasants in Bhutan becoming landowners.

[39] Bhutan was under the protectorate of British India until then. While the treaty assured Bhutan's full control over its own internal affairs, external affairs were to be still guided by India. The treaty returned the territory of Dewangiri to Bhutan. Dewangiri, in the southeast (an important region for rice cultivation in Bhutan today), had been seized after Bhutan's defeat against Britain in the Duar War (1864-65).

[40] Year of completion varies. According to (Savada, 1993), it was 1962.

isolated, and ancient utopia with the outside world, letting in civilization in its many forms, by the truck load (Nakao, 2011). With trade between Tibet officially banned, India was firmly established as Bhutan's primary trading partner[41].

The initial decades of the development of the agricultural sector were described as "a push for the green revolution, like in India," by Doe Doe, a plant protection specialist at the NPPC (interview: Doe Doe, 2015). Ever since the first FYP, the central emphasis of the government has been to increase food production through "regional specialization of crops, provision of improved seeds, implements, and fertilizers" (RGoB, 1972). Traditional methods of agriculture, such as shifting cultivation (*tseri*), were gradually curtailed starting in 1969, with the passing of the Bhutan Forestry Act, and officially outlawed by 1995 (Namgyel, Siebert, & Wang, 2008). Much like the way "the British viewed anything 'local' in India as primitive, (India) came up with these English provisions (for Bhutan) that banned shifting cultivation and all the local practices, as primitive" (interview: S. Wangchuk, 2013).

Initial phases of procuring and distributing synthetic fertilizers and PPC were executed through the Indian extension officers, whose recommendations were based on Indian standards. "Seeds were free, fertilizers were free, and pesticides were free from the 1960s until the mid-80s. Everything was free. We informally call that the toxic period" (interview: Doe Doe, 2015). The generation that was in the ministry and the peasant farmers who were trained during those years still hold to such standards, preferring the quicker, shorter term results, based on green revolution technologies, rather than the long-term viability of organic agriculture. Many such dissonant voices remain quite influential in society today (Doe Doe, 2015; Ghimiray, 2013).

4.4.1 Pesticides: Historical Trends and the Government's Reactive Policies

When he was active at his farm in Paro, Nishioka also imported herbicides from Japan, a bag of which was found carefully kept and still unused in the toolshed that belonged to a farmer who was interviewed in Paro. The expiration date, 1990, was stamped on the back (interview: P. Dorji, 2014). It is important to note that to this day limited access to roads and distribution systems still restrict the availability of synthetic inputs for many peasant farmers (K. D. Dorji, 2008; Norbu & Floyd, 2001). Official data regarding the distribution of PPC has been available since 1986, but this is not a reflection of its overall use.

[41] Today, India accounts for 84% of exports and about 73% of imports, causing trade deficits amounting to 10% of Bhutan's GDP (GNHC, 2013).

Until 1989, all types of PPCs, irrespective of their toxicity and persistence, were distributed free of charge, but concerns of their overuse began to mount. To solve this problem, the government implemented an import restriction on highly toxic and persistent pesticides, and in 1990, prohibited private imports (interview: Doe Doe, 2015; Gyeltshen, 2008). This was done by giving full authority of import, distribution, and sale of agro-pesticides (not household pesticides) to the NPPC under the Ministry of Agriculture. Realizing that there was also an accumulation of obsolete PPC, its presence also posing an environmental risk, the government conducted a campaign in 1995 whereby a total of 66 tons of obsolete PPC were collected and disposed of (interview: Doe Doe, 2015; Sakhan, 2002).

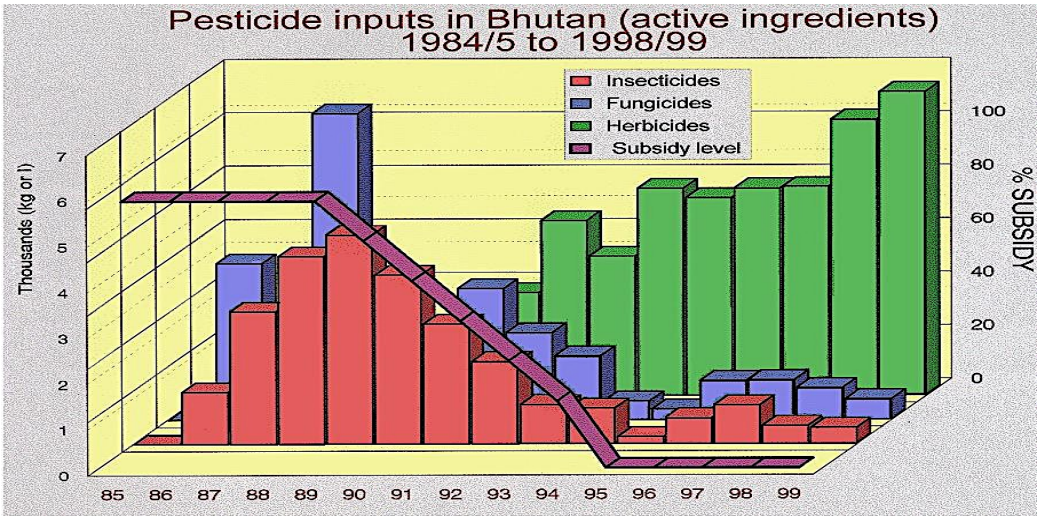


Figure 4.1 Pesticide distribution from 1984~1999[42]

The government subsequently imposed a drastic reduction in subsidies for PPC distribution, from 100% to 0%, implemented gradually between 1990 and 1995. The decline in fungicide and insecticide demand can be seen as directly correlating to the gradual removal of the subsidy (Figure 4.1) (Gyeltshen, 2008). It is worth observing, however, how the level of herbicides continued to increase to more than sevenfold of their 1990 levels (Figure 4.2) (Tshomo, 2014). Unlike PPCs, herbicides were never subsidized, which indicates that once the peasant farmers were required to pay full price for all PPCs, herbicides proved more useful. The increased use of herbicides can be explained as a reflection of the shortage of

[42] Graph sourced from (Gyeltshen, 2008). Farmers bought herbicides directly from the suppliers up until 1998/90, making actual herbicide inputs higher than what would be presented in the graph.

labor, the increasing cost of hired labor (due to a rapidly urbanizing population), as well as easier access to markets. In order to institutionalize a more conservation oriented approach to agriculture using less PPCs, the government decided to adopt integrated pest management (IPM) techniques in 1992. IPM is "a process you can use to solve pest problems while minimizing risks to people and the environment." It focuses on the long-term prevention of pests and other damage, by managing the ecosystem through a combination of methods (UC Davis, 2014). Since 1993, Bhutan has been receiving external assistance (from the EU) to develop and implement the IPM strategy (Sakhan, 2002). Consequently, recommendations from the government today emphasize improved preventative measures, to support the

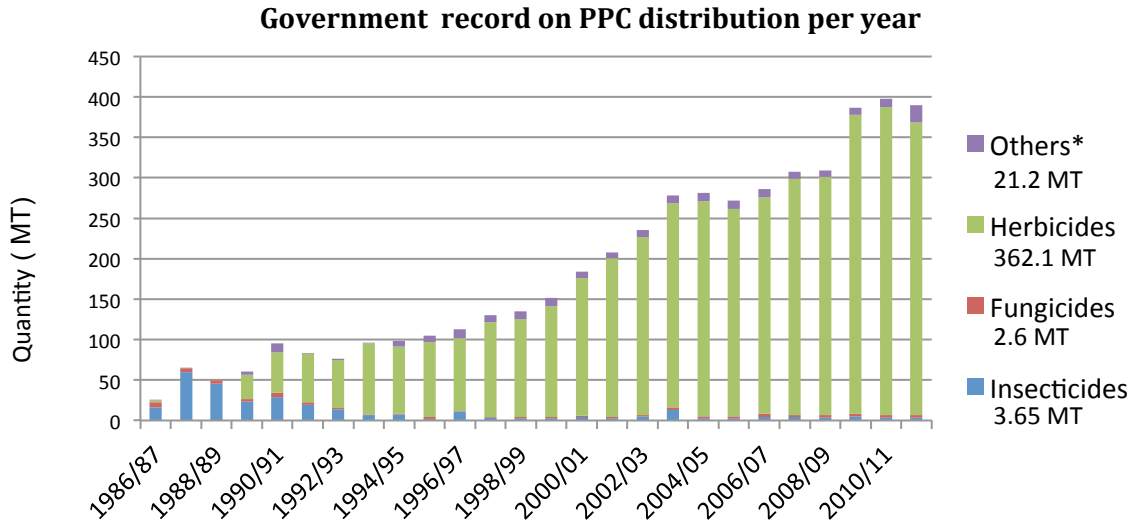


Figure 4.2 Historical increase in PPC use in Bhutan (1976~2011) [43]

decrease in subsidies for PPC, in an attempt to limit overall use. Herbicides available in Bhutan today include Butachlor (mainly used for rice), Glyphosate 41SL and Metribuzin 70WP (mainly used for potatoes). Until 2014, the procurement and distribution of Butachlor was done by the National Seed Center (NSC), but now it is through the NPPC (Doe Doe, 2015).

4.4.2 Fertilizers: Historical Trends and Traditions

As introduced in Chapter 2, nitrogen and phosphorus are the main limiting elements in

[43] Sourced from Kezang Tshomo, NOP office (Tshomo, 2014).

Bhutan's soil, which is considered to have low to medium fertility (Roder, 1990). In addition to pesticides, the import and distribution of synthetic fertilizers[44] were also initially managed by the government, until the responsibility was handed over to the newly privatized DSC, during the seventh FYP (1992 ~ '97). DSC trained commission agents would then sell the fertilizers directly to the peasant farmers. As its use was being encouraged, the import of synthetic fertilizers quadrupled during the initial ten years, from about 250 MT in the 1960s to over 1,000 MT between the 1970s and 80s. From 1989 to 1997, when more accurate

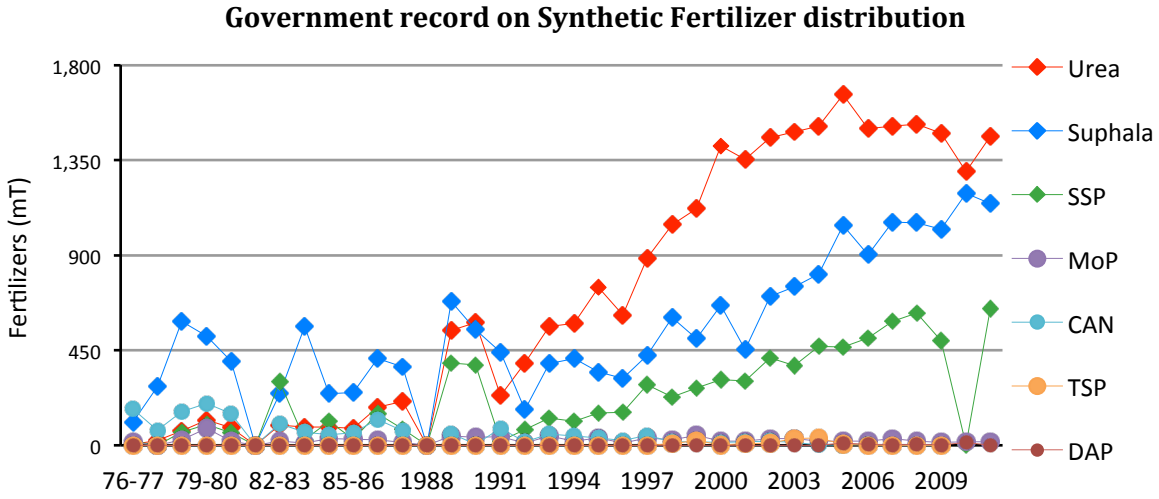


Figure 4.3 Historical increase in synthetic fertilizer use in Bhutan (1976~2011)[45]

accounts were probably kept, the import of synthetic fertilizers reached 11,436 MT. Subsequently, the total distribution of synthetic fertilizer rose from approximately 1,730 MT in 1997 to 2,998 MT in 2006 (K. D. Dorji, 2008).

Despite the dramatic increase of imported fertilizer, its overall use is still considered to be very low compared to many other countries (K. D. Dorji, 2008; Walter Roder, 1990). As references, recommended rice cultivation practices issued by RNR RDC Bajo for high altitude temperate agro-ecological zones (which mostly cover the areas in which field work for this study took place), where they use high yielding varieties of seeds at the rate of 50-

[44] The most prevalent synthetic fertilizers used in Bhutan are Urea (46% N), Suphala (NPK 15:15:15) and SSP (Single Super Phosphate (SSP): main raw materials are rock phosphate and sulphuric acid.). Of the total fertilizers used during the last ten years, urea made up approximately 55%, followed by Suphala 28%, SSP 15% and MoP (Muriate of Potash (MoP): Potassium chloride) 1% (Norbu, 2008 (unpublished) in K. D. Dorji, 2008).

[45] Graph compiled based on data procured from NSSC (2011).

60kg per hectare, they first start by recommending a basal application of 5~8 t/ha of FYM, followed by 35kg N/ha, 35~40 days after transplanting. If sufficient FYM is not available, a 75:40:0 NPK kg/ha supplementation is advised (Ghimiray, 2015)[46]. The management of soil fertility, in this case through the application of amendments in the form of synthetic fertilizer, emphasizes how organic agriculture cannot be achieved merely by scaling up leaf-litter and manure applications, particularly if it is to be ecologically sustainable over the long term.

Urea is the most popular source of fertilizer, due to its comparatively low price and the response it produces, but also possibly due to the limited awareness farmers may have of soil nutrient management practices using other sources of chemical amendments (K. D. Dorji, 2008). As with the case of synthetic fertilizers, urea is most commonly used on rice, while the more expensive compound fertilizers, suphala and SSP, are mainly applied to cash crops, namely potatoes and apples.

Alongside the use of synthetic fertilizers, other methods of soil fertility management were also being promoted. Cropping patterns such as crop rotation and intercropping with legumes were encouraged in order to maintain or improve soil fertility, apart from increasing the diversity in food products. According to Dorji (2008), compost making was subsidized in the 1970s and 80s along with synthetic fertilizers. Composting and green manuring have been promoted especially in the southern and eastern regions of the country, where the production of FYM, fertilizer made with locally available plant material mixed with animal manure [details of which will be further discussed in Chapter 6], is not as common, and soil nutrient loss due to heavy rainfalls is of greater concern (K. D. Dorji, 2008).

4.4.3 High Yielding Seeds

According to the director of the National Seed Center branch in Bajo, where he has been employed since 1979, the first seeds to be brought to Bhutan were open pollinated varieties supplied by Denmark. According to Chhetri, the varieties introduced included cabbage (var. Copenhagen Market) and cauliflower (var. White Top, White Summer and Progress), suitable for various altitudes (interview: D. Chettri, 2014). In 1984, the National Agriculture Seed and Plant Production Program (NASEPP) was established, whose mandate

[46] Because government agencies did not have data on the actual usage patterns of synthetic inputs by the peasant farmers, recommended rice cultivation practices issued by RNR RDC Bajo were referenced (Ghimiray, 2015). To compare, the recommended amount of synthetic fertilizers in Japan would be 20-30:100:60 NPK kg/ha as basal application, followed by 10-30:0:30 NPK kg/ha (taken from cultivation guidelines for the mountainous regions of Niigata prefecture) (MAFF, 2009).

was to produce and supply the domestic need for improved varieties of seed and fruit plants (Tshering & Domang, 2004). NASEPP was privatized in 1995 and became the DSC, only to be re-placed again under the government in 2010, to become the NSC, which is how it is known today.

Increased commodification of agricultural produce is a result of an increase in entrepreneurial farming. An increase in market dependency shifts priorities more towards an artificialization of agriculture, where locally available resources, such as manure, grass fodder, or labor, is replaced by chemical inputs, concentrated feed and machines (Altieri & Hecht, 1990), leading to new dependency relationships. Though limited and highly variable between communities, an increased use of synthetic fertilizers and pesticides, as well as high yielding varieties of seeds could be observed.

Imports of hybrid seeds were initiated in 2006. As hybrid seeds had been banned prior to this introduction, initiating their use presented a fundamental change in the network base from which farmers sourced their seeds. Privatization of plant breeding has been extensively analyzed and criticized over the last three decades, especially within the context of the Green Revolution (Hisano, 2012). Kloppenburg, in his book *First the Seed,* published in 1988, eloquently invokes discussion about commodification of biological information through the development of seeds that cannot be reproduced (Kloppenburg, 2004). While some seeds that were developed are capable of reproducing, they do not reproduce true to the desired characteristics of the original parent crop. Without the ability to store seeds from one year to the next, farmers are forced out of self-sustenance and into the global capitalist economy (Singh, 2012, p105).

4.5 Opening Up to the Market

The national policy during the 1980s, ‘90s, and early 2000s focused on increasing vegetable production to enhance nutritional standards and household income. Extension agents distributed leaflets and books to raise awareness of vegetable cultivation. They provided technical assistance through exhibitions and demonstrations, along with free samples of seeds (K. Wangchuk et al., 1990). Vegetables, for the most part, remained as crops grown predominantly for home consumption. Selling them in local markets or exporting the produce to India was only economically practical if production was sufficiently near large local markets or near the Indian border, and provided there was access to a motorable road and a vehicle for transporting the fresh produce. On the other hand, once

access to the Indian market was established in the 1960s, potatoes started being widely grown as a cash crop (Walter Roder, 2004; Walter Roder et al., 2008).

Today, farmers and distributers gather before dawn each week in anticipation of lining up their fresh produce at the open-air markets. In many urban centers, such weekend markets are where most consumers do all their food shopping for the week. At the Century Food Market, a two-story facility that was constructed in 2008 in Thimphu, mountains of fresh fruits and vegetables are displayed. The market is open all week; but it`s particularly lively during the weekend, starting on Fridays, with many more stalls of fresh produce overflowing into the streets. The two-story facility segregates the vegetables between imported (mainly from India) produce on the first floor and domestically grown produce on the second floor. With urban populations increasing, such markets have become an indispensable part of the culinary culture of Bhutan. The growing demand for vegetables in recent years, both qualitative and quantitative, has not been met by sufficient domestic supply, requiring increased imports from India (MoAF, 2012a). Domestic consumers, however, prefer locally produced vegetables, given the growing awareness that India is using greater quantities of PPC (general perception among consumers observed during field work, also sited in McCrae-Hokenson, 2014). “Even I don’t go down to the Indian vegetable section, because I know that the frequency of (PPC) applications in cabbages, cauliflower, carrots, and tomatoes is fifteen to twenty times”, said Doe Doe at the NPPC, differentiating between domestic and imported produce and further clarifying, “the vegetables that we get from Bhutan, the application is maximum three to four times (2015). It cannot be more than that”. Economic constraints, however, lead many consumers to purchase the less expensive imported vegetables. The availability of comparatively inexpensive produce from India, on the one hand, is said to lead to competition that, in the end, discourages domestic peasant farmers from increasing their production, particularly of winter vegetables (MoAF, 2012a). On the other hand, the increasing demand for cheaper Indian products has encouraged the development of both private and government-backed initiatives for more intensive commercial production of food[47].

Improved access to Indian markets not only expanded what was cultivated in Bhutan, but also contributed to decreased varietal diversity, since the availability of cheaper products

[47] This trend has been particularly noticeable in the livestock sector with the recent establishments of private cattle farms in eastern Bhutan (Wangdi, 2015), or the development of the National Poultry Development Center in Sarpang (interview: Gaylal, 2016).

imported from India, such as wheat and vegetable oils, came to be preferred over those produced locally. In a village in Paro, a peasant farmer showed us his fields of mustard, which he processed for oil. The oil, he explained, would be brought to the market to be exchanged for 'vegetable cooking oil' from India (personal communication, Nov. 2014).

When the 4th King stepped down from his position of absolute leadership in June 1998, the cabinet members at the time compiled a document that would embody their aspirations. The document, titled "Bhutan 2020: A Vision for Peace, Prosperity and Happiness", was to serve as a touchstone to help the new leaders of Bhutan not lose sight of the way as they furthered their efforts to develop a modern nation (P. C. RGoB, 1999a). The document described Bhutan's outlook of economic development as one based on the production of "high value/low volume products" which will be "recognized as the products of one of the least polluted and least contaminated countries to be found anywhere on earth". Among niche markets prescribed, they included the possibilities for hydropower, natural resource mining (ferrosilicon and calcium carbide), tourism, and as a final suggested activity, "organically produced agricultural products," was mentioned. Organic agriculture was essentially referenced as an activity that could help extend Bhutan's 'clean image', a means by which to achieve a larger goal, to strengthen the foundation of Bhutan's economic standing.

4.5.1 Certification

A simple third party organic certification system was developed by the NOP in coordination with BAFRA, called the 'Bhutan Organic Certification System' (BOCS), based on standards outlined by the National Organic Standards of Bhutan (NOSB) (MoAF, 2011). The NOSB is based on ISO65, to meet international market standards. The system involves a set of guidelines for BAFRA inspectors to use to assess a farm. Farms found to be compliant to the set standards will then be certified to use the 'Bhutan Organic' logo. While the inspection was to be provided free of cost to promote greater awareness, the process had not been implemented as of November, 2014.

A private company named Bio Bhutan was the first company to get organic certification. This was done in October 2005, through financial support provided by the UNDP, Helvetas, and the government, to certify lemongrass oil through INDORCERT, an Indian certification company.

4.6 Discussion

Figure 4.4 compiles the historical trends that have been described thus far with the introduction of external inputs and imported materials since the 1960s. What was described informally as the "Toxic Period" was a time when pesticides, irrespective of their toxicity, were being imported, and the government was keeping no records of their distribution. Having realized the consequences of unmonitored distribution of toxic chemicals, in 1989, the government responded by restricting imports of the highly toxic pesticides, followed by a gradual reduction in subsidies, between 1990 and 1995, together with a comprehensive reclamation and disposal of any obsolete pesticides. The use of pesticides remained low thereafter, according to government data, because farmers were not interested in what was no longer free. Herbicides, however, were never subsidized, and their use has continuously grown. This can be attributed to the shortage of labor, the increasing cost of hired labor (due to a rapidly urbanizing population), as well as easier access to markets. However, if viewed in context with other trends, we can also see how the increase is closely associated with the initiation of the National Potato Program in 1983, and increased emphasis place on intensified rice production starting in the mid 1980s.

Improved varieties of seed are characteristically high yielding, but greater yield requires higher and more efficient nutrient uptake. In comparison to other external synthetic inputs, we can see how the increase in synthetic fertilizers does not correspond to the "toxic period" as such, but rather coincides with the introduction of improved varieties of vegetable seeds. More specifically, it correlation aligns closely with the production and privatization of NASEPP in 1995. Although the NASEPP was later returned to being a subsidiary of the

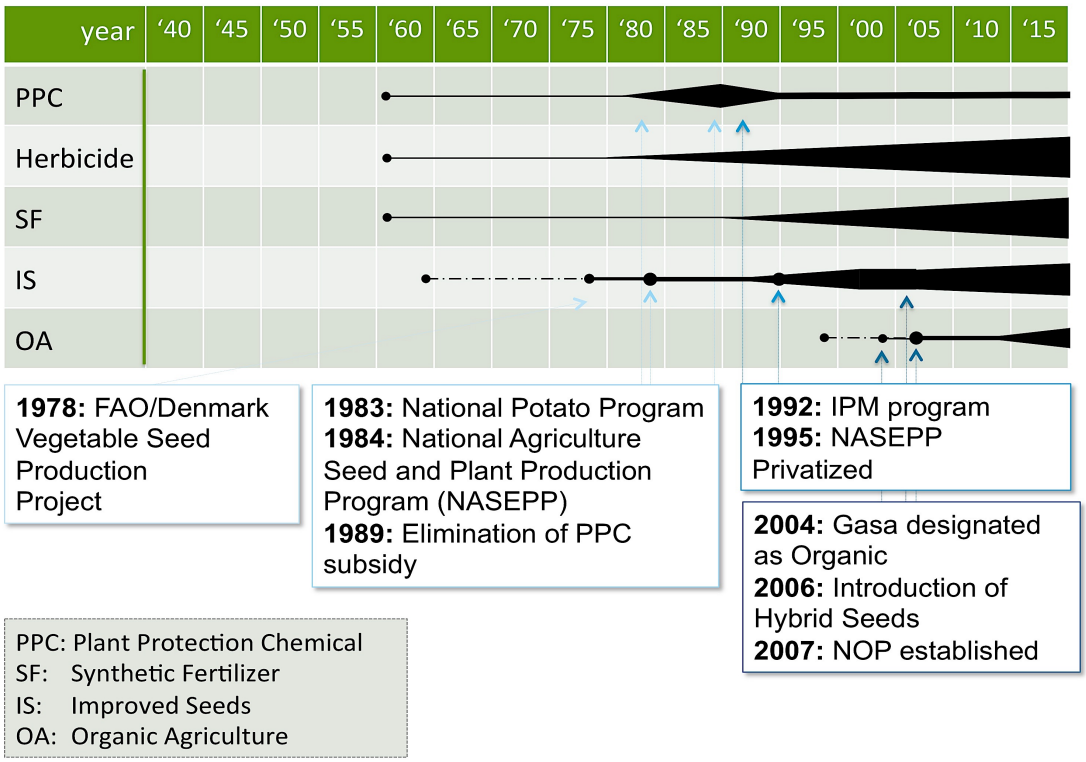


Figure 4.4 Historical comparison between introduction of external inputs

MoAF in March, 2010, because it was unable to sustain sufficient profits, and renamed the National Seed Center, its mandate to increase profits through the sales of seeds and fertilizers would have had influence over the pattern of synthetic fertilizer distribution and use.

Organic agriculture was mentioned in a government report written in 1999 as a means to sell Bhutan's "clean" image, a way to add value to Bhutan's products. By the time the NOP was established in 2007, Bhutan was already implementing the use of hybrid seeds to further increase food production.

The larger context of agricultural modernization in Bhutan must be understood as encompassing a transition from a largely subsistence based and transhumant system of living to a sedentarized system of increasingly intensified annual cultivation. Not only is Bhutan far from simply being "organic by default", but it has been in the midst of a larger evolution where an agricultural sector, as separate from the forestry and livestock sectors, has been established, which has been mandated to diversify and intensify food production not only for an increasing domestic population, but even for export, as the initial justification for encouraging organic agriculture showed.

