Published in final edited form as:

East Asian Sci Technol Soc. 2013 March ; 7(3): 397–423. doi:10.1215/18752160-2332366.

Qualitative Exploration of the Potential Causes of Serious Reduction in Availability of Medicinal Plants in the Qinghai-Tibetan High Plateau

Mingji Cuomu

Wellcome Trust Postdoctoral Research Fellow, Institute of Social and Cultural Anthropology, University of Oxford, 51-53 Banbury Road, Oxford OX2 6PE, UK

Abstract

In the last ten years, there has been a dramatic reduction in medicinal plants in Tibet. This situation has attracted the attention of many researchers from different professional backgrounds, yet very few documents have been published on the general theoretical context and the actual process of herb collection as it occurs at different levels in clinics in Tibet. This article begins with a systematic review of the general principles of medicinal plant collection methods as set out in the ancient traditional medical system. Because the demand for plants is generated by the need to make Tibetan medicines, it is necessary to consider the original context of Tibetan medicine to understand pharmacological needs and the principles behind collecting medicinal plants to develop a strategy that might guarantee sustainable development of the plant supply. After considering the wider context of this study, the article presents research mainly based on case studies with the intention of understanding different stakeholders' experiences and social relationships in the contemporary herb collection process in order to discover behavioral patterns within the dynamic social roles involved in this process as these inform policy formation and to seek to promote appropriate methods in the future.

Keywords

Tibet; medicinal plants; conservation; traditional medicine

In the contemporary world, traditional medicines play a vital role in health and well-being in many developing countries (Lambert et al. 1997). Medicinal plants are the essential element in almost all forms of traditional medicines. Therefore, many experts believe that the most important action required to conserve medicinal plants is to preserve a country's cultural heritage; any other actions, such as cultivation, can only partially solve the problem (Blaikie 2009; Pei, Huai, and Yang 2009).

For many centuries Tibetan medicine was the sole medical system serving the population in Tibet and other neighboring countries (e.g., Mongolia, Bhutan, and some parts of Nepal and India). Even today it remains one of the mainstream health care systems in Tibet (Migmar

2004). It is reported that 70–80 percent of Tibetans in Lhasa in 2009 would choose the Tibetan Medicine Hospital as their first option for medical treatment (Tibet.News.CN 2009). Medicinal plants (*sman rtsa* in Tibetan) are of central importance for Tibetan medicine, since they form the basis of most medical treatment.

While Tibetan medical treatment continues to be the treatment of choice for many Tibetans, its popularity has also been increasing in other parts of the People's Republic of China. Information from the sales department of the Gzhong pa lha chu Tibetan medicine factory (personal communication, 2003)¹ shows that the demand from China has been increasing yearly, which places a strain on normal supplies as well as stimulating regular price surges. This trend indicates that the efficacy of Tibetan medicine is valued and accepted, serving not only Tibetan ethnic groups but also people all over China and even the West (Pordié 2008). In order to maintain this valuable healing tradition, it is of key importance to conserve medicinal plants in order to ensure the regular supply of Tibetan medicine for clinical treatment for local people.

A number of recent meetings and conferences have highlighted concerns about this issue. On 28–29 July 2007, Rokpa International² held an international conference in Yushu, Tibet, on the cultivation and collection of Tibetan medicinal plants and the impact of standardization, tourism, and global environmental issues (see Drangsong 2008). This meeting, for which I was a co-organizer, aimed to raise concerns regarding environmental protection and to seek a joint solution with relevant professional bodies to rescue those plants featured high on the list of endangered medicinal plants. We invited Western participants, including ecologists, public health experts, and Western doctors from Canada, Germany, England, Ireland, and the USA, as well as Tibetan medical physicians, factory staff, and project coordinators from nongovernmental organizations in central and eastern parts of Tibet. During the final roundtable discussion, Tibetan medical practitioners from different areas identified the current situation in their local areas and also analyzed the possible causes in relation to the situations of their own regions. The Western participants presented two recommendations during the roundtable discussion:

- Establish scientific measurements of quality assurance procedures on the basis of observations of clinical effects and laboratory tests in order to determine whether cultivated plants can have the same potency as the wild herbs;
- Raise funds and organize a specific project to rescue endangered or seriously reduced plants.

A similar meeting, a dialogue on the conservation of Himalayan medicinal plants involving representatives from China, India, and the United Kingdom, had taken place in Kunming, China, on 24–27 April 2007. It was found that medicinal plants throughout the Himalayan regions are under similar pressures; this includes Tibetan parts of China, India, and other countries such as Nepal and Bhutan. All participants agreed that the involvement of local

¹The Gzhong pa lha chu Tibetan medicine factory is a Good Manufacturing Practice (GMP)–registered Tibetan medicine factory located in Tulung County, Lhasa Municipality, Tibet.

²Rokpa International is a registered charity, founded in 1980 by Chöje Akong Tulku, a Tibetan doctor and teacher, along with Ms. Lea Wyler, a Swiss actress, and her father, the Swiss lawyer Dr. Veit Wyler, with the aims of relieving poverty and supporting education and health care in countries in the developing world (Rokpa International 2009).

communities in the management of medicinal plants is of great importance. In particular, traditional doctors are the most knowledgeable concerning medicinal plants and the local social group most concerned with their conservation (Plant Life 2007).

On 7 September 2009, the Seventh International Congress on Traditional Medicine was held in Thimphu, Bhutan, with eighteen panels and more than two hundred participants from thirty countries. The overall theme was “Asian Medicine: Cultivation Traditions and the Challenges of Globalization.” One panel, “Cultivating the Wilds: Idioms and Experiences of Potency, Protection, and Profit in the Sustainable Use of Materia Medica in Transnational Asian Medicines,” focused specifically on the conservation of medicinal plants. Eighteen speakers, including botanists, herb traders, anthropologists, Tibetan doctors, and project coordinators, analyzed the current situation in different regions; eleven of the papers were subsequently published (Craig and Glover 2009). Calum Blaikie, one of the speakers at this panel, linked the issue of conservation of medical plants to the changes in the way that Tibetan medicine is practiced, moving from individual small-scale practices to big medical institutions, with the consequent pressure to manufacture medicine (Blaikie 2009). Other speakers emphasized the relationship between cultural diversity and biodiversity (Pei, Huai, and Yang 2009; Dorje 2009).

However, despite a great deal of discussion around this topic, there is a lack of research into fundamental points. My main concern in the present study was to identify the reasons that, after many centuries of sufficient and healthy supply of medicinal plants that caused no apparent harm to natural resources, a dramatic decrease in medicinal plants has occurred over the last two decades. Two factors appear to be critical: the increased level of demand and the change in the collection methods. The latter results from the change in the overall health administration and from the industrialization of medicine production, which is no longer purely for therapeutic purposes but rather for sale.

The aims of the research project were therefore to investigate the causes of the reduction in availability of medicinal plants on the Tibetan plateau, and to synthesize empirical data and existing literature to inform future policy and practice concerning adequate supplies and biodiversity conservation.

In order to identify the underlying problems, it is important to have the entire narrative picture, from collection in the wild up to dispensing to patients. One needs to look at who is involved and how the substances are handled (in terms of the identification, the parts that are used, and the harvesting time) under the recent systems of social and health administration where herb collection is no longer under the careful control of the doctor's hand for therapeutic purposes but instead has become industrialized, with more parties involved.

I first examine textual descriptions of herb collection methods, to see whether they can contribute to ensuring sustainable development, and consider how the present situation is affecting these methods. Then I present a series of six case studies in which I describe the herb collection process today at different regional levels, where the overall social health infrastructure and accessibility of the market differ, and present qualitative data from

different stakeholders involved in this issue, concerning their knowledge and behavior patterns in relation to herb collection. Then follows discussion and conclusions.

1 Methods for Collecting Medicinal Plants in Tibet

An essential initial research question is what we mean by sustainable development in general (see Dunham 2009). More specifically, how should we set appropriate standards for sustainable development when referring to each individual plant? To be able to answer this question, we need to trace Tibetan medical textual descriptions in the light of the relationship between pharmacological requirements and the actual use of the parts of the plants in Tibetan medicine. Are the principles for collection and supply of medicinal plants designed in accordance with the natural biological cycle of plants, or are they merely to fulfill the medical need, since the demand for the medicinal plants is mainly for clinical supply. This phase of the research therefore began by studying and analyzing the principal Tibetan medical textbook, the *Four Tantras (Rgyud bzhi)* (Yu thog yon ten mgon po 1993). This was supplemented by my own knowledge of how herb collection and supply had been carried out in the past, based on my work in the field of Tibetan medicine for many years.

