

Agriculture and Usage of Natural Resources in Bhutan

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Abstract : Bhutan is a small, landlocked and mountainous country with the geographic area of 38,394km². Its population stands at 672,425 distributed over 125,115 households out of which 69.1% reside in rural areas. Agriculture is the dominant employment (43.6%) and main livelihood (79%) source. It contributes 26% of the gross domestic product. Based on the national poverty line (Nu. 740.36/month), 31.7% of Bhutan's population is poor. Because the poverty in Bhutan is of rural phenomenon, agriculture sector has the major role in alleviating poverty. Therefore, the main goal of the Ministry of Agriculture for the 10th Five Year Plan (2008-2013) is poverty alleviation through research and development in agriculture and through sustainable utilization and management of natural resources. Bhutan's biodiversity is one of the richest in the world. Of the country's total area, 72.7% is under forest cover. The most abundant natural resource is timber, water resources and non-wood forest products (NWFPs). In addition there are also a number of mineral deposits like gypsum, coal, etc. The most important natural resources for the majority of rural population are NWFPs. They are a major source for off-farm income, food, medicinal and aromatic products, fodder, fiber and also for local construction. Many of them are importantly traded commodities at local, national and international levels, providing employment and income at each level. The most importantly traded commodities are *Cordyceps sinensis*, *Cymbopogon flexuosus*, *Tricholoma matsutake*, *Illiciul griffithii*, *Neomicrocalamus andropogonifolius*, *Swertia chirayita*, *Borinda grossa*, *Piper pedicellatum*, *Acorus calanus* and *Neopicrorhiza scrophulariifolia*. Realizing the potential of natural resources, Bhutan's forest policies and Constitution of Bhutan strongly favour the conservation and sustainable utilization and management of natural resources. It is hoped that the important natural resources for the livelihood of rural community is sustainably utilized and managed for a long time.

Key words : biodiversity, employment, households, livelihood, poverty, natural resources, non-wood forest products, rural

1.0 Introduction

Bhutan is a small landlocked eastern Himalayan country, bordered by China in the north and India in the east, west and south. The geographic area of 38,394km² is almost entirely mountainous with the flat land limited to the broader river valleys. The elevation varies from 100 meters above sea level (masl) in the southern foothills to more than 7,500 masl in the north. The area under 3,000 masl is only 55.1 percent. Bhutan has three major landform features: the southern

foothills, the inner Himalayas and the higher Himalayas (Central Statistical Organization, 2001). The population of Bhutan stands at 672, 425 distributed over 126,115 households out of which 69.1% reside in rural areas (Population and Housing Census of Bhutan 2005). Based on the national poverty line established at Nu.740.36 per month, 31.7% of Bhutan's population is poor. Of this, only 4.2% of the urban population is poor, against 38.3% living in the rural areas (National Statistics Bureau, 2007). The Poverty Assessment Report (2000) indicates 63 geogs¹ (of 201) deficit in grain. Poverty alleviation is today a high priority international agenda. In 2000, all 191 United Nations Member States pledged to eradicate poverty by 2015. Therefore, one of the Millennium Develop-

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¹ geog means city/town/village.

ment Goals of Bhutan is also to reduce poverty by half by 2015.

2.0 Agriculture in Bhutan

Agriculture is the dominant employment (43.6%) and main livelihood (79%) source. It contributes 26% of the Gross Domestic Product, of which about 8% come from livestock and 7% from forestry (RMA Annual Report 2005). At the macro-economic level, Bhutan is doing extremely well with an average GDP growth rate of 7 to 8% over last two decades. The GDP in 2003 was over Nu. 28.5 billion with a per capita GDP of US \$834, one of the highest in the South Asia (RGoB, 2005). However, at the micro-economic level, the Household Income and Expenditure Survey in 2000 shows that our rural farmers earn US \$0.80 a day, indicating that our farmers are poor and live in poverty as measured against the international poverty line of US \$1 a day (CSO, 2001). Because the poverty in Bhutan is of rural phenomenon, agriculture sector has the major role in reducing poverty and accelerating economic growth (9th & 10th Plan goal).