It is important to note, however, that many modern technologies, such as PPC, fertilizers, and hybrid seeds, have not yet been universally adopted by farmers throughout Bhutan. Although 15 improved rice cultivars for different agro-ecological zones have been released, with proven higher yields, about 80% of the total rice production is still of traditional rice varieties (K. D. Dorji, 2008). The main reasons for this are that improved high yielding cultivars require high fertilizer inputs, which incur extra costs, and they do not meet the standards of the desired grain color and taste (Thinlay, Finckh, Bordeos, & Zeigler, 2000). Traditional cultivars therefore command a higher price in the local market. Furthermore, since rice straw provides an important source of fodder for livestock, farmers prefer the traditional landraces with longer straw lengths as they provide more feed. Varieties that are considered "improved", based on their grain yield, and bred to accommodate mechanized harvesting, have shorter straw lengths (K. D. Dorji, 2008; Thinlay et al., 2000). While this is just one example of how new technologies introduced from the top are not universally incorporated, it makes the point of how what at first looks like neutral technical specifications, is instead a representation of a hierarchical mode of governance and a mode of ordering that restructures the social as well as the natural context in which it is introduced (Hilmi, 2012). The ways in which this re-patterning is taking place can also be seen as extending into other policies implemented by the government. As is evident with Bhutan's relationship with India, the changes are associated with the increased mobility of enlarged flows of capital, which gradually take the place of local constellations that had been founded on relative self-reliance and autonomy.

4.7 Summary

Chapter 4 revisited the initial phases of Bhutan's agricultural modernization, starting with the pre-modern life styles revolving around transhumant-pastoralism and extracommunity trading of commodities, to the post-1960's development of agriculture as a government and economic sector. The chapter illustrated how Bhutan's interest in organic agriculture stemmed from two sets of priorities. One was a reaction to the potentially harmful effects of synthetic inputs, characterized by modern agricultural interventions based on green revolution technologies, starting with the unmonitored imports of PPC from India, informally described as Bhutan's "toxic period". This was particularly important because, although organic agriculture has been introduced within the context of Bhutan's unique developmental paradigm, it has not been sufficiently equated to Bhutan's relationship to India and Japan and

their contributions to the process of agricultural modernization. In this sense, Bhutan is sharing similar 'anti-modern' characteristics to those within the international organic agricultural movement.

The other priority was a reaction to the growing interest and market demand for organic products around the world, which Bhutan identified as an economic opportunity to take advantage of. Rather than highlighting Bhutan as a country that is 'organic by default', as previous government reports and studies have done, it was clarified that Bhutan's interest in organic agriculture is a reaction to, as well as an extension of, the government's efforts to modernize and commodify agriculture.

As emphasized, a transition from subsistence agriculture to commercially oriented agriculture has been promoted by the government since its first FYP. The foundation for agricultural modernization was first established through India's involvement in the initial stages of Bhutan's developmental process. Since the 1950s, Japan has played a significant role in shaping the transition of agriculture from a subsistence based practice to an increasingly market oriented enterprise. It is important to keep in mind, however, that Nakao, the father of the father of modern agriculture, documented how he cautioned the 4th King of the inherent dangers of establishing dependence on foreign countries for basic agricultural inputs, and Nishioka, who followed Nakao's guidance, maintained this awareness by only introducing open-pollinated (OP) seeds into Bhutan, despite the availability and increasing popularity of hybrid seeds by that time in Japan.

When the government of Bhutan decided to adopt organic agriculture as national policy, it was met with appreciation and praise by the world at large. This was of strategic importance; it helped to boost Bhutan's 'clean' image. From the point of view of the peasant farmers, it was not criticism against government-promoted modern agriculture that attracted them to organic farming. It was also not a particular interest in organic agriculture itself. Rather, the farmers were responding to a shift they found themselves in the midst of, from an environment in which they were able to sustain themselves through a process of getting food in various ways, by gathering, growing, or bartering, to an environment in which their position changed from being independent, self-sufficient peasant farmers, to being a contributing members in the agriculture sector. Finding themselves playing a socio-economic role in a modern society, some responded by choosing organic farming. Thus revealing the point that if the government wishes to lead a top-down movement promoting organic

agriculture, it must be in alignment with the constraints and incentives of the peasant farmers.

In tracing the history of the introduction of modern agriculture in Bhutan, throughout this whole period, the government has reacted consistently to the greater needs of increasing food security, while maintaining its image as a progressive and conservation oriented state. This can be seen by the fact that, despite stopping subsidizing free synthetic fertilizers, they have not stopped offering new seeds; their intentions to increase productivity has been and still is strong.

In terms of how an emphasis placed on organic agriculture fits into the larger context of modernization and development in Bhutan, the following chapters will further discuss how organic agriculture in Bhutan is a parallel movement in sync with modernization.

Chapter 5 The Expression of Peasant Farmers

5.1 Introduction

The forgoing chapter discussed the importance of looking at agricultural modernization within a larger context in order to better understand the ways in which organic agriculture has been introduced and prioritized in Bhutan. This chapter focus on various reflections of such government activities and on how the peasant farmer communities are reacting and adjusting to government led initiatives. Emphasis will be given to the second research question: how organic agriculture is being discussed within Bhutan; and how the discourse is different between what is understood by the peasant farmers and by the government.

Ever since the Royal Government of Bhutan implemented its first development plan, it has been actively promoting an alternative to subsistence agriculture and facilitating the increased commercialization of the Bhutanese food system (GNHC, 2013; PPD, 2015; P. C. RGoB, 1999b). The current organic policy can be said to largely follow this orientation, although the residual impact productivity improvements that were forged in a decidedly non-organic phase of agricultural modernization cannot easily be dismissed. In the early stages, the government has attempted to achieve an increase in food security with the now-emblematic interventions of the green revolution, including the introduction of new varieties of synthetic inputs, agricultural machinery, seeds, water management and rural infrastructure projects, most notably farm road development. By jumping on board with the contemporary discourse that increasingly considers the successes of modern agriculture to have come at an unacceptable cost to human health, societal well-being and the surrounding ecosystems (Coulibaly et al., 2007; McKeon, 2015; Patel, 2013; Tegtmeier & Duffy, 2004), Bhutan has largely followed this trend. While not meant to diminish Bhutan's courageous commitments in the world stage, it is important to note that the alternative of organic agriculture is still developing its potential worldwide as a comprehensive and viable agricultural model. In this sense, Bhutan's pledges can only be indicative of the state of the art in organic agriculture, which is still largely based upon principles, rather than practices, for reconciling commercialization with ecological ideology.

In order to address the need to substantially increase food production, while decreasing the negative impacts on the ecosystem, sustainable agricultural intensification has been emphasized as a way to produce more food from the same area of land while reducing the

negative environmental impacts, and at the same time increasing contributions to natural capital and the flow of environmental services (Godfray et al., 2010; Pretty, 2008; The Royal Society, 2009). Proponents of such projects propose that sustainable production systems should have attributes that include 1) avoidance of the unnecessary use of external inputs; 2) use of crop varieties and livestock breeds with increased productivity; 3) harnessing of agro-ecological processes including nutrient recycling, predation and parasitism, allelopathy, and biological nitrogen fixation, and 4) minimal use of technologies or practices that have an adverse impact both on the environment as well as human health (Pretty, Toulmin, & Williams, 2011). There are no blueprints for a sustainable agricultural practice. But it is in an effort to accommodate such intelligence that Bhutan has set out on a mission to promote organic agriculture, alongside the employment of a variety of agro-ecological methods, including direct crop varietal development, IMP, soil conservation, and improved livestock management. This chapter takes up a few of the above mentioned methods, by focusing on three levels of responses: firstly, the difference in perception, particularly on the emphasis placed on organic agriculture, secondly, the materials and technologies that the peasant farmers have chosen to employ, and thirdly, the actions or activities that result from these choices may differ in communities of peasant farmers in regions with varying socio-economic and geographical conditions (as elaborated in Chapter 3) within western Bhutan. Results are based on the household questionnaire survey as well as interviews.

To initiate the discussion, Table 5.1 summarizes the differences between and characteristics of the three *dzongkhags* surveyed in this study, based on information collected through the household survey.

Table 5.1 Comparison between dzongkhags based on survey data

SURVEYED DATA	GASA	PARO	WANGDUE
1. Number of surveyed households (n)	30	51	66
2. Surveyed communities	Khatoed, Khamed (*Geogs*)	Pangbisa, Getena, Baangdey (in Lungyi Geog)	Phobjikha, Kazhi Dangchu (Geogs)
3. Average age of respondents (age range)	45.4 (26~73)	44.5 (18~72)	46.9 (16~74)
4. Respondents' sex (% Female)	86.9	64.7	58.6
5. Respondents who have attended school (%n)	20.0	43.1	18.6
6. Average family size (Number living at home)	7.1 (4.8)	8.8 (5.3)	8.7 (5.5)
7. Households with one or more members with off-farm employment (%)	56.7	66.7	46.0
8. Land tenure (own) (%)	96.7	98.0	100
9. Borrowing land (%)	6.7	23.5	27.2
10. Major crops grown by respondents	Wheat, Barley, Cabbage, Potato	Rice, Potato, Apple, Asparagus,	Potato, Turnip, Buckwheat
11. Households with cattle (%)	96.7	78.4	100.0

5.2 Reflections on the Top-down Policies of Organic Agriculture

5.2.1 The Government's Perspective

As outlined in the last chapter, organic agriculture in Bhutan was emphasized as a means to encourage sustainable development and improve rural livelihoods through decreasing dependence on external inputs (in particular synthetic fertilizer and plant protection chemicals, which are increasing in cost worldwide) (NOP, 2012). Organic agriculture was also first introduced as a means to capture market opportunities domestically as well as internationally, with Europe, the U.S. and Japan often quoted as the largest potential markets for organically grown products (NOP, 2010; P. C. RGoB, 1999a). In order to understand how peasant farmers are reacting and adjusting to changing external circumstances, focus was placed on the second research question: how is the government's emphasis on organic agriculture different from that of the peasant farmers`.

The training manual developed for organic production in Bhutan introduces itself by stating:

> *"Principles of organic agriculture encompass ecological, social, and economic aspects which go much beyond the prevalent paradigm restricted to the use of organic inputs. These principles are extremely relevant in the Bhutanese context where small farmers are losing interest in farming and are gradually migrating to cities, as agriculture is not a viable option for livelihood. In addition, the impact of the global climate change is more severe on the poor and vulnerable communities who mostly depend on agriculture for their livelihoods. The transition from fossil fuelled industrial production to ecologically-based agriculture with focus on supplying local needs and utilizing the natural resources is an important step towards adaptation to climate change"* (NOP, 2012).

In much of the world 'organic', as a concept and in practice, emerged as an alternative to 'conventional' farming, characterized by intensive monocropping and the use of synthetic fertilizers and pesticides. Such forms of 'conventional' farming, represented in the above quotation as "fossil fueled industrial production", have had innumerable negative effects on human health and the environment, starting with the erosion of the biological potential of the soil, the depletion and pollution of underground water resources and erosion of unique cultural practices. As elaborated in Chapter 4, in Bhutan, priorities in agriculture have been transitioning with increasing emphasis on intensified agricultural production while also balancing a conservation oriented approach, as seen in the implantation of IMP techniques. While many farmers are transitioning into a more market-oriented production system, it is

important to note how, 'conventional' in Bhutan is neither "fossil fueled industrial production" nor "organic by default". Having said that, however, the lack of soil fertility is resulting in an expanding reliance on synthetic agrochemicals to supplement the need to increase food security. While the government emphasizes the ideological understanding of organic being an ecologically-based agriculture, the utilization of local natural resources does not represent an automatic, nor easy cross-over to 'productive organic' on the ground.

5.2.2 "Organic" on the Ground

To gain a better understanding of the general level of awareness of organic agriculture among peasant farmers in Bhutan, an assessment was made of their perception and understanding of the term 'organic' through a baseline questionnaire survey. When household representatives were asked whether they were familiar with the term 'organic', affirmative answers ranged from lowest at 52.1% in Wangdue (with the lowest level of awareness found in Phobjikha at 39.5%), followed by 68.6% in Paro, to the highest at 80.0% in Gasa *Dzongkhag*. Awareness levels in Gasa were high, as expected, since in 2004 the district was designated the NOP pilot site (MoAF, 2012b). The overall low awareness levels found in the other districts were below what might be expected in a country known for its focus on organic agriculture.

Results from a government-led survey conducted in 2012 revealed slightly contrasting narratives. In the government survey, farmers were asked if they had applied 'chemical fertilizers' to their fields; affirmative answers ranged from 0.0% in Gasa, 27.7% in Paro, and 0.1% in Wandue. In comparison, results from the baseline survey conducted for this study found that 3.3% in Gasa, 86.3% in Paro and 90.2% in Wandue *use* synthetic fertilizers on their fields. The MoAF survey further asked respondents *why* they did not apply synthetic fertilizers. To this, 96.3%, 3.9% and 3.2% in Gasa, Paro and Wandue, respectively, answered that it was because they were "aware of the benefits of organic" (MoAF, 2013a). The results, while confirming that practices on the ground are highly heterogeneous, also reveal the difficulties in comparing results from two quantitative surveys, particularly when it involves a concept that may be new to peasant farmer communities[48].

[48] Additionally, the survey conducted by the MoAF did not specify the communities the survey was conducted in, nor the N value of the households surveyed. Though this makes it difficult to compare, I wanted to highlight it here as representative of how the government is trying to survey the levels of awareness of organic agriculture.

In Bhutan, where English is not the universal language spoken, it is important to remember that a direct translation for the term "organic" does not exist in the local languages. This makes both the question difficult to ask, and the answers difficult to assess. If the peasant farmers say they are familiar with the term 'organic', the perception or understanding of what the term means may vary, based on the kind of information the respondents have had access to. While there is abundant outreach material provided by the NOP, many of the older farmers today remain illiterate. The average age of the farmers who participated in the survey for this study was 45.6 years old; and only 27.2% of them had attended school. Even if respondents said they attended school, it may have only been for a few years, which does not automatically imply literacy. Information on new methods of farming, therefore, is apt to come from the AEOs, whose awareness levels would also vary; or information may come from the farmers' children, who learn about it in school.

As described in the NOP training manual for organic agriculture (above) and as emphasized by former Prime Minister Jigmy Thinley himself, in his speech in 2012, organic agriculture is not simply a matter of input substitution, nor can it be defined simply by what it does not use, as controversies over the conventionalization of organic farming have shown (Lockie, Lyons, & Lawrence, 2000; Lyons, 1999). For the purpose of this survey, however, in order to better understand the general perception of 'organic', a multiple-choice question was given to the peasant farmers asking them to specify what they understood as organic. Respondents were asked to choose one or more among the following terms, to define 'organic': use of leaf litter, use of animal manure, saving your own seeds, not using chemical pesticides and synthetic fertilizers, making your own pesticides, getting certification, or other. Of those who were familiar with the concept of 'organic', an average of 86.8% (with 95.8%, 77.1% and 86.9% in Gasa, Paro and Wangdue, respectively) answered that organic agriculture is a form of farming that uses animal manure (represented in red in Figure 5.1); an overall average of 59.2% (with 70.8%, 65.7%, and 41.0% in Gasa, Paro, and Wangdue respectively) understood the word 'organic' to mean a method that does not use synthetic fertilizers or pesticides (represented in gray); while 40.3% (with 56.7%, 43.1%, and 21.1% in Gasa, Paro, and Wangdue, respectively) answered that the term signified both the use of animal manure and the non-use of synthetic chemicals (represented in red stripes) and very few (8.3% in Gasa and 11.4% in Paro) mentioned certification as a criterion for something

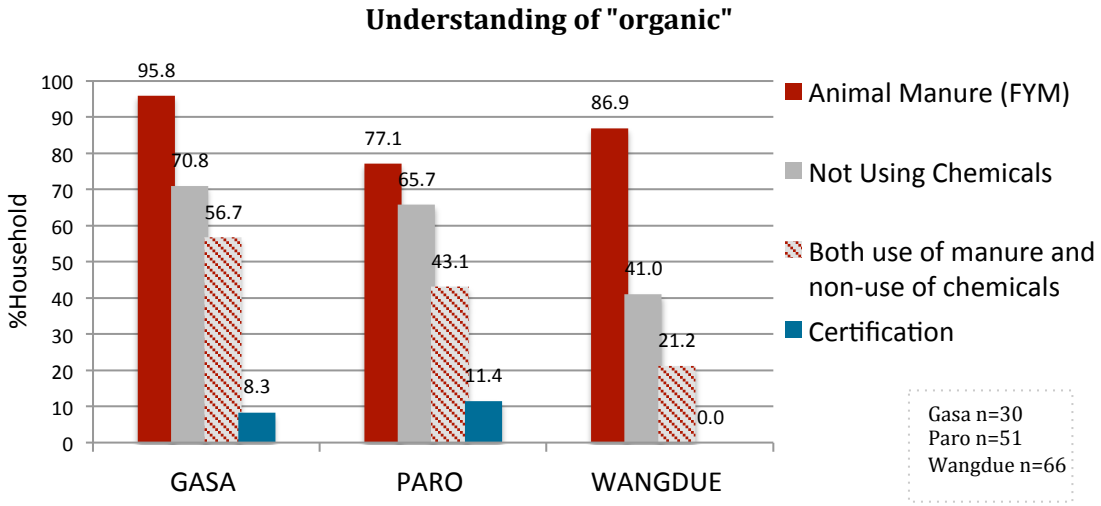


Figure 5.1 Regional variations in concept of "organic"

to be termed 'organic' (Figure 5.1). The large percentage of farmers who only answered that 'organic' signifies the use of animal manure, which translates as the use of FYM, may imply that though the farmers may use synthetic fertilizers, they may still consider their form of farming to be 'organic' because they use animal manure. Examples of such contradictions were observed throughout the survey. That such a low number of households mentioned certification is logical, since such practices are not yet implemented by the government. Though there is a separate organic section at the Thimphu market, as a survey conducted in 2013 at the Century Farmer's Market[49] in 2013 indicates (Zangpo, 2013), generally consumers do not yet make a distinction between organic and non-organic.

In addition to multiple-choice questions, the respondents, when asked to elaborate on their understanding of 'organic', described the term using various expressions (described below in Table 5.2). References were made on the use of seeds distributed by the government; some of the expressions used reflected the positive image of organic agriculture that the government used in promoting it, words like 'cleaner', 'healthier', 'improved' or 'better'. Finally, their understanding of the word 'organic' included the perception that it has always been practiced in subsistence-level agriculture.

[49] The first organic sales outlet for vegetables in Bhutan was established at the Thimphu Century Farmers Market in 2010 under the initiative of the Happy Green Cooperative and the Department of Agriculture and Marketing Cooperatives. The sole supplier of the outlet is Toktokha Organic Farm located in Punakha (Zangpo, 2013).

Table 5.2 Elaboration of peasant farmer's concept of "organic"

Location	"Organic" is…
PARO	Using seeds distributed by the government.
	A farming style that has been continued since my grandparent's time.
	Using pesticide free (un-coated) seeds.
	Self-sufficiency farming.
	An improved way of farming.
	Not using synthetic chemicals because they are hazardous to our health.
GASA	About health concerns for humans.
	A cleaner type of farming.
	A method using top soil of forest
WANGDUE	A better way of farming because it improves the soil condition.
	About self-sufficiency.
	About health.
	Something I learned from a TV show.
	About the conservation of water.
	A method of farming we practice for everything but our potatoes.

5.2.3 Perceived Benefits of Organic Agriculture

Despite the positive image reflected in the respondents' general awareness of the term 'organic,' when asked whether practicing organic agriculture will increase overall yield on the farm, responses varied significantly. Figure 5.2 shows the variations in outlook the respondents had regarding the relationship between yield and organic methods of farming, based on five categories. The blue colors indicate an overall positive outlook, which include those who answered, "Yes, it already has" increased overall yield, based on direct experience, and "Yes, in the long term", indicating optimism for the future. The highest, a third in Gasa (33.3%), followed by Paro (23.5%), indicated that their organic farming practices have already contributed to increase in overall yield. In comparison, none of the households surveyed in Wangdue indicated that they have experienced positive yield increase. For the response "Yes, in the long term", again, Gasa had the highest percentage in this category. The orange colors indicate a neutral or negative outlook. The response "No, it remains the same" is a neutral outlook toward the effects of organic agriculture; the respondents do not expect any changes, perhaps because they hope to sustain current levels of productivity based on methods they already consider partially or fully organic (depending on their definition). The response "No, it will decrease", reflects the respondents' pessimistic outlook on the impact of organic agriculture, based on either experience or perception. Although 15.9% in Wangdue suggested that they have optimistic expectations for the future, the largest percentage of households who had a pessimistic outlook was found in Wangdue. The gray color represent

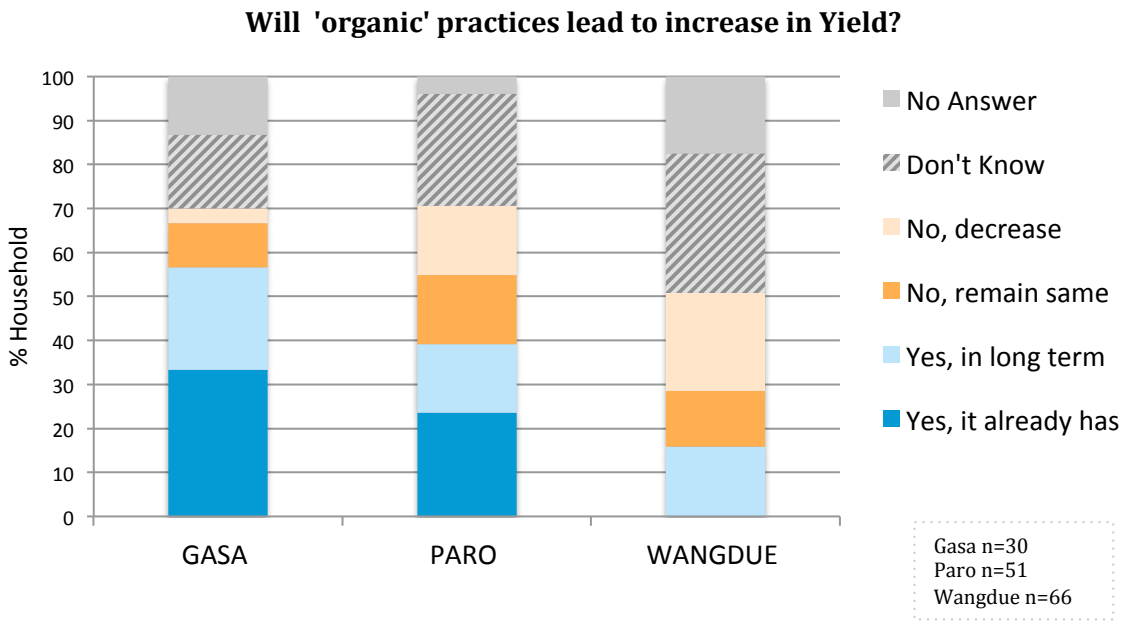


Figure 5.2 Regional variation in perception of organic agriculture and increased yield

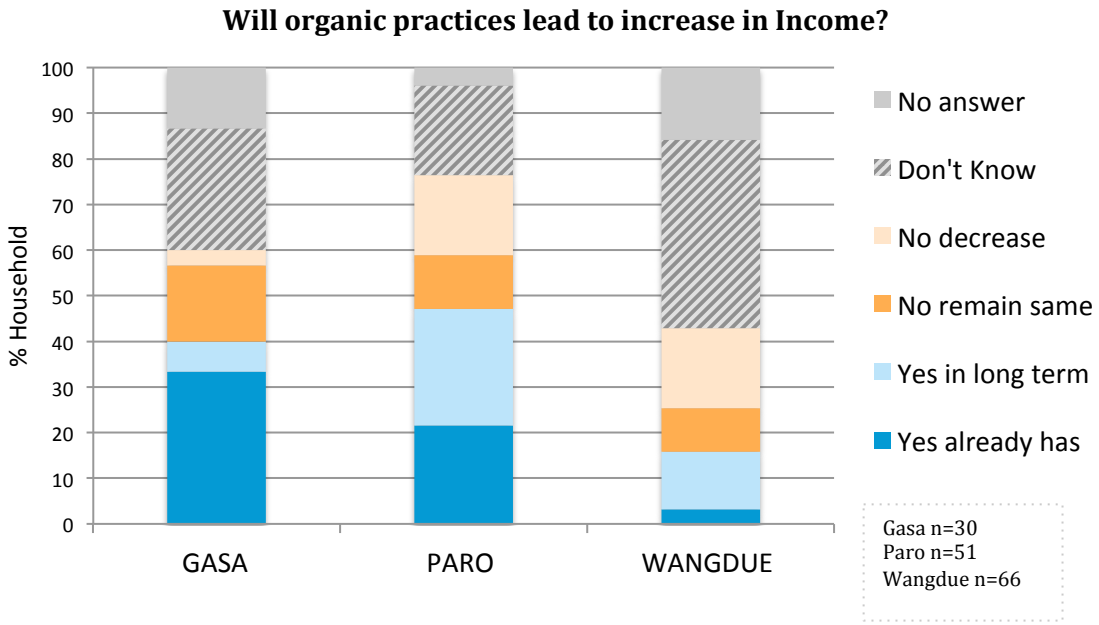


Figure 5.3 Regional variation in the perception of organic agriculture and increased income

the response “Don’t know” and no answer, suggesting an honest or realistic opinion based on the fact that future yields are simply difficult to predict. In Wangdue 31.7% said that they do not know and 17.5% did not specify any opinion, which can be interpreted as “don’t know”.

When respondents were asked about the possibilities for organic agriculture increasing their income, the overall pattern of the responses was similar to the regional variations seen for expected yield increase (Figure 5.3). Some significant differences, however, include the comparatively low percentage of overall positive responses (again in blue) in Gasa, with 33.3% answering “Yes, it already has” (increased overall income), and 6.7% answering “Yes, it will in the long term”. A greater number responded positively in Paro, with 21.6% answering “Yes, it already has” and 25.5% responding “Yes, it will in the long term’. These variations may be a reflection of the difference in market access between the two locations. Again, the overall responses in Wangdue were either neutral (9.5%), pessimistic (17.5%) (again marked in orange colors), or “don’t know” (41.3%) (in gray).

5.3 Seed Procurement Patterns

Seeds are the genetic material, which are the first link in the food chain, the source of life, of future plants, and even of culture (Shiva et al., 1995 in Jarvis, 2005). The seed system is defined succinctly by Thiele (Thiele, 1999) as an interrelated set of breeding, management, replacement, and distribution. The properties of seeds determine the capacity to cope with adverse situations, for both the short and the long term, from disease outbreaks to climate change (GIZ, 2014). As such, the sowing, harvesting, and sharing of seeds was and remains central to human development. Proponents of organic agriculture throughout the world emphasize the importance of saving seeds.