1.1 Tibetan Cultural Beliefs and Medical Principles in Relation to Plant Collection

The theory of Tibetan medicine is based on a holistic understanding of human health and its relation to the natural environment. The *Four Tantras* (Yu thog yon ten mgon po 1993) reveals methods for overcoming health problems by gaining the right balance among various biological dynamic factors (i.e., the three *nyes pa*, *rlung*, *mkhris pa*, and *bad kan*), peace in the society, and harmony with the natural environment, by appreciating the deep interconnection among various health determinants (psychological, biological, sociological, and the ecological environment). This means the medical theory is developed in line with a full appreciation of the wider natural cycle that exists between humans (and all other sentient beings) and the natural environment, from which a sustainable system has formed naturally.³ This is based on the Tibetan philosophical approach known as *rDzogs chen*, a key philosophy and mode of practice in the *rNying ma* school.

This holistic view, as applied to medicinal plants, can be seen in the principles of herb collection procedures described in the *Four Tantras*. These not only aim to ensure the best quality of medicinal plants for clinical use, but also, as detailed in later sections, have a positive effect on conserving biodiversity.

Culture is an important factor that should not be neglected when studying this recent phenomenon of the reduction in medicinal plants. This is important not only to understand the individual's behaviors when harvesting medicinal plants but also for research that aims to achieve sustainable development of herb collection procedures with the aim of using community-based health education (among other things).

³“Wider natural cycle” refers to the greater universal autonomous system; for instance, humans need to intake oxygen, which is produced by plants; humans excrete carbon dioxide as waste, which in turn is a nutrient for the plants.

Traditionally, for many centuries Tibetans have led a life in which they have had very strong collective sensitivities that are expressed not only between humans, but also toward all sentient beings, as well as the natural environment. This is because of their particular cultural and religious beliefs, which confirm a profound concern for the ultimate well-being of all sentient life: they consider that all forms of life, even insects or elementary forms of conscious existence, have a life similar to their own and are worthy of respect.

Thus, the *Four Tantras* argues that life manifests not necessarily only in biological forms but also in the wider environment, such as the atmosphere and other substantial elements in various forms that could be present in the soil, in water, in the air, and in trees, rocks, and mountains (Yu thog yon ten mgon po 1993: chaps. 23, 79). These spirit entities are considered to be valuable and significant forms of life, and it is believed that their welfare plays an important part in the maintenance of a healthy environment for people to live in and can be a major cause of various health problems once the harmony is destroyed.

Tibetan medical and Buddhist culture of the Qinghai-Tibet Plateau has cultivated a significant awareness of the environment and an understanding of its importance for sustaining human life, as part of their holistic knowledge system. This general belief, coupled with the long historical development of the use of medicinal plants and their contribution to local people, has nurtured a unique cultural consciousness that has shaped local people's attitudes toward plants and the natural world. One example of this can be given from my observation that it is taboo in Tibetan culture to take anything (e.g., plants and stone) that grows or exists in sacred areas, as these are considered to be parts of the bodies or belongings of natural deities. Taking away any such substance can cause harm due to the anger provoked by the inappropriate action.

Despite the cultural belief that asserts a respectful attitude toward the natural environment, action is still needed for the provision of training in herb collection methods. As this involves specific knowledge in terms of identification, collection, and knowing the required seasons to ensure quality for clinical use, following the required methods should bring less or no harm to the natural environment. This will be explained in a later section. In particular, when the collection site is not a sacred area, people tend to collect freely as much as they can get without being aware that their way of collecting risks endangering certain plants.

Recent evidence suggests that medicinal plants are not just diminishing in quantity but also in size, since many plants take about five or ten years to mature (see Dunham 2009). Carroll Dunham considers that the most effective, sustainable plan for preserving medicinal plants would be to create some sacred areas,⁴ which will invoke a greater degree consideration by most people (see Dunham 2009). In Tibetan culture and in local traditional cultural belief, it is not permitted to take any substances, including plants or stones, from sacred mountains, because there are special natural spirits that own that part of the landscape. If people neglect the existence of that natural power, this would cause illness. Regardless of whether or not there really are natural spirit powers, these attitudes would be good to take into

⁴In general, sacred areas in Tibet are often identified by Buddhist masters on the basis of spiritual visualization and perception during various deity practices or some other ritual related occasions.

consideration not only when trying to understand the behavior patterns around collecting medicinal plants but also when formulating educational materials about herb collection methods.

1.2 Methods for the Collection of Medicinal Plants in Tibetan Medical Texts

Herb collection should be carried out according to the pharmacological requirements defined in Tibetan medicine. These involve specific collection seasons for each individual plant and descriptions of the part to be used in the making of medicine, along with other relevant methods (e.g., drying and storing). Tibetan medical textbooks teach the best seasons and methods for collecting medicinal plants for each individual plant.

Thus, the *Four Tantras* states the following about the harvest season:

Root, branch and stem are the stem family and treat diseases of the bone, vessels and flesh, the harvest season is at the very end of autumn when all the fruits are completely dried up; Leaves, white fluid and shoots are leaf family and they are useful for illnesses of the hollow organs. The harvest season is during the summer time when leaves are flourishing. Flowers, fruits and tips are fruit family, they are effective for diseases of the eyes, viscera⁵ and head. The recommended harvest season is in the autumn when all the fruit are mature. Coverings, layer between and nuts are the covering family, which is good for diseases of the skin, cartilage and limbs. They should be harvested in the springtime when flowers start to emerge. (Yu thog yon ten mgon po 1993: chap. 12)

If the part to be used requires harvesting leaves, the collecting season for the majority of plants should be in the summer. The reason for this is that the nutrients of the plants in this season are accumulated in the leaves, and therefore, this time of the year is the most effective for collecting leaf ingredients, to ensure greater potency. Collecting leaves alone will not harm plants that grow and mature continuously, so the system is designed in accordance with the natural law, which in turn contributes to ensuring long-term sustainability. Similar methods are applied to other parts such as fruits, flowers, and roots. It can therefore be concluded that combining knowledge of the parts to be used with specific harvesting seasons shows a high appreciation for the perfect cycle between the best use of the potency of plants and preventing harm to the natural environment (see Fig. 1). This procedure reveals the existence of a natural harmony between inner beings and the wider environment.

An example illustrates how Tibetan medicine places great importance on harvesting plants during the right season. *Srad kar* (*Oxytropis ochrantha*) is one of the most effective therapeutic plants for treating various kind of edema. (See the appendix for a list of Tibetan medicinal plants referred to in the article.) The part that should be used is the root, and the collection season is at the very end of the autumn (or the start of winter). This is when all the fruits have dried up, and because this plant has few colors and the flowers are white, it is supposed to be suitable for treating edema. Once the flowers have withered, it is difficult to

⁵Tibetan *don*. This includes the heart, lung, liver, spleen, and kidney.

differentiate them from the stems or leaves. In order to collect the root of *srad kar* at the end of the autumn, Tibetan physicians go to the mountains in the summer when the flowers come out and make a special mark beside the flowers, and then collect them at the very end of the autumn. Tibetan physicians believe that plants are only effective if one carefully selects the effective parts during the right season.

There are special requirements for collecting some plants regarding the season or time, so that they increase in medicinal power. For instance, *par pa ta* (*Hypecoum leptocarpum*) needs to be collected after the first thunder is heard in the spring. *Pri yang ku* (*Dracocephalum tanguticum*) is meant to be harvested when it grows about 3 cm tall, but the roots should be left. It is important to collect the plant known as *zwa* (*Urtica dioica*, stinging nettle) on the fifteenth day of the fourth month of the Tibetan lunar calendar.