However, agriculture development is also constrained with many factors. Firstly, the limited arable land (8% of the total land area) is further coupled with the loss of some of the most productive agricultural lands to urban development. Secondly, most agricultural lands are scattered around small, remote settlements on hill slopes and valley bottoms. Thus a limited access to markets is coupled with a low potential for mechanization. Thirdly, the proneness to natural disaster (monsoon floods and landslides) further marginalizes the highly integrated, diverse and labor-intensive farming systems. Fourthly, the rural population has to make a living on an average income of less than half of that of the urban population (Bhutan Poverty Reduction Strategy Paper 2004) leading to rural urban migration and thus creating shortages of labor and subsequently increasing the cost of production of agricultural goods. There is, therefore, an urgent need to intensify agriculture production

and diversify agricultural production systems to increase household income, improve nutritional standards and improve food security.

3.0 Research and Extension in Renewable Natural Resources of Bhutan

Up to the early 1960s research in Natural Resource Management was left to innovative Bhutanese farmers who experimented with new production methods and new plant and animal species and plant varieties. Activities of such informal research had a strong impact on the Bhutanese farming system with introductions such as chili, maize and potato. The first documented government sponsored research activities started in the mid 1960s, after the inception of the first development plans in 1961. Early activities focused largely on agriculture. Unfortunately these early activities are poorly documented and lacked follow up and continuity.

Agricultural extension service has evolved in relation to agricultural research systems under the assumption that research systems would develop agricultural technologies, and extension systems would disseminate them to farmers who are viewed as passive beneficiaries rather than clients, stakeholders, and active participants. Bhutan must develop a pluralistic extension model involving client orientation and participation; decentralization of service delivery; outsourcing of service delivery; and co-financing by direct beneficiaries.

4.0 Natural Resources of Bhutan

Bhutan's mountainous topography severely limits the amount of land suitable for agricultural production. Of the country's total land area, 72.7% is under forest cover (Energy and Resource Institute, 2008) which is one of the main reasons as to why Bhutan's biodiversity is one of the richest in the world. The most abundant natural resource is timber, water resources and non-wood forest products (NWFPs). In addition there are also a number of mineral deposits like gypsum,

dolomite, coal, etc. The timbers from the forests are used for various purposes like house construction, firewood, furniture, etc. The leaf litter from the forests are used for bedding cattle and as manures in the agricultural field. The water resources are used for the generation of hydropower (99.6%) besides its usage as drinking water and for irrigation. Mineral deposits are extracted and exported in the form of cement, gypsum, marble, coal, slate, etc. However, the most important natural resources for the majority of rural Bhutanese population are NWFPs.

With 69% of the population living in rural areas, NWFPs play an important role in the daily lives and overall well being of the Bhutanese people especially among the rural farming community. They are a major source for off farm income, food, medicinal and aromatic products, fodder, fiber, and also for local construction. Many of them are importantly traded commodities at local, national and international levels, providing employment and income at each level. The most importantly traded commodities are *Cordyceps sinensis*, *Cymbopogon flexuosus*, *Tricholoma matsutake*, *Illicium griffithii*, *Neomicrocalthamus andropogonifolius*, *Swertia chirayita*, *Borinda grossa*, *Piper pedicellatum*, *Acorus calamus* and *Neopicrorhiza scrophulariifolia*. Numerous case studies show or have shown the potential of NWFPs for income generation. According to Renewable Natural Resource (RNR) Statistics 2000, about 42% of households in the country use bamboo resources for a variety of purposes, while about 21% of households are engaged in harvesting mushrooms from the wild, and 38.6% of households in fern top harvest during summer months (Ministry of Agriculture, 2000). Farmers from Mongar, Lhuentse, Trashigang, and Trashiyangtse earned an income worth Nu. 51,247,045 over a period of 10 years (1994-2004) from the sale of lemon grass oil according to reports from Essential Oil Industry of Bhutan (Dorji Wangdi & Galey Tenzin, 2006). In Bjoka, Zhemgang Dzongkhag² a study revealed that 66% of the monetary income was derived

² Dzongkhag means province.

from bamboo & cane products (Moktan et al., 2004). The Laya communities located at 3,700 masl are semi nomadic pastoralists with income from a variety of activities, including: 12% of income from yak husbandry, 8% from agriculture, 14% from incense making, and 50% of their income is derived from the collection and sale of *Cordyceps sinensis* (Namgay et al., 2007). On average Chirata (*Swertia chirayita*) contributed to 42% of the household cash income of Shingkar Lauri farmers in 1996-97 (Pradhan et al., 1998) and star anise (*Illicium griffithii*) provided a good cash income for farmers in Yabrang in Trashigang Dzongkhag and Aja Nye in Mongar Dzongkhag (Mukhia et al., 2006). Furthermore, the Community of Wamanang (97 households), in Trashiyangtse Dzongkhag could potentially generate more than Nu. 500,000 from *Borinda grossa* products (Dorji & Tenzin, 2007).