Since the establishment of the first five-year development plan, emphasis on plant breeding has been an expressed priority for Bhutan. The government initiated several model agricultural and seed-multiplication farms, in which Dasho Nishioka played a central role. The establishment and growth of formal seed systems, characterized by ex-situ seed production and conservation, namely in gene banks, supported by academic or government-led research and corporate breeding programs, while playing an important role, are also known to lead farmers towards becoming more dependent on highly centralized and oligopolized seed markets (GIZ, 2014). Seed varieties selected and bred by such ex-situ

production systems are usually bred using non-organic practices. Today, hybrid crop varieties are the most common form of seeds produced and traded in formal seed systems. While exhibiting benefits of high yield and homogeneous phenotype, because the conditions have been bred into them, hybrids also require high inputs of synthetic fertilizers, PPC and water. While hybrid seeds are useful for commercialized production, separation between the production, multiplication and use of seeds leads to the loss of traditional knowledge and skills surrounding seeds (GIZ, 2014).

One response to such problems has been to promote participatory plant breeding programs, which emphasize the importance of breeding for site specific conditions and needs, showing how over time such breeding practices result in increased yield, disease resistance, genetic diversity and adaptability (Dawson, Murphy, & Jones, 2008; Murphy, Lammer, Lyon, Carter, & Jones, 2005). As such, Bhutan's standards for organic agriculture adhere to international guidelines that place importance on the selection and utilization of seeds, seedlings and planting materials that are "well adapted to local conditions". The guidelines further stress that "traditional seeds, OP seeds, and local planting materials should be used as they are naturally resistant to pests and disease, and emphasis should be given to maintain biodiversity of the farm" (MoAF, 2011).

5.3.1 Saving Seeds

The ability to control the quality of seeds, organic or otherwise, is critical for the survival of any farm. The household questionnaire survey results showed that the majority of households, 96.7%, 98.0%, and 96.8% in Gasa, Paro and Wangdue, respectively, were saving their seeds every year from the crops they cultivated. The content of what varieties were being saved, however, varied greatly from region to region, reflecting the variations in major crops grown in tandem with the varying climate and agro-ecological conditions (Figure 5.4). It is these differences that necessitated trading of seeds and food commodities across agro-ecological boundaries and even across international borders in the past. In Gasa and Paro, 40.0% and 41.2%, respectively, of the farmers surveyed mentioned that they were saving rice seed, compared to only 6.3% in Wangdue. In Gasa, the rice would be the upland variety of rice, which has recently been promoted by the government, whereas in Paro, it would be cultivars for wetland production. Wangdue, a high potato production region, had a comparatively high percentage of households (73.0%) saving potatoes for seed. As for other grain varieties traditionally cultivated before rice became the preferred staple, 46.7%, 29.4%

and 54.0% in Gasa, Paro and Wangude, respectively, were still saving seeds and maintaining their cultivation for wheat, barley and buckwheat. While chili is a celebrated staple in Bhutan, saving chili seeds was predominant in Paro, where the weather is warmer, compared to Gasa and Wangue. The seeds households save directly reflect what seeds or food commodities get traded. In all three regions, it is interesting that the largest percentage of households mentioned they were saving vegetable seeds, predominantly turnip, radish, and mustard greens. In Gasa and Paro, additional varieties included cabbage, broccoli, carrots, peas, cucumbers, and pumpkin. The hybrid seeds that have been introduced into Bhutan are limited to the brassica species (Appendix VI). While some peasant farmers mentioned they were saving brassica seeds no one reported they were using hybrid seeds. It is important, nevertheless, to consider the implications of introducing hybrid seeds to a culture where seed saving is second nature.

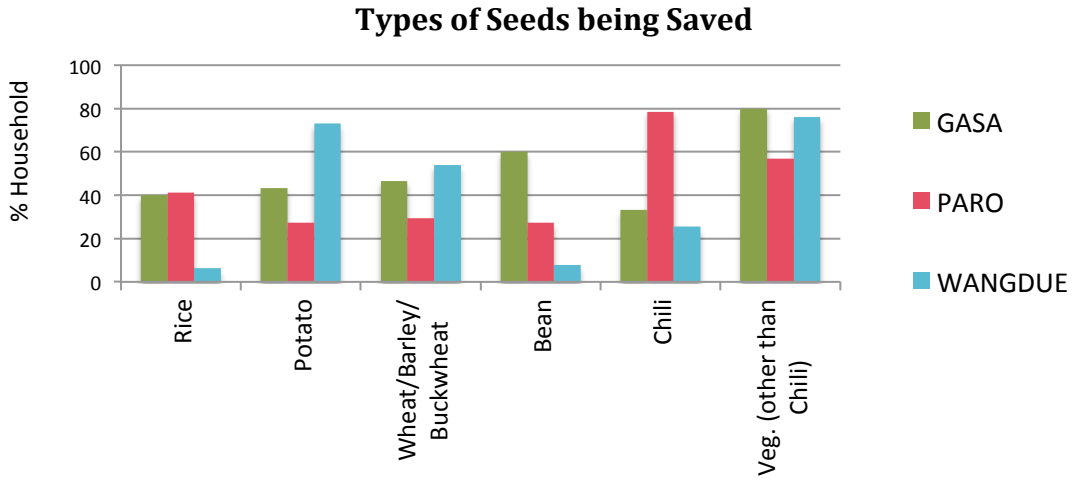


Figure 5.4 Difference in variety of seeds being saved within each *dzongkhag*

5.3.2 Trading, buying and receiving seeds from the government

In addition to in-situ conservation of seeds at the household-level, there are three other means of obtaining seeds. As with food commodities, acquisition of seeds can occur through internal trade within the community, or through extracommunity exchanges. Such customs take advantage of different agro-ecological environments between communities; for example, the growing season on farmland in higher altitudes is too short for saving chili seeds, therefore each year, communities in lower altitudes would save and grow chili seedlings and

then bring them to communities in higher elevations when the climate is warm enough.

The market as well as the government both play a growing role in seed procurement. The Department of Agriculture decided to provide seeds and seedlings free of charge, because, despite the government's encouragement towards intensified production, many farmers were reluctant to invest a lot of money in seeds, a high upfront cost, since there was no assured market for the resulting products (NOP, 2014). The NOP has also been providing free seedlings, such as asparagus, under the condition that farmers maintain their crops as fully organic for five years (NOP, 2014). In western Bhutan, most, if not all, seeds distributed by the government were supplied by the NSC in Paro. Where Yuichi Tomiyasu, the senior horticulture specialist was working, in the eastern part of Bhutan, seeds were being imported directly from suppliers in Japan, "for greater quality assurance", multiplied at the RNR Center, and then distributed to the farmers (interview: Tomiyasu, 2014). Requests for specific varieties of seeds are made to the local AEO, or to NOP in the case of Gasa, and then procured from the NSC or the Horticulture Division of the Department of Agriculture. What the extension agents are able to acquire and distribute varies according to their allotted budgets for the fiscal season, as well as the availability of seeds at the NSC.

Depending on seed availability and the amount of provisions coming from the government, peasant farmers buy seeds directly from seed companies, from the AEOs or from commission agents. For the purpose of this study, households that were 'buying' seeds from informal sources, such as from villagers within the community, were categorized as 'trading' seeds. While the markets influence crop patterns, production is typically slated for local and household consumption. For staple crops, many households still rely on seeds from "traditional" landraces. Although the questionnaire survey was unable to get detailed accounts of seed varieties, among those who did specify, what farmers were receiving from the government and what they were buying at the markets were similar, composed mainly of new and improved varieties within the formal seed systems, familiarized since 1978, such as asparagus, broccoli, cauliflower, cabbage, carrots, tomatoes, onions and garlic.

In Figure 5.5, the average percentage of households (marked as ♦) that mentioned they trade, receive seeds from the government or buy their seeds is plotted. The range (maximum and minimum) found between surveyed communities within each *dzongkhag* is plotted using error bars. The *dzongkhag* that had the highest average in the trading of seeds was Wangdue (33.3%), followed by Gasa and Paro (23.3% and 19.6%, respectively). The specified seed

varieties traded include rice in Paro, rice and vegetable seeds in Gasa, and barley, buckwheat, wheat, beans, chili, maize, radishes, turnips and potatoes in Wangdue. With a slightly higher rate of households trading seeds, Wangdue is also the community with a comparatively low number of households receiving seeds from the government (73.0% in Wangdue, compared to 80.0% in Gasa and 82.4% in Paro). Nonetheless, in all the communities, more than half the households were receiving free seeds from the government. In the most urbanized community of Paro, also the closest to the NSC, 100% of the households were receiving seeds. As for households buying seeds for production, the greatest variation within a *dzongkhag* was found in Wangdue, with a range that went from 10.0% to 86.8%. Although the overall average was highest at 80.4% in Paro, and lowest at 26.7%, in Gasa, there was little variation in the proportion of households buying seeds between the surveyed communities within these two *dzongkhags*.

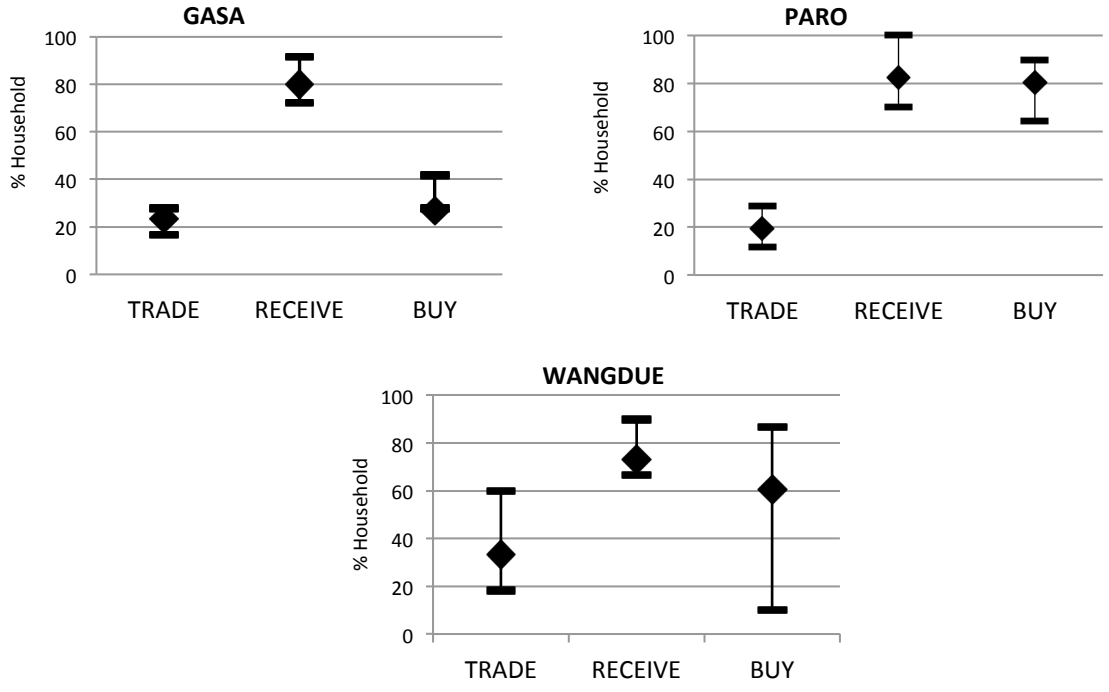
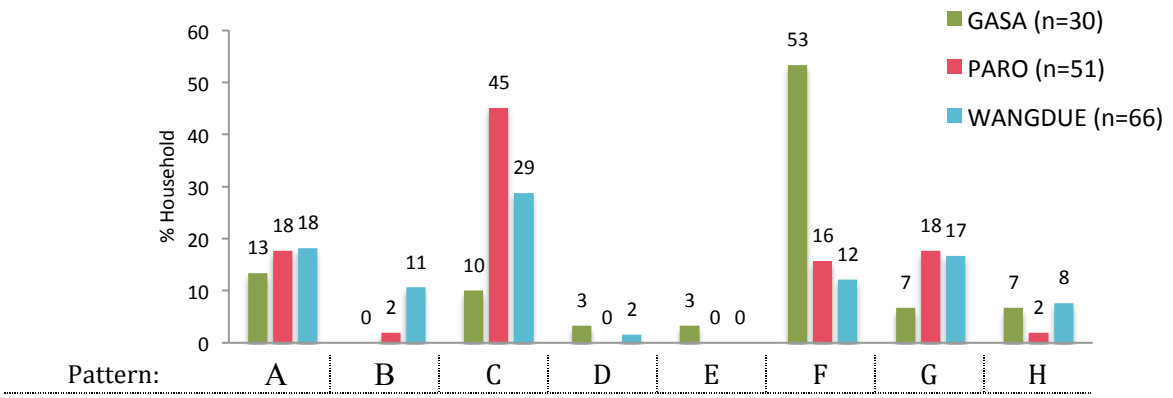


Figure 5.5 Variation within Gasa, Paro and Wangdue *Dzongkhags* in seed procurement patterns



Pattern A: Trading + Receiving free seeds from Gov. + Buying
Pattern B: Trading + Receiving free seeds from Gov.
Pattern C: Receiving free seeds from Gov. + Buying
Pattern D: Trading + Buying
Pattern E: Only Trading
Pattern F: Only Receiving free seeds from Gov.
Pattern G: Only Buying
Pattern H: Not getting seed from outside the household

Figure 5.6 Regional comparison of seed procurement patterns

Many households source their seeds through multiple locations. Figure 5.6 compares the various patterns of seed procurement prevalent in each *dzongkhag*. A through H are the various procurement patterns. Notably, households that were taking advantage of all three methods of seed sourcing, trading, and buying (Pattern A) accounted for 13% in Gasa and 18% in both Wangdue and Paro. In Gasa, the largest number of households (53%) was *only* receiving seeds from the government (Pattern F), implying a disproportionately high dependence on the government, compared to the other two *dzongkhags*. In Paro, the largest number of households (45%) were receiving seeds from the government, as well as purchasing seeds (Pattern C); in other words, they had become dependent on the newly established formal seed systems. The highest percentage of households in Wangdue shared the same pattern as in Paro, but they were fewer, at 29%. Very few households relied only on trading seeds (Pattern E), although 7%, 2% and 8% of the households in Gasa, Paro and Wangdue, respectively, did not rely on any external sources of seeds (Pattern H).

5.4 Increasing Market Incentive: the Use of Hybrid Seeds

As previously mentioned, hybrid seeds were released in 2006. Household survey results

showed a varied incorporation of and preference for hybrid seeds (Figure 5.7). In Gasa, 13.3%, in Paro 52.9%, and 34.3% in Wangdue were using hybrid seeds. Higher quality and yield were two main reasons given for their use. When asked whether farmers wanted to start using hybrid seeds, if they were not already, 66.7% in Gasa, 29.4% in Paro, and 27% in Wangdue said they would like to if they had the opportunity. This invites one to speculate that the future usage of hybrid seeds could be close to 60 ~ 80% in every region, depending on availability. Because organic production techniques encourage the use of OP seeds, usage rates found in Gasa were low. However, the high level of interest in hybrid seeds is indicative of the increasing importance commercial vegetable production is given in Gasa. Considered alongside the fact that hybrid seeds are three to fifteen times more expensive than OP varieties available through the NSC (PPD, 2015)[50], the purchasing of hybrid seeds would represent a different set of investment priorities, compared to OP varieties.

Opinions of hybrid varieties, however, were not always positive. On several occasions interviews revealed complaints were voiced about the characteristics of hybrid vegetables. Dukpa Wangda, director of NSC headquarters in Paro, mentioned how the hybrid cabbage is too large and can only be harvested once (interview: Dukpa, 2014); the same sentiment was shared about hybrid broccoli, stating a clear preference for OP varieties (interview: Ghimiray, 2014). Since the high cost of hybrid seeds remains a limiting factor, the NSC is looking into importing less expensive varieties from Bangladesh. They are not accommodating the need for organic seeds; but they are consciously maintaining the supply of both hybrid and OP seeds, "following the middle path" explains Dukpa (interview: Dukpa, 2014).

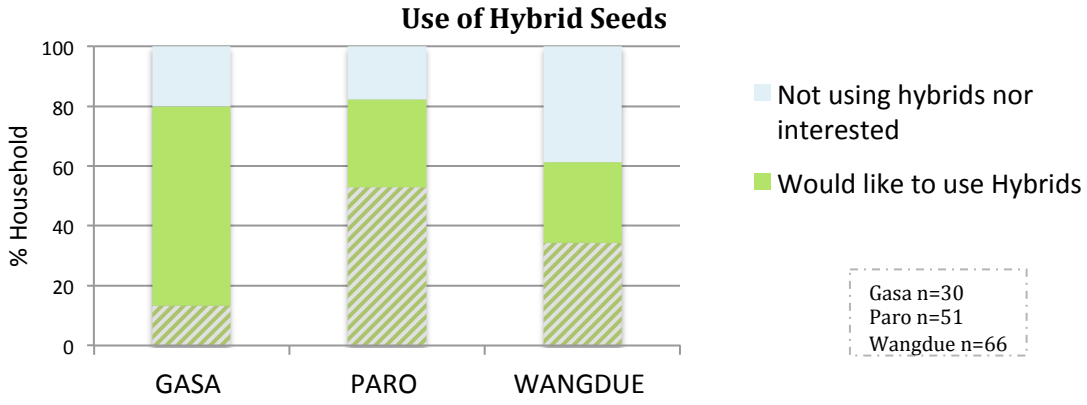


Figure 5.7 Current and potential use of hybrid seeds among farmers in three *dzongkhags*

[50] For example, a hybrid broccoli seed (Centauro) costs 155 Nu/10g, while an OP (Dessico) is 10 Nu per 10 g seed packet (PPD, 2015).

5.5 Contemporary Usage Patterns of Plant Protection Chemicals

5.5.1 Herbicide Use

Today, procurement and distribution of pesticides is entrusted to the NPPC under the government, which distributes them to the regional *dzongkhag* headquarters. As the national referral center for plant health management issues, the work led by the NPPC revolves entirely around IPM techniques. On the other hand, as is clear from the graph in Figure 4.2, the use of herbicides has steadily increased over the years. Herbicides are predominantly used for the most widely cultivated crops, including rice, potato, chili and various fruit. Unlike the other PPC, herbicides are sold separately through Commission Agents[52] (interview: Doe Doe, 2015). A peasant farmer in Paro mentioned how "everybody uses herbicides for rice" (interview: P. Dorji, 2014). According to a farmer interviewed in Paro, herbicides today are directly imported from India, through a private distribution company. He noted, that the quality this year was particularly terrible, the contents were half mixed with sand (interview: P. Dorji, 2014).

September and October are the months when potatoes are harvested in the mid-hill regions of Bhutan. Potatoes are the largest cash crop; they made up 90.4%, by weight of all exported vegetables in 2012 (MoAF, 2013b). In Kazhi *Geog*, in Wangdue *Dzongkhag*, there is a village described by the local AEO as a place where "traditional farming" is practiced. In and among the lush green fields of chili, beans, millets, corn, and very large cucumbers, all the potato fields were brown before harvest, after the application of glyphosate, an active ingredient in the well known herbicide 'Roundup' (Figure 5.2). This was a common technique among peasant farmers, as it helped them increase efficiency, based on production cost and the availability of labor. Aside from studies concerning the negative impact of glyphosate on yield and quality of potatoes (Robinson & Hatterman-Valenti, 2013), a survey conducted in Bhutan between 2005 to 2007 by Roder et al. found that the overuse of herbicides (in this case metribuzin), alongside the deeper tilling of the soil (described as the cutting of rhizomes by plough or spade), high inputs of fertilizer, and the continuous cultivation of potatoes, were causing an increase in the most common weed species, *Persicaria runcinata*, thus increasing the overall labor required for weeding (W Roder, Dochen, Nidup, & Dorji, 2009).

[52] Commission Agents are shop owners who sell seeds and herbicides on behalf of NSC and Bhutan Alpine Seeds Co. Commission Agents get 5% of the sales profit.

Figure 5.8 Farmhouse and potato field (right hand side) in Bayul Village, Kazhi *Geog*, Wangdue. The field is brown after use of herbicides applied a month before harvesting of potatoes

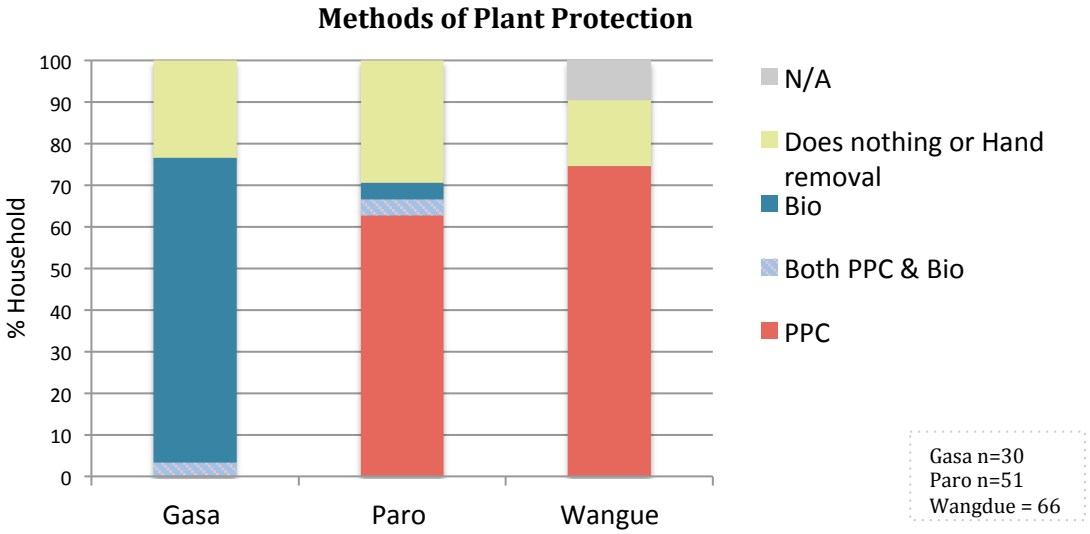


Figure 5.9 Variation between districts in PPC and Bio-Pesticide Use

5.5.2 Plant Protection Chemicals

Unlike the use of herbicides, the use of PPC is far from uniquitous in Bhutan. Marked variation was found within both Paro and Wangdue (Figure 5.9). The highest PPC use was found in a community surveyed in Phobjikha, in Wangdue. Phobjikha, incidentally, is famous for its large commercial cultivation of potatoes. The accounting for both chemical and biological pesticides, their reliance was greater than 70% in all *dzongkhags*.

Among the peasant farmers who said they were using PPC, some specified that they make their own pesticides. They referred to techniques learned through government-supported programs organized through the NOP. Some of the techniques included the use of lemongrass or a species of *Artemisia*[53]. While synthetic PPC would not be allowed in Gasa, 73.3% specified that they use bio-pesticides supplied by the NOP. The most common product used was Neem Baan, a Neem (*Azadirachta indica*) based pesticide made in Thailand, or a concoction made on their own using recipes taught through training programs on organic agriculture. Garlic mixed with cow urine, was one brew mentioned particularly often.

A farmer in Gasa referred to the use of walnut bark mixed with other plants, called *buse*, later explained as a name literally meaning 'killing insects' (interview: Pulami, 2014). The use of ash was also reported as a common form of plant protection; rituals were also conducted as an endemic method of pest control.

While looking at a beautiful cabbage growing in the field, Tomiyasu, the JICA specialist introduced in the previous chapter, mentioned how it is probably being grown without the use of any PPC. More than being 'organic,' it's rather 'do-nothing-farming', he said, smiling (interview: Tomiyasu, 2014). Problems arise in March, after the cabbage flowers bloom and the seeds are ready to be harvested, when aphid colonies emerge which can damage the crop. According to Tomiyasu, while the crop may be produced organically, in order to save the seeds, pesticides become necessary. New vegetable cultivars indirectly contribute to the implementation of new requirements for external inputs, in this case PPC, to enable continued cultivation through the saving of seeds.

5.5.3 Evolution of the Perception of Pests

As with the changing requirements of external inputs, another interesting factor that should be considered is how fundamentally the concept of 'weeds' or 'pests' may vary, as

[53] Mug wart (ヨモギ).

well as evolve with the introduction of new cultivars. Hints of such insights were found in how many of the peasant farmers surveyed did not consider pests to be a serious problem[54]. In Paro, 37.3% of the respondents said they "rarely have pest problems". The changing quantity and varieties cultivated, as well as the method of cultivation, would also influence how susceptible plants are to pests. In Paro, a peasant farmer spoke of the ways his grandparents snacked on wild vegetables that they found around their fields. What would have been a salad for lunch is no longer available, he explained, since they started using herbicides. Sources of food, along with the knowledge required to identify edible plants, have both disappeared since the conception of the 'weed' (interview: P. Dorji, 2014).

Furthermore, and quite significantly, religious preference was also seen as playing a role when an individual was deciding whether or not to use insecticides. In the household questionnaire survey, several respondents answered that they do not use PPC or opt to do nothing, leaving the pests as they are, because, as Buddhists, they consider it a sin to commit an act of deliberate killing. Changes in such religious sentiments, as the younger generations take over the management of the household, is a topic that may have considerable influence over how Bhutan will evolve as a state embracing organic ideals.

5.6 Presence of Livestock

5.6.1 Cattle and Oxen

Indicative of the high percentage of respondents defining 'organic' as the use of animal manure, livestock plays a central role in the agricultural practices found within the study region. Traditionally, livestock was used as an indispensable source of food for the household, in the form of meat (pig, chicken, or goat depending on the region) as well as milk products (butter and cheese). Such products were also important as commodities for trading; in the past they were traded for salt from Tibet for feeding the livestock in Bhutan (Nakao, 2011). Due to urbanization, the decrease in household labor is believed to change the presence of livestock on the farm; however, the household survey showed that 96.7%, 78.4%, and 100.0% of the households in Gasa, Paro and Wangdue, respectively, maintained the

[54] References to crop damage were limited to issues surrounding damage caused by grazing cattle, as referenced in an explanation of community or village based institutions where a person called "*Shingsungpa*" was specifically appointed as agricultural crop damage arbitrator. However, the only protection related to damage caused by grazing cattle (S. Wangchuk, 2005).

presence of cattle on the farm (Figure 5.7). The error bars on each column in Figure 5.7 indicate the range found within each *dzongkhag*. While the ranges are small in both Gasa and Wangdue, there was a community in Paro, the closest community to the urbanizing center of Paro, where less than 40% of the households owned cattle.