1.3 Changes in the Pattern of Tibetan Medical Service and Production

The change in health administration has moved plant collection away from local practitioners collecting herbs themselves to government institutions represented by factories and hospitals. Thus, the knowledge patterns have changed. In the past knowledge was transmitted at a local level in terms of the whole cycle of collection, detoxification, production, diagnosis, and prescription, and this was all in the hands of local doctors (see Fig. 2). Now a different pattern of knowledge exists, with more specialized roles in each procedure (see Fig. 3). However, no effective education system is applied to the herb ordering process, given that this procedure is no longer controlled by doctors but by factory staff or herb dealers. These people might themselves not have sufficient knowledge of herb collection methods.

For example, from my professional knowledge as a doctor of Tibetan medicine for many years, in the past each individual doctor had to have all the relevant skills such as being able to identify different plants, detoxify raw materials, and produce, diagnose, and prescribe medicine (Fig. 2). The advantage of this traditional operating system was that it not only ensured a better quality control for the herb collection process but also led to better quality in both medical practices and the production of the medicines. Because the system of Tibetan medicine was highly individualized (both the diseases and the knowledge of the doctors), the ratios and selection of the ingredients could be varied depending on the ways that various health problems manifest, and often the most effective medicines were prepared with the careful examination of the state of the three dynamics (*nyes pa*), to decide upon the types and ratios accordingly prior to synthesis into a medicinal compound. The creation of new remedies or clinical research of Tibetan medicine was similarly conducted in such a way, involving careful observation in terms of the changes in the pattern of the three dynamics in different diseases with the uses of the different medicines through various diagnostic methods. Such an observational process also helped to refine the medical skills of Tibetan doctors.

The medical practice or the production of the medicine was mainly for therapeutic purposes, with emphasis placed on a pure motivation (compassion) throughout the entire learning and practice process—this is one of the most important elements in medical professional development, with not much attention being paid to economic benefits. As a result, there

was no fixed price for consultations or medicines: patients would offer whatever they could based on their individual financial situation—poor people would get free treatment or just pay a little, whereas the rich would pay quite a large amount. Tibetan doctors enjoyed a high social status despite the fact that their income might be just enough to maintain their continual practice.

Thus, according to Jinpa, an interviewee from sBra-chen, Nag-chu, Tibetan Autonomous Region: “My father is a family lineage doctor; I remember when I was small, patients came from all over surrounding areas. With poor patients, my father not only gave them free treatment, but also provided the accommodation and food until they got better. Due to the condition of the house, the patients slept all over my home.” When the medical practice is operated in this way, we can see that not only the influence is on the medical practice or medical production, but also the cultural belief (generated from the medical and philosophical theory), the social response, the behavior pattern, and the value of life (both by doctors and by patients) are such that spiritual values and moral principles are highly appreciated. Thus, I argue that the preservation of the Tibetan medical tradition is of key importance for biodiversity conservation, as the medical system is designed in a way that requires the handling of every procedure in a mindful and healthy way.

In contrast, nowadays medicines are produced in factories in large quantities as a commercial product intended for sale (Fig. 3). Because all the procedures are related to motives around profit, people just want to increase the weight of the collected plants in order to earn more money, which results in the pulling out of whole plants. By the same token, in factories, in order to achieve higher profits, attempts are made to save time and increase weight. Thus, the indicated effective parts of plants according to the medical texts are not always carefully selected; rather, whole plants are used, in a crude way. This would not cause severe harm in most cases, but according to the *Four Tantras* it could make the medicines less effective or cause problems with the digestive process.

Moreover, along with the reform of the Chinese economy at the end of the twentieth century (Chinese *gai ge kai fang*), and in particular in 1998, after the introduction of a new policy document that separated the administration of medicines from that of hospitals, the Tibetan Autonomous Region established an administrative department to control the production of medicines. Since that time, production of Tibetan medicines has to pass through several experimental controls in order to fulfill GMP (good manufacturing practice) regulation requirements, while the market demand for the supply of herbs has also increased dramatically. Nevertheless, there is still no state regulations for wild herb collection to maintain a balance between economic development and environmental protection (Phuntsok 2010).

2 Case Studies in the Current Herb Collection Process

In this section I present material from a number of interviews with people involved in the collection process in different parts of Tibet. The data for these studies were collected mainly in Lhasa and Qinghai in the summer of 2009, with further additional data being

gathered in August 2012. I conducted sets of interviews in central and eastern Tibet, through my professional work connections as a traditional medical doctor.

2.1 Herb Purchasing from Herb Dealers or Individual Wild Collectors by the Tibetan Medical Factory in Lhasa (Central Tibet)

I begin with excerpts from an extended interview with the director of the Herb Procurement Section of the Tibetan Medical Factory in Lhasa.⁶ Medical factories are key to the process of herb collection, so any future plans either for the provision of training for the relevant stakeholders or for making recommendations to the policy makers need to be based on their work. However, many private doctors and villagers still produce their own medicines, so while medical factories account for a large share of herb collection, they do not account for it all.

2.1.1 Definition of the high-plateau plants and natural collection sites—The first excerpt emphasizes the variation in quality of medicinal plants with the place of collection.

Based on our daily work experience in herb collection and supply, we found that high-plateau medicinal plants can be defined as growing between the altitude 3,700 and 5,000 meters or above. While lower than that, we found the size, shape and the function can differ even with the same species. We therefore rarely use medicinal plants coming from low altitude areas such as Kongpo. For instance, *btsan dug* [*Aconitum kongboense* Lauener] grown in Kongpo (about 2,600 m above sea level) is totally different from that which grows at high altitude and is not the right type to be used in medicine.

These medicinal plants form an important part of Tibetan medicine and are mostly used exclusively only in Tibetan medicine, apart from very few plants such as *spang rgyan sngon po* [*Gentiana stipitata* Edgew., Chinese *long dan hua*] and *bya rgod sug pa* [*Saussurea medusa*, common term *gang lha me tog*, Chinese *xue lian hua*], which have been used in Chinese medicine.

2.1.2 Herb collection process—The supply comes from specific areas, either directly or through herb dealers.

Historically, most medicinal plants are collected from Dogde, Todlung, and Myangre. Since the 1980s, the major medicinal plants have been collected from Tudlung, while high-altitude plants are harvested from Medro Gongkar. These include plants such as *re skon tsi dmar* [*Corydalis conspersa* Maxim], *stong ri zil pa* [*Corydalis hendersonii* Hemsl.], and *bya rgod sug pa*.⁷ When they become rare in the areas close to Lhasa such as Todlung and Dokde, the orders are made from Lhoka and Shikaze prefecture.

Herb dealers now have a major role as intermediaries; however, the factory often also buys directly from farmers.

⁶All translations are by the author.

⁷These are typical high-altitude plants often growing at the top of high mountains.

It is difficult for the factory to purchase if the quantity that the individual farmer is selling is too small, as all the raw materials have to be sent to the drug administration for laboratory testing to see whether the chemical component complies with the required standards. This is a compulsory procedure that every medicinal ingredient should go through. It is difficult to do the laboratory test when the amount is too small, due to the work and the cost. In this case, we then have to rely on herb dealers to purchase enough quantity separately before sending it for laboratory tests.

Nevertheless, with some of the rare medicinal plants, such as *aud pal sngon po* [*Meconops toquata prain*; blue poppy], we purchase them in whatever the amount we can get, providing the supply comes from the right areas. Since the variety collected from eastern Tibet and Gongpo is shown to have a different quality, it is not suitable to be used in Tibetan medicine. We do not purchase it when it is not the type that we are seeking to buy.

2.1.3 Quality control during the herb collection process—Quality control is handled in three ways: herb collection principles stated in the *Four Tantras*, daily management, and laboratory testing.

Concerning herb collection principles, seven key methods were instructed in the *Four Tantras*, to maximize the effect within each single procedure of collection and synthesizing. These include choosing the location, right season, proper drying procedure, keeping fresh, detoxification, smoothing, and appropriate synthesizing. The first four steps should be handled during the collection process. This is difficult to manage nowadays, since doctors are no longer directly involved in the collection process, which is handled by herb dealers and farmers, whose knowledge of herb collection is very limited. Also, the need to have enough material for the much higher volume of medicines now being produced makes it difficult to follow the principles in the *Four Tantras* precisely:

It is rather difficult to handle the herb collection process according to the principles required in the *Four Tantras*. In particular, as those rare medicinal plants such as *so lo dkar po* [*Pegaeophyton scapiflorum*] and *aud pal sngon po* are really rare and not easy to obtain, we use the whole plants even if the part required is just the flower. This applies, for example, to *aud pal sngon po*, *sum bcu tig* [*Saxifraga umbellulata*], and *so lo dkar po*. However, with the more easily available medicinal plants, a better standard can be reached, for example, with *se ba* [*Rosa omeiensis* Rolfe], we collect exclusively the flower part, paying a higher price. With this, the order is also only for the part to be used, or the factory staff will put in extra work to get rid of the unusable part.