4.1 Current status of Non-Wood Forest Product

Bhutan's forest policies strongly favour the conservation and sustainable management of natural resources. For instance, the draft Constitution of Bhutan under Article 5 Section III has explicit provisions to maintain a minimum of 60% forest cover at all times to come and is dedicated to the conservation and sustainable utilization of the country's natural resources. The Ministry of Agriculture is the main agency involved with the formulation of rules and regulations, policies and administration of the forestry sector. Recognizing the utilization potential of NWFPs for food and income security and sustainable forest management, a wide range of institutions and organizations have taken responsibility and are involved in NWFP development in the country. Government agencies that are involved include Department of Forest, Council for Renewable Natural Resources Research in Bhutan (CoRRB), National Biodiversity Centre, National Mushroom Centre, Agriculture Marketing Services, Natural Resources Development Corporation Limited (NRDCL), Institute of Traditional Medicine and Services (ITMS), Ministry of Economic Affairs, Bhutan

Agriculture Food and Regulatory Authority, Forestry Training Institute in Langmego, Bumthang & College of Natural Resources. In April 2007, the National NWFP working group was established with the objective to share information, strengthen cooperation and to get feedback on the work accomplished by the NWFP section under FRDD. It comprises of members from the Forest Resource Development Division, Institute of Traditional Medicines and Services, National Resource and Development Corporation Ltd., RNR-RCs (Bajo, Yusipang), Social Forestry Division (SFD) and Agriculture Marketing Services. Currently, there are only a few established private sector institutions involved in NWFP marketing, including 17 licensed incense entrepreneurs (Tideman, 2006), Bio - Bhutan, mushroom exporters and a few Daphne traditional paper making enterprises. There are also a number of NGOs, donors and foundations supporting Bhutan in NWFP development and they are The Netherlands Development Organization (SNV), The Food and Agriculture Organization (FAO), Helvetas/SDC, The International Development Research Centre (IDRC), The United Nations Development Program (UNDP), The European Union and Tarayana Foundation.

4.2 Non-Wood Forest Product Resource Management

Bhutan is rich in agro-biodiversity with a long list of species, either used locally or traded in the local or overseas markets. Bhutan has currently identified 600 medicinal plants species, 97 mushroom species, 97 kinds of fruits & nuts, 50 bamboo species, 14 cane species, 25 oil & resin species, 20 different kinds of spices, 38 fibres plants, 70 ornamental plants, 181 fodder related varieties, 36 types of dye plants, 12 kinds of tubers and 77 forest vegetables (FRDD, 2006). Of the many, a priority NWFP list was prepared based on a number of criteria like economic, social, environment and technology criteria and they are as follows: (1) Wild Mushrooms (*Auricularia sp.*, *Cantharellus cibarius*, *Lyophyllum shimeji*, *Rozites*

caperata & *Tricholoma matsutake*), (2) Bamboos and Canes (*Bambusa sp.*, *Borinda grossa*, *Dendrocalamus sp.*, *Neomicrocalamus andropogonifolius*, *Yushania spp.*, *Calamus acanthospathus*, *C. latifolius* & *Plectocomia himalayana*), (3) Medicinal plants (*Aconitum heterophyllum/lacinatum*, *Acorus calamus*, *Cordyceps sinensis*, *Illicium griffithii*, *Phyllanthus emblica*, *Picrorrhiza scrophulariifolia* & *Swertia chirayita*), (4) Aromatic plants (*Juniperus squamata*, *Ephedra geradiana*, *Rhododendron anthopogum*, *R. ciliatum*, *R. setosum*, *Selenium vaginatum*, *Nardostachys grandiflora*, *Innula racemosa*, *Cinnamomum tamala*, *Tanacetum nubigenum*, *Terminalia chebula* & *T. bellirica*), (5) Natural Dyes (*Rhus species* & *Rubia cordifolia*), (6) Vegetables and food crops (*Asparagus racemoses*, *Dioscorea belophylla*, *Dioscorea pentaphylla*, *Diplazium esculentum* & *Elatostema species*), (7) Spices (*Piper longum*, *Piper pedicellatum*, *Zanthoxylum armatum* & *Zanthoxylum piperidum*) & (8) Other plants (*Daphne species*, *Edgeworthia gardneri*, *Cymbopogon species*, *Elaeocarpus varuna*, *Gerardiana diversifolia*, *Lycopodium clavatum* & *Sarcococca hookeriana*).