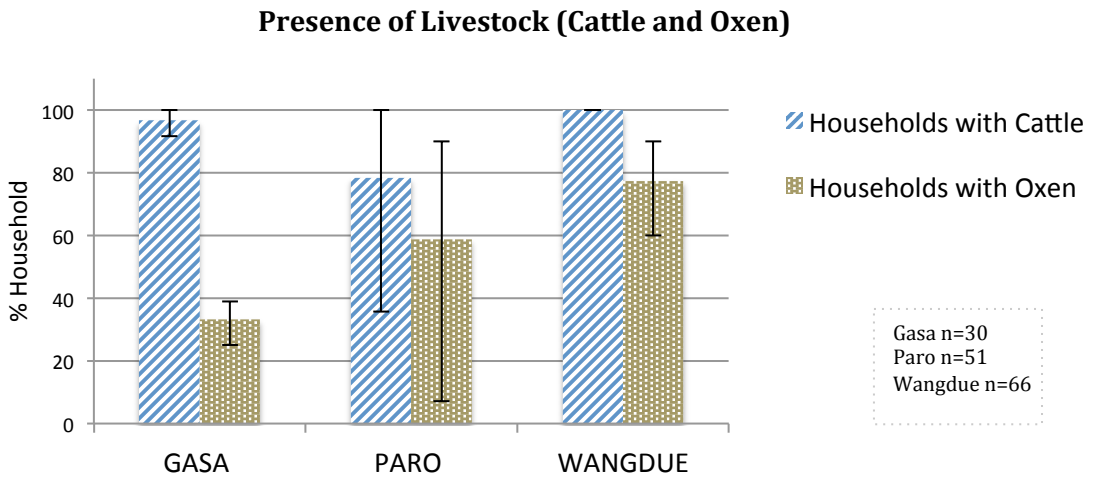


Figure 5.10 Comparison of proportion of households in region owning cattle and oxen

The scatter graphs below make further comparisons between the three regions (Figure 5.11). The graphs plot the area of cultivated land (x-axis) and the number of cattle in each household (y-axis). The difference in the relational patterns also suggests how unique the conditions under which agriculture practiced in Paro is. Throughout the *dzongkhag*, the number of cattle per household does not exceed five, even though the overall area of land cultivated is greater. In comparison, in Gasa and Wangdue, the range in the number of cattle per household is greater, ranging from 1 to a high of 14, while the overall area of land cultivated is markedly below 10 acres (Figure 5.11).

The overall decrease in cattle population in the most rapidly urbanizing areas of Paro suggests a correlation between development and population of livestock. What remains significant is the number of households who *do* still have cattle on their farms, ranging from 33.3% in Gasa to 77.3% in Wangdue.

The sustained presence of livestock can be attributed to their value as producers of milk products for both household consumption and trade between peasant farmers for other food items, or for selling in the market place. This trade is a critical, if not the only, source of

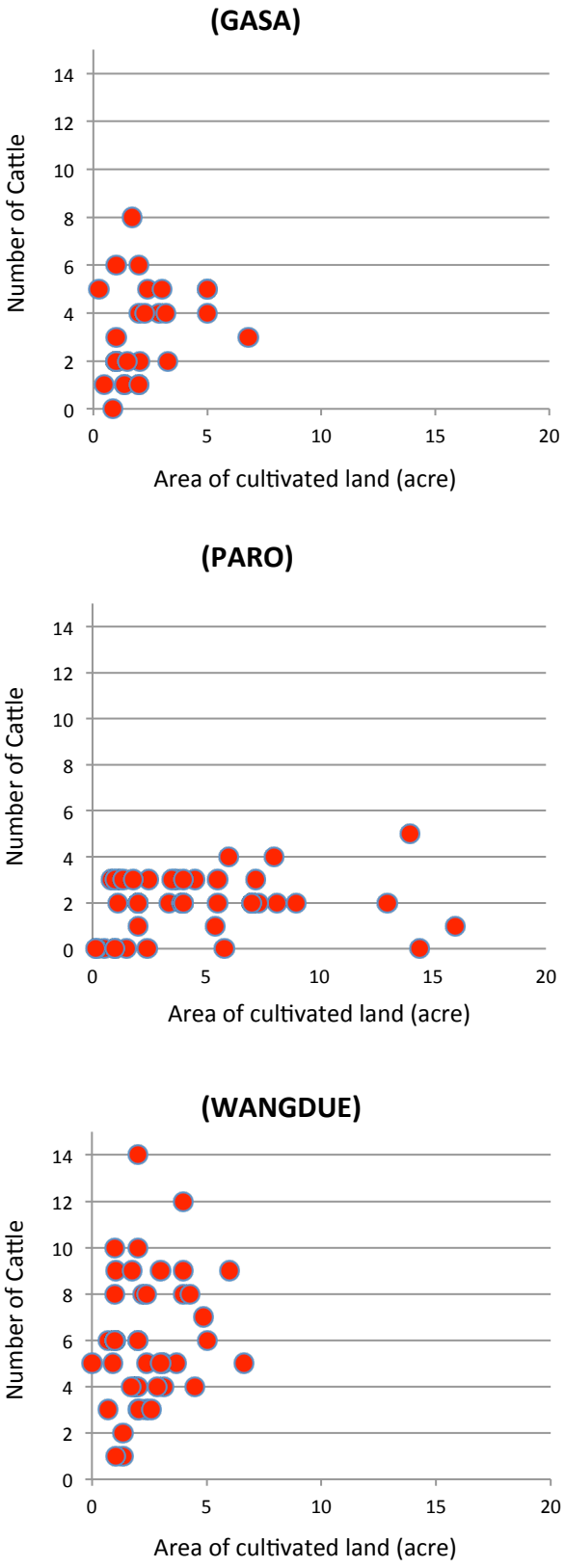


Figure 5.11 Scatter graph comparing relationship between number of cattle and area of cultivated land per household in the three *dzongkhags*

income for many subsistence level peasant farmers in Bhutan (PPD, 2015). Boosting dairy production by increasing the number of productive (improved breed) cattle and reducing the number of unproductive (local) cattle has been one form of intervention by the government's livestock department. In 2014, the ratio between improved breed cattle and the local breeds was roughly 1 to 3, with the former increasing at an annual rate of 1.1%, while the latter decreased at the same rate (PPD, 2015).

Local breed cows graze on nutrient poor grasses found in the forest. They produce less milk, but they do not get sick. Tomiyasu noted that if they eat nutrient dense grass, such as clover, they become more prone to sickness. Improved breed cattle (predominant varieties are Jerseys and Brown Swiss) produce more milk, but require more feed. To supplement the increasing need for cattle feed, there has been an increase of imported livestock feed. Although its quantity and prevalence are not yet confirmed, all animal feed currently manufactured and sold in Bhutan is from one supplier (Karma Feeds, headquarters located in Phuentsholing). In the three districts, 55.2%, 47.5% and 15.8% of households in Gasa, Paro, and Wangdue, respectively, mentioned that they rely on Karma feed for their milking cattle. Although Bhutan restricts the use of genetically modified materials, there is no official documentation proving whether the ingredients used for the feed are GMO or not. Given the rising levels of public concern regarding GMOs in many parts of the world, and given Bhutan's high dependence on cattle manure for soil fertility management, in addition to their interest in labeling their exported agricultural products as 'organic', careful monitoring of livestock feed is required. Furthermore, an increase in the number of improved breed cows requires a change in livestock rearing techniques, which commonly involves increased use of antibiotics. Monitoring the quality of manure and its residual impact on agricultural production will become necessary if strict standards for organic certification are to be employed.

5.6.2 Source of Fertilizer

Despite the decreasing reliance on cattle in Paro, a high preference for FYM (leaf litter and manure) was found in all three districts (Figure 5.12). Use of FYM is a tradition of such importance that peasant farmers who do not own livestock are able to borrow cattle from neighbors in order to manure their fields (W Roder et al., 2009). Such practices can be observed in Paro, where the decrease in the number of cattle is being supplemented by the procurement of manure from other farms. The use of synthetic fertilizers varied greatly

between the regions surveyed. Access and utilization of these resources is discussed further in the following chapter. As expected, Gasa had the lowest average usage at 3.3%, followed by 86.3% and 90.2% in Paro and Wangdue, respectively. The two latter *dzongkhags* both had communities where 100% of the households were using chemical fertilizers. Compared to the large variations seen between communities using PPC within each *dzongkhag*, there was less variation between communities using synthetic fertilizers.

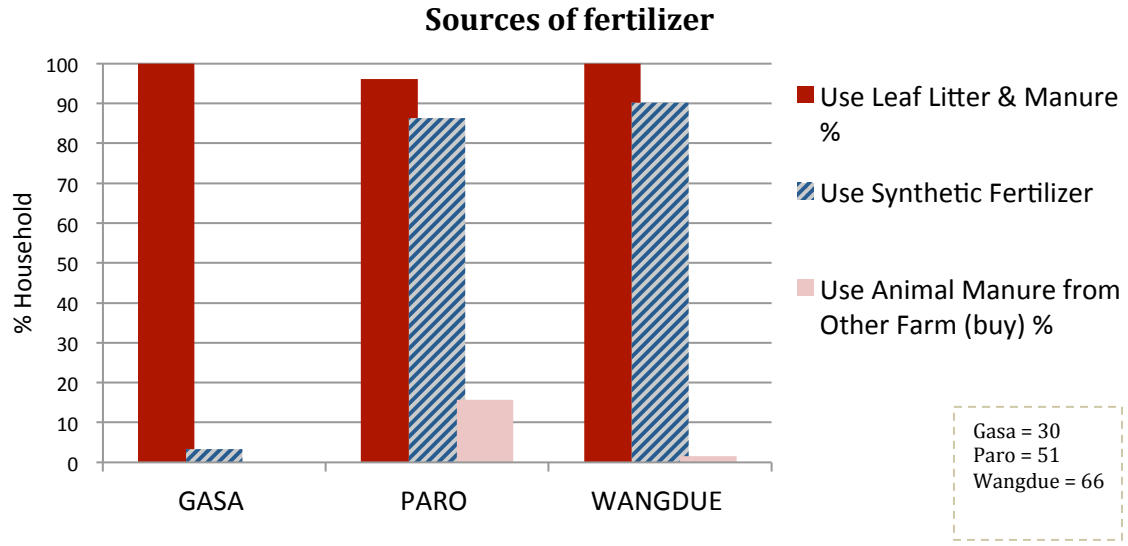


Figure 5.12 Source of fertilizer in the three *dzongkhags*

5.6.3 Patterns of Mechanization

A farmer in Paro, who also works at the AMC, mentioned how mechanization "freed the cows and horses from hard work that no animal should have to be subjected to" (interview: P. Dorji, 2014). A pamphlet created by the AMC proudly describes its mission as reducing drudgery and increasing per capita working capacity through mechanization by the use of power tillers or tractors (AMC, 2012).

According to the household survey, there were wide regional variations in the rate and timing of households implementing the use of machinery (Figure 5.13). Furthermore, in communities where there was high usage of mechanized plows, many continued to also have oxen on their farms.

In Figure 5.13, the grey column on the left hand side shows the percentage of surveyed farmhouses that were using farm machinery, particularly for tilling. The right hand column

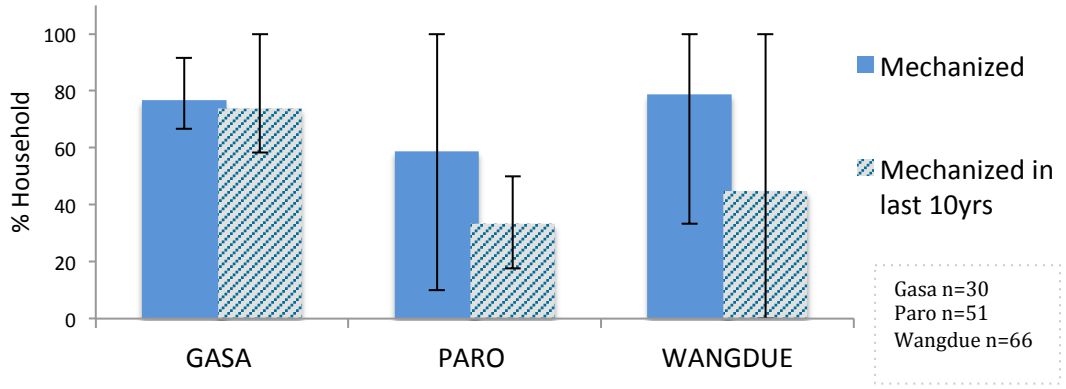


Figure 5.13 Variation in implementation of mechanized farming in the three *dzongkhags*. Bars showing average, with error bars showing range within each *dzongkhag*

shows the percentage that started to use machinery within the last ten years. The range within each *dzongkhag* is shown by the error bars in each column. Variations in mechanization were not great between communities. While the majority in Gasa (76.7%) use farm machinery, most initiated their use within the last ten years, correlating roughly with its designation as an organic district. While the prevalence of mechanization ranged from 100% to around 10% in one community in Paro, it held to a general average of around 30% in a community in Wangdue. The percentage of farms which started to use mechanized tools in the last ten years is relatively low, implying that mechanization occurred earlier, if incorporated at all. In a community in Paro almost no one was using mechanized equipment; people were still using draft animals for plowing, despite the fact that there were members in the community who had known Nishioka and had initiated the usage of farm machinery 40 years ago. They maintained that their land was too steep for a machine; in communities like this one, a high percentage of households had oxen by necessity. In communities with high percentages of mechanization, however, such as Bondey, in Paro where the AMC is located, there was a low percentage of households that still maintain oxen.

Figure 5.14 shows the relationship between mechanization and the presence of oxen on the farm. The percentage of households on the x-axis, and the percentage of households using mechanized plows on the y-axis. Each dot represents a community, and the color represents a different *dzongkhag*. There was no correlation between the usage of machine plow and the presence of oxen on the farm. Communities with high use of mechanized plows, particularly in Wangdue, were not replacing their oxen , most likely because the animals produce manure,

a valuable component of FYM (W Roder et al., 2009). In Gasa, the recent introduction of mechanized plows (Figure 5.13) seems to be more correlated to fewer households with oxen. In Paro, all trends are found: a highly mechanized community with few oxen, a community with few mechanized households with high number of households with oxen, and one where both are high.

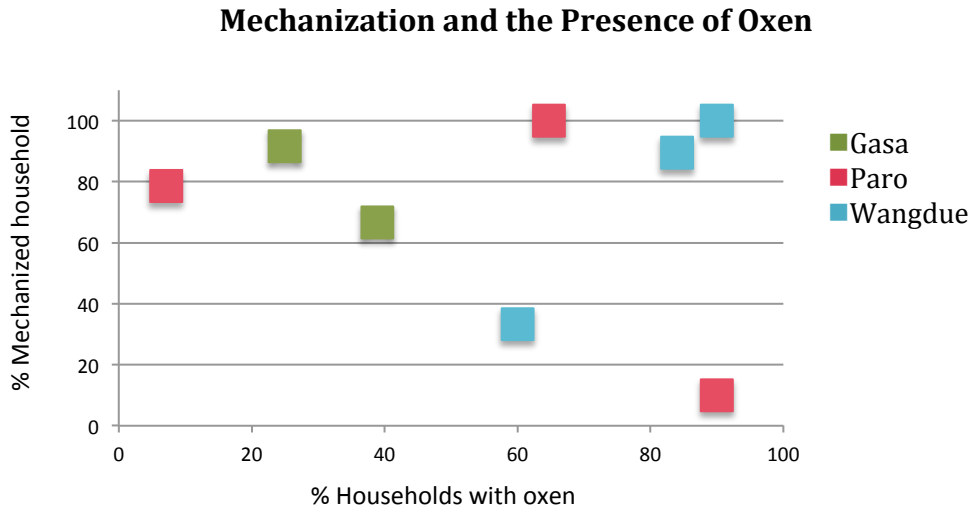


Figure 5.14 Relationship between proportion of households and oxen ownership

5.7 Emergence of Markets and the Changing Consumption Patterns

When the pioneering historian of Bhutan, Yoshiro Imaeda, first arrived in Thimphu in 1981, he described a complete absence of markets where he could buy fresh produce (2008). This reflects how, just three decades ago, even in the capital city of Thimphu, food was not being bought but procured through personally established social networks within the community or between extended family living nearby.

Although demand for vegetables existed in the past, fewer varieties were grown domestically. A peasant farmer in Paro described how the vegetables his grandparents cultivated were limited to turnip, radish, pumpkin, chilies, mustard greens (referred to as '*saag'*) and mustard seeds (for oil) (interview: K. Penjore, 2014). Plants, such as *Perilla frutescens* (known in Bhutan as '*Namnam'* and familiar in Japan as '*Egoma'*) and Sichuan pepper (*Zanthoxylum piperitum,* known in Bhutan as '*Thingney'* and in Japan as '*Sansho'*) would have also been common, as they still are today. An extensive variety of wild edible plants made up for limited cultivated varieties (Chhoeda, 2014); today local lore describes

how the lack of famine was due to the abundance of wild plants (Darabant, 2014). A few examples commonly harvested today include orchids (*Cymbidium hookeianum,* known locally as *Olache*), young ferns (known locally as *Nakay*), and wild asparagus (*Asparagus racemosus*) (Matsushima et al., 2006; Nakao & Nishioka, 2011). Choeda (2014) reported 33 varieties of wild vegetables at his study site in Tsirang, in south central Bhutan, of which 66% were reportedly consumed for their medicinal value, and the remaining for their nutritional value. Wild vegetables are still popular and are extensively gathered in order to be sold at local markets or along the roadsides. Various species, such as orchids, have been partially domesticated and cultivated nearby farmhouses, as marketable commodities (observed in Gasa and Tsirang). The consistent demand is said to be leading to overharvesting in the forests, contributing to an overall decline of the wild vegetable population (Chhoeda, 2014). However, as dietary preferences change among the younger generations, a gradual decrease in demand is also being reported, stemming from disinterest and leading to a loss of knowledge (Chhoeda 2014). The collection of 'wild' foods and materials play a significant role in what the NOP depends on for a large portion of what it has been reporting as domestic "organic" production (Willer & Lernoud, 2015).

Between 2000 and 2010, the area of vegetable cultivation increased from 1,675 ha to 9,508 ha (according to the RNR Census sited in MoAF, 2012b). With only a few exceptions (in Gasa and Paro), more than 90% of surveyed households in all three districts were selling some produce to the local markets (Figure 5.15). The majority also reported that their sales have increased in recent years. In Gasa, 80~100% of the households started selling within the last ten years, which again, correlates with when it was designated as an organic district. In Paro, approximately half of the households started to sell their produce within the last ten years. In Wangdue, the variation between the surveyed communities (marked with the error bar) was great (ranging from 0~100%). The low overall average indicate that many households have been selling for more than ten years.

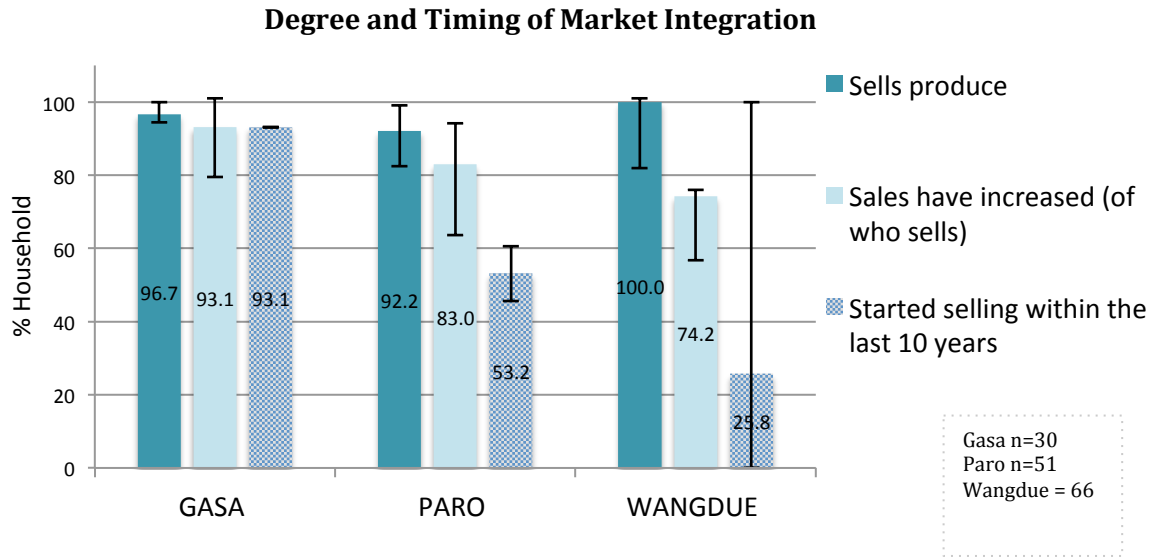


Figure 5.15 Regional comparison of the degree and timing of market integration

5.8 Discussion

Figure 5.16 outlines the dominant factors that contributed to the aforementioned changes in agricultural practices. Overall, the dominant response in all the communities was the need for more income, which included 21%, 33% and 38% of the surveyed households in Gasa, Paro, and Wangdue respectively. In addition, 26%, 20% and 28% of the households answered that they made changes because of suggestions given by the AEOs. Many of the enumerators employed were AEOs, which could have had influence over what responses were given, however, one can surmise that civil servants, who essentially represent the government, do have some authority over the changes that occur in how agriculture is practiced in these communities. In Paro, 33% of the households also considered the lack of labor to be a significant factor. In the former case, income does not refer to "labor income", which can be equated to income as a result of family labor input. The income that is becoming required here is surplus income in the form of cash, which can be reinvested or exchanged, enabling households to obtain goods (such as clothes, cooking oil, salt, sugar, tea, or electronic amenities such as a television or cell phone). On a peasant farm, capital is "family capital," (van der Ploeg, 2013); it is what allows the peasant family to sustain itself. Capital is what determines their ability to produce an income. Such income, however, is not profit. If profit were a priority, people would sell their land.

In Bhutan, it is not allowed to develop on farmland. Wetland must be maintained as

wetland. Exceptions are made when a piece of land is designated as a *thromde*, meaning that the land gets placed under the jurisdiction of the local government (Land Act 2007). In Paro, currently, there is conflict between the local peasant farmers and the government, which wants to convert some prime wetland into property to develop (T. Tashi, 2015). The peasant farmers are protesting such blatant efforts by the local government to expand urban development projects. One resident explained that the people of Paro are trying to protect their land "because they can not afford to lose their land". If the peasant farmers lose the land on which they grow rice, the conversion will increase the value of their land so that they will no longer be able to afford farming on it.

These various influencing factors are important when considering the methods by which new farming concepts and techniques, such as organic agriculture, are being incorporated.

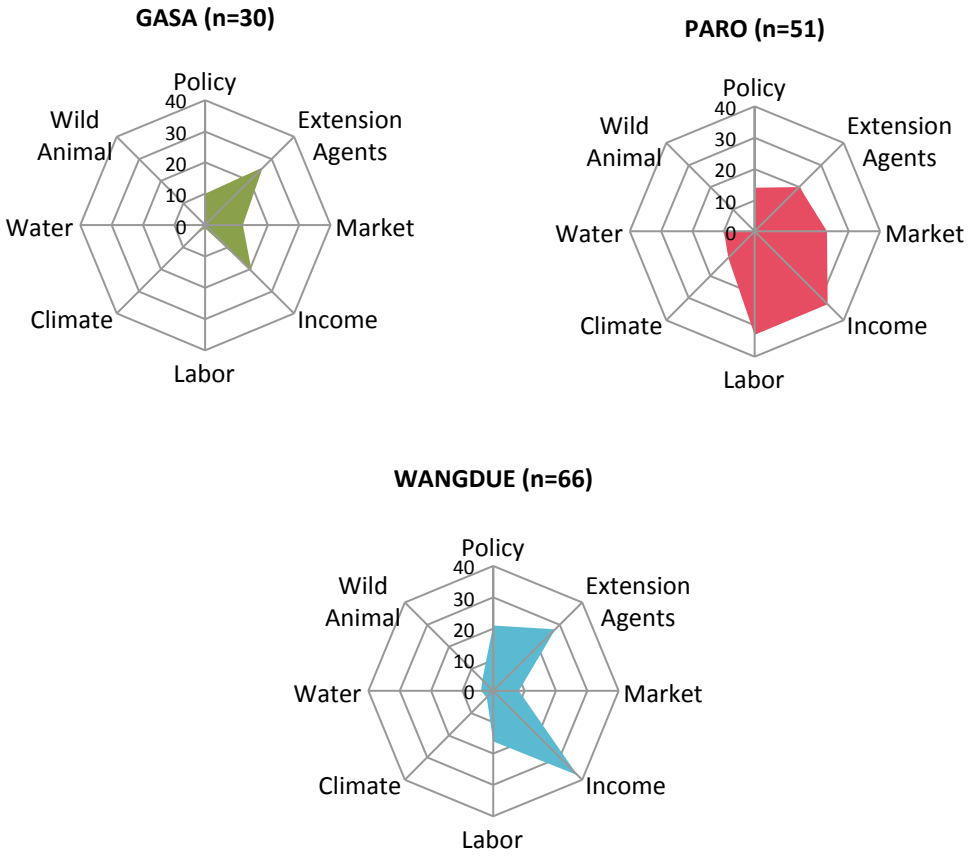


Figure 5.16 Regional variations in reasons for changing agricultural practices

In the midst of a growing and urbanizing population, pressure for agricultural modernization, increased domestic self-sufficiency, and sustainable agriculture has shaped agricultural policies since 1961 when the first FYP was initiated. From Keiji Nishioka's introduction of cash crop varieties from Japan, to the imports of hybrid vegetable seeds, initiated in 2006, Bhutan has attempted to diversify its production of food and expand its production and distribution of reliable high-quality seeds. While the number of marketed products diversified, it remains unclear whether overall seed variety has been diversified as a result of the government led introduction of new varieties.

The integration of hybrid seeds was quick, though depending on the region, its incorporation remains highly variable. Approximately half the farmers in Paro were using hybrid seeds to gain marketable products, while in Gasa the percentage stood at 13.3%. These variations can be attributed to differences in the overall economic standing of each region; some farmers are more able to afford expensive seeds, and have better access to markets, allowing them to make greater material investments. In Gasa, since it is a pilot district, the enforcement of organic agricultural standards could be playing a significant role. While no formal certification has been established, the NOSB adheres to basic international standards that place importance on planting materials well adapted to local conditions that are, wherever possible, produced under organic conditions. Hybrid seeds fail to adhere to such standards, as they require one to continually purchase new seeds every season. As such, when asked about the use of hybrid seeds, one organic farmer mentioned that it would be "against the norm." Nonetheless, curiosity towards hybrid seeds was high in Gasa, suggesting a potential increase in future demand.