Quality control within the factory's daily management has to be handled so as to ensure the quantity of supply needed for production. This is a rather complex procedure, and the implementation of any of plans and strategies will have to fit or support legal regulations. In any case, government support in terms of research and finance is essential, without which any plan can barely be put into action.

In practice, the work of quality control and environmental protection needs to be handled side by side, since the environment is the fundamental source of medicinal plants, without which both supply and quality cannot be guaranteed. Thus, the relevant professional bodies need to work together to formulate policies allowing a healthy use of the resources. The task of quality control in the factory's daily management can only be achieved by working in line with environmental protection, policy making, and government support. This is difficult when there is a lack of much evidence-based research or a clear system of policy and information. This is reflected in the interviews below:

There is a saying: "Though *btsan dug* is widely growing, the best can be found in Kharak."⁸ Our factory has been fencing that area to be our special collecting site. However, as only the leaf part of the *btsan dug* is identified as *dzin pa*, when we accept exclusively only the leaf and flower parts, it is impossible to meet the required quantity. For example, if we need 250 kg of *btsan dug* to produce a particular medicine, we may only be able to collect 50 kg from that area. As a result, the action of fencing a particular area seems to bring better effects as regards environmental protection, but not in terms of ensuring herb supply.

The medical factory is continuously trying to establish specific areas as herb collection sites. However, this also can sometimes create problems:

For instance, we have our collecting site created in Kharak and Medro Gonggar, where all the plants are supplied exclusively to our medical factory. We are hoping to set a new one in Tudlung. But with the introduction of the new law for farmers [Chinese *san nong zheng ce*], they now enjoy better conditions, and nobody is interested in harvesting medicinal plants. Another problem is when the environmental issue becomes substantial: a law called "closing hillsides and forest cultivation" [Chinese *feng shan yu lin*] was issued by the forest bureau in order to protect forests, with significant funding provided. In Kharak there grow large numbers of *ba lu* [*Rhododendron primulaeflorum* Bur. et Franch] and *spen ma* [*Potentilla arbuscula* D. Don / *P. fruticosa* auct. non. L.]. This was also determined as a protected site and people have been engaged to look after the area. However, the guardians prevent any cutting even for the collection of medicinal plants, despite the fact that adequate collection would not cause any harm to the mountain. It is of course a useful law, but if not handled skillfully, it can go to another extreme and waste resource.

In short, the local population cannot handle these matters flexibly on the basis of the real situation due to an inability to see the whole picture. When the importance of environmental protection filters to the local population and they see the dangers, they stop any work of collection. When there is no such information or law, no protection takes place no matter how great the harm.

Sometimes, although it is valuable to take traditional experience and ideas into account when making policy, it is still necessary to see the feasibilities of that plan in terms of the current social context.

⁸An area in Nanggang ze County, Lhokha Prefecture, Tibetan Autonomous Region.

Some people highly praise the introduction of GMP standards, and are glad about the inclusion of some of the traditional practices into those standards, for example, setting some historically well-known collecting sites to be the required collection areas as part of the guidelines to be followed. However, we find it is not realistic in practice because it is impossible to satisfy the demand if one is limited to collect from one single location. Therefore, instead of setting the standard according to historically renowned sites, it is better to take the altitude into consideration as a method for identifying the areas. Thus, the standard that we now take, for example, with *btsan dug*, is that those plants which grow between an altitude range of 3,700 and 5,000 meters, maintain the same medicinal qualities, while at lower altitudes, the potency differs.

Staff at the Tibetan Medical Factory have noticed the problem of lack of professional knowledge among the herb dealers and village collectors. They have produced small leaflets for certain medicinal plants, including some detailed methods, to hand out when orders are made. In addition, they have tried to set quality requirements in the contracts with herb dealers when making orders of medicinal plants, as a form of quality control. Attempts are also being made to organize training.⁹ However, all of these plans have faced difficulties.

We also make contracts with herb dealers when making the orders for the annual medicinal plants. We inform them about the required collection season or time and so on to ensure quality. However, due to business competition between existing factories,¹⁰ some of the factories increase their purchase price in order to ensure the supply. For example, for *aud pal sngon po* we pay 10 yuan (\$1.40) per half kilo, but there can be another factory willing to pay 20 yuan, and then when we increase to 20 yuan, the herb dealer prefers to sell the herbs to the other factory as the request for the quality is much lower in that factory. We therefore have to pay higher prices than others (30 yuan) to ensure quality.

Having no national standard regulations [Good Agricultural Practice] implemented in this procedure, it is rather difficult to have proper quality control. Proper regulations, which ensure quality control, are essential, as well as room for making adequate profit. If the laws are too tight, limiting space for profit, nobody would be interested in this career.

If a system of training and tests were to be set as a condition for applying for an herb trade license within China, this would ensure better skills in the herb collection process by herb dealers. This in turn would make it possible for many of the key collection methods to be integrated into the professional rules that must be followed. Thus, these special requirements would become part of the professional work. However, herb dealers have no proper business license for their trade in medicinal plants, which makes it difficult to impose professional

⁹The purpose of the training is to ensure that collectors understand some of the very basic knowledge, for example, the identification, the parts to be used, the collection season, the right drying procedures, and the location in association with the quality. Each individual plant has its own specific requirements to ensure proper quality.

¹⁰For example, just in Lhasa there are three factories (Mentsikhang factory of the Tibetan Medical Hospital in Lhasa, the Tibetan Medical Factory of the Tibetan Autonomous Region for the Traditional Tibetan Medical College, and the Gzhong pa lha chu factory) competing with one another.

guidelines. Consequently, there are no restrictions, and suppliers can do whatever earns more money.

We do emphasize quality in the contracts, since if the quality of the medicinal plants is not good, it would affect the factory's business and become impossible to survive in the long run, so therefore we make contracts to ensure quality. In the past, we would even take a financial deposit from the herb dealers to avoid the risks of any changes. If the herb dealer has supplied the medicinal plants in accordance with the original request, we will then return the deposit money as well as pay the actual cost. However, this can be difficult sometimes, when another factory pays higher prices that even cover the deposit money plus the cost. In that case, herb dealers or individual collectors do not mind losing the deposit money as they would anyway earn more money with lower quality requirements.

In Tibet, most herb dealers work without having a proper license, whereas in China, most herb dealers have a national standard business license (Chinese *yao wu jing ying zhi zhao*), and there are many huge medical factories that can afford to fund training in herb collection methods. However, here it is difficult to get funding for such training, and the degree of support from the government is also limited; it would otherwise be very good if training could be organized so that both herb dealers and collectors will have better knowledge in herb collection methods and environmental protection.

One of the fundamental reasons for introducing proper regulation is the lack of professionally trained teams of wild collectors and herb dealers, properly informed in herb collection methods. The official license, however, is impossible for any individual herb dealer to secure, because of its extremely high standards.

Very often, medicinal plants are collected directly from farmers; they would not have such licenses. Few herb dealers even have a business license. This is not for dealing in medicinal plants, but it is a license named under business for local special products, for two reasons: easier permission and lower tax. Because the license allowing for the business of medicinal plants would cover the whole of China, not only is the tax high, but one needs to establish a proper company that includes staff from the Drug Administration. Unlike starting a small shop, it is rather complicated, and a very high standard is required, which is impossible for ordinary herb dealers whose education is relatively limited. To secure a properly regulated supplying procedure, we [all three factories in Lhasa] thought a market that allows wholesale and retail herbal business would be ideal solution. However, this has been proved to be difficult: those who have the herbal business license are limited by the fact that, on the one hand, the medicinal plants are restricted to certain types, and on the other hand, the supply of the Tibetan medicinal plants can only go to the Tibetan Medical Factory as they are not used in Chinese medicine. As a result, the demand is also not high; the possibility for making profit would also be small, not enough to merit setting up a company.