In Bhutan there are two legal systems in place for the management of NWFP resources in the wild. A system of permits that requires obtaining written approval from authorities to collect NWFPs and through the establishment of Community Forests (CFs). There are more than 100 approved CFs of which 13 Community Forests focus on NWFP management. The guidelines for the resource assessment and management of Lemon grass (*Cymbopogon flexuosus*), Star Anise (*Illicium griffithii*), Chirata (*Swertia chirayita*), Pipla (*Piper pedicellatum*), Yula (*Neomicrocalamus andropogonifolius*), Bamboo (*Borinda grossa*), Chudala (*Acorus calamus*) & Putishing (*Neopicrorrhiza scrophulariifolia*) have been developed. Besides management, the cultivation of NWFPs is also encouraged and promoted. The Natural Resource Development Corporation Ltd. (NRDCL) concentrates on large scale bamboo plantations. Institute of Traditional Medicines Services (ITMS) and Renewable Natural

Resource Research Centre(RNRRC)- Yusipang are into the domestication and cultivation of *Dracopis tanguiticum*, *Carum carvi*, *Inula* species, *Aconitum orochryseum*, *Dactylorhiza hatagirea*, *Podophyllum hexandru*, *Angelica glauca*, *Valenriana jatamansi*, *Lycium barbarum*, *Carthamus tinctorius*, and *Saussurea lappa*. In addition, RNR-RC Yusipang has developed cultivation sites for medicinal and aromatic plants spread over ten Dzongkhags. In 2007 alone, six metric tons of ruta (*Saussurea lappa*) was cultivated in three Dzongkhags constituting Bumthang, Haa and Gasa, while three metric tons of *Curcuma longa* have been successfully cultivated from Zhemgang. Furthermore, also some Agarwood (*Aquilaria malaccensis*) plantations were established in order to try out artificial agarwood inducement techniques (Chhetri D.B., Kunzang Dhendup and Dorji Gyeltshen, 2004). SFD is another agency that supports a number of CFMGs in small scale plantations of cane and bamboo.

4.3 Post Harvest, Marketing and Trade of Non-Wood Forest Products

A small percentage of NWFPs collected are processed in Bhutan. The weaving of bamboo baskets, mats and other goods for daily, seasonal, and ceremonial uses is common. Natural dyes are used for coloring the woven cloths in the weaving centre of Khaling. Other small-scale cottage industries include herbal dye making, honey production, paper making, incense making and lemon

grass oil production. Bio-Bhutan has launched the first ever air spray made in Bhutan with organic certified lemon grass. Tarayana Foundation started candle making using local natural dyes to colour the candles and weaving of nettle plants (*Gerardiana diversifolia*) cloth and other fibres. Similarly, licensed incense manufacturers have undertaken small and cottage scale processing using high land aromatic plants. ITMS has developed *Tseringma* herbal teas using most of its ingredients (saffron, cinnamon & Himalayan goose berry) from India, Cordyplus capsules using *Cordyceps sinensis* as a major ingredient and a range of bath elixirs including salts besides initiating small scale processing equipment with drying units in Lingshi for high altitude medicinal and aromatic plants (MAPs) and Langthel for low altitude MAPs. The EODP continues to promote lemon grass distilleries in Dungsum, Yalang and Toetso in Trashiyantse. Canning of matsutake (*Tricholoma matsutake*), ngala shamong (*Lyophyllum shimeji*) and Golay shamong (*Catathelasma* sp.) have been carried out in Ura by the National Mushroom Centre (NMC) in 2006/2007 in collaboration with a farmers group and a mushroom exporter.