The vast majority of farmers are maintaining the tradition of saving seeds. Though the seeds saved largely reflect major crop varieties common in each region, it is noteworthy how more than 50% (and up to 80% in Gasa) responded that they saved vegetable seeds. With increasing use of hybrid seeds overall, further investigation is necessary to see what vegetable varieties are saved and why.

In addition to saving seeds, peasant farmers sustain their reciprocal relationships of exchanging goods and services within and between communities, despite options available to buy or receive subsidized seeds from the government. While this can be understood as a preference, it can be deduced that seeds and goods being traded are serving an entirely different function than those that are bought and received from the government. Though still

a minority, survey results showed that 17.6%, 13.3% and 18.2% in Paro, Gasa, and Wandgue, respectively, were taking advantage of all options of seed acquisition, suggesting an opportunistic and flexible relationship to production, as well as proof that each source is fulfilling a different purpose, allowing for greater autonomy and even resilience. More than half of respondents in Gasa (53.3%) showed particularly high levels of dependency on subsidized seeds from the government, while many in Paro and Wangdue (45.1% and 28.8% respectively) relied on both the government and external sources of seeds, rather than on relationships of reciprocity. Nonetheless, traditional cases of exchange were being sustained in both regions, allowing for subsistence independent of the market. It should also be observed that in each region, patterns of dependency and the ability to remain relatively autonomous were not uniform, making way for diverse coping strategies and future changes as depopulation and aging of rural farming communities persist.

5.9 Summary

As introduced in chapter four, Bhutan has been trying to balance its effort to modernize while taking advantage of its unique position as a still developing country. This can most clearly be observed in the government's concerns surrounding food security.

Beyond the farmers' perceptions and understandings of the term 'organic', what is perhaps more significant is the importance the peasant farmers place on soil fertility management as a definitive element sustaining their lifestyle. The next chapter will look further into the significance of this finding.

A brief history was presented to clarify how vegetables came to be so prevalent in the markets in Bhutan today. Their introduction is influencing how farmers source and depend on resources which they cannot live without, such as seeds. With the establishment of domestic as well as international markets, together with extensive support from the Bhutanese government and foreign development agencies, there has been an increase in overall vegetable production over the past four decades, and a consequential need to change what, why and how certain seeds are acquired. Reciprocal relationships of exchanging labor or resources remain, serving to sustain economies independent of the market and the government. This can be observed by the difference between what is traded and what is bought or received from the government. While particular focus was placed on influences from Japan, further investigation is needed on the new and recent influences that are taking place, coming from India, Thailand, Denmark, and other European nations.

Increasingly, societies are advised to move away from top-down centralized modes of political and economic organization. Rather than a government-led effort towards decentralization, existing relationships of reciprocity surrounding seed procurement and food production should be further assessed in order to strengthen and expand upon their possibilities.

Nestled in the steep and heterogeneous climatic conditions of the Himalayan foothills, mechanization, though encouraged, is still difficult or impossible in many places. Though increasing, the use of synthetic input remains very low. Due to the limited access and high cost of synthetic fertilizers, most farmers continue to make use of locally available resources, such as leaf litter from *sokshing* forests. A lot of improved varieties of food crops are still at an experimental stage. Preferences towards traditional varieties of crops remain in many regions, as the plants serve many purposes beyond the provision of food. There is no clear answer to the question: how is Bhutan progressing in its vision to become the first 100% organic nation in the world, much less an answer to how Bhutan is going to achieve it. But what is clear is that we are witnessing a shift in the consumption patterns and priorities of a nation, leading to a material and symbolic re-ordering of agricultural practices. The gradual incorporation into the global agricultural and food product market is giving rise to new concerns and a need for improved monitoring systems.

Chapter 6 Transitions in Forest Leaf Litter Use and Agricultural Practices in Western Bhutan

6.1 Introduction to the tradition of *Sokshing*

The practice of collecting leaf litter from the forests to be used as FYM has been documented and studied throughout the Himalayan mountain range, principally in Nepal (Gilmour & Fisher, 1992) and in India (Mizuno, 2012, pp. 129–136; Rao & Saxena, 1996; Semwal et al., 2004). Agriculture in these vast mountain ranges can be perceived as mere patches in the larger matrix of the forests. But it has been these forests that livelihoods have relied on, through practices of crop-livestock-mixed farming practices well attuned to such agro-ecosystems. This chapter assesses to what extent the government led interest in organic agriculture has influenced existing farming practices, as well as how government led initiatives influence the ways in which peasant farmers are relating to their surrounding landscape, both ecologically and socially.

6.2 Government Led Conservation Policies

In order to implement strong conservation measures to protect the largest resource it had, the Bhutanese government decided to centralize regulation of forest management. The Forest Act of 1969 designated all forests, including *sokshing* and *tsamdrog* (grazing land for livestock, referred to in Ch. 2), as 'government reserved forest' (S. Wangchuk, 2001). Later re-defined under the Land Act of 1978, the land and trees in government forests were to belong exclusively to the government, but former landowners were given priority over the rights to collect leaf litter, though not allowed to cut down trees without an issued permit. In 2007, another new Land Act was passed, which, among other things, deleted all records of private and community ownership of *sokshing* and *tsamdrog,* (Kinga, 2010; M. of A. RGoB, 2008)[59]. Peasants have contested the implementation of the newest land act, declaring that "*sokshing* is a category of land, which they 'own' and not a 'right' that the state grants them" (Kinga, 2010). As a result, the act remains controversial and is only partially implemented,

[59] Like the *sokshing*, *tsamdro* rights were also deleted from the *Thram* with the passing of the Land Act in 2007. *Tsamdro* were reverted and are maintained as Government land or Government Reserved Forests land. Starting from 2017 (10 years after the enactment of the Land Act), the leasing of *tsamdro* will be limited to those who are residents of the *dzongkhag* where the *tsamdro* is located (RoGB, 2007 pg.200). This will fundamentally disable any migration the farmers have traditionally relied upon to winter their cattle in warmer climates.

with the idea and practice of ownership and use still unclear.

Studies have shown superior management practices of community owned forests compared to government owned forests (Rao & Saxena, 1996).

Studies have also been done to assess traditional institutions that supported sustainable resource use and management practices prior to the forests being nationalized (S. Wangchuk, 2005). Before any government interventions, forest plots near the farmsteads were utilized as *sokshing* by individual households; these plots were later registered under the name of the head of the household. As a source of fertility for their fields, *sokshing* was indispensible and, as such, carefully managed by the individual households and passed down through generations, in much the same way farmland would be passed down among family members (L. Dorji, Webb, & Shivakoti, 2003; S. Wangchuk, 2001).

Since the nationalization of forests, however, some *sokshing* has been converted and utilized for other purposes, such as apple orchards, as reported in Paro (S. Wangchuk, 2013). Private forests can also exist if the land was designated as farmland in the past and was then converted into a forest (interview: K. Penjore, 2014). Dryland farmland and orchards have higher property value, since it is possible to develop them. Wetland has lower property value, since by law, wetland must be maintained as wetland (further study is needed to assess which law this is and what its potential impacts are).

Such conversions, from *sokshing* to apple orchards or farmland to forests, are a reflection of the changing priorities placed on forests near villages. It also perhaps reflects a change in soil fertility management practices. The conversion may also reflect how the legal (*du jure*) ownership and locally significant (*de facto*) access and utilization rights are in fact ambiguous, and people are utilizing and exercising rights over these forest plots as traditionally recognized within the community. Increasing urban migration and aging within the rural communities, however, is causing a shortage of available farm labor. This, combined with the increasing availability of synthetic fertilizers, has led many scholars and policy makers to predict a decrease in the tradition of leaf litter collection (G. B. Chettri, Ghimiray, & Floyd, 2003; L. Dorji et al., 2003). Other studies have indicated an unwavering preference for FYM amongst farmers, and cases of overuse have been reported, leading to a decline in the *sokshing*'s leaf litter productivity (PPD, 2013). This has caused concern over the long-term sustainability of *sokshing* use if current usage patterns continue (Chhetri, Toomsan, Kaewpradit, & Limpinuntana, 2012; Walter Roder et al., 2003).

The nationalization of the forests, that was previously alluded to, essentially reduced *sokshing* 'owners' to 'proprietors,' by changing the arrangement of legal (*de jure*) rights the local residents had over forests. However, Lam Dorji found that *de jure* change had little significance for rural communities, since the acts still recognized household rights over leaf litter, enabling people to assert their rights over their *sokshing* (L. Dorji, Webb, & Shivakoti, 2006).

The stripping of property rights commonly leads to a loss of incentives to continue investing time and effort to maintain the property (Hardin, 1968). In 1997, in order to re-establish decentralized management institutions, the government of Bhutan established Community Forests.

Dr. Sangay Wangchuk, a nature conservation specialist in the Ministry of Agriculture and Forests, emphasized the negative implications of nationalizing the *sokshing*. When interviewed, he talked of how, in the past, everybody in the family would take part in looking after the *sokshing* (interview: S. Wangchuk, 2013). After it's nationalization, technically anybody could have access to the forest plots without needing consent from the previous owners. "This really hurt the sentiments of the owners", he explained. "These forests, which had been looked after for generations and generations, with huge oak trees", that had been carefully managed through pollarding, could now be altered without the consent of the former caretakers, whose access and use was also going to be restricted (S. Wangchuk, 2013).

6.3 Forest Leaf Litter Collection: Access and utilization of *Sokshing*

'Optimal foraging' patterns are believed to dictate where people gather their leaf litter, implying that communities work to maximize returns by accessing forest resources that are nearest to their villages (Scweik, 2000 in L. Dorji et al., 2006). As such, leaf litter can be collected from various locations, which today also include community forests, if managed for that purpose[60]. Community forests in Bhutan are also government-owned forestland, which community forest management groups are granted the management and use rights to. The rights are given according to a management plan established by the group and approved by

[60] The legal basis for community forests was created under the Forest and Nature Conservation Act 1995. There was an upsurge of new community forests starting in 2007, bringing the total number of approved community forests to 556, covering an area of 62,115ha (2.3% of total forest land), involving 23,808 rural households as of 2013 (R. Dorji, MoAF, Schmidt, & Intercooperation, 2014).

the Department of Forests and Park Services.

The dominant species found in the *sokshing* surrounding the study area are blue pine (also referred to as Himalayan pine) (*Pinus wallichiana*) in Paro, several species of oak (*Quescus griffithii* ; *Quercus semecarpifolia*) in Gasa, and a mixture of both in Wangdue[61].

Leaf litter is usually collected by the women in the community during the dry season (October to March). It may be collected by one person, as seen in the photo (Figure 6.3), or a group of as many as ten women helping each other within the community. During collection, smaller shrubs growing on the forest floor would be removed and piled up to make raking the leaves easier, while the secondary growths of preferred tree species would be left. Much of the leaves in these plots are apt to be removed during the collection season, leaving the forest floor quite barren.

Figure 6.1 Woman in Gasa collecting leaf litter in *sokshing* forest. January 2014

[61] In the wet tropics (altitude 200-800masl), major species used for leaf litter become *Schima wallichii* and *Castanopsis indca;* in the foot hill region (altitude 600-2,500masl) *Alnus nepalensis, S. wallichii* and *Quercus griffithii*; in the dry valleys (altitude 800-2,600 masl) *Pinus roxburghii, Q. griffithii, Q lanata* and *P. wallichiania;* and in alpine regions (altitude 2,700-3,500masl) *P. wallichiania* and *Q. semecarpifolia* (Chhetri, Toomsan, Kaewpradit, & Limpinuntana, 2012; Walter Roder, Dorji, & Gratzer, 2003).

Figure 6.2 Tools used to collect leaf litter - sickle, two three-pronged sticks used to rake leaves, and bamboo basket with rope to tie leaves down when carrying. Gasa, January 2014

Figure 6.3 Woman carrying leaf litter in Gasa. February 2014 (Photo by Tanka Maya Pulami)

Figure 6.4 Leaf litter pile at base of *sokshing* forest before collection by truck in Wangdue. February 2014

The collected leaf litter is brought back to the farmhouses and stockpiled in a shed (Figure 5.6) or piled up in a heap beside the farmhouse (Figure 6.6). The leaf litter is then used as bedding for the cattle for 10 to 15 days (Figure 6.8). Once mixed with cattle dung and urine, the leaf litter is put aside for 2to 3 months to mature, making FYM (Figure 6.8). The FYM is then brought into the fields (Figure 6.10) by the women (in much the same way the leaf litter is carried Figure 6.3) to be used as mulch or plowed in as fertilizer (Figure 6.11). While the exact amount and rate of use has not been calculated, two large mounds of pine needles were reduced to perhaps a quarter of their size after ten months (as shown in Figures 6.6 and 6.7), giving us a rough estimate of the amount of leaf litter that would have been utilized during the spring and summer seasons by a farming household in Paro. A study conducted by Chhetri, Ghimiray and Floyd (2003) suggests the average FYM application rates to be 7t/ha, which means it would fail to replenish adequate amounts of phosphorous to the soil, but it is enough to contribute to the maintenance of soil organic carbon.

Figure 6.5 Storage shed for collected leaf litter in Gasa. January 2014

Figure 6.6 Collected leaf litter piled near farm house in Paro. January 2014

Figure 6.7 Same leaf litter pile as seen in Figure 6.6 in Paro, 10 months later. November 2014

Figure 6.8 Cattle lying on collected leaf litter in Wangdue. February 2014

Figure 6.9 FYM maturing by farmhouse in Gasa. November 2015 (Photo by Tanka Maya Pulami)

Figure 6.10 FYM brought out into fields to be plowed in Gasa. February 2012 (Photo by Tanka Maya Pulami)

Figure 6.11 FYM being used as mulch in Gasa (Photo by Tanka Maya Pulami)

The forests in which the cattle graze remain an important source of cattle fodder to this day. Though slightly outdated, Roder et al. report how more than 50% of households surveyed in five *dzongkhags* brought their cattle to the forest to graze (Figure 6.12) (W. Roder, Gratzer, & Wangdi, 2002)[62]. They were brought to graze in the *sokshing* to return nutrients to the forests. The dung and urine left behind fertilized the forest floors. Such activity could be seen at a watering hole in a community forest utilized for leaf litter collection in Trashigang *Dzongkhag* in eastern Bhutan (Figure 6.13).

[62] Roder et al. reports on quantitative observations made on the impact of forest grazing. His findings show enhanced regeneration of conifer species, reduced damage by small rodents, but a reduction in the number and density of broad-leafed species (W. Roder, Gratzer, & Wangdi, 2002).

Figure 6.12 Watering pong for grazing cattle in community forest *Sokshing* found in Wakhar Village, Trashigang. October 2014

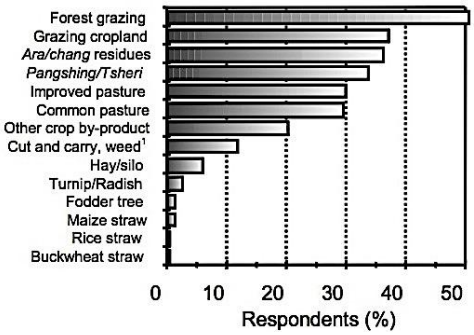


Figure 6.13 Fodder resources Main fodder resource during the summer period, listed by respondents from five districts (733 households) (Paro, Wangdue, Zhemgang, Trongsa and Bumthang)

6.4 Changing Patterns of Forest Leaf Litter Use

The household survey conducted during January and February, and again from September to December, 2014, indicated that 98.7% of the farmers surveyed used FYM, and 98.0% collected leaf litter in *sokshings*, confirming sustained utilization, as suggested by Chhetri et al. and Roder et al.. There were only three households that were no longer collecting leaf litter, two in Paro and one in Gasa. The reasons given in Paro included no longer owning livestock and an inability to continue collecting due to a shortage in labor. The household in Gasa stated simply that they were no longer using leaf litter.

As described in the previous chapter, since its introduction, government statistics have indicated a steady increase in the overall use of synthetic fertilizers. While promoting organic agriculture, the government has also emphasized the importance of boosting productivity as a means of increasing local incomes. The question that arises is whether synthetic fertilizers are replacing the tradition of leaf litter collection from nearby forests.

To see whether the collection patterns have changed and what factors may have contributed to these changes, we asked peasant farmers whether their leaf litter collection has increased, decreased or not changed over the last ten years. We compared this to other variables including changes in synthetic fertilizer use and area of cultivation.

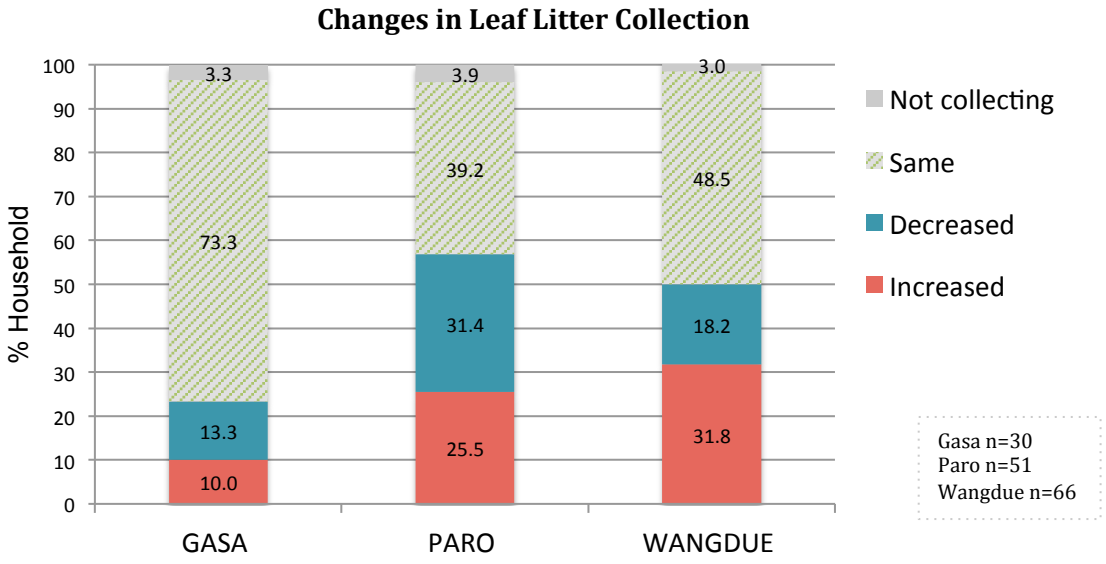


Figure 6.14 Regional differences in changing *sokshing* leaf litter collection

Overall, Wangude had the largest number of households who reported that their leaf litter collection has increased (31.8%), followed by Paro at 25.5% and Gasa at 10.0% (Figure 6.14). The largest number of houses with decreased leaf litter collection was seen in Paro (31.4%), followed by Wangdue (18.2%) and Gasa (13.3%). The majority in Gasa (73.3%), 48.5% in Wangdue, and 39.2% in Paro said that their leaf litter collection patterns have not changed. Only in Paro did we see households that were no longer collecting leaf litter.

The most common reasons for changing leaf litter collection practices are described in Table 6.1, organized by economic, social and environmental factors. The most prevalent reason for increasing leaf litter collection were economic reasons, founded on the need to

increase production. In contract, social and environmental factors were the predominant

Table 6.1 Factors contributing to changes in *Sokshing* use

	Increased	Decreased
ECONOMIC	● Increasing production (PARO/GASA/WANGDUE) ● Have more livestock (WANGDUE) ● To improve the soil (investment) (PARO)	● Fewer cattle (PARO) ● Trees used for timber (PARO)
SOCIAL	● Improved access with new road (PARO) ● Improved management of community forest (PARO)	● Shortage of labor (PARO) ● Farm road construction through their forest (GASA/WANGDUE) ● "Taken by the government" (PARO) ● Ownership removed (PARO) ● Population increase (more competition) (PARO/WANGDUE) ● Land divided between family members (WANGDUE)
ENVIRONMENTAL	● Trees producing more litter (PARO)	● Less trees due to wind storm (GASA) ● Forest fire (PARO) ● Aging of trees (PARO)

explanation for a decrease in leaf litter collection. Shortage of labor, road construction through their land, or their forests being 'taken by the government', or an overall increase in population within the community leading to increased competition over the same resource were mentioned. While causes for increase were predominantly proactive, cause for decrease were largely factors outside of the family's control.

6.4.1 Relationship between leaf litter collection and synthetic fertilizer use

As can be expected in an organic pilot district, no one reported an increase in synthetic fertilizer use in Gasa; whereas Paro and Wangdue, 53.0% and 35.3%, respectively, both reported an overall increase (Figure 6.15). On the other hand, 26.7% of the surveyed households in Gasa, 21.6% in Paro, and 12.1% in Wangdue reported that their overall use of synthetic fertilizers has decreased. While "same" signifies an unchanging pattern of usage in Paro and Wangdue, the majority in Gasa reported an unchanging pattern of non-usage, with 70% not using fertilizers (Figure 6.15).

The most common reasons for changing synthetic fertilizer use are described in Table 6.2, organized by economic, social and environmental factors. The most prevalent reasons for increasing synthetic fertilizer use were economic and social, founded on the need to increase production and to supplement labor shortages. In particular, an increase in synthetic fertilizer use was associated with an increase in area of potato cultivation, particularly in Wangdue.

The reasons for decreased usage were due to financial limitations and awareness of its negative impact, based on knowledge gained through a source in the community, or knowledge gained directly through experience, by observing the decreasing quality of the soil.

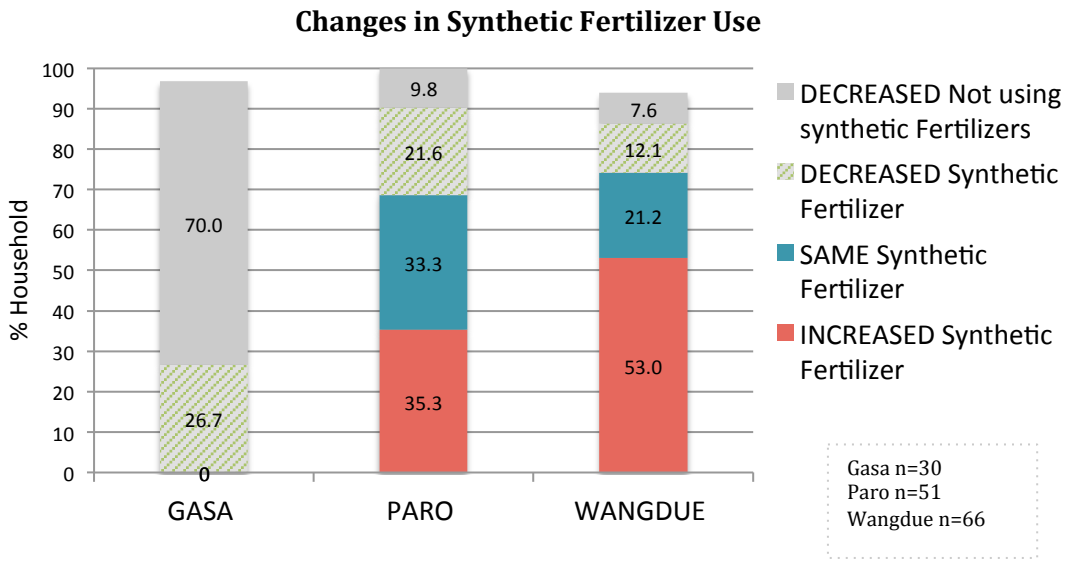


Figure 6.15 Regional differences in pattern of changing synthetic fertilizer use

Table 6.2 Factors contributing to changes in synthetic fertilizer use

	Increased	Decreased
ECONOMIC	● Increasing yield and quality of production (PARO/WANGDUE) ● Increasing production of potatoes (WANGDUE) ● Increase in production for sale (WANGDUE) ● Less cattle (PARO/WANGDUE) ● "Have to keep using" (PARO/WANGDUE) ● Borrowing more land (WANGDUE) (could be categorized as a social factor)	● Cultivating less (PARO) ● Becoming expensive (PARO/WANGDUE)
SOCIAL	● Lack of labor (PARO) ● Available in the market (PARO) ● Easy (WANGDUE)	● Information about the importance of using organic manure (PARO) ● Given awareness of organic agriculture (WANGDUE)
ENVIRONMENTAL		● "Because we know its effects are bad" (PARO) ● To improve soil quality (PARO/WANGDUE)

Results from a cross tabulation analysis between changes in leaf litter collection and changes is synthetic fertilizer use was conducted. Here, Gasa was excluded because synthetic fertilizer use is negligible. Leaf litter collection is described as "*sokshing* collection" in Figure 6.16 and 6.17 below. In red are households that have increased synthetic fertilizer use in each category of changing leaf litter collection pattern. A decrease in *sokshing* collection was not inversely correlated to an increase in synthetic fertilizer use in either Paro or Wangdue, where market incentives are increasing. Contrariwise, the largest percentage of households were increasing leaf litter collection alongside an increase in synthetic fertilizer use (15.7% in Paro and 24.2% in Wangdue). In Paro, among the people who said they were collecting basically the same amount of leaf litter, the largest proportion said they were decreasing their use of synthetic fertilizer (15.7%) (Figure 6.16). However, the largest proportion in Wangdue said they were sustaining their leaf litter collection patterns and increasing their use of synthetic fertilizers (19.7%) (Figure 6.17). While the trend is less compared to those increasing both their leaf litter collection and synthetic fertilizer use, there is a statistically significant portion of households who have replaced leaf litter use with synthetic fertilizer; namely 11.8% in Paro and 9.1% in Wangdue have decreased leaf litter use while increasing synthetic fertilizer use. The same can be said for households who decreased leaf litter collection but sustained the same level of synthetic fertilizer use.

