Conservation and Income Generation Opportunities from High-Value Species: Cordyceps Policy in Bhutan and its Implications for the Himalayan Region

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Farmers are allowed to harvest and sell Cordyceps on condition that they do it on a sustainable basis: long-term sustainability should be the focus.

Introduction

Cordyceps sinensis (Berk.) Sacc. is currently a hot topic in the Hindu Kush-Himalayas. Its value as a medicinal plant par excellence makes it expensive, hence the name of the plant carries with it an air of high mountain mysticism and the lure of a gold mine. The mountain communities in Bhutan say it is their 'gift from the sky': God rewarding them finally for their long toil in beautiful but forbidding high mountain conditions.

People's optimism about income from the sale of *Cordyceps* is unrealised. *Cordyceps sinensis* is a protected species in Bhutan. Following field research and policy review, however, the Royal Government of Bhutan lifted the total protection status in 2004 and allowed local communities to collect it for trade. Nevertheless, the government remains highly concerned about sustainability issues, and the probable extinction of *Cordyceps* due to intense commercialisation.

Species' conservation and rural income opportunities present themselves as two conflicting objectives in managing plant resources. Do conservation and development mean a parting of the ways or could they converge? Taking the case of *Cordyceps* in Bhutan and by means of a general literature review, the research attempts to answer two central questions.

1. How justified is the optimism of high mountain communities about their 'gift from the sky'?
2. How justified is the state's concern about species' conservation and sustainability issues?

Taxonomy: ecology and distribution

The first time *Cordyceps* came to be known in the West was in 1736 when Du Halde wrote about it, but it was not until 1842 that the first *Cordyceps* specimens arrived in England. Berkeley, in 1843, formally described and illustrated the fungus as a member of the Pyrenomycetes family, under the name *Sphaeria sinensis* n.s. Later, in 1878, Saccardo transferred it to the genus *Cordyceps* (Fr.) Link, as *Cordyceps sinensis* (Pegler et al. 1994). Zang and Kinjo (1998) reported 33 species of *Cordyceps* from the alpine areas of China and Nepal, of which, *C. nepalensis, C. kangdingensis,* and *C. multiaxialis* are described as new species. Globally, over 300 species of *Cordyceps* have been recognised. Modern taxonomic listing of *Cordyceps* is still incomplete (Jones 2002). *Cordyceps* is found in cold, grassy, alpine pasturelands of mountain ranges over 3,800 masl; the distribution range in the Hindu Kush-Himalayas includes Bhutan, Nepal, the Indian Himalayas, Tibetan Plateau, and mountain ranges in interior China. In Bhutan, it is found between 4,070m and 4,800m[1] in the high alpine mountain valleys in the northern part of the country

Cordyceps belongs to the entomogenous fungi, the group that attacks the egg, larvae, or adult stages of insects. The spores from the fungus infect the insect and the mycelium spreads rapidly to fill the whole insect body. The fungus can remain dormant inside the insect for long periods, particularly when conditions are dry. When the conditions are moist and temperature favourable, hyphae emerge throughout the body (Cooke 1977). The *Cordyceps* spores are widely dispersed by wind and water in autumn. Some of the spores fall, germinate, and penetrate into the caterpillar larvae of *Hepialis* species of the Lepidoptera order of insects (moths and butterflies). The infected caterpillars are killed by spring. The uninfected caterpillars pupate into relatively large, primitive moths and take two years to complete the life cycle. The caterpillars live in vertical tunnels in the soil and emerge at night to feed on roots and aerial parts of plants. Some species are reported to be serious pests in pastures. The fluctuations in *Cordyceps* populations are related to weather conditions (Luk 1998; Zhu et al. 1998; Pegler et al. 1994; Jones 2002).

[1] The lowest altitude recorded for *Cordyceps* for western Bhutan was 4,070m, behind Lingshi Dzong, and the highest 4,800m.

Status of *Cordyceps* in Bhutan

The common perception of *Cordyceps* is that it is rare and endangered, thus requiring protection. In Bhutan, it is accorded total protection status under the provisions of the Forest and Nature Conservation Act 1995. Total protection is accorded to a species when its population has fallen to a precipitously low level and when its survival is unlikely if the causal factors continue operating (IUCN 2001). Namgyel and Tshitila (2003) argue that no scientific evaluation was undertaken to justify its position as a totally protected species. In the absence of scientific information, we learn from the local people.