A variety of NWFPs are sold in the weekend markets in different Dzongkhags. Over 100 different NWFPs are sold in the weekend market in Thimphu (Chandrasekharan, 2006). The market and trade channels for most of the NWFPs follow a general pattern of forest and meadow to village to road-head, then on to larger trade centres.

Table 1. NWFP export in quantity and value

Commodity of export	Quantity (Kg)			Value (Nu.)		
	2004	2005	2006	2004	2005	2006
Mushroom	1,286	3,006	1,480	5,125,282	5,636,706	3,145,926
Bamboo works	2,600	3	15,130	42,050	550	11,400
Lemon grass extract	4,860	490	4,610	2,470,217	126,000	1,449,000
Incense	2,000	644	132	109,000	124,769	49,092
Natural honey	100	45	16	10,970	6,600	7,426
Chirata	1,200	NA	NA	76,100	NA	NA
Natural dye	99	NA	NA	16,208	NA	NA
Handmade paper	896	NA	NA	76,000	NA	NA
Cordyceps	158	196	506	10,680,000	13,000,000	42,915,586

Source : Bhutan Trade Statistics, 2004, 2005, 2006.

Four different types of trade are prevalent in the country: a) among community members and in the local markets for onward trade, b) among middle men and exporters, traders and national institutions, c) informal trade across the political boundaries of China and India, and d) formal exports to other countries, which include both raw materials and finished products. The most commercially important NWFPs exported are high value mushrooms, lemon grass extract, *Cordyceps sinensis* and incense. Attractive markets for Matsutake mushrooms are in Japan, Singapore, Thailand and UK. Bhutanese essential oils have been well received in the European markets with growing demands from UK and Canada. Incense sticks are exported to Singapore, Taiwan, USA, UK and Hong Kong. Cordyceps are in huge demand from Hong Kong, Singapore, China and in the state of California in the USA (Table 1).

In order to reach economies of scales, the formation of groups and/or associations was promoted to help access markets and to bargain for better prices. The recent CF group in Bjoka has united to sell cane and yula products, pressing buyers to accept prices as determined by them. The total annual average income of the group is Nu 3,475,000, which means an average annual income earning of Nu 26,320 for each household (Meijboom, Rai, & aus der Beek, 2008). In 2007, a lemon grass cooperative has also been formed comprising farmers in the eastern region.

The Agriculture Marketing Services (AMS) provides market information on RNR products on a regular basis and also identifies, promotes and facilitates intra-regional trade through price and demand broadcast over the national radio. Mar-

ket information on inputs and markets are collected from relevant agencies, such as: Food Corporation of Bhutan (FCB), Dzongkhags, Department of Revenue and Customs, Bhutan Food and Agriculture Regulatory Authority (BAFRA), National Plant Protection Centre, Druk Seed Corporation, NRDC, and extension agents.

Bhutan is landlocked with huge mountains and deep gorges and faces unique transport challenges. Roads are the only means of surface transport for goods and passengers. Certain roads become difficult to drive on during winter months on mountain passes and during the rainy season (June, July, August & September). Landslides are common during the monsoons, further hindering access. Druk Air, the national flight carrier is the only means of air transport to the outside world markets and is rather expensive, but such an arrangement is not to undermine marketing potentials, assuming Bhutanese entrepreneurs tap the right market with the right product.

One of the main agencies promoting small and medium enterprises is the Entrepreneurship Promotion Centre (EPC) attached to the Ministry of Economic Affairs. Such initiatives have supported micro, small and medium-scale enterprise development through training, development of business plans and in some cases conducting feasibility studies. For instance, the Nado incense, formerly a cottage industry has now made good business progress with products being exported to Europe, USA, and in the Chinese markets of Southeast Asia. There are various agencies involved in training entrepreneurs with respect to different item commodities. Some of the main ones are provided below in Table 2.