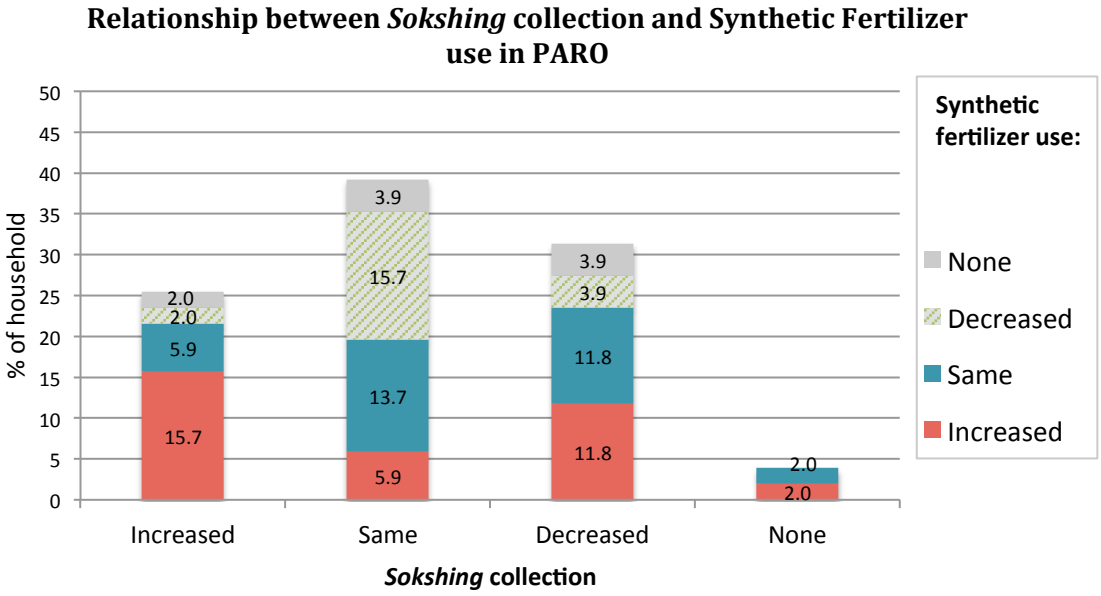


Figure 6.16 Relationship between changing patterns of *sokshing* use

and synthetic fertilizer use in Paro (n=51)

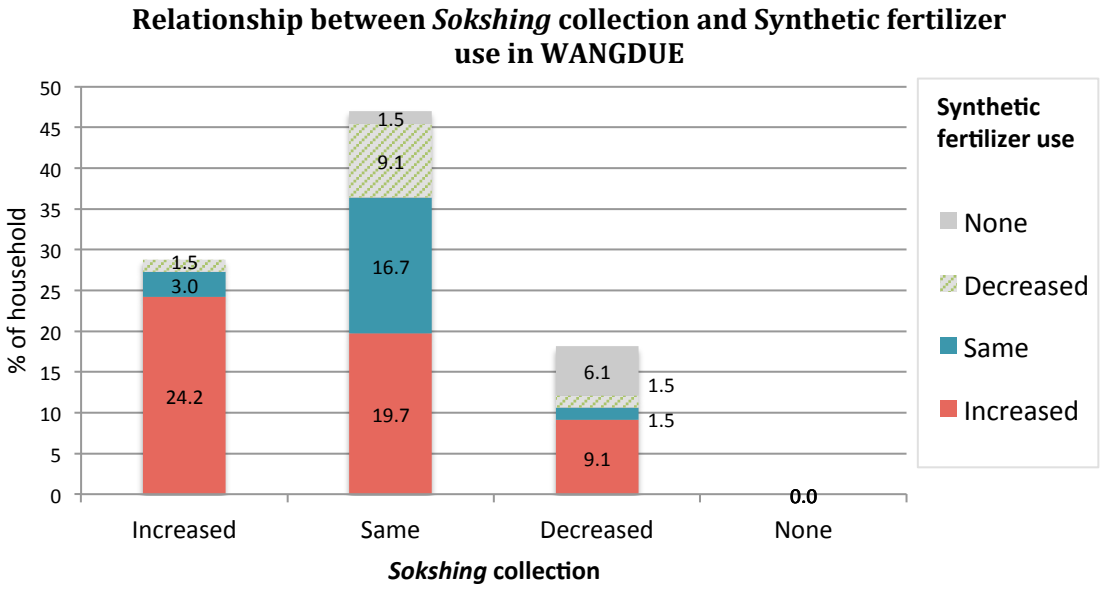


Figure 6.17 Relationship between changing patterns of *sokshing* use and synthetic fertilizer use in Wangdue (n=66)

6.4.2 Relationship between leaf litter collection and area of cultivation

Increased production has been mentioned as a reason for an increase in both leaf litter collection and synthetic fertilizer use. In order to assess the degree of intensification, and to further explore the reasons why changes in resource utilization were necessary, a cross tabulation analysis between changes in leaf litter collection and changes is area of cultivation was conducted. In red are households that increased their area of cultivation in each category of changing leaf litter collection pattern. Most significantly, in Gasa, of the 73.3% of the households that have not changed their leaf litter collection patterns, 43.3% mentioned that they increased their area of cultivation (Figure 6.18). The large number of households not changing their leaf litter collection patterns could be interpreted as a sign of stability, which may be due to Gasa's comparatively remote location; however a total of 56.7% of the respondents reported that they have increased their area of cultivation, giving 'economic incentives' as their predominant reason. This implies the use of a third source of fertilization in Gasa (one that is not leaf litter or synthetic fertilizer); or it is a misinterpretation of the word "same" in the survey. Regardless, a significantly large number of households in Gasa, are increasing production through increasing their area of cultivation.

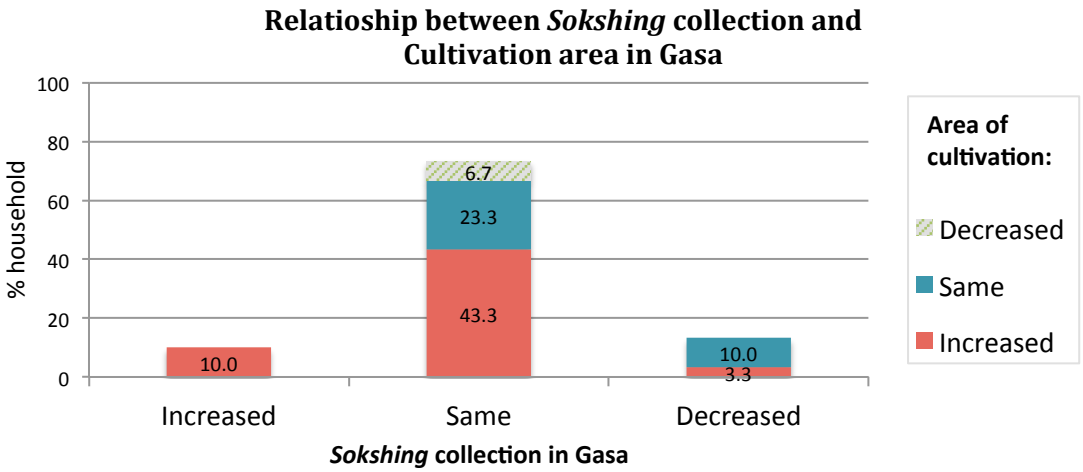


Figure 6.18 Relationship between changes in leaf litter collection and area of cultivated land in Gasa (n=30)

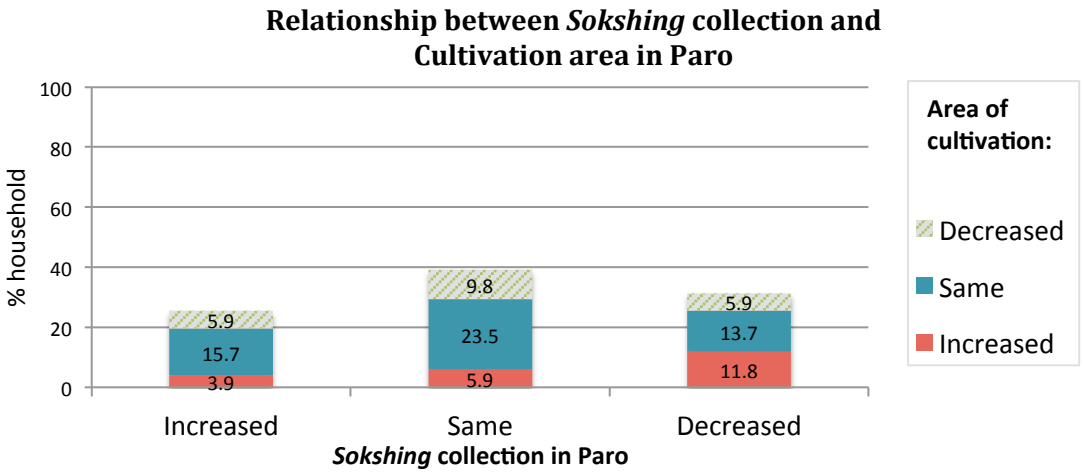


Figure 6.19 Relationship between changes in leaf litter collection and area of cultivated land in Paro (n=51)

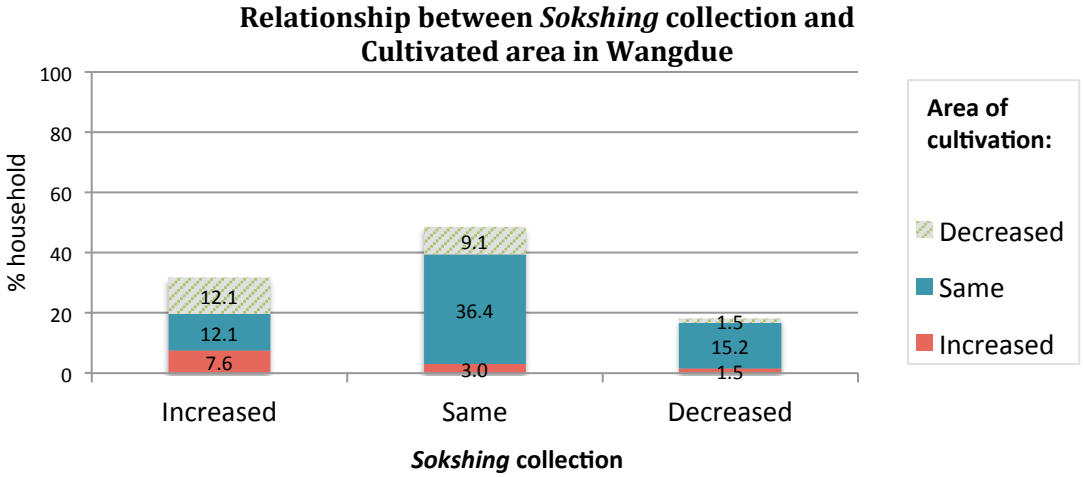


Figure 6.20 Relationship between changes in leaf litter collection and area of cultivation in Wangdue (n=66)

In both Paro and Wangdue, 39.2% and 48.5%, respectively, reported that the amount of leaf litter they collected has not changed (Figure 6.14). Even more so than in Gasa, 23.5% of the households in Paro, and 36.4% in Wangdue neither changed their leaf litter collection patterns nor their area of cultivation, suggesting a state of relative stability (Figures 6.19 and 6.20). Unlike Gasa, households in both Paro and Wangdue were not changing their area of cultivation, indicating that the intensification of production is achieved through increasing fertilizer inputs. It is curious, however, how 12.1% of the households in Wangdue who increased their leaf litter collection decreased their area of cultivation (Figure 6.20). Conversely, in Paro, 11.8% of the households who decreased their leaf litter collection increased their area of cultivation, implying an increase in alternative sources of fertilization (Figure 6.19). In the case of Paro, it can be assumed that this would more likely be synthetic forms of fertilizer.

6.5 Location of Leaf Litter Collection

While persistent in its use overall, how have government policies influenced where people access their leaf litter and the ways they use the available resources? With their legal (*du jour*) rights to utilize their inherited *sokshing* removed through the 2007 Land Act, how have the farmers changed their fertility sourcing practices? If there are changes, how may it vary between regions with different farming conditions? Figures 6.21 to 6.23 are flow diagrams describing three categories of forests where leaf litter are being collected. They include one's own *sokshing* forest, described as simply "*sokshing'* (in pink), implies that informal (*de facto*) rights of access, withdrawal and management are maintained within the

community. 'Government Forest' (in dark green) implies that *de jour* rights are recognized, and farmers are collecting leaf litter in forests where individual families have no management, withdrawal or exclusion rights. 'Community Forests' (in lighter green) are forest plots that only member households have the right to access, withdraw resources, manage and exclude others from entering. In red are households that were collecting from more that two forest categories.

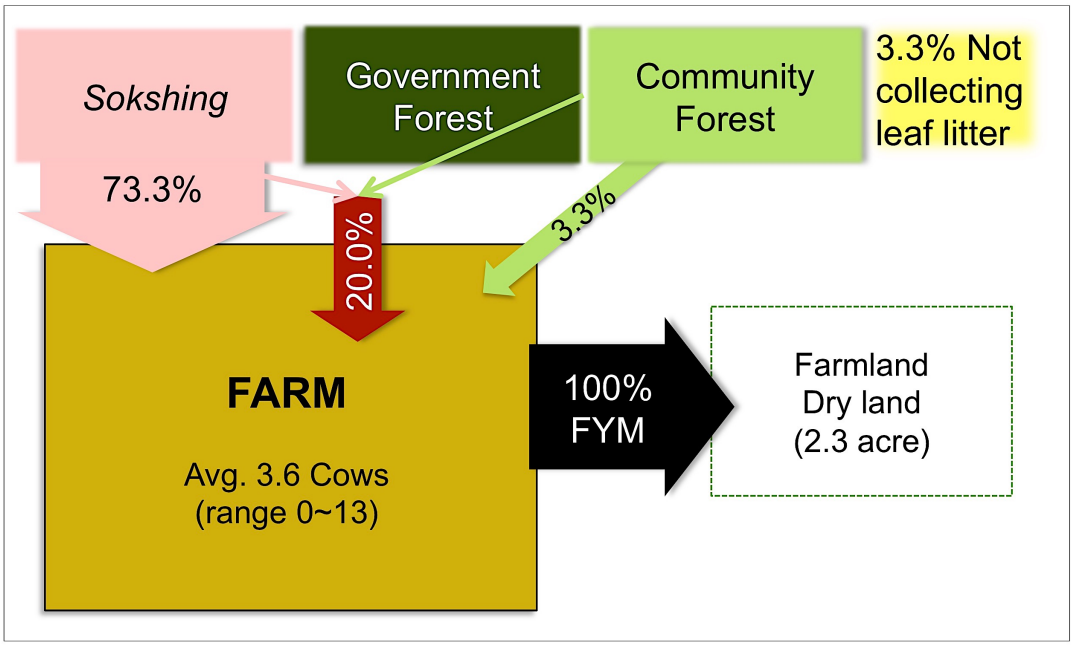


Figure 6.21 Distribution of where leaf litter is collected in **GASA**

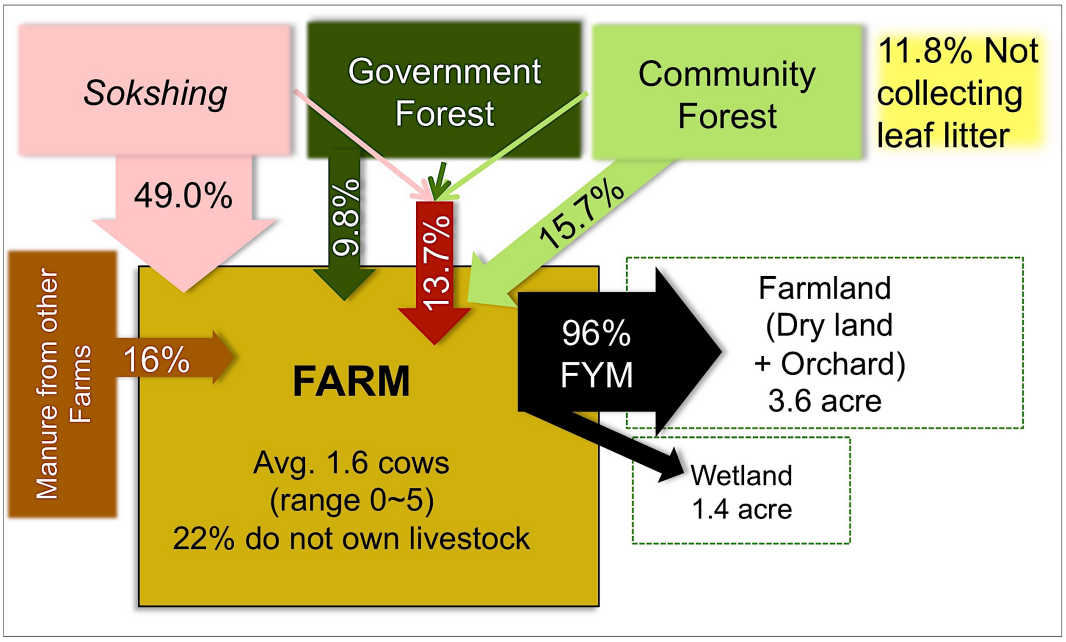


Figure 6.22 Distribution of where leaf litter is collected in **PARO**

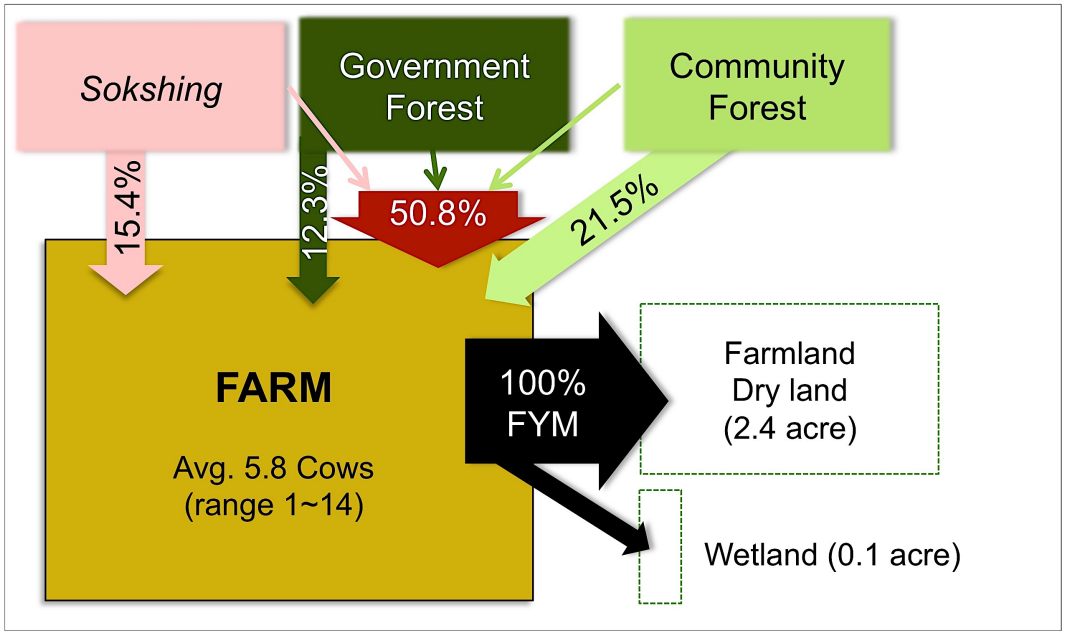


Figure 6.23 Distribution of where leaf litter is collected in **WANGDUE**

6.5.1 How Perceptions of Ownership and Access are Changing

In Gasa (Figure 6.21), the majority of households (73.3%) were only collecting leaf litter from their 'own *sokshing'*. Nobody mentioned that they collect from 'Government

Forests', and only 3.3% responded that they collect from 'Community Forests'. Some households said they collected from both their 'own *sokshing'* and 'Community Forest' (20%).

In Paro (Figure 6.22), the locations were slightly diversified. Approximately half the respondents (49.0%) reported they only collect from their 'own *sokshing'*, 15.7 % reported they collect from 'Community Forests', 9.8% reported they collect from 'Government Forests', while 13.7% reported they collect from more than one locations. Significantly, 11.8% were no longer collecting leaf litter, while, as mentioned earlier, 16% are procuring manure from other farms to supplement their lack.

In Wangdue (Figure 6.23), the locations for leaf litter collection varied even more. The largest number of households, 50.8%, reported that they collect from more than one category of forest, Fewer households (15.4%) collected only from their 'own' *sokshing*, 12.3% collected exclusively from 'Government Forests', and a comparatively larger number of households (21.5)% collected only from 'Community Forests'.

6.6 Discussion

Since the cost of synthetic fertilizers is increasing and relatively difficult to access, farmers still rely heavily on leaf litter. Overall, the largest decline in leaf litter collection was seen in Paro (31.4%), the region geographically closest to a rapidly urbanizing area. Wangdue had the second largest decline (18.2%), followed by Gasa (13.3%) (Figure 6.14). In Paro, 5.9% of the respondents said they also decreased the area of cultivation, which implies less overall production (Figure 6.19). They suggested this was in reaction to legislative changes that limited their access to *sokshings,* some specifying that forestland was "taken by the Government". In Paro and Wangdue, respondents indicated that increased competition over the same resource pool was one of the reasons given for decreased leaf litter collection. Other common explanations included division of family inheritance among siblings, wildlife damage, and farm road construction by the government. Conversely, the two primary reasons given for increased leaf litter collection in Paro and Wangdue were improved access to forests, due to the construction of new roads, and an increased need for leaf litter, in order to expand production on the farm.

Although an overall increase in synthetic fertilizer use substantiates data given by the government of their increasing distribution of synthetic fertilizers (MoAF, 2013a), this study showed that its distribution and usage patterns are extremely varied between regions. An

organic designation has a strong influence over how synthetic fertilizers are used, though there may be a slight bias especially in Gasa, as data was collected with government extension agents.

The region with the largest decrease in leaf litter collection was Paro, suggesting that urbanization may be leading to a decrease in *sokshing* use. Notwithstanding an increase in synthetic fertilizer use and 22% no longer owning livestock, the majority of households still relied on FYM. Even though circumstances prevent them from sourcing their own FYM, reliance on FYM still remains.

In order to increase production, farmers in Paro and Wangdue were resorting to greater use of fertilizers (both synthetic and FYM); in Gasa, very few farmers were increasing their overall fertilizer use, but were expanding their cultivation area. Further studies must be conducted to see how soil fertility is being maintained on larger cultivation areas, without increasing overall leaf litter collection, as well as to see whether other forms of fertilizer besides leaf litter and synthetic fertilizers are being used. In both Paro and Wangdue almost a quarter of the farmers reported that their area of cultivation decreased; the reasons given were land fragmentation in the course of inheritance, lack of labor and/or wildlife damage. Despite that, farmers in both areas were increasing their fertilizer inputs. Further assessment is necessary to see if this can be sustained in the long-term without compromising the productivity of both the farmland and *sokshing*, and weather the various approaches taken to increase production in the three regions adequate to sustain and increase soil fertility in the long term.

The perception farmers have of their "own *sokshing"* suggests that though *du jour* rights have been removed, *de facto* rights to exclusive access to *sokshing* remain stronger within some communities, such as in Gasa, where the majority collected from only one location, which each family considered its "own". The use of Community Forests as *sokshing* varied between regions, despite the fact that the MoAF census data show all three regions with a comparable percentage of community forest member households per total household (PPD, 2013). In community owned forests, every year the farmers gather together to decide when they will all go together and collect leaf litter. Efficiency in collection is of the essence, as you are only given that day to collect (S. Wangchuk, 2013). Further study is needed to explore how the various patterns of leaf litter collection, along with the perceived rights of access, influence the intensity of collection, and therefore the impact on the overall *sokshing*

ecosystem. This will be important in Bhutan's efforts to improve forest management and conservation, in order to prevent overharvesting. It will also help to establish a better argument for an organic agriculture that supports, rather than opposes, agricultural expansion and diversification.

In addition to grazing and providing locally available plants as fodder, there has been an increasing use of imported livestock feed to supplement the cattle's diet. Although the quantity and prevalence of its use are not yet confirmed, all animal feed currently being manufactured and sold is by one company. Although Bhutan restricts the use of genetically modified materials, there is no official documentation to prove whether the ingredients used for the feed are GMO or not. Given the rising levels of public concern regarding GMOs in many parts of the world, Bhutan's high dependence on cattle manure for soil fertility management, and Bhutan's interest in labeling its exported agricultural products as 'organic', careful monitoring of livestock feed is required. Furthermore, an increase in the number of improved breed cows requires a change in livestock rearing techniques, which commonly involves an increased use of antibiotics. Monitoring the mineralogical composition and the source of manure and its residual impact on agricultural production will become necessary if strict standards for organic certification are to be employed.

6.7 Summary

This chapter summarized findings based on farmers` perceived changes in how they manage soil fertility on their farms, and where they are collecting their leaf litter. Though the data does not represent absolute values, we can still see that despite predictions of an overall decrease in the use of leaf litter, based on expanding use of synthetic fertilizers and urbanization, farmers in Bhutan continue to be heavily dependent on FYM, and therefore *sokshing*. Farmers in different regions had varying connections to their *sokshing,* with regards to ownership and therefore access. In terms of supporting long-term forest health and agricultural productivity, the implications of state led decentralization policies through the establishment of Community Forests, amidst the nationalization of forest ownership, as opposed to *de facto* institutions of *sokshing* use, are all yet to be well understood. Presuming that the majority of farmers will continue to utilize FYM, greater attempts are necessary to make sure the optimal composition of fertility is sufficiently available to sustain increased agricultural production. Further evaluations with absolute values will strengthen this assessment and corroborate our findings.

Chapter 7 General Discussion

This chapter draws on the contents of the previous chapters in order to summarize, clarify and further corroborate my discussions regarding reactions and adaptations of peasant farmer communities in western Bhutan to the government's organic agriculture policy formally initiated in 2007.

7.1 Modernization as a Choice

Leading up to Bhutan's a agricultural modernization period, the pre-1960s economy revolved around extensive intra- and extra-community migrations of people and goods. Food procurement, as detailed in the excerpt from Kunzang Choden's memoir[63], was one that involved extensive trade networks reaching across the Himalayan mountain range into the Tibetan plateau, to the southern sub-tropical plains. Choden describes how necessary foods were gathered, cultivated and traded, with little to no involvement in capitalist market economies. Significantly, Choden's memoir probes us to think beyond conventional constructs of modern markets by reminding us of the international trade that was endemic before Bhutan "opened up" its borders to the outside world, often symbolized by the completion of the first motorable road from India in 1961.

Post 1960s agricultural modernization was characterized by government tailored incentives, particularly by the introduction of synthetic fertilizers. As reflected in the ways in which synthetic fertilizers were referred to as *Zhingkha-Khi* (government fertilizer) or *Jaga lue* (Indian fertilizers), the initial introduction and promotion of synthetic fertilizers were closely related to India-led government interventions to encourage the intensification and commodification of agriculture. As Bhutan's first and primary trading partner, India critically influenced the foundations of Bhutan's agricultural sector as it was being established.