Laboratory testing is a scientific method for ensuring not only the right species but also the quality of the medicinal ingredients. It is a commonly used method worldwide and is being

introduced in Tibet as a compulsory procedure: “The measures for determining the suitability of the herbs or other medicinal ingredients are no longer based on the naked eye, personal judgment, or experience as in the past, but are based on possessing the right components that are defined with each medicinal plant. Nowadays there are strict regulations to control each step of the procedure. If any mistakes or problems happen, one cannot attribute those to wrong identification.”

It is clear from this extended interview with the director of the Tibetan Medical Factory’s Herb Procurement Section that the old system is no longer sufficient. The social situation has changed, and the population using Tibetan medicine has greatly increased. In the past, a doctor would collect half a kilo of medicinal ingredients, which may be enough to help quite a number of patients who seek treatment, whereas it is impossible to handle things in such a way now. What appears to be most important is to create an herbal business market with a proper system of regulation meeting the requirements of present-day society. However, it seems that there is neither support from the present policy for such moves nor a way to make recommendations to inform policy.

2.2 Herb Collection and Supply Process for Village Clinic (Central Tibet)

The herb collection and supply processes in most village clinics in contemporary Tibet are close to the traditional methods referred to above, as the overall social structure and people’s way of life have remained similar to what they were during the initial development of Tibetan medicine, compared with the urban areas. People are unlikely to have direct access to the market, and the overall social infrastructure is very primitive. Herb collectors are mainly doctors themselves, and the villagers collect herbs either to assist doctors or just for personal medication needs. None of them are paid for their work, because performing it is seen as a way to show one’s gratitude and appreciation to the doctor.

One of my case studies was conducted in Nyerong County, in the town of Serchen, where there is little or no industrial network. It is a typical remote Tibetan nomad town located in the extreme northern part of Tibet. The local populations still follow a traditional lifestyle and are entirely dependent upon animal husbandry for their survival. I interviewed the traditional village medical doctor who works in the town clinic and has received formal medical training. He stated: “No one in our village ever got the idea of earning money by starting a business based on medicinal plants. They will only collect the plants if asked by doctors or for their own on-going medication needs.” Since their livelihood is mainly dependent on animals, a small number of households—who are organized into groups—are scattered over large areas so that they have enough grass to feed their domestic animals. Traditional physicians have to travel long distances to provide medical treatment to the surrounding people. Based on my own professional experience of working in a county hospital as a traditional medical physician, the annual subsidies allocated by local governments to county- and village level clinics to buy medicines are very limited. It is therefore crucial for village clinics to produce their own medicines in order to improve their supplies. Moreover, producing one’s own remedies is traditionally part of the duty of each individual doctor when trying to find a cure for some severe chronic or complicated

condition. The patterns of disease cannot always be generalized according to Tibetan medicine as expounded in the *Four Tantras*. As stated by the same interviewee:

Part of the medicines used in this clinic, we produce ourselves in the clinic. We go to the mountains and spend more than twenty days every year there, once in the summer and once in autumn, depending on the types of the medicinal plants that we intend to collect.¹¹ This year we remained in the surrounding areas, whereas in certain years we used to go to another town, where the variety of plants is much greater than in this town.

When questioned about the loss of biodiversity observed in recent years, he said: “People report that the chances to come across species such as *sum bcu tig* and *re skon tsi dmar* have decreased dramatically. I personally noticed when I was younger that there were a lot of these yellow flowers [*sum bcu tig*]. However, they are much harder to find nowadays although they are a very important ingredient in treating gall-bladder disorders.” I noticed that the loss of biodiversity in this part of Tibet affects plant species differently, depending on what the customer demand is on the market. Later in the interview, I raised the issue of the situation of the most commonly used species such as *sro lo dmar po* (*Rhodiola* spp.) and *bya rgod sug pa* and how seriously the numbers of these plants have declined. However, the interviewee stated that these plants could still be found as easily and in the same amount as before. For example, if a collector goes to the mountains in the very early morning, he can easily harvest half a kilo of *bya rgod sug pa* by lunchtime. But based on the other case studies conducted with wild collectors, this is almost impossible in the surrounding wild areas of Lhasa.

Regarding the plants that, according to local populations, were most dramatically affected by the loss of biodiversity around Serchen, the interviewee thought that the causes are mainly the lack of care and knowledge among wild collectors: “Ordinary wild collectors, but also village physicians (especially junior physicians) are only aware of the potency of medicinal plants, but do not care about details such as collection methods. They themselves very often uproot the whole plant when they will only really use the leaves or flowers. Once the whole plants are pulled out, it is next year’s growth and harvest that is affected.” Despite this situation, no formal public policy has been implemented in Tibet to help address this issue, as well as the related issue of plant commercialization in modern times. However, there is a concern for prevention, which is associated with local cultural belief. According to the same interviewee: “Indeed, pulling out the root causes damage to the whole plant. Among the villagers there is a saying: ‘if anybody pulls out the root of *sum bcu tig*, then there will be *sdig pa* [negative karmic consequences].’ ” Local culture and traditional collecting methods therefore have built-in protective and sustainability aspects.

2.3 Herb Collection for an Urban Medicine Factory in Central Tibet

Unlike the situation in private and village clinics, in factories there is no direct connection with patients: medicines are produced to be sold. The entire procedures are operated as an

¹¹Each plant needs to be collected in a specific season or month according to Tibetan medicine.

industry. Herbs are either purchased directly from village wild collectors or supplied by herb dealers at a fixed price.

Dokde is a small village, which is historically well known for its large variety of medicinal plants species and has for many years been one of the most important herb collection sites for the Tibetan medicine factory in Lhasa. It is located about twenty kilometers away from the northern part of Lhasa and has been known for many centuries as a major practical training location for traditional Tibetan medical students who are seeking to learn to identify medicinal herbs.

Although this area is one of the largest providers of medicinal herbs, and almost all the households in the area are engaged in wild plant harvesting to one degree or another, the population is not solely dependent on herb collection, which was introduced by the director of the Department of Medicine at the Tibetan Medical College in Lhasa, and it never becomes their full-time occupation. Rather, their livelihood is mainly based on a mixture of agriculture and livestock-related work. As described by one of the wild collectors from Dokde, they collect medicinal plants when the Tibetan Medicine Factory places an order. The ordering process is very simple, given that local people have their own lay name for herbs. A female collector said: "The people from the medicine factory bring us some samples of the plants that they wish to order, and tell us their name; we will then collect them accordingly. In general we have been living in this area since we were born, so we have our lay names for each and every plant, and when the people from the factory come and show the sample, we can catch up easily and also learn the medical name of the plants." Although most herbs are supposed to be harvested in autumn, some of the plants should be harvested in spring or summer. According to my respondents, late July and August are the busiest harvest season for villagers in this locale. They collect the requested species in the quantities specified by the factory. Then, in the early morning, they carry the plants down to the factory on their backs, a two-hour journey on foot, and the sale is completed. I was told that, in this area, the local people have a direct connection with the factory, and the network is mainly formed between the collectors and the factory staff.

My respondents stated that, since the Mentsekhong factory is the main factory belonging to the Tibetan Medical Hospital in Lhasa, the factory staff have always kept their promises and always buy whatever they order. The village collectors appreciate this partnership with the local medicine factory, which is based on mutual trust. Recently, a new herb dealer came to the town to order *sro lo dmar po* root, but no one wishes to collect for him because they do not have confidence that this dealer or his agents will come back to the village to buy whatever they have ordered.

This local knowledge and resource-based industry bring significant economic benefits to the local people. A village collector said: "This actually generates a rather substantial income although it is hard to figure out the exact amount. Roughly speaking, it covers most of our food and grocery expenses, including meat, butter, and other essential foods except cereal grains, which is very helpful for our living conditions."¹² The interviewees carried on talking about the reduction of availability of *sro lo dmar po* and another herb:

Actually, there is not much *sro lo dmar po* left, because it has always been in great demand since the middle of the last decade. This species used to be very common before but now we no longer have that much. There is another species called *kyi lee dkar po* [*Gentiana straminea*] which is also subject to the same problem. Many Muslim people come and just pull out the whole plant, including the root. We hear that they use it to produce a special spice, but the worst thing about this is that this species, in the area where it grows, somehow seems to hold the soil together with its dense root network, so when the root of this plant is pulled out, it causes the soil at this specific location to turn into sand.

