Transitions in Seed Sovereignty in Western Bhutan

Mai KOBAYASHI*, Rekha CHHETRI**, Katsue FUKAMACHI***, and Shozo SHIBATA**

Abstract: This paper attempts to examine Bhutan’s transitioning agricultural sector through shedding light on the history of the government initiated seed production and distribution programs, and its influence on farming households in western Bhutan. A framework for seed system development is used, based on the recognition that there are two district seed procurement systems: formal (outsourced commercial seed production) and informal (non-commercial household, or community-based). The analysis is based on a household questionnaire survey and interviews conducted in western Bhutan and Japan in 2014 and 2015. Emphasis is placed on Japan’s influence on the formal seed system, notably through the introduction of improved vegetable seed varieties in the mid-1960s, and hybrid vegetable seeds since 2006. The household survey revealed varied but sustained coexistence between the two seed systems, with a high rate of seed saving as a common thread in all communities. Variation between districts reflected degree and maturity of market integration, and the increasing popularity of hybrid seeds.

Key Words: Formal and informal seed systems, Rural development, Seed sovereignty, Vegetable production, Western Bhutan

INTRODUCTION

Bhutan is a nation that has been celebrated for its progressive approach to development. Their announcement to become the first 100% organic nation was yet another confirmation of their commitment towards a paradigm of growth that values social and ecological well-being (Kobayashi et al., 2015). A significant motivation behind a commitment to organic agriculture has been rooted in a concern over sustaining the autonomy of Bhutan as a nation. With more than half of the population (745,153 in 2014) engaged in agriculture (NSB, 2014), high dependence on imported external inputs (such as synthetic fertilizers and pesticides) was considered an unnecessary risk to food security. Despite such concerns, however, this land-locked country along the foothills of the eastern Himalayan mountain range is in the midst of rapid socio-economic changes alongside efforts to expand and modernize agricultural production. This study attempts to examine the broader topic of agricultural modernization in Bhutan, by way of assessing its seed provisioning practices as a lens.

Discussions of food self-sufficiency and food security have been central to the Bhutanese government’s vision of development since the drafting and implementation of its first five-year development plan in 1961 (Daly and Thinley, 2005; Minot, 2010; RGoB 1966, 1972). Despite extensive concern, little attention has been paid to how the peasant farming communities themselves are reacting and adjusting to the government’s development plans, particularly with regards to the impact of the changing practices of saving and procuring seeds.

Bhutanese peasant farmers, much like peasant farmers around the world, are increasingly being incorporated into the formal seed system where seeds are an outsourced commercial product and a material input, provided through a specialized and often highly regulated supply chain (Louwaars, 2007). This supply chain includes gene banks, breeders, seed producers, marketers and distributors which are outsourced. This is in contrast to informal seed systems, where seed provisioning is contained and sustained within a household or community (FAO, 2004: Louwaars, 2007). Based on this framework, this paper will first contextualize how Bhutan has initiated,

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incorporated and institutionalized its formal seed systems, particularly with relation to developmental aid coming from Japan. We then seek to understand how the two seed systems are evolving and coexisting. Amidst government efforts to increase food self-sufficiency and food security, how are farming communities strategically navigating their relationships with the emerging formal seed system to assure a sustainable source of high-quality seeds? And how do their reactions inform efforts to assure seed sovereignty, which, much like food sovereignty, is defined by Jack Kloppenburg as the right of people, communities, and countries to determine how seeds are saved, replanted, and shared (Kloppenburg, 2014).

1. METHODS

1.1 Survey sites and data collection
Qualitative and quantitative data were collected using three methods: 1) archival research and literature review of primary and secondary source documents; 2) unstructured and semi-structured interviews; and 3) a household questionnaire survey. The unstructured and semi-structured interviews were conducted with peasant farmers, as well as regional representatives, researchers, and extension workers within the Ministry of Agriculture and Forests, foreign development aid workers and volunteers, particularly with the Japan International Cooperation Agency (JICA), both current and former. The household survey was conducted during the period between January and March, and again in October, 2014, with the assistance of regional extension agents, as well as students from the College of Natural Resources, Royal University of Bhutan.

