

# COLLECTION OF MEDICINAL PLANTS AND THE PRODUCTION OF TRADITIONAL MEDICINES IN BHUTAN

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## **Introduction**

Bhutan, with its unique geographical setting is known for its rich biodiversity. Owing to this biological wealth of medicinal plants, the traditional medical system in this country has come a long way since its inception in 1967. It is one of the most sustainable and affordable methods of healthcare delivery as traditional medicines are manufactured utilizing these rich medicinal assets and the human resources are developed within the country.

The traditional medicine service in Bhutan is fully integrated with modern healthcare delivery system. It is available in all 20 District Hospitals and some selected Basic Health Units (BHUs). The services will be further extended to all the BHUs. This would require Pharmaceutical and Research Unit to upgrade its production capacity in terms of raw materials collection, production machines, infrastructure and human resources to meet the growing demand for traditional medicines.

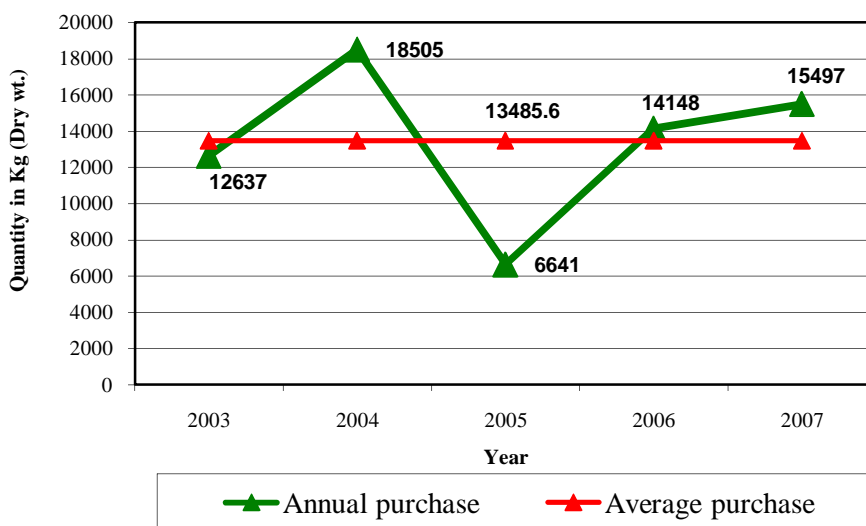
In the past, all medicines were produced manually. Small scale mechanized production started only in 1982 with support from World Health Organization. From 1998 onwards, the manufacturing Unit was upgraded to the Pharmaceutical and Research Unit (PRU) and today all products are produced mechanically. For the sustainable production of traditional medicine, the sources of raw materials for the production have to be ensured through sustainable collection and utilization. The increase in collection of medicinal plants from wild will have detrimental impact on biodiversity if conservation issues are not addressed strategically. The farmers are now being trained in good collection practices and encouraged in sustainable collection and cultivation of medicinal herbs. To diversify collection sites, alternative sources for medicinal resources are identified and cultivation promoted for some potential herbs.

## **Resources for Traditional Medicine**

According to *gSo-ba Rig-pa*, more than 2990 different types of raw materials are known for use in the manufacture of traditional medicine and about 600 medicinal plant species have been identified in Bhutan. However, the Unit currently uses about 300 ingredients to manufacture 98 compounds that constitute as National Essential Traditional Medicine List and 14 additional products for commercial purposes. The main raw material, around 90% of the prevailing traditional medicine, are medicinal plants and the remaining part is derived from animal and mineral origins. The high altitude medicinal plants are sourced from areas with altitudes ranging from 3500 to 5000 meters above sea level (masl) and low altitude from 200 to 1500 masl. Although most of the plant ingredients are collected from the wild, some of the species are now being cultivated/domesticated by the farmers. Perhaps medicinal plant collection may be one of the first economical activities initiated and sustained in this highland.

Of the total 16 tons of raw materials procured, about 85% of it was collected within the country. The remaining 15% were mostly imported from India. The Unit procures or collects around 13.5 metric tons of raw ingredients on the average as illustrated in Fig. 1 but this quantity is expected to double within another 2 to 3 three years.