As we saw with the previous case study conducted with the village doctor in Serchen, when the factory staff come to order medicinal plants, apart from showing the samples in order to allow for identification of the plants to be collected, they do not provide even basic training regarding collection methods. Both interviews clearly showed that this particular aspect of the process is missing. Thus, when speaking of the possibility of the promotion of a program for plants and biodiversity conservation, the village wild collectors showed a very supportive attitude: “People will cooperate, nobody wishes bad things to happen in our own area, and we do not wish any plants to go extinct, I am sure people will listen if there is any project aiming at tackling this issue.”

2.4 Herb Dealers in Eastern Tibet

In the city of Xining in Qinghai, the overall social background is slightly different from the one that we see in Lhasa. This is a multiethnic city where modern socioeconomic models of development have a stronger influence. The population of Xining is twice as large as that of Lhasa, and its strategic geographical location facilitates access to a wide Chinese market.

The Jingke Tibetan medicine factory in Xining is also relatively very large and generates a massive demand for herbs. This demand can no longer be satisfied by local wild collectors from surrounding areas. As a result, third parties are involved in this process that take on a specific role by ordering the required medicinal plants from local wild collectors in order to satisfy the huge demand. Naturally, these intermediaries make a substantial profit out of this business. According to an informant, one of the most successful herb dealers in this region started out as a simple herb collector and gained his knowledge of herbs from his uncle, who has been a famous doctor since the first Tibetan medicine hospital was developed in that province over twenty years ago. There was subsequently a sharp increase in the demand for herbs, which was accompanied by an increase in sales of Tibetan medicines in the market at the factory in Xining. This doctor then started ordering the required plants from specific collectors not only in Qinghai Province but also in other neighboring provinces such as Sichuan and Gansu in order to satisfy the increased demand, and this successful strategy brought him to his current position.

However, yet again, according to the informant, no form of education or training has been included in the ordering process with regard to herb collection methods. It is also difficult

¹²Meat is a major item in the diet and the single highest food expense. Butter is the second most costly item, since individuals may consume up to 4 kg of butter per month, and it is fairly expensive compared with other types of food. The main cereals eaten are barley, rice, and wheat.

for herb dealers to have correct knowledge of what parts of the plants are to be used or knowledge of the seasons during which the individual plants should be harvested.

2.5 Herb Collection in Areas Where *Cordyceps sinensis* Is Found in Abundance

The caterpillar fungus (*Cordyceps sinensis*), commonly known as *yar tsa gun bu* in Tibetan, is an important item in Tibetan medicine, where it is referred to as *rtsa da byid*. It is found in many areas of the Qinghai-Tibetan Plateau, including the adjacent high-altitude areas of the Himalayas (Nepal, Bhutan, and parts of the Indian Himalaya; see map in Winkler 2009: 293). It is highly prized in Tibetan medicine and, according to the *Four Tantras*, mostly used to cure various kidney disorders and to sustain life energy (Yu thog yon ten mgon po 1993: chap. 20).¹³ It is also extremely popular in Chinese medicine, and demand among Han Chinese has led to a dramatic increase in the price in recent years.

This increase has had a huge positive economic impact on local populations. As a result, the financial value of ordinary medicinal plants, the structure of the social network in the process of herb collection, and the socioeconomic relationships between physicians and patients in areas where *Cordyceps* is found in abundance are different from those elsewhere in Tibet. The area of Bekar Village, Biru County, Nagchu Prefecture, is one of the largest providers of caterpillar fungus in central Tibet. The private village doctor in that town states: “No one in the area would really be interested in ordinary herbs when we have so much caterpillar. Just by harvesting this single plant for about a month, you could cover your expenses for a whole year. Therefore, nobody really pays attention to ordinary plants.” The market price for *Cordyceps* shot up to CNY 40,000 (Chinese yuan) per kilogram (equivalent to over £4,000) in 2003 (Winkler 2005) and continued to rise until 2008 (personal observation; see also Winkler 2009). Village private physicians in this area have to collect medicinal plants themselves, or if they have students, they may be able to ask them for help.

During my fieldwork, I raised the issue of the need to promote sustainable collection methods for *Cordyceps* in these areas. Caterpillar fungus is, indeed, the main source of income for local people. However, it is only the root of the caterpillar fungus that is used. While it may generate huge demand, it also causes severe damage to the landscape. Therefore, the need to raise environmental protection awareness among local people is absolutely crucial. The village doctor agreed and stated: “The environmental problem is such an urgent issue now and any form of education would be very beneficial, and local people would accept it if only they saw the long-term benefits.”

2.6 A Village Leader's View on the Effects of Excessive Collection

Pundo Village is located more than one hundred kilometers from Lhasa. Although the inhabitants' livelihood is based mainly on agriculture, the range of their diet is limited. Local populations cultivate mostly barley, along with radishes, cabbages, and potatoes. Each household owns only a few cows to provide milk and butter. The overall standard of living is very low; according to a local doctor, almost all the old people suffer from rheumatism,

¹³*Da byid* is classified in thirteen types in the *Four Tantras*. The indicated potency in the given reference is for meat-type *da byid*, whereas *Cordyceps sinensis* is grass-type *da byid*, which has a similar function.

and many also suffer from high blood pressure. The village leader said that there used to be a lot of *sro lo dmar po* in the area. This plant is used in both Tibetan medicine and Chinese medicine.¹⁴ Over the last eight years, many Chinese businesspeople came, placed large orders for *sro lo dmar po*, and transported it away in lorries. In just a few years, this species has almost disappeared from this area. According to the village leader, the local people did not even benefit much in financial terms since the price paid was very low (CNY 2 per kilo). Because it is the root of the plant that is used, village people just pull out the root. The village leader sincerely regrets that this plant now faces extinction and wishes that there were rules to ban overharvesting and to protect the local flora.

3 Findings and Discussion

3.1 Lack of Integration between Theory and Practice in the Herb Collection Process

The herb collection methods prescribed in the *Four Tantras* require one to follow the natural biological cycle of plants, so one does the least harm to them and, where possible, encourages the further growth of plants. The *Four Tantras* also teaches that different seasons have the potential to nourish different parts of plants. The nutrient in the plants concentrates in the roots between the end of the autumn and the start of winter, and so this is the best time of year to collect the roots. This is also the least harmful to plants that are very fragile, as the small branches of the roots firmly hold them in the ground. As regards the leaves, the summer is the recommended season for harvesting leaves. The leaves are at their most effective at that time, and harvesting the leaves will stimulate the growth of more flowers and fruits and make them mature. The same logic applies to the fruits and flowers. Thus, the correct way of collection would not harm the natural biological cycle.

Therefore, we can see the principles developed in Tibetan medicine can contribute to sustainable development and are worth further exploration and synthesis into policy documents. Although following these principles is difficult when the production quantity is large; nevertheless it is always important to keep them in mind as the basis of the herb collection methods, which should be followed whenever possible.

3.2 Findings from the Case Studies on the Causes of Reduction in Plants

In some of the case studies, we saw the traditional way of collecting medicinal plants where the local physicians harvest medicinal plants with the villagers in a nonprofit and sustainable way, in line with traditional understandings and practices. The action of harvesting is still largely to fulfill medical need. Although no government policy has directed herb collection procedures, local cultural beliefs help to ensure that the villagers do not pull the plants up by the roots. However, despite a general agreement on the importance of plants from every person interviewed, the case studies also demonstrate how this situation is changing. They reveal the commercial pressures on villagers in the areas where collection is taking place primarily for money, as an economic activity. Villagers are being paid to collect larger and

¹⁴In Chinese medicine, it is claimed to boost the immune system, eliminate blood viruses, combat high altitude sickness and tumors, and reduce blood sugar levels (Changsha Natureway 2009).

larger amounts of plants and are doing so in ways that damage the potential to grow more, and this is changing the systems and practices.

Although it is generally agreed that there has been a dramatic reduction in the number of medicinal plants, as described in the case studies and in material presented at conferences (see Craig and Glover 2009), the species high on the endangered list vary from region to region. Few patterns can be generalized as yet. Decreases in medicinal plants popular for industrial production are greater in areas where there is better access to markets or where there are more connections with businesspeople. This can be accounted for by high demand and poor collection methods. In other areas, the reduction is caused primarily by poor collection methods.