Bhutan is host to a diverse range of agro-ecosystems. The climate varies from wet sub-tropical in the lower elevation (100–600 meters above sea level (masl)) in the south to alpine in the north (3600–7500masl). For comparison, survey sites were all selected within the mid-hill regions (2000–3000 masl) of western and west-central Bhutan, where the greatest socio-economic changes are currently taking place.

The selected districts are Gasa, Paro and Wangdu Phodrang (hereby shortened to Wangdue) (Figure 1). The three districts represent different socio-economic and agro-ecological conditions for comparison. Characteristics of the three districts are further summarized in Table 1. Within each district, three communities active in agriculture, that are also accessible by car, and within one day’s travel from a major market center, were selected. Surveyed households were randomly identified to obtain a sample size representing more than 50% of the total households within each community.

In all, 147 households were surveyed. One representative from each household was asked to participate in the structured questionnaire survey. In addition to basic information about the household, respondents were asked multiple-choice questions on changing trends in their overall agricultural practices, particularly regarding the saving and procurement patterns of cultivated crop varieties.

2. RESULTS

2.1 Historical context the formal seed sector
The transitions taking place at the household level must first be contextualized within larger trends taking place, leading up to the government-led introduction of the formal seed system.

Farming households throughout Bhutan have always had a strong tradition of harvesting an extensive variety of wild edible plants, such as orchids (Cymbidium hookeianum), young ferns (locally called na-kwe), and wild asparagus.
<table>
<thead>
<tr>
<th>Agro ecological Zone</th>
<th>Elevation (surveyed sites) (masl)*</th>
<th>Mean annual temp. (C) (Min/ Max)</th>
<th>Avg. rain fall (mm)</th>
<th>Major crops</th>
<th>Avg. age of respondents (age range) [% female]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GASA</strong> (n=30)</td>
<td>Cool Temperate 2175~2360</td>
<td>11.3 (-2~19)</td>
<td>2241</td>
<td>Wheat, Barley, Brassicas</td>
<td>Avg. 45.4 (26~73) [86.9%]</td>
</tr>
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</table>

Located entirely within a National Park, Gasa was formally recognized as Bhutan’s first organic pilot district in 2004 (RNRRC, 2012). A car road leading to urban markets outside of the district was completed only in 2011. Through government encouragement and improved access, the number of households cultivating vegetables for the market is increasing.

| **PARO** (n=51)      | Warm Temperate 2250~2840           | 15.2 (-3~25)                     | 801                 | Rice, Apple, Asparagus                     | Avg. 44.5 (18~72) [64.7%] |

A large rice-production region, considered one of the most productive and prosperous dzongkhag in the country with its fertile land and high accessibility. One of the communities surveyed is where Keiji Nishioka, an agricultural specialist from Japan had his experimental farm (Dorji and Penjore, 2011).

| **WANGDUE** (n=66)   | Cool Temperate 2200~3000           | 22.2 (-4~30)                     | 1099                | Potato, Turnip, Buckwheat                  | Avg. 46.9 (16~74) [58.6%] |

Although wetland rice cultivation is common in the lower altitudes of this region, the selected field sites are known as one of the earliest places to incorporate commercial potato cultivation. Today they have the largest average area of potato cultivation in the country (0.99ha/household) (Roder, Nidup & Chhetri, 2008). In recent years, a hydroelectricity project has created employment and expanded market opportunities in the region.

*masl = Meters above sea level

(Asparagus racemosus) from the forests (Nakao & Nishioka, 2011; Matsushima et al., 2006). Vegetable cultivation for human consumption and income generation is a relatively recent phenomenon. Interviews and a review of contemporary and historic literature shed light on how little, besides chilies, turnips, buckwheat and grains (such as wheat and barley), was routinely cultivated. Yoshiro Imaeda (2008) described the absence of markets and the non-availability of fresh produce in the capital city of Thimphu when he first arrived in 1981.