Table 2. Government agencies involved in enterprise development & business skills training

Ministry	Agencies
Economic Affairs	Entrepreneurship Promotion Centre, Essential Oil Division, Trade Division, Regional Trade and Industry Office
Agriculture	Social Forestry Division, National Mushroom Centre, Agriculture Marketing Services, Medicinal and Aromatic Plants Project and Horticulture Division.
Health	Institute of Traditional Medicine and Services
Corporation	Natural Resource Development Corporation Ltd, Bhutan Chamber of Commerce and Industries

4.4 Intellectual Property Rights

Intellectual property protection is a new area in Bhutan and the fundamental laws, including the Copy Right Act and the Industrial Property Act (including designs, patents and trademarks), were only enacted in 2001. However, with the growing interest in research, market value and commercialization in NWFPs, policy-makers like the Intellectual Property Division within the Ministry of Economic Affairs and other stakeholders are beginning to recognize the need for intellectual property rights regarding the appropriation and use of indigenous/traditional knowledge especially on craftsmanship, ethno-botanical knowledge, geographical indicators, copyrights and bio-security.

However, a greater understanding and documenting of indigenous knowledge and access benefit sharing is imperative if any system of rights based upon that knowledge is to protect and compensate the rural populations. For example, the *nga dose*³ is a traditional right of communities in Ada geog in Wangdue. This perhaps is one of the most interesting cases for investigating the interface between property rights and conservation in the context of food security and poverty alleviation. Traditional communities must be able not only to manage their resources optimally but also to improve their production systems and technologies, offering products at competitive prices and deriving comparative advantages.

4.5 Research and Development on Non-Wood Forest Products

RNR research programs have been taken up as national programs under the management leadership of the Council for RNR Research of Bhutan (CoRRB). Research programs on forest products (timber & NWFPs) are coordinated nationally by RNRRC-Yusipang and implemented in regions

through RNR-RCs located at Bajo, Wengkhari and Jakar. Some of the past biological research includes bamboo and cane studies in Bjoka, sustainable agarwood production through artificial inducement in Samtse, and studying the impact of matsutake collection on local economies. Some of the ongoing research includes studying the life cycle of *Cordyceps sinensis*, sustainable propagation and harvesting methods of important bamboo species and development of fern arboretum. RNR-RC Bajo through Community based natural resource management supports action research in Bjoka on bamboo and cane management, lemon grass extraction in Dremitse, sustainable harvesting of pipla (*Piper pedicellatum*) in Nanglam, pasture management in Dhur, *Swertia chirayita* management in Singkhar lauri, *Borinda grossa* in Bomdeling and matsutake in Genekha and *Cordyceps sinensis* in Lingshi. The effect of controlled forest fire on the production of lemon grass oil is currently underway in RNR-RC Wengkhari. ITMS is focusing on MAP using it as active ingredients for manufacturing herbal remedies and cures. Marketing research is conducted by AMS, ITMS, NRDCL and the Ministry of Economic Affairs. AMS continues with market research in Pipla, Chirata, Rubia, Ruta, Aconite, Shilajit, Kutki, Matsutake, Chinese caterpillar and Star Anise in various countries like India, Singapore, Thailand, Japan, China, etc. In addition, the marketing section within the Pharmaceutical Research Unit (PRU) of ITMS performs related market surveys, audits and selling of products from the sale counter located within the establishment complex along with market research for product development in Singapore and Hong Kong. Past records showed PRU sales of Nu. 4 million in 2005 with top of the line products including *Tseringma* herbal tea, cordyplus capsules, incense sticks and powder, and herbal bath elixirs. The Ministry of Economic Affairs in partnership with the private sector continues to develop markets for lemon grass extracts, incense, mushrooms, handicrafts and traditional textiles. Furthermore, RNR-RC Wengkhari has developed a number of herbal home

³ Fish baked between two hot stone plates is traditional practice by the people in Ada geog for generations and an important source of livelihood to households.