Fig. 1 Raw material consumption trend (2003-07)



### Sustainable Production of Traditional Medicine

The sources of raw materials for the production of traditional medicines have to be assured for the sustainable production and ultimately for

sustainable delivery of traditional medicine services. Since the bulk of these ingredients are medicinal plant species, the conservation of medicinal plant resources is a concern and has been accorded top priority. Even the focus of ongoing European Union funded Medicinal Plants Project II is the development technical and organizational methodologies for sustainable conservation, collection and/or domestication of a range of high altitude medicinal plants and the development of medicinal plants industry at all levels including sustainable collection and/or production and marketing of herbal products.

To address this concern and promote the judicious use of medicinal plant resources, the following strategies are in place:

- **Minimizing wastages**

Lack of proper drying technology and collection time coinciding with peak monsoon contributes to wastage of herbs and deterioration of quality. To minimize wastages and sustain the production of quality Traditional Medicine, Lingshi under Thimphu and Langthel under Trongsa were selected as collection and drying centers for high altitude and low altitude medicinal plants respectively. The Lingshi Drying Centre is run by 10 KW Micro-hydel but since the capacity is only 10 KW, the quantity of energy generated became inadequate with the increase in collection volume. This influences the supply of both quality and quantity of traditional medicines.

- **Management of Medicinal Plants**

Community Based Sustainable Management of Medicinal Plants was established and some species introduced for cultivation/domestication in collaboration with the Medicinal and Aromatic Plants (MAP) Section of the Ministry of Agriculture. Only those residing in local communities are registered as authorized collectors and their collection sold to PRU either through the drying centers or at the factory premises.

- **Training on sustainable collection**

With the technical assistance from MAP, farmers are regularly trained in sustainable collection methods and good collection practices including some aspects of plant biology. The intention is to ensure long-term survival of wild populations and their associated habitats.

- **Introduce alternative collection sites**

Lingshi has been collection centre for high altitude medicinal plants since 1967. For sustainable collection, other highlands like Gasa, Haa, Bumthang and Dagala are being explored to introduce as alternative collection sites.

- **Cultivation of medicinal plants**

To ensure long-term sustainability of medicinal plants, farmers are encouraged in cultivation/domestication of medicinal herbs. The intention is that farmers can grow medicinal plants as a cash crop in the same manner as fruits and vegetables. For any produce in excess, a ready market already exists in India and other countries.

### **Good Collection Practices (GCP)**

Following the WHO guidelines on good agriculture and collection practice for medicinal plants and using its outline as the basis for evaluation, the current collection practices of Pharmaceutical and Research Unit, depending on plant parts (roots, leaves, fruits, seeds, flower, etc.) to be collected include:

- **Permission to collect**

The collection permits are obtained from Department of Forest, Nature Conservation Division and Park Management prior to collecting any natural resources or medicinal plants from the wild. Although the concern local communities carry out actual collection, the Unit depending on the requirements obtains the permits. If it is for export, phytosanitary certificates, export permits and CITES certificates are sought from Bhutan Agriculture and Food Regulatory Authority (BAFRA) and National Biodiversity Centre.

- **Technical planning**

Prior to initiating a collection expedition, the annual requirements are calculated, geographical and population density of the target medicinal plant species are determined, seek collection permits and organize collection team conversant in ethnographical information, identification, etc. and comprising of quality expert and personnel for sorting, cleaning, drying, storage and bulk transportation.

- **Selection/identification/authentication of medicinal plants**

The medicinal herbs are selected as per the traditional text and pharmacopoeia and the samples identified by traditional medicine experts according to the texts. The farmers are regularly trained in basic plant biology and identification of right species. Further, to help authenticate the species the medicinal plants herbarium has been established and quality control section assures the quality and authenticity of the collected herbs.

- **Collection**

As far as possible, the collection practice ensures the long-term survival of wild populations by determining the population density of the target species at the collection sites. The local communities are also trained on collection of roots and barks and tools to be used. The herbs are collected during appropriate season depending on plant parts (roots, leaves, fruits, seeds, flower, etc.) to be collected and as prescribed in the traditional text. Usually the bulk collection season starts from July to September and December to February for high and low altitude medicinal plants respectively. The collected raw medicinal plants are then subjected to preliminary processing of cutting, sorting, washing and drying and are kept protected from insects, rodents and other pests before transporting to the processing unit.