To strengthen Bhutan’s national security amidst the changing geo-political context in the late 1950’s, the importance of domestic seed production was emphasized in the first five-year development plan. A government-led initiative to begin their own breeding program was initiated only after the arrival of Keiji Nishioka (respectfully known as Dasho Nishioka, the father of modern agriculture in Bhutan), who served as an agricultural specialist under the Colombo Plan, from 1964 to 1992 (Dorji and Penjore, 2011). He was stationed primarily in Paro and established a model farm in 1966, known as Bangdey Farm. This was where Nishioka introduced a number of open pollinated vegetable seeds from Japan, which are still known by their Japanese names, including the Tokinashi daikon (radish), Usui peas, Tetsu Kabuto (pumpkin), and a variety of Chinese cabbage known as ‘Kyoto 1’. In 1978, a government-led scientific research project on vegetable production was initiated with the launching of the Vegetable Seed Production Project led by FAO and the Danish International Development Agency (DANIDA) (Wangchuk, Pradhan & Wangdi, 1990). According to an interview with a longtime government employee who worked in Bhutan’s seed sector since 1979, the seeds first introduced through this program were open pollinated varieties of cabbage (var. Copenhagen Market) and cauliflower (var. White Top, White Summer and Progress), due to their suitability in various climatic conditions. In 1984, the National Agriculture Seed and Plant Production Program (NASEPP) was established, whose mandate was to produce and supply the domestic need for improved varieties of seed and fruit plants (Tshering and Domang, 2004). NASEPP was later privatized in 1995 and became the Druk Seed Corporation (DSC). The DSC struggled as a private business, and was reinstated under the auspices of the government in 2010, and is referred today as the National Seed Center (NSC). The production and dissemination of improved open pollinated vegetable seed varieties were

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considered an important strategy for rural
development. Open pollinated varieties were used,
and hybrid seeds were intentionally banned from
import, in order to prevent communities in
general, and Bhutan as a whole, from becoming
overly dependent on external material imports.
Encouraging increased self-sufficiency to maintain
its autonomy was thus important. Other reasons
for banning hybrid seeds included the high upfront
economic cost, the higher demand for nutritional
inputs, inherent on hybrid seed cultivation, and a
concern that foreign seed companies would sell
lower quality seeds to small countries like Bhutan,
that did not have the technical means to
evaluate the quality of hybrid seeds (interview
Nishikawa, 2014). To assure that peasant
households had access to sufficient seeds,
government extension agents supplied every
household with fully subsidized seed samples,
along with technical assistance through
exhibitions and demonstrations: and distributed
leaflets and books to raise awareness about
vegetable cultivation and seed saving (Wangchuck
et al., 1990). Such seed distribution programs have
persisted to this day. Today, peasant farmers’
requests for desired varieties of seed are made to
the local agriculture extension agent, who will
then process the request through the NSC and/or
the Horticulture Division, under the national
government’s Department of Agriculture. What is
distributed will depend on the budget allocation
for each district, and available stock at the NSC. If
peasant farmers are unable to receive sufficient
quantity, quality or a desired variety of seed from
the government, they can opt to purchase seeds
directly from the NSC, commission agents or from

Bhutan Alpine Seeds, which is Bhutan’s sole
private seed company, established in 2000.
In 2006, a former employee of Takii Seed
Company in Japan came to Bhutan as a senior
JICA volunteer and was stationed at what was
then known as the DSC. Seeing the limitations to
the national breeding programs and the degree to
which improved self-sufficiency was to contribute
to overall food security, he was shocked to find a
formal seed system still functioning without the
use of hybrid seeds. He quickly assessed and
facilitated efforts to transform the existing seed
provisioning system and pushed to allow limited
varieties of hybrid seeds to be imported. Having
been contemplating their benefits for some time,
the Ministry of Agriculture took this as an
opportunity to give permission to initiate limited
importation of hybrid seeds in 2006 (Nishikawa,
2014; Tshering and Tensin, 2007). Varieties of
cabbage, cauliflower and broccoli were the first
to be imported, later expanding to carrot,
watermelon, and squash (Nishikawa, 2015).