Appendix 1: List of medicinal plant species cultivated by the ITMS

Botanical name	Local name	Botanical name	Local name
<i>Aconitum ochrochryseum</i>	Bong-dkar	<i>Hypecoum leptocarpum</i>	Par-pa-ta
<i>Aconitum sp.</i>	Bong-dmar	<i>Inula sp.</i>	Ru-rta
<i>Angelica sp.</i>	Ca-ba	<i>Lancea tibetica</i>	Pa-yag
<i>Aquilaria agallocha</i>	A-ga-ru	<i>Malva verticillata</i>	So-ma-ra-zha
<i>Asparagus racemosus</i>	Ni-shing	<i>Marabilis himalaica</i>	Ba-spru
<i>Carthamus tinctorius</i>	Gur-gum	<i>Meconopsis horridula</i>	Tsher-snon
<i>Carum carvi</i>	Go-snod-dru	<i>Meconopsis simplicifolia</i>	Aut-pal
<i>Carum copticum</i>	La-la-phud	<i>Mucuna imbricate</i>	Jam-bras
<i>Chesneya nubigena</i>	sTsa-stag-sha	<i>Myristica fragans</i>	Za-ti
<i>Choenomeles lagenaria</i>	Se-yab	<i>Onosma hookeri</i>	Bri-smug
<i>Chrysosplenium forestii</i>	Gya-kyi-ma	<i>Piper nigrum (black)</i>	Pho-ba-ri-nag-po
<i>Cinnamomum tamala</i>	Shing-tsha	<i>Piper nigrum (white)</i>	Pho-ba-ri-dhar-po
<i>Codonopsis convolvulaceae</i>	Sin-ba	<i>Polyalthia simiarum</i>	sNing-zho-sha
<i>Corydalis gerdæ</i>	sTong-ri-zil-pa	<i>Pterocarpus santalinum</i>	Tsan-den-dmar-po
<i>Crocus sativus</i>	De-zang	<i>Punica granatum</i>	Se-bru
<i>Cuminum cyminum</i>	Ze-ra-dkar-po	<i>Roscota purpurea</i>	Yung-ba
<i>Dactylorhiza hatagirea</i>	Dbang-lag	<i>Santalum album</i>	Tsan-den-dkar-po
<i>Delphinium brunonianum</i>	Bya-rgod-spos	<i>Selinum vaginatum</i>	Tang-kun-dkar-po
<i>Dracocephalum tanguticum</i>	Pri-yang-ku	<i>Strychnos nux-vomica</i>	Ko-byi-la
<i>Elettaria cardamom</i>	Sug-smul	<i>Syzygium aromaticum</i>	Li-shi
<i>Genciana urnula</i>	Gang-ga-chung	<i>Terminalia chebula</i>	A-ru
<i>Geranium sp.</i>	Gla-sgang	<i>Tr?bulus terrestris</i>	gZe-ma
<i>Glycyrrhiza glabra</i>	Shing-mnar	<i>Triplostegia glandulifera</i>	Sga-tig-nag-po
<i>Herpetospermum pendunculatum</i>	gSer-gyi-me-tog	<i>Vitis vinifera</i>	Grun-drum-dkar-po

Appendix 2: List of NWFPs with export potential

Botanical name	Trade name	Local name
<i>Aconitum sp.</i>	Aconite	Tsendhoog
<i>Auricularia auricula</i>	Jew's ear	Jili namchu
<i>Cantharellus cibarius</i>	Chanterelle	Sisi shamu
<i>Cordyceps sinensis</i>	Chinese caterpillar	Yartsa guenboob
<i>Cymbopogon sp.</i>	Lemon grass	Sorbang
<i>Diplazium esculentum</i>		Pangkey (fern)
<i>Diplazium polypodioides</i>	Fiddle head	Nakey (fern)
<i>Elatostema lineolatum</i>		Damroo
<i>Illicium griffithii</i>	(Species of star anise)	Dhomleeshee
<i>Lycopodium sp.</i>	Lycopodium	Zalagadang
<i>Nardostachys jatamansi</i>		Pangpoi
<i>Picorrhiza sp.</i>	Kutki	Putishing
<i>Pinus roxburghii</i>	Resin	Thangcchu
<i>Piper longum</i>	Pipla long	Pipiling
<i>Piper nigrum</i>	Pipla round	Pipiling
<i>Plectocomia himalayana</i>	(Species of cane)	Patsha
<i>Rhododendron anthopogon</i>		Baloo
<i>Rubia cordifolia</i>	Rubia	Tsoy
<i>Saussurea lappa</i>	Ruta	-
<i>Shilajit</i>	Shilajit	Dragzhuen
<i>Swertia chirayita</i>	Chirata	Latij
<i>Thysanolaena sp.</i>	Broom grass	Tsakusha
<i>Tricholoma matsutake</i>	Matsutake	Sangay shamu
<i>Zanthoxylum armatum</i>	Sichuan pepper	Thingay

This list was prepared by AMS (November 2007)

remedy products based on the Aryuvedic principles which further needs marketing research.