Dokde is an area that is historically well known as a wild collecting site, and local people are knowledgeable about the area. The local factory also acknowledges this as an important location, and local people have direct access to the medicine factory. Because of their existing partnership, there has always been trust between the various agents. They reject outside businesspeople because of the risk that such people may not keep their promises and return to the village to purchase what they have ordered. In other areas, such as Pundo County, the villagers do not have as much experience as the people do in Dokde. As this is one of the most deprived areas of Tibet, local people sell their labor at a very low prices. There are few opportunities for them to earn spare money to supplement their incomes since their linguistic limitations prevent them from integrating into the social mainstream.¹⁵ Although both areas have experienced a dramatic decrease in plants that are popular in the herb industry, the degree of benefit that local people receive differs.

People in Nyerong County gain a reasonable income from medicinal plants by having direct access to a factory. In contrast, in Pundo, local people only earn CNY 2 per kilo for *sro la dmar po*, although the price in the Tibetan market is CNY 12 for just a small amount in a properly prepared box, and CNY 18 in the Chinese market. There is an imbalance between the economic benefit to local people and the huge profits made by businesspeople.

The situation in Serchen differs from that in the other two areas in terms of the species of plants. Here the quantities of *sro la dmar po* and *bya rgod sug pa* are almost the same as they were before, because the lack of easy access has meant that no businesspeople have entered this area to purchase medicinal plants (it is remote, the roads are bad, and the weather is harsh). Nor do local people consider medicinal plants to be market goods.

3.2.1 Lack of education regarding herb collection methods—So far, there have been few serious attempts at education regarding herb collection methods. The Tibetan Medical Factory of the Tibetan Autonomous Region had produced and distributed a leaflet, but it covered only certain medicinal plants. In addition, not all herb dealers or collectors received the leaflet. The wild collectors from Dogde had never seen such written information about the collection of medicinal plants.

¹⁵The official language in Tibet is Chinese, while the majority of Tibetans only speak Tibetan, which is very different from Chinese. This is the case especially for rural and less-educated urban Tibetans.

All the case studies demonstrate the need for training about herb collection methods. As described in the Serchen, Dokde, and Xining case studies, when medicinal plants are ordered from wild collectors, the only information given is to help wild collectors to recognize plants; there is nothing about collection methods. Furthermore, factory employees and traditional physicians themselves do not always follow instructions when collecting medicinal plants. No one seems to pay serious attention to the long-term environmental consequences of overcollecting what has been a very rich resource for many centuries. The selection of the required parts is a process that occurs before medicines can be synthesized. Thus, lack of precise selection of the part to be used not only is harmful for the environment due to poor collection methods but also puts the quality of the medicine at risk. These are key issues that involve careful harvesting during the right season and selecting the parts that are to be used in synthesizing the medicines. At present, the emphasis is being placed only on the medicinal and economic benefits, while environmental issues are becoming a neglected area. In particular, there are a few very important medicinal plants, such as *sum bcu tig*, *stong ri zil pa*, *aud pal sngon po*, and *so lo dkar po*, that are naturally very rare, as borne out by my own professional experience after many years of working in this field. It is therefore necessary to be especially careful about the collection methods because of their vulnerable situation.

3.2.2 Common concern among all levels of the population—The interviews in all six case studies show a very clear and positive attitude toward environmental protection. Even village people with no modern education still understand the importance of the environment. When asked about how much local people would be willing to promote correct herb collection methods, their response is that “of course nobody wants anything bad to happen in their village” and that “this is an urgent issue that needs to be taken into consideration.”

The interview with the village doctor from Serchen is especially interesting. This reveals that the local people are already concerned and that they act in accordance with local cultural beliefs in the effects of karma. For Tibetans, karmic consequence is a general principle of life. In their view, results follow naturally from actions in a very subtle way and on different time scales. There is no kind of cosmic judge that rules over the consequences of actions. Buddhist masters use this principle to promote harmony and socially beneficial action in a skillful way in a collective sense, and this has helped to cultivate a respectful attitude toward the natural environment. In fact, the serious decline in medicinal plants is a proof of the law of karma, given that we are experiencing the negative consequences (the challenge in satisfying the medical need) caused by overusing resources without performing the right collection methods. It is worth considering using this karmic logic when promoting right collection methods, since it is something culturally easy and comprehensible to the local people.

3.2.3 Lack of informed policy—The case studies show that there is little education with regard to the collection process. As a general policy issue, this is partly the government’s responsibility. Factories may wish to provide training, but it is difficult to bring the herb dealers together and provide training because of the lack of a proper herbal trade licensing

system. The policy-making process for health administration in Tibet, as all over China, hardly takes the local culture into consideration. This is partly due to a lack of understanding of ethnic minority cultures¹⁶ and ignorance regarding the effect of cultural factors on environmental protection as well as the individual's health and well-being (Cuomu 2010). Consequently, those officials who have knowledge of Tibetan medicine are rarely in a position to make decisions in health bureaus or other relevant higher government organizations. Despite the existence in medical textbooks of a range of well-developed principles in herb collection methods, no promotional health education has been implemented for the laypeople involved in the herb collection process to guarantee a suitable supply of medicines and conservation of biodiversity.

Similar problems occurred in the policy making for GMP (Good Manufacturing Practice), which was formulated simply by copying the Western approach or according to the theory of Chinese medicine. Because of an assumption that all traditional medicine would follow a similar pattern, the drying and storage procedures listed in policy documents in fact contradict those required by Tibetan medical textbooks (Craig 2006). This has a negative impact on the efficacy of the medicine. Yet there is no state regulation of medicinal ingredients (Good Agricultural Practice) being properly practiced in Tibet. The standard is too high for local herb dealers to achieve, and no herb market is available for the wholesale and retail transaction of medicinal plants. As a result, factories compete for supplies, and there is no effective quality assurance. In addition, there is no communication between relevant professional bodies (e.g., forest bureau, agricultural bureau, and environmental protection bureau) to find a joint solution by formulating laws for sustainable use of the natural resources.

4 Conclusions

The dramatic decrease in medicinal plants in Tibet needs to be seen against the backdrop of the low level of awareness of the issue among policy makers and stakeholders. Although Tibetan medicine developed systematic collection methods over a thousand years ago, and these are well documented in Tibetan medical textbooks, this knowledge does not inform policy making today and has not been passed on to different stakeholders. In particular, since the start of the last century, there has been a significant change in public health administration, as it moved away from being based on private physicians toward becoming a regulated government institution. This has resulted in more and more specialized roles for the performance of each procedure. Each group focuses on its own particular task: physicians concentrate on providing medical treatment; factory staff are busy with producing medicines; herb dealers focus on being intermediaries between factory employees and wild collectors; and wild collectors just collect plants ordered by factory employees or herb dealers. No party has overall control of the long-term security of supply or is able to prevent negative consequences for the wider environment in this process.

Moreover, the industrialization of medicine has significantly increased the demand for plants, yet there is no state regulation of wild collection, no herb trade licensing for

¹⁶Non-Han populations in mainland China are referred to as *minzu* ("ethnic minorities").

individual herb dealers, and consequently, also no appropriate education system to maintain a balance in the new circumstances.

Solutions for maintaining the herb supply and conserving biodiversity need to be implemented by gaining a good understanding of traditional medicine (see Fig. 4), thus maintaining cultural diversity. Such forms of medicine have developed over a long time. They require a respectful approach and encourage efforts to find patterns in nature that will determine policies. In addition, education for all stages of the herb collection process can be key strategies to promote through developing specific projects. Research is an important factor that cannot be ignored, as some of the rare species require a search for substitutes to ensure the supply and also to reduce pressure on the environment. Since looking for substitutes is a method used in Tibetan medicine throughout history, relevant methods can also be traced from the existing knowledge.

The results presented here are mainly based on a number of preliminary case studies. These were carried out with the intention of understanding the current herb collection process in terms of the behavioral patterns of different stakeholders that are involved in the process. This may in turn contribute to establishing a plan to promote herb collection methods for future development. It would be good to do further research into quantifying the specific plants high on threatened and endangered lists by mapping plant collecting regions with the use of quantitative research methods. In order to solve the problem of shortage of supplies of medicinal plants, many Tibetan medicine-related institutes, including Tibetan medicine factories and medical colleges, are starting their own farms to cultivate different herbs in Tibet and many other neighboring countries. But not enough work is being done to assess whether these plants are as effective as wild plants, given that only wild plants have been used throughout the history of Tibetan medical practice, and insufficient information is being exchanged about the number of species that can be grown successfully. It is therefore important to establish a quantitative data center regarding the growing of plants and also to do further research and exchange knowledge on techniques that are currently being used. It is important to conduct these studies collaboratively by involving different disciplines such as botany and chemistry.