- **Personnel**

While embarking on collection task, the management ensures that the collection coordination team has adequate technical knowledge on collection process and that the local collectors have sufficient knowledge of the species targeted for collection. The team has the duty to convey awareness on protection and conservation of plant species, as well as social benefits of sustainable collection of medicinal plants. The team also has to take necessary measures to ensure safety and welfare of all personnel involved in the collection.

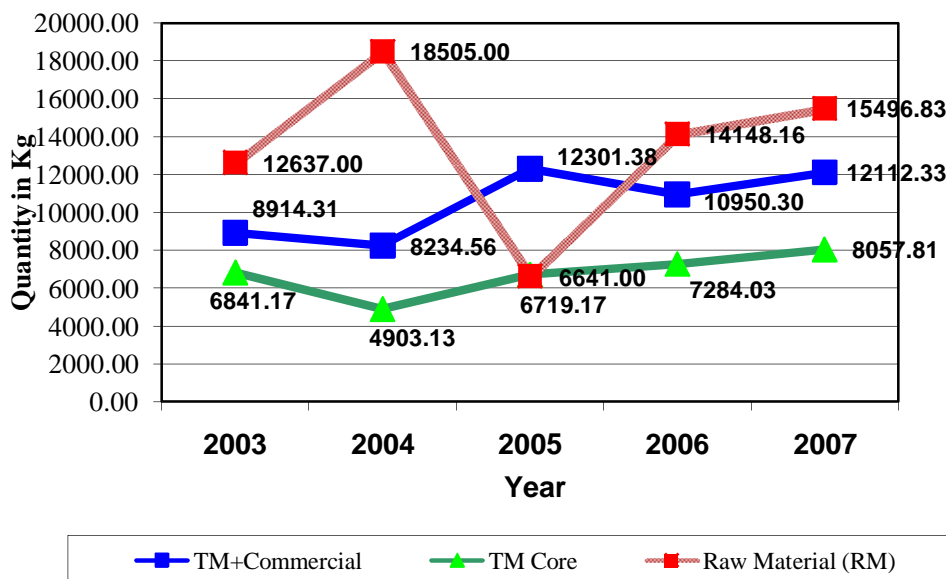
### Technical aspects of GCP

The technical aspects pertaining to good collection practices include post harvest care to assure the quality of collected raw medicinal plants. The quality of materials is assessed through visual inspection to screen cross-contamination by foreign matters. The collected materials are also subjected to organoleptic examination such as appearance, damage, size, colour, odour and to certain extent for taste prior to primary processing of washing, sizing and drying. The primary processed raw ingredients are then packed, labeled, and stored for transportation.

### Production of Traditional Medicine

Today traditional medicines are produced using modern science and technology based on principles of GMP while not deviating from the principles and concepts of *gSo-ba Rig-pa*. At present PRU, alias *sMen-jong gSo-rig* Pharmaceuticals produces 98 products that constitute as National Essential Traditional Medicine List and 14 additional products. Of the 12 tons of total production, about 8

Fig. 2 Production output vs raw material consumption (2003-07)



tons are core traditional medicines. This is an increase of production by about 9.6 % compared to previous year (2006).

### Conclusion

With the plan to expand the traditional

medicine services in the periphery, timely supply of quality traditional medicine in sufficient quantity would be necessary for the effective delivery of quality health services. To sustain production and meet the growing demand for traditional medicines, production capacity of PRU needs to be upgraded. The sources of raw materials will have to be ensured through sustainable conservation, collection/ cultivation/domestication of medicinal plants. While MAP had made good progress in cultivating/domesticating some high altitude medicinal plants, challenges are faced to mimic the habitat for cultivation of some species. The PRU must exert immense efforts to develop a strategic framework including action plan through community involvement that will contribute significantly to the conservation and development of medicinal plants industry at all levels including sustainable collection and production of traditional medicine.

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