Living for generations in the area with regular visits to *Cordyceps* habitats, while herding yaks, the local people have practical experience of the *Cordyceps'* ecology. Across the region they believe that *Cordyceps* follows a cycle of good and bad crop years. Some sites follow a cycle of three years, and others alternate years. Some sites bear *Cordyceps* on a regular basis year in and year out, albeit in small quantities. Some previous sites bearing *Cordyceps* will not bear it in the following year, while some sites with no previous *Cordyceps* will bear it. There is no definite growing pattern. Local people also do not think collection will lead to extinction or cause a decline in *Cordyceps*. They say they have observed for many years hundreds of Tibetans across the border picking *Cordyceps*, and it is still available. Its production is more influenced by weather conditions than collection.

Commercialisation of *Cordyceps'* collection

Cordyceps is extraordinary in that it is a mushroom growing out of the head of a caterpillar. Locally people believe that it takes the form of a 'plant' during summer and an 'animal' during winter. The Bhutanese and Tibetans call it 'Yartsa Guenboob'[2], and the Chinese call it 'dong chong xia cao'. Both the terms refer to *Cordyceps* as 'summer grass winter worm'. The Nepalese call it 'kira gans'- the insect grass. It is a herbal medicine with a long history of use in China. It is said that the First Emperor Shih Huang Ti (B.C. 219), the architect of the Great Wall of China, talked about a magical mushroom – the 'herb of deathlessness' – which ,when eaten, gave one long life or immortality. In Tibet, pastoralists have observed for generations that yaks which grazed on *Cordyceps* rangelands showed increased strength and renewed energy (http://216.55.141.125/*Cordyceps*.htm). As *Cordyceps* grows in remote high mountain valleys and is perhaps not widely known amongst the common people, it was considered rare and was available or known only to the emperors and their courts.

Du Halde, in his historical account of China in 1736, gave the following account of *Cordyceps* (cited in Pegler et al. 1994):

> "You must take five grams of this root entire to the very end, stuff the belly of a tame duck with it, and boil it over a gentle fire; when it is boiled take it out of the duck again, the virtue of which will have entered entirely into the flesh of the duck; eat of this morning and night for eight or ten days together. I accordingly made the experiment when I immediately found my appetite return, and my strength restored; the Emperor's physicians gave me the same account but told me that they only prescribed at Court because of the difficulty they had to procure it."

[2] In Nepali literature, it is commonly known as 'Yarsa gumba'. The 'gumba' is perhaps the Nepalese equivalent of the Bhutanese/Tibetan word 'guenboob', meaning winter insect.

With the growing affluence of China in the last 50 years, and development of the market economy, items once beyond reach became available to the masses. Thus use of *Cordyceps* in China as a health tonic became more widespread over the years. It has only been in recent years, however, that *Cordyceps* has drawn scientific interest and gained international prominence (Jones et al. 2002; Pegler et al. 1994; Zhu et al. 1998).

The introduction of *Cordyceps* to the West and the promotion of its medicinal potency created an international market demand for it overnight. This also dovetailed with the global trend of more and more people turning to 'alternative' or 'traditional medicines'. Demand has been reinforced by the mostly positive research results showing *Cordyceps* as an all-round medicine for treating circulatory, respiratory, immune, and sexual dysfunction, and for improving energy, stamina, appetite, endurance, and sleeplessness (Zhu et al. 1998; Holliday et al. 2004). With the street value of a kilogramme of *Cordyceps* ranging from US$ 2,000 to 10,000 (Jones et al. 2002), the farm-gate prices have also become attractive. Locally, traders in Bhutan pay US$ 800 to 1,300/ kg to collectors, and they sell it across the border in Tibet (China) for US$ 1,000 to 2,000. Similar prices are reported from the Nepal and Indian Himalayas (ANSAB 2003a; Jayshi 2003; Negi 2003; Garbyal et al. 2004).

Policy dimensions of *Cordyceps* trade

The commercialisation of *Cordyceps* is a new phenomenon in the Himalayan region. Only in recent years has it begun to appear, albeit in a romanticised form, in the popular press[3], and as a discussion topic on the electronic forums[4]. Socioeconomic and ecological research on *Cordyceps* is limited at the moment. Internet searches indicate that clinical research trials relating to the culture, hybridisation, isolation, and testing of active compounds have mushroomed. The results of a study commissioned by ICIMOD on policy approaches in the region are summarised in the box.