4.6 Strategic Plan for Non-Wood Forest Products

The strategic plan for NWFP development is divided into six major themes as follows:

Legal Framework : Create an enabling legal and policy environment to support the sustainable utilization and management of NWFPs, promote domestic and international trade through simplification of trade procedures and establish a clear policy at the geog, Dzongkhag and national levels for the sustainable management and commercial development of NWFPs.

Organizations & institutions : SFD/NWFP to collaborate closely with all the relevant stakeholders, establish a National NWFP Coordination Committee, review the functions of the various government agencies currently engaged in NWFP management, use, development and trade, make the NWFP Working Group to focus on the technical issues related to NWFP management and use, incorporate the NWFP development needs in the 5-year Dzongkhag and Geog plans as well as in the forest management unit plans and strengthen regional/international collaboration.

Capacity building : Develop and implement a curriculum for NWFPs at the College of Natural Resources degree programs, organize workshops, meetings, forums, trainings, study tours, etc. on NWFP related issues for relevant stakeholders, develop NWFP materials for training and extension purposes, select and use a number of sites where NWFPs are collected, processed and marketed based on an approved management plan as demonstration sites and built the capacity of farmers in managing, marketing and enterprise

developments.

Resource Management : Continue with the development of NWFPs guidelines for resource assessment and management plans, encourage cultivation of potential NWFP species on private lands if the demand is high and has no adverse impacts on the wild population, include NWFP specimens in the National herbarium at the National Biodiversity Centre, standardize the classification of NWFPs, establish a data base on NWFP resources, mainstream the NWFP development needs in forest planning and management and develop and implement adequate monitoring and evaluation methods.

Marketing and Trade : Identify NWFPs with export potential, conduct value-chain analysis and/or feasibility studies on potential NWFPs from its resource base to its final sale, look into the possibilities for processing, developing appropriate processing technologies and further product development & designs, strengthen the private sector through supporting the establishment of small and medium enterprises, continue with formations of associations and cooperatives, brand and certify products as organic which are originating from the wild, provide market information to farmer/groups, prepare control measures for specific species to deal with the problems of illegal trade and stimulate institutions such as ITMS and NRDCL to diversify their business lines.

Research : Establish linkages with renowned international research institutes to improve the technical capacity, focus research on requests from stakeholders, enhance the timely dissemination of research results, enhance strong collaboration between research, training and extension and carry out research on cultivation of selected high potential NWFPs.

ブータンにおける農業と自然資源の利用

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要 約

ブータンは国土面積38,394km²の小さな山岳国家である。人口は約67万人で、その70%は田園（田舎）地帯に住み、農業従事者は約44%で生産額はGDPの26%を占める。ブータンの基準で人口の31%が貧困であり、その大部分は田舎に住む人々である。そこで、農業省の第10次5ヵ年計画（2008-2013）では、農業技術の研究開発と、自然資源の持続的利用と管理を通じて貧困を減らすことが目標となっている。ブータンは生物多様性が世界で最も豊かな国の一つであり、国土の約73%が森林に覆われている。最も豊富な自然資源は木材と水資源、そして木材以外の森林からの生産物（非木材林産物 NWFPs）である。田舎の人々にとって最も重要な自然資源はこのNWFPsである。NWFPsは農業以外の収入、食料、医薬品、香料、飼料、繊維および建築材料の源である。それらの多くは地域、国内、国際レベルで重要な産物として取引され、雇用と収入をもたらしている。最も重要なものは *Cordyceps sinensis*, *Cymbopogon flexuosus*, *Tricholoma matsutake*, *Illiciul griffithii*, *Neomicrocalamus andropogonifolius*, *Swertia chirayita*, *Borinda grossa*, *Piper pedicellatum*, *Acorus calamus* and *Neopicrorhiza scrophulariifolia* などである。自然資源の持つ可能性を実現するために、ブータンの森林政策とブータン王国憲法は、自然資源の保全、持続的利用と管理を強く奨励している。田舎の村落の生計に重要な自然資源が、長期的に持続的に利用、管理されることが望まれる。

キーワード：田舎、雇用、生計、貧困、自然資源、生物多様性、非木材林産物