2.2 Seed sourcing
Results from the household questionnaire survey
will be highlighted to assess how peasant farmers
are relating to the emerging formal seed system to
assure a sustainable source of high-quality seeds.
The household questionnaire survey results
showed that 96.7%, 98.0%, and 96.8% of the
peasant farmers in Gasa, Paro, and Wangdue,
respectively, are continuing their practices of
saving seed at some capacity. The variety of seeds
differed according to agroecological conditions but
also their relationship to the market (as seen in
the high percentage of farmers saving the major
cash crops of chili seeds in Paro and potatoes, in

Figure 2 Variety of seeds being saved
household with fully subsidized seed samples,
government extension agents supplied every
peasant farmers are unable to receive sufficient et al., 1990). Such seed distribution programs have evaluate the quality of hybrid seeds (interview distributed will depend on the budget allocation the local agriculture extension agent, who will requests for desired varieties of seed are made to the government, they can opt to purchase seeds quantity, quality or a desired variety of seed from directly from the NSC, commission agents or from
the Horticulture Division, under the national development. Open pollinated varieties were used, and hybrid seeds were intentionally banned from usage seed at some capacity. The variety of seeds consideration an important strategy for rural

In order to assess how peasant farmer households were engaging with the emerging formal seed systems, the survey questioned how else, besides non-monetary forms of exchange, were households acquiring seeds. As previously mentioned, peasant farmers in Bhutan receive fully subsidized seeds from the government (marked as “receive” in Figure 3) in effort to increase national food self-sufficiency and stimulate rural economic development. The survey found that the majority, but interestingly not all, households were receiving seeds provided by the government, with 80.0%, 82.4%, and 73.0% in Gasa, Paro, and Wangdue, respectively (Figure 3).

Given physical and economic access, households are also able to purchase seeds. The survey showed a large regional variation, with 33.3%, 80.4%, and 68.3% in Gasa, Paro, and Wangdue, respectively (Figure 3). We can see that the greatest variation was found in Wangdue, where households buying seeds ranged from 26.7% to 86.8%, depending on the community. In comparison, variations within other districts were less. This could partially be attributed to the large variation in access and agroecological conditions found within Wangdue being the largest district in Bhutan.

The diversity in seed procurement patterns or the degree of opportunism was further examined through cross assessment of the three variables. Figure 4 shows a regional comparison of eight different patterns of seed procurement (Patterns A to H). Particularly notable was how 53.3% of the households in Gasa were procuring their seeds exclusively from the government (Pattern F), and a smaller percentage, 13.3%, was procuring their seeds from all three sources (Pattern A). In contrast, in Paro, the largest number of households, 45.1%, both received as well as purchased their seeds (Pattern C), while 17.6% were acquiring their seeds from all three sources (Pattern A), and another 17.6% were solely buying their seeds, not taking advantage of the government program (Pattern G) (Figure 4). Further in Wangdue, we found 28.8% of the households both buying and receiving seeds from the government (Pattern C), and 18.2% taking

![Figure 3 Inter-regional variations in seed procurement patterns](image-url)
advantage of all three sources of seeds (Pattern A) (Figure 4).

2.3 Varietal variation in different seed systems
Varieties of seeds that are traded, bought and/or received from the government differed according to the region. Among those who specified, we found that seeds procured through the formal seed systems, i.e. receiving from the government or buying, were mainly those which were introduced and familiarized since 1978, such as asparagus, broccoli, cauliflower, cabbage, carrot, tomato, onion, and garlic. Whereas species of seeds within the informal seed system, i.e. saved and traded, included rice in Paro, rice and vegetable (unspecified variety) seeds in Gasa, and barley, buckwheat, wheat, beans, chili, maize, radishes, turnips, and potatoes in Wangdue. Furthermore, seeds within the informal seed system were found embedded within a larger relationship of reciprocity, where peasant farmers exchange cultivated foods and services. Surveyed results showed that 23.5% of the surveyed households still trade rice in exchange for chili, butter, oil (mustard), meat, or vegetables. Rice, straw, and labor were mentioned as exchanged for livestock products, such as butter or cheese. In Wangdue, 39.4% of the households mentioned that they bartered: labor was traded for butter, meet for rice, and rice or potatoes for chili. In one community in particular, 90.0% of the households mentioned that they were bartering chili for rice. In Gasa, while details about bartering practices were not collected, reports have mentioned bartering of wheat and rice for the brewing of alcohol (ara), since rice cannot be grown by those living in higher altitudes (Duba et al., 1995).