The government made conscious efforts to incorporate development models based on sustainable intensification as a reaction to the initial introduction of technologies inspired by the green revolution during the 1960s, 70s, and 80s. This was reflected in the incorporation of IMP techniques, which went alongside the discontinuation of government subsidies that provided for PPC, as well as seeds and livestock breeds that produced higher yields. Emphasis was placed on the introduction of new vegetable cultivars from Japan, leading up to the introduction of hybrid seeds in 2006. This fundamentally changed the role of vegetable

[63] Excerpt referenced in Chapter 4 (Choden, 2007).

production from being mainly for subsistence to a commodity to be sold.

The newly developing economy has essentially transformed agriculture, from being one activity among many that supported rural lifestyles, into a sector that "employed" more than half of the population of Bhutan. Despite a self-described emphasis on GNH, contemporary values placed on agriculture are predominantly based on national GDP on overall economic growth[64]. The government's interest in organic agriculture must, therefore, be understood as stemming from a reaction 1) to interventions based on green revolution technologies, and 2) to growing market opportunities for organic products as a means to contribute to the rural economy.

As a means for supporting the notion of organic agriculture, government reports and studies have highlighted Bhutan as a country that is 'organic by default'. This was based on the reasonable assumption that Bhutan has a comparatively low dependence on synthetic inputs. While dependence on synthetic inputs are low in most regions of Bhutan, as evidenced in the RNR census (PPD, 2015, p. 61), my study shows that this does not characterize the whole country. Additionally, while "organic by default" may allow for easy certification based on the non-use of synthetic inputs, it places an ideological blinder, distracting from the more challenging issue of achieving a standard of "productive organic", to directly address the larger politics of food security in Bhutan.

One of the main challenges to achieving food security in Bhutan is the inherently poor quality of the soil, which requires support to expand agricultural production. In response to this, government research centers have consistently made recommendations to supplement FYM application with synthetic fertilizers. The result has been widespread reliance on synthetic amendments found in the majority of households in Paro and Wangdue. Optimizing organic production compels an alternative be found for what these amendments provide beyond simply scaling up leaf litter and manure application, if it is to be ecologically sustainable.

Results from the household questionnaire survey help substantiate this claim. Three *dzongkhags* in western Bhutan: Gasa, Paro and Wangdue, were selected as regions most exposed to the socio-cultural, political and economic changes taking place in Bhutan. The communities selected are all relatively accessible to major markets: namely the capital city of

[64] RNR sector contribution to GDP is reported a major section in the biennial Bhutan RNR statistics, published by the PPD, MoAF. According to the most recent report, share of RNR sector in 2013 was 16.18% of total GDP (PPD, 2015).

Thimphu; the border town of Phuntsoling, the largest gateway city enabling trade with India; as well as Punakha town and Bajo town in Wangdue, two rapidly developing towns closest to the construction sites of the Punatsangchuu hydroelectric dam projects. Gasa was chosen because of its status as the first *dzongkhag* to be designated as an organic district. Paro and Wangdue are agriculturally active *dzongkhags* that are not mandated to follow organic standards, but are instead known as districts with the highest rates of synthetic chemical use, after Thimphu *Dzongkhag*. Paro is a fast urbanizing district, known for its rice paddies and apple orchards. It benefits from improved access to major markets, as well as imported technologies, since both the SNC and AMC are located there. Wangdue represents a region that is more remote, with greater dependence on the sustained production of a cash crop, in this case potato cultivation, the most important cash crop in Bhutan today. Each district, in effect, represented a different response or adaptation to the process of agricultural modernization.

Chapter 5 highlighted the results from the household questionnaire survey. Variations were seen in the dynamic responses by peasant farmers regarding the changing contexts and needs in agriculture in Bhutan today. Significantly, the survey revealed the various ways peasant farming communities are incorporating and adjusting to the development of the agricultural sector and the introductions of modern farming techniques. Results depicted regional variations in the degree of awareness, understanding and expectation for organic agriculture. Regional variations were also found in the materials and technological adaptations employed by peasant farmers, in the procurement of seeds, the use of synthetic chemical inputs, the presence of cattle and oxen on the farm, and the actions and activities taken as a result of these choices.

While the government's emphasis on organic policies has been present for a decade, survey results showed that the concept of 'organic' was not well understood among the peasant farmer population. Familiarity with the concept of organic was expectedly high in Gasa, followed by Paro, then Wangdue. Variations in the level of familiarity could be recognized as largely dependent on government initiatives, as seen in Gasa. In communities with limited to no government directed efforts towards institutionalizing organic agriculture, awareness levels were significantly lower. Moderate awareness of organic agriculture in Paro was possibly due to higher rates of literacy and greater access to information, alongside an awareness of and interest in the diversity of market demands, as seen in their more optimistic

outlook for organic agriculture contributing to greater income. By contrast, in regions where there are established sources of income, such as with potato production in Wangdue, peasant farmers were either not aware of the concept of organic agriculture, or if they were aware, they were not optimistic about any long-term prospects, as they had no incentive to be. Among those familiar with the concept of organic, this study found that the peasant farmer definition of organic placed highest emphasis on soil fertility management methods, i.e. the use of leaf litter and animal manure.

Though not found as a direct reflection of the organic policy that the government emphasizes, results of the survey show that households were sustaining a localized resource base, as observed in the high degree of seed saving and the varied but sustained presence of cattle and oxen on the farm.

To further emphasize how traditional agricultural practices were transitioning, attention was given to one of the only residual SFM practices relied upon to replenish soil fertility, without depending on imported synthetic amendments. Chapter 6 documented forest leaf litter access and use, and elaborated on survey findings to show how leaf litter collection remains a dominant practice in western Bhutan today. While decreasing the most in the most urbanized communities, the practice was being maintained, while actively adapting itself to changing economic, agro-ecological and socio-political circumstances. These adaptations are in relation to both local and non-local influences, such as family subdividing land for inheritance or forest fires (local); and government removal of forest ownership and exclusion rights (nonlocal), in some cases leading to the government constructing a road through what had been a family-owned *sokshing* forest. Whether a local or nonlocal influence, specific factors contribute to how and why peasant farmers choose to manage their resources in a particular way. Unlike assumptions made in government reports or former studies forecasting its decline, my study found that leaf litter collection practices were not being replaced by an increasing use of synthetic fertilizers but, instead, were being sustained, if not intensifying, within the surveyed communities. The survey further showed that the majority of households that were increasing leaf litter collection were doing so alongside an expanding use of synthetic fertilizers. In Gasa, where synthetic amendments are not possible, a greater number of households were expanding their cultivation area, in order to accommodate for the need to strengthen production. This further shows how the surveyed communities are firmly integrated into a changing market economy. This again demonstrates how “organic by

default" cannot be supported as a benchmark standard to describe communities engaging in agriculture; it is not a desirable concept for framing agricultural development in Bhutan. A more proactive approach to organic agriculture is necessary to meet the needs of the peasant farmers who are, themselves, actively negotiating their integration into the market economy. While this study highlighted the practice of leaf litter collection as a reflection of a sustained locally specific tradition that supports the ideals of organic agriculture, it simultaneously elucidates the underlying difficulty in securing organic nutrients in the context of changing government policies, in this case referring to the 2007 Land Act. Locations for leaf litter collection were most diversified in Wangdue, with 50.8% collecting leaf litter from more than one category of forest; however, this was not necessarily increasing access to leaf litter, as those who were decreasing leaf litter collection were doing so in response to increasing competition over the resource within the community. The highest decrease in leaf litter collection was found in Paro, with almost a third of the surveyed households mentioning a decrease, referred causes were also demographic, both with increased competition with other community members for the same resource, as well as decreased availability of labor.

Significantly, this section of my study found that *sokshing* practices were playing an important role in increasing rural economic activity, and, simultaneously, government policies were confining access and usage of *sokshing*, ultimately contradicting its efforts to increase productivity in order to enhance rural livelihoods. While overuse has been reported as a concern, further assessment as to the different levels of impact based on varying patterns of leaf litter collection should be made.

7.2 Limitations of Government Incentives

Bhutan's developmental philosophy, legitimated by mounting global concerns surrounding environmental destruction, helped to guide the government's priorities. Promoting organic production has been a strategic move on the government's part, given their interest in establishing "Brand Bhutan"[65], essentially based on the marketing of the country's clean image: a way to add value to a whole range of products from Bhutan, from red rice to packaged tours. This was evident in how the concept of organic agriculture has been observed since the 1990s. In the text of "Bhutan 2020: A Vision for Peace, Prosperity and Happiness", organic agriculture is described in reference to activities that could help

[65] As explicitly described in Bhutan's Economic Development Policy (RGoB, 2010).

extend Bhutan's 'clean image', a means by which to achieve larger economic goals (P. C. RGoB, 1999a).

Ever since former Prime Minister Gigme Thinley Dorji announced to the world that organic is a national prerogative for Bhutan, it has received considerable media attention, setting Bhutan apart as a beacon in progressive governance. In the annual report on global organic agricultural statistics and trends compiled by IFOAM and FiBL, Bhutan was referred to as a "spiritual lighthouse", the only country in the world that has chosen to be wholly organic (Willer & Lernoud, 2015). In this way, the organic policy has become not only an approach to improved food production, but an important reflection of Bhutan as a country, and the ideals by which she stands.

Pressure to increase food security on a national level is also a critical motivating factor in Bhutan, given its high dependence on India for food imports, which increases Bhutan's vulnerability to price fluctuations through exposure to world markets. Food insecurity is also fueled by internal factors, however, such as those stemming from an increasingly urban population or changes in food preferences. Efforts to overcome the causes of limited production, by increasing activities that prioritize economies of scale (i.e. incorporation of hybrid seeds), and by replacing resources and their limiting factors (i.e. cattle and machine plows), and (what is seemingly contradictory where emphasis on increased production is concerned) by using synthetic fertilizers and plant protection chemicals.

This study reinforces previous findings that FYM is still the foundation of household SFM practices. However, the high and increasing reliance on synthetic fertilizers to meet necessary productivity levels, as seen in Paro and Wangdue (instituted since the decidedly non-organic phase of agricultural modernization in Bhutan), as well as the increase in cultivation area that was found in Gasa since its initiatives as an organic district, all suggest a more comprehensive need for increased productivity, not only to improve national food security, but to simply support the well-being and assure the survival of individual households. This must be supported by proactive efforts to build soil fertility. Merely promoting the ideals of organic will not achieve this, as evident in the low awareness levels found in this study. A broad transition to "productive organic" must be supported by soil science extensionists, to meet the idiosyncratic needs of varying farm soils in their different agroecological conditions in ways that supplement the folk knowledge of soil quality that exists.

7.3 The Living Peasant

Emphasis placed on the concept of 'peasant farmer' was important, in order to enable an evaluation of agricultural activities based on adaptations to changing circumstances, rather than a mere assessment based on quantification of production.

More recent discourse is increasingly re-recognizing peasants as an important category of people, represented by innovative capacities to respond to constant changes, who work toward improving and protecting the regenerative capacity of the social and ecological resource bases on which they rely for survival (Milone, Ventura, & Ye, 2015, p. 4). The activities of peasants typically revolve around multiple forms of livelihood activities, "including agriculture, wage labor, pastoralism and livestock production, artisanal production, fishing and hunting, gathering of plant or mineral resources, petty commerce, and a variety of other skilled and unskilled occupations" (Edelman, 2013). This ultimately contributies to creating and sustaining their autonomy, not only for themselves but for the wider rural economy, in order to reduce economic and environmental risks. This is accomplished by minimizing dependency on external inputs and pressures, and maximizing creative adaptations to external circumstances, thus lending itself to the differentiation made between peasant and entrepreneurial modes of farming, described by the degree of autonomy that is built into the resource base (Milone, Ventura, & Ye, 2015, pp. 328–329; van der Ploeg, 2009, pp. 20–23). In other words, it is based on the farmers' ability to directly access and use what they need to sustain their means of subsistence.

The Himalayas, perhaps more than any other region on earth, necessitates a conglomeration of highly diversified mixes and modes of farming. Evolution of the market economy through the course of modernization is homogenizing the logic of practicing agriculture. The development of the agriculture sector in and of itself contributed to the definition of such a logic, also reflected in the ways organic agriculture is emphasized by the government.

The need for income is rising overall, as evident from findings that saw all farmers in all communities, with very few exceptions, responding that they are selling produce to the market, with a desire to sell more in the future. Private initiatives on organic production were a reflection of independent incentives and opportunities that may be increasing within the urban community, rather than simply the result of government promotion and/or intervention.

The procurement patterns of seeds, described by respondents, showed the coexistence

of hybrid seeds with OP seeds, and specifying an increasing potential desire for hybrid seed use in the future. This suggests an increase in a market oriented mode of production and an increased dependence on an international network of formal seed systems. Gasa in particular had an exceptionally high dependence on government supplied seeds. Despite this trend, the survey results showed that most households were saving many varieties of seeds, both for commercial and household use. Other than saving seeds, farmers procured seeds through trading between and amongst community members, government distribution, and buying seeds. The study found that while the procurement sources of seeds are changing, a degree of autonomy was maintained through a sustained system of reciprocity and through having multiple sources for seeds. The degree of seed sovereignty varied drastically between communities, based on access to government programs and to the market.

Furthermore, the persistent reliance on *sokshing* leaf litter collection can also be understood as a reflection of the peasant farmers' ability to minimize dependency on external inputs and pressures, enabling households to respond and adapt to societal changes and family needs.

During a conversation with an individual who calls himself a "farmer", when communicating in English, I asked what a "farmer" would be called in the *dzongkhag* language. He lived in the most rapidly urbanizing area of Paro, making a living through the sales of shiitake mushrooms and apples, among other commodities; he is someone I would not hesitate to call an entrepreneurial farmer. He offered three words: *Menap*, *Sanampa* and *Zingpa* as terms that could be used to translate "farmer". Of the three, he explained that *Sanampa* and *Zingpa* were relatively new words, and that *Menap* was the term most comparable to peasant. When I asked him what he considered himself to be, he quickly answered "*Menap*". When I asked him why he considered himself a *Menap*, he said that it is very difficult to explain. However, it was in this vague but definite difference, that seemed to embody the very transition Bhutan is going through. The conceptual difference that exists within Bhutan between a "farmer" and a "peasant" seemed to be represented by the newly introduced emphasis on agriculture as an economic activity, versus the sustained emphasis on activities that enable individuals to continue living in rural areas. Rather than a transition from "conventional" to "organic", as is often described, it is in introducing the concept of "farmer" versus the sustained identity of individuals as "peasants" that embodies the

transition that is taking place in Bhutan today.

As earlier emphasized, the increase in market dependency often shifts priorities more towards an artificialization of agriculture, where locally available resources, such as manure, grass fodder, or labor, ecome economic resources that are easily replaced by synthetic chemical inputs, concentrated feed, and machines, leading to new dependency relationships. A focus on a market oriented frame of analysis critically overlooks how peasants are a heterogeneous group that have been pressured from many sides for innumerable reasons, including current state-led developments. Accordingly, they cannot be recognized independent of the variability in their agency in order for interventions, such as the organic agriculture policy, to be effective.

For the peasant farmers, "organic agriculture" cannot be simplified into a broad goal, it must be a means to a larger expression of development. It is in the need to sustain a livelihood that results in expressions of adaptations to various external priorities.

The term 'organic farming', since it was first used by Lord Northbourne in his book *Look to the Land* (1940)[66], embraced a vision of farming that "did not refer solely to the use of living materials (organic manures, etc.) in agriculture, although obviously included them", but an "emphasis on 'wholeness'", best encompassed by the definition "of, pertaining to, or characterized by systematic connection or coordination of parts of the one whole (Oxford English Dictionary, 1971)" (Scofield, 1986). Since then, the term has been shaped and refined, appropriated and misappropriated to a significant extent by producers and distributers throughout the world. Today, beyond providing a legal framework, the concept has been employed by the government as a means by which to give shape to a vision for a better future.

Apart from the customary objectives of development: to increase GDP on a national level and increase incomes at the household level, the government of Bhutan emphasizes development as including the achievement of less quantifiable objectives. They include "ensuring the emotional well being of the population, the preservation of Bhutan's cultural heritage and its rich and varied natural resources" (RGoB, 1991, p. 22). These are principles that were inherited from Buddhist philosophy, one of the main features of which is the importance placed on environmental conservation, which includes respect for all sentient

[66] Lord Northbourne embraced the teachings of Rudolph Steiner's biodynamic farming and held a "vision of a farm as a sustainable, ecologically stable, self-contained unit, biologically complete and balanced—a dynamic living organic whole—" (Northbourne, 1940)

beings. Farming and spirituality are like the father and daughter who walked up the mountain to make an offering to the spirits that look over the harvest for the year, who speak through the act of a crow that comes to eat the offering; these are the reflections of co-production (van der Ploeg, 2009, pp. 24–25) that are made awkward through an emphasis placed on an image or an agricultural practice.

A modernization approach that focuses on entrepreneurship leaves little space for peasant modes of relating to their socio-ecological surroundings. This study presented a general picture of Bhutan's initiation into the process of modernization, but also a look into how priorities in agricultural activities may be changing between generations. As evidenced in how the perception of "weeds" and "pests" are changing, care should be taken in observing how agricultural practices are guided by religious sentiments, as they may have considerable influence over how Bhutan will ultimately evolve as a state, not only in how it embraces organic ideals, but the ways in which it will define its progress.

Chapter 8 Conclusion

> "The preparation of a Vision Statement (referring to the "Bhutan 2020" document at large) is not without its attendant risks. There is always the danger that we will be prisoners of the conceptual world we know rather than advocates of the one we desire. There is also the risk that informed analysis can give way to wishful thinking, resulting in a view of the nation that is beyond our reach."[67]

Bhutan's announcement to become the first 100% organic nation in the world was yet another confirmation of its progressive approach towards development. Hailed as 'living GNH', the government-led effort to support small-scale agro-ecologically sustainable farming methods came at a time of growing global recognition of its importance. Bhutan has attracted a great deal of interest, despite the fact that very little is known about the implementation of its policy. Reports and studies on the topic have predominantly reflected the government's perspective, without sufficient consideration given to how the peasant farmer communities have been responding and adapting to such government-led initiatives.

In order to better understand the transitions in agricultural practices in Bhutan, the local encounters with and the embeddedness of the policy on organic agriculture was explored.

Three essential and inter-linked areas were framed as questions to guide the exploration: organic agriculture viewed within the larger realities of ongoing agricultural modernization organic agriculture viewed from the perspective of peasant farmers and organic agriculture as it relates to existing traditional methods of agriculture.

Throughout the last half-century, Starting from the initiation of the first FYP in the 1960s, the government of Bhutan has attempted to facilitate a transition from subsistence level agricultural practices to a more entrepreneurial activity. India and Japan played a particularly large role in supporting this modernization process. The government's paternalistic policies, on the one hand, presented peasant farmers with mechanized plows and new and improved varieties of seed and livestock, often free of charge. Farm roads and market facilities continue to be built in order to increase economic activities in rural areas. On the other hand, the government put strict forest conservation laws in place and altered ownership and access rights to primary sources of fertility in the forests that peasant farmers had been relying on to sustain their farming practices.

[67] "Bhutan 2020: A Vision for Peace, Prosperity and Happiness", (P. C. RGoB, 1999a).

A structured household questionnaire survey was conducted in three different districts within western Bhutan, as well as extensive formal and informal interviews with civil servants, researchers, community leaders and peasant farmers from January to March, and September to November of 2014. Large regional variations were assessed, reflecting the different adaptations or resistance to government provisions of new technologies (including synthetic fertilizer, improved seed varieties, and livestock). Variations were linked to various factors, such as degree of market integration.

Various expressions of changing agricultural practices that were observed and termed as being correlated to increased urbanization (in the case of communities in Paro), or commodification of agriculture (in the case of communities in Wangdue), are transitions that can be viewed as expressions of modification or adjustment to changing conditions, rather than to diminishing traditions. In all three *dzongkhags,* almost all households were found maintaining cattle on their farms, except in the most urbanizing communities in Paro. The variations seen in Paro suggest that households in these communities were finding alternative sources of income and fertilization to make up for lack of cattle. This does not necessarily mean an overall deagrarianization of communities in Paro, but can be understood as an example of adaptation to changing circumstances characteristic of peasant economies, revolving around multiple forms of livelihoods, as a way of sustaining their autonomy. Other instances of creative adaptation were found, an overall increasing or a sustaining trend was observed for forest leaf litter collection, although government reports suggest otherwise. And where they collected from varied greatly between *dzongkhags*.

This study has challenged the assumption that Bhutan is organic by default, and showed how the idealized vision of being organic, put forth by the government, is being variously modified, readjusted, and resisted by the peasant farmers.

It is in the different expressions of adaptation, or of actively reconstructing autonomy, as Ploeg (2009, p. 23) has put it, that...though perhaps unconsciously done, shapes the future of Bhutan. This discrepancy between international expectations and what is currently taking place in Bhutan should be seen as an opportunity to re-examine and re-define what "organic" means to Bhutan.

One day, while working on a survey in a village in Bhutan, an 84 year old grandmother was sitting on her doorstep with her prayer beads, chanting "*Om Mani Padme Hum*". Beside her, young AEOs were chatting with friends on their smart phones, having just finished

measuring plots where a variety of Japanese pear and persimmon trees will be planted soon by Tomiyasu's crew. The AEOs then started talking about places in the forest where people go to pray to the local deities for rain. It will be within the coexistence of such idiosyncrasies and ancient prayers that a "production system that sustains the health of soils, ecosystems and people" will develop in Bhutan, taking many locally appropriate and diverse forms.

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Appendix I Terminologies

Dasho	Honorific
Chhuzhing	Irrigated and/or bench terraced agricultural land for rice based cropping systems.
Commercial agriculture farm	"The crop and livestock production for sale by employing modern production management and techniques established by an entrepreneur under the terms and conditions certified by the Ministry of Agriculture" (Land Act 2007).
Dzong	Fortress, also where district administrative offices are located.
Dzongda	District administrator
Dzongkha	National language
Dzongkhag	District
Geog	Block (administrative unit)
Gup	Head of block (geog)
Highlanders	High altitude herders whose livelihoods are directly and traditionally dependent on Tsamdro. (Land Act 2007)
Kamzhing	Agricultural land other than irrigated or terraced rice paddies (Chhuzhing) and orchard.
Kidu	Land granted by His Majesty the King (Land Act 2007)
Mithun	A domesticated free range bovine species (*Bos frontails*)
Nakey	Fern. *Diplazium esculentum / D. maximum* (Matsushima et al. identified more than 9 varieties of Nakey in the markets (2008))
Namnam	*Perilla fructescens*（えごま）
Pangzhing	Land for shifting cultivation
Protected agricultural area	Any land declared by the RGoB, based on the recommendation of the National Land Commission, to manage, protect and sustain agriculture production. (Land Act 2007)
Rehabilitation land	Land granted by His Majesty the King through Kasho to marginal farmers, farmers whose land has been destroyed by natural calamities, farmers living in ecological-risk prone areas, and landless households. (Land Act 2007)
Sharchogpa	Dialect spoken in eastern Bhutan
Shingsungpa	Agricultural crop damage arbitrator
Sokshing	A plot of the Government Reserved Forest land leased out for leaf litter production and collection (Land Act 2007)
Tshesa	Vegetable garden land
Thram	Land records, cadastral surveys, and any other records pertaining to land maintained by the National Land Commission. (Land Act 2007)
Thrimshung Chenmo	Supreme Law enacted in 1957
Thromde	Area under the jurisdiction of a Municial authority i.e. Government land. (Land Act 2007)
Tseri	Forest land registered by an individual for shifting cultivation
Tsamdro	Government Reserved Forest land, leased out for grazing and improved pasture management (Land Act 2007)
Yak	A domesticated highland animal used as a draft animal and for its milk (*Poephagus grunniens*)

Appendix II Surveyed Communities within the Three Dzongkhags

The 147 households in three *dzongkhags* were selected using mixed purposive sampling. If there were less than 20 households in a given community, every attempt was made to survey all households. If there were more than 20 households in a given community, households were randomly selected by the DAO and contacted beforehand.

In Gasa, 30 households from two *Gewogs* were surveyed: Khatoed (12 households in Baychhu, Rimi *Chiwogs*,); and Khamaed (18 households in Jabisa and Khailog *Chiwogs*). In Paro, all 51 households surveyed were all in Loong-nyi *Gewog*, within which Three *Chiwogs* were selected: Baangdey (14 households), Getena (also known as Dzongdraag-Gadraag) (17 households), and Pangbisa (20 households). In Wandue, a total of 47 households were surveyed in three communities; which included Kazhi (15 households from two villages), Phobjikha (19 households[69]), and Dangchu (13 households in Tashidingkha *Chiwog*) *Geogs*.

Dzonkhag	Geog	Chiog	Village	HH	Pop.	Surveyed HH	%	Avg.
Gasa	Khame	Jabaysa		20		8	40	
		Khailog		15		8	53	
	Khatoe	Baychhu		15		12	80	57.7
Paro	Lungnyi	Bondey	Bondey	34	233	14	41	
		Gatana		27	191	17	62	
		Pangbisa		23	226	20	87	63.3
Wongdi	Dangchhu	Tashidingkha		13		13	100	
	Kazhi	Bjaktey	Tsetoechu	7	30~40	1	14.3	
			Bjaktey	40	50~70	14	35	
	Phobji	Gungphey	Gungphey	20		19	95	61.1

[69] DAO in Phobjikha used a slightly different method. A random cluster sample of 12 villages was taken from within the *Dzongkhag*, from which one to four households were then selected.

Appendix III Sample of Household Questionnaire Survey

There were three main parts to the survey questionnaire. The first part focused on the socio-demographic and economic background of each household, including education level, family structure, occupations outside farming, and livestock on the farm. To analyze various trends, questions were asked about how land-size, farming practices and cropping patterns have changed in the past ten years. Bhutan consciously started to emphasize organic agriculture roughly ten years ago. Hence, a similar time frame was used to study changes in *sokshing* use and market integration.

The second part of the questionnaire further explored farming practices as it relates to use of external inputs such as synthetic fertilizers and purchased livestock feed for milking cows. Further questions were asked about the understanding of "organic" as a concept and farming practice, to see how it relates to the changing usage patterns of *sokshing*.

The third part of the questionnaire, which is largely the focus of this paper, emphasized patterns of *sokshing* usage. Open-ended and closed-ended questions were administered to see where and how people go to collect their leaf litter, and if, how, and why *sokshing* usage has changed in terms of frequency, amount and location of collection over the last decade. The implications of the 2007 Land Act that abolished traditional tenurial and user rights for *sokshing* owners were assessed, by asking about the ownership of the *sokshing* being accessed and used. The regional variations in the implementation of this controversial provision was questioned. Finally, informal interviews and personal discussions were conducted to supplement and expand understanding of the information collected through the questionnaire survey.