Acknowledgments

This research is funded by the Wellcome Trust as part of my postdoctoral fellowship, which commenced in June 2011. An early version of this paper was written as part of my master's degree in public health, which I began in 2008. I would like to thank the Wellcome Trust for their generous support of this research.

Appendix: Tibetan Medicinal Plants Referred to in the Article

Tibetan name	Botanical name
<i>aud pal sngon po</i>	<i>Meconops toquata prain</i>
<i>ba lu</i>	<i>Rhododendron primulaeflorum</i> Bur. et Franch
<i>btsan dug</i>	<i>Aconitum kongboense</i> Lauener; <i>A. gymnanthum</i> Maxim
<i>bya rgod sug pa</i> (common name <i>gang lha me tog</i>)	<i>Saussurea medusa</i>
<i>kyi Ice dkar po</i>	<i>Gentiana straminea</i>

Tibetan name	Botanical name
<i>par pa ta</i>	<i>Hypecoum leptocarpum</i>
<i>pri yang ku</i>	<i>Dracocephalum tanguticum</i>
<i>re skon tsi dmar</i>	<i>Corydalis conspersa</i> Maxim
<i>rtsa da byid</i> (common name <i>yar tsa gun bu</i>)	<i>Cordyceps sinensis</i>
<i>se ba</i>	<i>Rosa omeiensis</i> Rolfe
<i>so lo dkar po</i>	<i>Pegaeophyton scapiflorum</i>
<i>spang rgyan sngon po</i>	<i>Gentiana stipitata</i> Edgew.
<i>spen ma</i>	<i>Potentilla arbuscula</i> D. Don / <i>P. fruticosa</i> auct. non. L
<i>srad kar</i>	<i>Oxytropis ochrantha</i>
<i>sro lo dmar po</i>	<i>Rhodiola</i> spp.
<i>stong ri zil pa</i>	<i>Corydalis hendersonii</i> Hemsl.
<i>sum bcu tig</i>	<i>Saxifraga umbellulata</i>
<i>Zwa</i>	<i>Urtica dioica</i>

Biography

Mingji Cuomu is a Wellcome Trust research fellow at the University of Oxford. She holds a PhD in Tibetan medicine and public health in the Tibetan Autonomous Region from Humboldt University (Berlin, Germany), bachelor's and master's degrees in Tibetan medicine from the Traditional Tibetan Medical College, Lhasa, and a master's degree in Western public health from Sheffield Hallam University (UK). Since 2005 her work has focused on social studies of medicine, public health, Tibetan medicine, and Buddhism. Her publications include *Clinical Research on Tibetan Medicine: Challenges and Points of Consensus* (2012), coedited with Claudia Witt and Sienna Craig; and *Studies of Medical Pluralism in Tibetan History and Society* (2010), coedited with Sienna Craig, Mona Schrempf, and Frances Garrett.

References

- Blaikie, Calum. Critically Endangered? Medicinal Plant Cultivation and the Reconfiguration of Sowa Rigpa in Ladakh. *Asian Medicine: Tradition and Modernity*. 2009; 5:243–72.
- Changsha Natureway. [accessed 10 May 2012] *Rhodiola Rosea* P.E. 2009. <http://naturewayco.itrademarket.com/987451/rhodiolarosea-p-e.htm>
- Craig, SR. “Good” Manufacturing Practices; or, Efficacy by Whose Standards?; Paper presented as part of the Medicine, Health, and Modernity Panel at the Eleventh International Association of Tibetan Studies conference; Bonn, Germany. 2006; Aug 27. Sep 27.
- Craig SR, Glover DM. Conservation, Cultivation and Commodification of Medicinal Plants in the Greater Himalayan-Tibetan Plateau. Special issue of *Asian Medicine: Tradition and Modernity*. 2009; 5:219–443.
- Cuomu, Mingji. Social and Cultural Factors in Developing Tibetan Public Health System. Humboldt University; Berlin: 2010. Unpublished PhD thesis
- Dorje, Sonam. To Treasure Wild Medicinal Plant Resources and Conserve Tibetan Culture; Paper presented at the Seventh International Congress on Traditional Asian Medicine, Institute for Traditional Medicine Services; Thimphu, Bhutan. 2009; Sep 7–11.
- Drangsong. The Issue of the Shortage of Medicinal Plants in Eastern Tibet; Paper presented at the International Conference on the Cultivation and Collection of Tibetan Medicinal Plants and the

- Impact of Standardization, Tourism and Global Environmental Issues; Medical College, Yushu, Qinghai, China. 2008; Aug 28.
- Dunham, Carroll. From Wild to Cultivated: Can Valued *Sowa Rigpa* Medicinal Plants Meet Market Demands Sustainably and Benefit Local Communities?; Paper presented at the Seventh International Congress on Traditional Asian Medicine, Institute for Traditional Medicine Services; Thimphu, Bhutan. 2009; Sep 7-11.
- Lambert, John. Medicinal Plants: Rescuing a Global Heritage. World Bank; Washington, DC: 1997. Jitendra Srivastava, and Noel Vietmeyer.
- Migmar. The History of Tibetan Medicine (in Tibetan). Tso-Ngon; Xining: 2004.
- Pei S, Huai H, Yang L. Medicinal Plants and Their Conservation in China with Reference in Chinese Himalayan Region. Asian Medicine: Tradition and Modernity. 2009; 5(2):273–90.
- Phuntsok, J. Dus rabs nyer gcig pa'i gso rig gi rgyal bo chen po bod kyi sna mang gso rig gi khyad chos dang snag cig gso rig bar gyi drang bden brjod pa seng phrug nga ro. In: Craig, Sienna; Cuomu, Mingji; Garrett, Frances; Schrempf, Mona, editors. Studies of Medical Pluralism in Tibetan History and Society (PIATS 2006: Proceedings of the Eleventh Seminar of the International Association for Tibetan Studies. Königswinter 2006); 2010; Andiastr, Switzerland: International Institute for Tibetan and Buddhist Studies; p. 7-11.
- Plant Life. [accessed 2 January 2009] China/India/UK Dialogue on Conservation of Himalayan Medicinal Plants. 2007. <http://www.plantlife.org.uk/international/assets/med-plants/projects-casestudies/KIB%20Dialogue%20meeting/Dialogue-report.pdf>
- Pordié, Laurent. Tibetan Medicine Today: Neo-traditionalism as an Analytical Lens and a Political Tool. In: Pordié, Laurent, editor. Tibetan Medicine in the Contemporary World: Global Politics of Medical Knowledge and Practice. Routledge; New York: 2008. p. 3-32.
- Rokpa International. [accessed 17 November 2009] Basic Info. 2009. <http://www.facebook.com/pages/rokpainternational/138592448523?v=info>
- Tibet.News.CN. New Market for Traditional Tibetan Medicine. Sep 16. 2009 http://news.xinhuanet.com/english/2009-09/16/content_12061362.htm
- Winkler, Daniel. [accessed 8 December 2009] Yartsa Gunbu—*Cordyceps sinensis*: Economy, Ecology and Ethno-Mycology of a Fungus Endemic to the Tibetan Plateau. 2005. <http://www.danielwinkler.com/id71.htm>
- Winkler, Daniel. Caterpillar Fungus (*Ophiocordyceps sinensis*) Production and Sustainability on the Tibetan Plateau and in the Himalayas. Asian Medicine: Tradition and Modernity. 2009; 5(2):291–316.
- Yu thog yon ten ngon po. Four Tantras (Rgyud bzhi). Bdud rtsi snying po yan lar brgyad pa gsang ba man ngag gi rgyud. 3rd ed.. Tibetan People's Publishing Company; Lhasa: 1993.

Fig. 1.
Herb collection requirement versus biological cycle

Fig. 2.
Medical practice pattern in the past

Fig. 3.
Modern health administration

Fig. 4.
Ideal development of herb collection process