2.4 Popularity of hybrid seeds
Hybrid seeds have been considered a successful yet controversial addition to the agricultural landscape. To envision how the agricultural landscape may transition in the future we evaluated the popularity of the hybrid seeds that have been introduced since 2006. We asked whether farming households are taking advantage of this new technology, and if not, whether they would like to take advantage of it in the future.

Results showed varied incorporation of hybrid seeds. On the one hand, 13.3% in Gasa, to 52.9% in Paro, and 34.3% in Wangdue reported that they were already using hybrid seeds (Figure 5). Despite hybrid seeds in Bhutan being ten times more expensive than the open pollinated counterparts in the markets today, respondents replied that they use hybrid seeds because of their higher quality and yield. On the other hand, among respondents who were not using hybrid

![Figure 4: Regional comparison of seed procurement patterns](image-url)
bartered: labor was traded for butter, meet for labor (mustard), mea

cultivated foods and reciprocity, where peasant f
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turnip, buckwheat, wheat, bean

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Varieties of seeds that are traded, bought and

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7.6

17.6

1.5

3.3

0.0

GASA

PARO

WANGDUE

% HOUSEHOLD

20.0

66.7

13.3

17.6

29.4

52.9

38.7

27.0

34.3

Not using hybrids nor interested

Would like to use hybrids

Using hybrids

Gasa n=30

Paro n=51

Wangdue n=66

Figure 5 Use of hybrid seeds

seeds, 66.7% in Gasa, 29.4% in Paro, and 27.0% in Wangdue responded affirmatively that they would like to use hybrid seeds if they had the means and the opportunity (Figure 5).

3. DISCUSSION

From the introduction of cash crop varieties from Japan through Keiji Nishioka to the imports of hybrid vegetable seeds initiated in 2006, Bhutan has attempted to diversify its informal seed systems through formal government-led assistance from foreign countries, particularly Japan, in order to strengthen and expand cultivation of food products. In order to assure seed self-sufficiency at the household, community and national levels, the Bhutanese government initially allowed only open pollinated varieties to be produced and distributed. This reinforced the practice of saving seeds, as the surveyed clearly showed more than 96% of households in each district were saving seeds in some capacity. Further look into variety, however, shows that more than half of the surveyed households were saving vegetable seeds. While this indicates the successful interaction and integration of the formal and the informal seed systems as an arrangement for site-specific adaption to production and market challenges, this also presents a need for further investigation into what vegetable varieties are being saved and why, given the increasing popularity of seeds that are not designed to be harvested and saved, such as the hybrid vegetable seeds.

Nonetheless, the informal seed systems largely reflected traditional crop varieties common in each region, represented by foods that are staples in Bhutan, such as rice, barley, buckwheat, chili, maize, turnips and radishes. Crop varieties existing in the informal seed systems were also found embedded in practices surrounding the reciprocal exchange of benefits, based on the bartering of seeds, harvested food and services. The rich constellation of interdependencies between farming households cultivating in different regions is largely dictated by the agroecological setting and the relationship each community has to the market. For example, Paro, where there is high market access and the highest rate of urbanization between the surveyed sites, 45% of the households were receiving seeds from the government as well as buying their own seed. By contrast, more than half the respondents in Gasa (53%) showed high levels of dependency, with exclusive reliance on the government for their seeds, perhaps due to their greater remoteness, in addition their relationship to the market has not yet been fully established having only completed a road for cars to pass in 2011 (Table 1 and Figure 4). A comparatively lower percentage of households, 13% in Gasa, and 18% in both Paro and Wangdue, was maximizing their opportunities and taking advantage of all three surveyed options for seed procurement (Figure 4).