Questionnaire Survey for Farmers

Title: Exploring the role of organic agriculture in the promotion of socio-ecological resilience in Bhutan

Research Conducted by*:*

Royal University of Bhutan, College of Natural Resources, and Kyoto University Graduate School of Global Environmental Studies

Date*:*

Name of enumerator_____ Age_____ Male / Female
Occupation/profession of enumerator_____
Date survey conducted (dd/mm/yy)_____Time_____

Site: Village _____
Chiog_____
Geog_____
Person(s) answering the questions:
Name_____Age_____ Male / Female
Position in household_____
Other Occupation other than farming_____

A. **Basic information about the household / family**:

1. How many people are in your family? **(_____people)**

2. How many are currently at home? **(_____people)**

3. **Children:** How many do you have? **( )**

4. **Children:** How many are attending school? **( )**
   4.1) What grades are they in?
   (1· 2· 3· 4· 5· 6· 7· 8· 9· 10· 11· 12· University)
   4.2) Are any of them involved in monastic studies? **(Yes No)**
   4.3) How many are earning an income, or have a salaried job **( )**

5. Are any of your children farming? **(Yes No)**

6. Do your children help you on your farm? **(Yes No)**
   - □ Yes, regularly
   - □ Yes, when there is a lot of work (ex. during planting and harvest seasons)
   - □ Yes, financially
   - □ No, not interested
   - □ No, too young
   - □ Other ( )

7. **Education:** Have you attended school? **(Yes No)**
   7.1) Can you read and write? **(Yes No)**

8. **Livestock:** What animals do you keep? (**Please specify the type and the number**)
   Cows (Calf ( )) Ox ( )Yak ( ) Pig ( ) Chicken ( ),
   Goat ( ) Sheep ( ) Horse ( ) Other ( )
   8.1) Do you have **improved breed cattle?** How many, and what **variety**? (Ex. Jersey)

9. **Change in Livestock:** How has the number or type of livestock changed since your grandparents` time?
   (Decreased, Increased, Type Changed, Same)

10. **Farmland:** Does your family own your farm land? **(Yes No)**

11. **Farmland:** Does your family borrow any land to farm on? **(Yes No)**
    If yes, since when? **(since year_____/_____years ago)**

12. **Farmland:** Does your family lend farm land to others? **(Yes No)**
    If yes, since when? **(since year_____/_____years ago)**

13. **Farmland:** Did your family buy any land to farm on? **(Yes No)**
    If Yes, what **type** of land **(Wetland, Dry land, Orchard)**
    Where ( )

14. **Area of cultivation:** Has it increased or decreased since your grandparents` time?
    (Increased Decreased Same)
    WHY?

15. **Migration:** Did your family migrate seasonally to a different area?
    Where did they go? ( )

16. **Income source:** What are your major sources of income?
    - □ Sales of agricultural products
    - □ Sales of NWFP (ex. cordicep)
    - □ Money sent from family members who work outside
    - □ Other business
    - □ Other ( )

B. **Sokshing:**

17. Do you to collect leaf litter? **(Yes No)**
18. **Where do you collect from**

- □ From the family owned '*sokshing'*
- □ From a community forest
- □ From a natural forest (a Government owned forest)
- □ Not sure

19. Has the amount of '*sokshing'* you collect increased or decreased over the years?
(Increased Decreased Same)
WHY?

20. What months do you go to collect?

21. How many people help you?

22. How do you manage the sokshing? **(select all that applies)**
- □ I sweep the forest floor clean of dry leaves (as much as possible).
- □ I leave some dry leaves behind.
- □ I remove the small trees (regeneration) so that it is easier to collect.
- □ I leave the small trees
- □ I cut down the old trees
- □ Other _____

C. Farming

23. **Crops:** What are the major / most important crops that you grow?
(List according to importance)
1)_____: Varieties_____
2)_____: Varieties_____
3)_____: Varieties_____
4)_____: Varieties_____
5)_____: Varieties_____

24. How do you rotate cultivation? (Ex. First potato, then turnip, then bean…)

25. Are any of your fields kept fallow for parts of the year? **(Yes No)**
If yes, when and for how long?

26. **Fertilizer:** What do you use? **(Check all that apply)**
- □ Leaf litter from forest
- □ Locally available grasses
- □ Animal manure from <u>your own farm</u>
- □ Animal manure from <u>other farms</u>
- □ Other **(please specify)**_____
- □ Urea
- □ Other chemical fertilizers **(please specify)**_____

27. **Fertilizer:** If you **buy** your fertilizers, when did you start buying?
(Year _____ / _____years ago)

28. **Fertilizer:** Has the <u>overall use of chemical fertilizers</u> increased or decreased over the years?
(Increased Decreased Same)
WHY?

29. **Pesticide:** What kind do you use? **(Check all that apply)**
- □ Herbicides/Weedicide
- □ Insecticide
- □ Fungicide
- □ I <u>make</u> my own pesticide. **(What do you use?)**_____
- □ Mixed cropping methods
- □ Hand pick insects (manual control)
- □ Rarely have pest problems
- □ Other **(Please specify)**_____

30. **Pesticide:** If you **buy**, when did you start buying?

(Year _____ / _____years ago)

31. **Pesticide:** Has total use of chemical pesticides changed over the years?
    - □ Herbicide **(Increased Decreased Same)**
    - □ Insecticide/Fungicide **(Increased Decreased Same)**
    - □ Different depending on need

    WHY?

32. Are fertilizers and pesticides becoming more expensive? **(Yes No Don't know)**

33. **Soil Quality:** Has it changed in recent years? **(Yes No Same)**
    HOW has it changed?
    WHY do you think it changed?

34. **Seeds:** What do you **save**?

35. **Seeds:** What do you save that your grandparents saved?
36. **Seeds:** What seeds do you **trade** (barter)?

37. **Seeds:** What seeds do you **receive** from Extension Agents?

38. **Seeds:** What do you **buy**?

39. **Seeds:** What seeds do you **sell?**

40. **Seeds: When** did you start buying seeds? **(Year_____/_____years ago)**

41. **Seeds:** Do you use **hybrid seeds**? **(Yes No Not sure)**
    WHY or WHY NOT?
    If **NOT** using, would you use if you could? **(Yes No Not sure)**

42. **Machinery:** What kind do you use on your farm? (Ex. Power Tiller)
    WHEN did you start using machines? **(Since year_____ / _____years ago)**

43. **Machinery:** What do you borrow?

44. **Method of farming:** What are the reasons why it has changed in recent years? **(Check all that apply)**
    - □ Changes in policy, government rules
    - □ Reaction to advice from extension agent
    - □ Need for more income
    - □ Changes in climate
    - □ Increased problems with **wild animals (Since when?_____)**
    - □ Changes in market demand
    - □ Labor shortage
    - □ Changes in water availability (irrigation)
    - □ Has not changed
    - □ Other **(please specify)**_____

45. **Organic:** Are you familiar with the word "Organic"? **(Yes No Not sure)**

46. **Understanding of Organic:** If you are familiar, what is your understanding of 'organic'? **(Check all that apply. Do not suggest answers)**
    - □ Using leaf litter
    - □ Using animal manure
    - □ Saving your own seeds
    - □ Not using chemical pesticides and fertilizers
    - □ Making your own pesticides
    - □ Getting certification
    - □ Other (**Please specify**)_____

47. **Organic:** How did you learn about the word "organic"?

- □ Extension Agent
- □ Neighbor
- □ Family
- □ From your children who learned in school
- □ Reading
- □ TV
- □ Other

48. **Organic:** Do you practice organic farming?
    - □ Yes, for everything that I grow
    - □ Yes, for part of what I grow
    - □ No
    - □ Don't know / Not sure

    48.1) **How long** have you practiced organic farming? **(Year _____years)**

49. **Organic:** Do you think organic farming will increase income?
    - □ Yes, I know it does, it already has
    - □ Yes, I have heard that it does
    - □ Yes, it will in the long term
    - □ No, I think it will remain the same
    - □ No, I think it will decrease
    - □ Don't know

    Why do you think so?

50. **Organic:** Do you think organic farming will increase yield? **Why** do you think so?
    - □ Yes, I know it does, it already has
    - □ Yes, I have heard that it does
    - □ Yes, it will in the long term
    - □ No, I think it will remain the same
    - □ No, I think it will decrease
    - □ Don't know

    Why do you think so?

51. **Organic:** Do you think organic farming will **improve** the quality of the soil?
    (Yes No Not Sure)

D. Social linkages

52. **Labor trade:** do you and your neighbors help each other? **(Yes No)**
    52.1) How many households do you help in one season? And how many helps you?

53. **Labor hire:** Do you hire labor for money? **(Yes No)**

54. **Assistance:** If you are having trouble with your crops, who do you go to get help or advice? **(Check all that apply)**
    - □ Neighbors/relatives
    - □ Extension agent
    - □ Regional government offices (Ex. NPPC, NSSC)
    - □ I do not go for help or to get advice
    - □ Other (**please specify**)_____

E. Market

55. What are your **5 main cash crops** (Including NWFP and medicinals) How much (quantity) produce did you sell this past year and for how much (price)?

CROP	Quantity Sold (KG)	Rate (Nu/Kg)
1.		
2.		
3.		
4.		
5.		

56. When did you start selling your produce to the market? **(Year___years ago)**

57. Has your sales increased? **(Yes No Same)**

58. **Market Access:** Did access it improve in recent years? If so, when?
(Year_____/_____ years ago)

59. **Market Access:** How did access improve? (**Check all that apply**)
- □ Improved road
- □ Access to vehicle **(Own vehicle Taxi Neighbor's car Other)**
- □ New markets created near by
- □ Other reasons **(Please specify)**_____

60. Are you planning to sell (more of) your produce to the market in the future?
(Yes No Not sure)

61. **Self sufficiency:** What food products do you buy (Besides salt, sugar, oil..)?

62. **Trade:** Do you trade (barter) any commodities? (Such as butter or rice with labor?) If so, what do you trade? **(Please specify)**

63. **Animal Feed:** What do you feed your cattle?
- □ Locally available plants **(please specify)**_____
- □ Harvested crop residue **(please specify)**_____
- □ Karma feed **(please specify)**_____
- □ Other **(please specify)**_____

64. **Animal Treatment:** What do you do when your animals are sick?
- □ Use local plants (traditional remedies) **(please specify)**_____
- □ Commercial medicines **(Please specify)**_____
- □ Call the veterinary hospital, livestock extension agents.
- □ Other **(Please specify)**_____

Appendix IV List of Interviewees

(In alphabetical order according to category of affiliation)

#	Name	Affiliation	Location	Date interviewed
	Government staff			
1	Choeda	AEO Tsirang, MoAF	Tsirang	December
2	DD Chhetri	Regional Manager, **National Seed Center**, MoAF	Bajo, Wangdue	February 15, 2014
3	Dechen Tshering	Director, **Post Harvest Center**, MoAF	Paro	January 29, 2014
4	Doe Doe	Plant Protection Specialist. **National Plant Protection Center**, MoAF	Simtokha, Thimphu	November 6, 2014
5	Dorji Dradhul	Director, **Marketing Division**, MoAF,	Thimphu	Multiple occasions
6	Gembo	AEO **Paro**, MoAF	Paro	Multiple occasions
7	Jamyang	**National Soil Service Center**	Simtokha, Thimphu	November 6, 2014
8	Jigme Lhamo	AEO **Kazhi**, MoAF	Informally and email	October, 2014
9	Kesang Tshomo	Program Coordinator, **National Organic Program**, MoAF	Simtokha, Thimphu and informally (direct and email)	October 11, 2013 ; March 2014 ; Nov. 2014
10	Kinley	RNR **Wengkhar** Field Technician	Wengkhar	October 7~14, 2014
11	Luxmi	Staff researcher, **RNR Yusipang Research Center**, MoAF	Yusipang, Thimphu	January 28, 2014
12	M. L. Bhattarai	DAO **Haa**	Haa	February, 2014
13	Mahesh Ghimiray	Rice Specialist, **RNR RDC Bajo**, MoAF	Bajo, Wangdue	February 15, 2014
14	Nina Om	Legal Officer, **Policy and Planning Division**, MoAF	Thimphu	
15	Norden Lepcha	Senior Agriculture Officer, **National Organic Program**, MoAF	Simtokha, Thimphu	November 6, 2014
16	Rajan Rai	Field Technician Researcher, **RNR Yusipang Research Center**, also studied at the Asian Rural Institute in Tochigi Prefecture, Japan for 9 months.	Yusipang, Thimphu	January 28, 2014
17	Rinzin Dorji	Senior Planning Officer, **Policy and Planning Division**, MoAF	Thimphu	Multiple occasions
18	Sangay Wangchuk	Director, **SAARC Forestry Center**	Taba Thimphu	October 11, 2013
19	Tanka Maya Pulami	Research Officer, **RNR, RDC Bajo,** main coordinator for Gasa organic initiative. MoAF		Multiple occasions

20	Thinley Penjore	Research Assistant, **RNR Research and Development Center, Wengkhar**	Wengkhar, Mongar	October 7~14, 2014
21	Tshering N Penjor	DAO **Gasa**	Gasa	January 22, 2014
22	Wangda Dukpa	Director, **National Seed Center**	Paro	January 28, 2014
23	Yadunath Bajgai	Managing Director, **RNR RDC Bajo,** MoAF	Bajo, Wangdue	February 6, 2014
	Private Company / Project			
24		Owner, Resort in Bumthang		
25	Binai Lama	Portfolio Coordinator, Netherlands Development Organization SNV	Thimphu	
26	Jambay Dorji	Managing Director, Bhutan Alpine Seeds, Bhutan, apprentice to Dasho Nishioka	Paro	January 30, 2014
27	Pem Lama & & Sangay Thinley Dorji	Project Officer & Sr. Project Officer, **International Institute for Sustainable Development,** Green Public Procurement in Bhutan.,	Thimphu	November 6, 2014
28	Pema Dorji	Farmer, Senior Assistant ADM, Agriculture Machinery Center, used to work with Dasho Nishioka.	Paro	October 2-4, 2014
29	Tshewang Dendup	Samdrup Jongkhar Initiative Executive Director	Dewathang, SJongkhar	October 11, 2014
30	Yumiko Yanai	Activity Manager, Uma, Resort in Paro	Paro	September 2014
	Community Leader, Farmer, Students			
31	Dr. Thinley	Doctor, Thimphu General Hospital	Thimphu	Multiple occasions
32	Karma Penjore	Famer & Field Manager of **Haa Organic Vegetable Initiative**. Former teacher at CNR, Farmer	Paro	January 30, 2014 ~ present
33	Kinley Dorji	College of Natural Resources Sustainable Development division Student		Multiple occasions Informally and through email
34	Sangay Renchen, (Farmer Sangay)	Representative, Happy Green Cooperative	Thimphu	
35	Ngawang	Sherabutse College, student council, Student	Gasa,	January 20-23, 2014
36	Sonam Zangpo	Graduate of Sherabutse College	Thimphu	Multiple occasions Informally and through email
	JICA and Japanese Researchers			
37	Katsuhiko Nishikawa	Former JICA senior volunteer, National Seed Center (Druk Seed Co. at the time of his service) 2006-	Kyoto,	June 30, 2015

		08.		
38	Kenichi Matsushima	Associate Professor, Shishu University	Nagano,	December 18, 2014
39	Kenichi Sasaki	Project Coordinator / Farmers Organization, JICA Horticulture Research and Development Project , MoA, RNR RDC Wengkhar,	Wengkhar, Mongar	October 7 & 14, 2014
40	Yuichi Tomiyasu	Team Leader / Horticulture, JICA, RNR RDC Wengkhar, Mongar	Wengkhar, Mongar	October 7~14, 2014
41	Yumiko Asakuma	Chief Representative, JICA Bhutan Office	Thimphu	October 11, 2013

Appendix V Historical Time Table

Year	RNR related Events in Bhutan	Historical Event in Bhutan
1616		Drukpa monk Ngawang Namgyal arrives from Tibet, seeking freedom from the Dalai Lama
1651		Bhutan (called Drukyul) unified; Summer capital established at Thimphu (winter capital at Punakha).
1760s		Cooch Behar becomes Bhutanese dependency ; Assam Duars come under Bhutanese control
1774		Bhutan signs peace treaty with British East India Company.
1864-65		Bhutan War (Duar War): A confrontation for control over the Bengal Duar region.
1865		Treaty of Sinchula signed ; Bhutan Duars territories ceded to Britain in return for annual subsidy.
1907		Theocracy ends ; Hereditary monarchy starts with 1st King of Bhutan: Ugyen Wangchuk
1910		Treaty of Punakha signed with British India: guaranteeing Bhutan's independence, but British India took control over Bhutan's foreign relations (effective until 1947)
1926		Ugyen Wangchuck dies, and is succeeded by 2nd King Jigme Wangchuck.
1949		India-Bhutan Treaty Signed: guaranteeing non-interference in Bhutan's internal affairs, but allowing influence over foreign relations. India returns land around Deothang.
1952	Department of Forestry established	3rd King enthrowned: Jigme Dorji Wangchuk (reformist monarch) ; Establishemnt of National Assembly
1953		National Assembly (the Tshogdu) established as part of government reform.
1957	The enactment of *Thrimshung Chenmo* (Supreme Laws) shifting power from communities to the central government	
1958		Sasuke, Nakao first visits Bhutan ; Slavery abolished.
1959		Refugees from Chinese annexation of Tibet given asy in Bhutan ; Subsequent closure of Chinese border.
1960		
1961		1st FYP initiated ; First all-weather road completed between Phuntsholing and Thimphu.
1962		Joins the Colombo Plan for Cooperative, Economic, and Social Development in Asia and the Pacific.
1963		
1964		Prime Minister assassinated by competing political factions.
1965		
1966		Thimphu becomes the year-round capital
1967		2nd FYP
1968		First Cabinet established ; the Indian Border Roads

		Organization builds an airstrip in the Paro valley.
1969	Bhutan Forest Act 1969	
1970		
1971		Joins the United Nations (Sept. 22)
1972		3rd FYP; King Jigme Dorji Wangchuck dies. 4th King Jigme Singye Wangchuck crowned
1973		The Bhutan Broadcasting Service (radio) started in Thimphu
1974		New monetary system established, separate from India; First foreign tourists allowed entry.
1975		
1976		4th FYP
1977		
1978	Land Act 1978 ; FAO/Denmark Vegetable Seed Project initiated	
1979		
1980	Livestock Act	
1981		5th FYP; Bhutan's first airline, Drukair established.
1982		
1983	Agricultural Machinery Center established; National Potato Program initiated	First passenger aircraft lands in Paro Airport; Sherubtse College in Langlung established as a 3-year college affiliated with the University of Delhi.
1984	National Agriculture Seed and Plant Production Program (NASEEP) ; First systematic study of plant diseases (Thinlay et al., 2000) ; Establishment of the Plant Protection Center (NPPC)	Council of Ecclesiastic Affairs (Dratshang Lhentshog) created, encouraging monks to play a greater civic role.
1985		Became a member of SAARC
1986		New law granting Bhutanese citizenship based on length of residence, leading to the expulsion of thousands of Nepalese laborers
1987		6th FYP
1988		Census leading to labeling of many ethnic Nepalese as illegal immigrants.
1989	Social Forestry and Afforestation Division established within the Department of Forest (renamed Social Forestry Division in 2002, today, the Social Forestry Extension Division)	Establishment of Diplomatic Relationships with Thailand ; Unrest among Nepalese minority ; Nepali language dropped from school curricula ; Code of etiquette introduced requiring civil officials to wear traditional dress while on duty.
1990	MoAF implements decrease of PPC subsidy	Ethnic unrest and anti-government protests in southern Bhutan.
1991		
1992	IPM project initiated (funded by the EC)	7th FYP; K. Nishioka Passes Away
1993		
1994		
1995	NASEEP privatized and becomes Druk Seed Co.	Forest and Nature Conservation Act of Bhutan
1996		
1997	First Community Forest established in Mongar	8th FYP;
1998		4th King relinquishes some power as head of government. Cabinet now elected by assembly.
1999		Television and Internet services
2000		
2001		
2002		9th FYP

2003		Establishment of Druk Hydro Power Corporation
2004	Gasa becomes an Organic District; Community Forestry Manual for Bhutan developed	
2005		National Constitution revealed.
2006	NOP established ; Introduction of Hybrid Seeds ; Forest and Nature Conservation Rules amended	4th King abdicates, crown prince assumes throne
2007	National Framework Organic Farming in Bhutan (NFOFB) launched	5th King signed a new treaty of friendship with India to replace the treaty of 1949.
2008		10th FYP; First Democratic Elections: Pro-monarchy Bhutan Harmony Party wins; 5th King Jigme Khesar Namgyel Wangchuck crowned; India - Bhutan 'free trade' accord (trade without tariffs); Bhutan rupee crunch.
2009		
2010	Samdrup Jongkhar recognized as an organic district	
2011		
2012		
2013		11th FYP; Parliamentary elections: opposition People's Democratic Party wins
2014		
2015		

Appendix VI List of Released Vegetables in Bhutan

The vegetable varieties screened since 1982 that have been released for general cultivation. Table compiled through information gathered by author from (D. Chhetri, 2014; FAO, 1994; MoAF, 2006; Walter Roder et al., 2008; K. Wangchuk et al., 1990).

Table VI 1 List of Released vegetable varieties

Vegetables	Varieties	Year released	Notes
Potato	Yusikap	1988	Though year of release is mentioned, potato cultivation as a cash crop was initiated during the 2nd FYP (1966-1970)
	Kufri Jyoti	1989	
	Desiree	1989	
	Khangma Kaap	2002	
Pea -	Bonaville		
	Frilla		
	Usui		Introduced by Nishioka（ウスイ豌豆）
Bean -	Borloto (Borlotto)	1990	Heirloom pole bean/French bean
	Pusa Parvati	1990	Heirloom pole bean/French bean
	Kentucky Wonder	1990	Heirloom pole bean/French bean
	Brothbone	1990	Heirloom pole bean/French bean
	Top Crop	1990	Heirloom bush bean
	Rasma	1994	
	Long John	1994	
	KPS 2 / Barimung	2002	
Cabbage -	Copenhagen Market	1990	OP brought by the Danish [interview]
	Golden Acre	1990	
	Baldura	1994	
	Pride of India	1994	
Cauliflower -	White Top	1990	OP brought by the Danish [interview] (D. Chhetri, 2014)
	White summer	1990	OP brought by the Danish [interview] (D. Chhetri, 2014)
	Progress	1990	OP brought by the Danish [interview] (D. Chhetri, 2014)
	Snow Ball-16	1994	
Chili -	Sha Ema	1990	A popular heirloom variety local to Bhutan
	Hot wax	1990	Hungarian wax pepper (?)
Capsicum –	California	1990	Heirloom. A popular variety globally

(sweet bell pepper)	Wonder		
Carrot -	Early Nantes No. 127	1990	Seed source (HRIGRU[72] 6089) (Bradeen et al., 2002)
	Chantenay Improved	1990	Original Chantenay seed source (Vilmorin Seeds) (Bradeen et al., 2002)
Radish -	Spring Tokinashi Comet	1990	Probably introduced by Nishioka （時無大根）
	Minowase	1990	Introduced by Nishioka（美濃早生大根）released by NASEPP
	Miyashige	1990	Introduced by Nishioka （宮重大根）released by NASEPP
	Shogoem Short	1990	Miss-spelling of Shogoin?（聖護院大根？）released by NASEPP
	Hong Kong White	2002	Re-named “Bajo Laphu 1”
Tomato -	Roma	1990	
	Helfruch	1990	
	Nozomi	1990	Source unclear. Marukyo Agricultural Network (Japan) produces a tomato by that name.
	Fusi 3 (Fuse-3)	1990	Released by NASEPP
	Rattan	2002	Renamed “Bajo Lambenda 1”
Turnip -	PTWG	1990	
	Local Purple	1990	
Mustard -	Him Beauty	1990	
	Takama	1990	
Japanese Greens -	Taisai	1990	
	Neguna	1990	
Bulb onion-	Senshu Yellow	1990	Common over-wintering onion
	Nasik Red	1990	
	Senchu Red	1994	
	Red Creole	2002	Renamed “Bajogop 1”
Welsh onion -	Kujo	1990	Possibly introduced by Nishioka. 九条ネギ Released by NASEPP
Ladies Fingers / Okra	Blue Bell	1994	
	Pusa Sawani	1994	
	Kranti	2004	
Lettuce -	Great Lake	1990	
	Sunny	1994	
Cucumber -	Shabigenchu	1990	
	Santon No. I	1990	
Spinach -	All Green	1990	

[72] HRIGRU: from the Horticulture Research Institute, Genetic Resource Unit, Wellesbourne, Warrick, UK

Chinese cabbage -	Kyoto 1	1990	Introduced by Nishioka.（京都一号）Takii Seed Co.
Pumpkin -	Ramthang Brumsha	1990	
	Tetsu Kabuta	1990	Introduced by Nishioka. Probably the "Tetsu Kabuto" from Takii Seed Co. （鉄甲南瓜）
	Utsuki Red	1990	
Brinjal – (Eggplant)	Paro Local	1990	
	Big Round	1990	
	Pusa Purple Long	1990	
Garlic -	Local Selection	1990	
Celery -	Sort Lake	1990	
Parsley -	Paramount	1990	
Broccoli	Desico (Deccicco)	1994	
Summer squash	Zucchini (green)	1994	
Melon	Honey Dew	1990	
Watermelon -	Asahi Yamato	1990	
Asparagus	Mary Washington		

Table VI 2　List of Imported Hybrid Seed Varieties

Crop	Varieties	Notes
Broccoli	Centauro (F1)	Takii & Co. Ltd. (Japan)
Cabbage	Green Coronet (F1) Bondey Cross (F1) Golden Cross (F1)	Takii & Co. Ltd. (Japan)
Cabbage	Lucky Bull (F1)	Kaneko Seed Co. (Japan)
Cauliflower	Snow Crown (F1) Snow Mystique (F1)	Takii & Co. Ltd. (Japan)
Carrot	Season Cross (F1)	Takii & Co. Ltd. (Japan)
Radish	Ivory White (F1)	Annup Seed (India)
Bitter Gourd	BGH-110 (F1)	Annup Seed (India)
Onion	Pune Red (F1)	Jasiwal Seed (India)

(Source: NSC 2014)