Policy makers and resource managers in Bhutan, Nepal, and India are for the most part ignorant of commercialisation of *Cordyceps* and have yet to grasp its scale and scope. Given the limited literature available on the socioeconomic status of *Cordyceps* even in China, it may also be a new subject there.

In China, *Cordyceps* was classified as a Class 2 protected species in 2001 and requires a provincial permit for trade. The provincial governments are not strict, but, nevertheless, more and more counties now require people to obtain licenses to gather *Cordyceps*. This requirement is mainly targeted at outsiders, and it enables local administrations to earn more money through the issue of permits to outsiders. In some cases, however, the result has been that outsiders outnumber the locals, and this is a source of conflict in the context of revenue sharing and use of the resource base (Daniel Winkler, personal communication 2004).

[3] 'Local 'Viagra' destroying Tibetan way of life.' *Indo-Asian News Service*, March 19, 2004; 'Old Chinese mushrooms pep up the middle-aged.' *The Independent*.
[4] Mountain Forum-Asia, an electronic discussion group for mountain topics

Policy research on Cordyceps

Cordyceps sinensis, known in Bhutan as 'yartsa guenboob', is an important high-value product in the HKH region. ICIMOD commissioned a study on the *Cordyceps* species to look into traditional conservation practices, national and international market demand, linkages, and potentials for commercialisation. In the international market *Cordyceps* brought about US$800 to 1500/kg. Local people have no control over the collection of *Cordyceps*. Due to its high monetary value, *Cordyceps* is extracted illegally and the Government of Bhutan loses US$ 4 million every year to illegal poachers. Law enforcement capacity is stretched to the limit because of the difficult and rugged terrain, thus there is illicit trading on a large scale by outsiders. As a result, *Cordyceps* is in the hands of outsiders who take the monetary benefits and earn substantial incomes. Now, as a result of the research, Bhutan has legalised the harvesting of *Cordyceps* following a royal command issued by His Majesty the King on June 17, 2004 so that local people can benefit. Farmers are allowed to harvest and sell the *Cordyceps* on condition that they do it on a sustainable basis. Long-term sustainability should be the focus. Bhutan has introduced a community-based natural resource management (CBNRM) model for *Cordyceps*. This change in approach is important in remote rural areas of developing countries where biodiversity is concentrated, where poverty tends to be pervasive, and where the reach of development programmes is often limited. This will lead to renewed emphasis on finding ways of deriving new economic opportunities from biological resources which do not lead to further losses of biodiversity.

In Nepal, the government lifted the restriction on *Cordyceps* trade in 2001, but two conditions were introduced. The first is the royalty of Nepali rupees 20,000/kg of *Cordyceps*, and the second is the ban on export of *Cordyceps* in a raw form. These conditions are difficult to implement. Firstly, the royalty is exorbitant and beyond the means of poor mountain peasants and pastoralists. Nepal exports annually an estimated amount of over 2,000 kg of *Cordyceps*, but royalty collections for one year only amounted to Rs 60,000. Secondly, *Cordyceps* is traded in raw form, and even if entrepreneurs want to add value, the necessary infrastructure, such as packaging, processing, and high-end marketing is not available in the country. Cordyceps can become an important source of revenue for some groups (ANSAB 2003b; Jayshi 2003).

Although *Cordyceps* is currently receiving the attention of natural resource managers and policymakers in India, it is not listed in any schedule of protected species in the country. At this time, India appears unworried about the trade in *Cordyceps* because it is not listed in CITES (WTI 2003). In Bhutan the government lifted the policy ban on *Cordyceps* collection in 2004 (Box). This policy change is largely due to the results of research studies that suggested that the policy ban was ineffective, and it was merely a source of conflict between the government and local communities. The result of the high price of *Cordyceps* for Bhutan is a serious transboundary problem because thousands of Tibetan collectors pour into the country and local communities will not cooperate with the government to stop foreign collectors as they find themselves unable to resist the temptation of cash from *Cordyceps* collection. Furthermore, there is no scientific justification as yet for total protection of *Cordyceps* (Namgyel 2003; Namgyel and Tshitila 2003; Jones 2002).

Conclusion

The high price of *Cordyceps* is creating a 'gold rush' phenomenon in the Himalayan-Chinese region: people from poor mountain areas travel in great numbers to the high alpine valleys in the hope of earning substantial incomes from it. From the numerous press reports, particularly in Nepal and India, one can surmise that it is presumed that the *Cordyceps* resource base is already threatened by intensive collection. This researcher feels it is too early to tell and that only long-term research can provide the correct information.

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