Even though the introduction of hybrid seeds in Bhutan, which began in 2006, was quick to take root, the survey showed high variance in their use between the districts, with more than half in Paro using hybrid seeds (52.9%), while Gasa was particularly low at 13.3%. If we take into account the desire to use hybrid seeds if they had an opportunity (Figure 5), overall interest in hybrid seeds (current use and desire to use in future) added up to more than 60% in all regions. Variation in current usage could be attributed to physical access and the economic means by which to buy expensive hybrid seeds. Those in Paro were able to afford them due to their comparative advantage in market access and to new technologies, as the NSC is located in Paro. In the case of Wangdue, the reason behind the relatively low usage and low interest in the hybrid seed may
be due to their well-established potato production, lowering their need to diversify their production. Turnips are also extensively cultivated in Wangdue, but a significant portion is for livestock feed, for which hybrid varieties would be too expensive and unnecessary. In the case of Gasa, the enforcement of organic agricultural standards could be contributing to the low usage of hybrid seeds. Although no formal organic certification has been established, the National Organic Standards of Bhutan adhere to basic international standards that place importance on planting materials well adapted to local conditions, which, to the extent possible, are produced under organic conditions (RGoB, 2011). Hybrid seeds are characteristically not organic. While hybrids are utilized for their uniform and high yielding characteristics, they inevitably require the cultivator to continue purchasing the seeds each season. When asked about the use of hybrid seeds, an organic farmer in Gasa mentioned that it would be “against the norm” to use them. But in spite of that, more than a quarter of the households indicated an interest in hybrid seeds, suggesting a potential increase in future demand.

CONCLUSION

A brief history of the introduction and integration of the formal seed systems in Bhutan was described, with a particular focus on the influence from Japan. An assessment was then made of the various states in which the formal seed systems are coexisting with the informal seed systems in Western Bhutan. The coexistence between the two seed systems was based on a distinct division of labor, so to speak, between varieties represented by the two seed systems. With regards to the informal see system, it was found that more than 96% of the households in the surveyed districts practiced seed saving. The varieties that they saved, however, were distinct from what was introduced through the formal seed systems. The formal seed systems, starting with the tested and imported varieties familiarized through Nishioka and the FAO/DANIDA vegetable seed production project in the 60’s and 70’s, expanded to include the import dependent market-oriented mode of production, later represented by the introduction of hybrid seeds.

With the establishment of domestic as well as international markets, alongside extensive support from the Bhutanese government and foreign development agencies, there has been a push to increase overall vegetable production over the past four decades, and a consequential need to change what, why and how certain seeds are acquired. Depending on when a community started to actively sell their produce in the market, the degree of dependence on the government for its integration, such as in the case of Gasa with its organic designation, the degree of access and dependence on formal seed systems varied greatly.

This study attempted to capture one perspective in Bhutan’s dynamic process of agricultural transition. While this study placed particular focus on influences from Japan, further investigation is warranted on the consistent presence of India throughout Bhutan’s process of modernization, and the more recent but intimate relationship with Thailand, through the Thailand International Cooperation Agency (TICA).

As Paul Nicholson states, food sovereignty, and hence seed sovereignty, is a process, and an inherently dynamic one (Nicholson, 2012). Further research to assess the future impact of the market and government policies on the preferential treatment and coexistence of the informal and formal seed systems among peasant farmer communities is necessary to assess the dynamics of how the rights to determine and shape seed systems are transitioning.

In line with the possibilities in expanding dependence on formal seed systems, it is important to note that Bhutan’s emphasis on organic agriculture may be playing a critical role in preventing the introduction of genetically modified organisms (GMO). The sustained adherence to GMO-free standards would play a significant part in protecting not only the environment but the intrinsic sovereignty of peasant farmers. Questions remain whether genetic and varietal diversity found within cultivated crops have been diversified or simplified as a result of a government mediated introduction.
of formal seed systems. The answers to such questions will further deepen our understanding of the transitions taking place and the dynamic process in which seed sovereignty is constantly negotiated.

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