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ATTITUDINAL VALUES TOWARDS SACRED GROVES, SOUTHWEST SICHUAN, CHINA

IMPLICATIONS FOR CONSERVATION

By

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A report submitted in partial fulfillment of the requirements for the MSc and/or the DIC.

September 2007

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Attitudes and Values of Sacred Groves, Southwest Sichuan, China

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ABSTRACT

Sacred sites are found throughout the world and are important elements linking both nature and culture and emphasising that humans are intrinsically part of the ecosystem. Various entities such as woods, forests and trees dedicated to ancestral spirits or deities can be considered sacred. These sacred groves have multiple values, representing generations of cultural and biological diversity. Embedded traditional cultural and religious belief systems in such sites often constitute an effective means for environmental conservation, with taboos and access restrictions providing protection from degradation. Whilst providing a cultural identity the long-term conservation of sacred sites also encourages high biodiversity within otherwise degraded environments, demonstrating their high biological value.

However, cultural values are dynamic and constantly evolve. Rapid environmental changes, standardized national legislation and socioeconomic development make indigenous cultures susceptible to the erosion of associated traditional management practices; increasing the vulnerability to depletion of the natural resources connected with these cultures.

A study of sacred groves in southwest Sichuan identified that strong Tibetan cultural beliefs and high environmental values protected the sacred groves. Although dominated by Tibetan ethnicity, the influence of Han Chinese culture upon the environment was evident. NTFP market commercialization is driving unsustainable exploitation of non-sacred forests, increasing the pressure on the sacred groves to extract natural resources.

Lack of flexibility and local relevance of current state management policies may disassociate Tibetan people from their dependence upon their environment for their livelihoods; losing both cultural and biological diversity in the region. Without the recognition of cultural values of the environment and consideration of traditional beliefs and practices in conservation policy we risk losing both cultural and biological diversity that has shaped environments for generations.

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ACCRONYMS AND ABBREVIATIONS

CCF	Chinese caterpillar fungus
CV	Contingent Valuation
NTFP	Non-timber forest product
PRA	Participatory Rural Appraisal
PRC	People's Republic of China
RMB	Chinese Yuan Renminbi*
RRA	Rapid Rural Appraisal
TAR	Tibetan Autonomous Region
TEV	Total Environmental Valuation
USD	US Dollar *
WTA	Willingness to accept
WTP	Willingness to pay

*All conversions of RMB to USD are at the rate of 1RMB: 0.13USD/ 1USD: 7.55RMB as taken on 2 September 2007. Source: Reuters UK [Available at: http://investing.reuters.co.uk/Investing/Currencies.aspx?WT.mc_id=ext_SEM_Google_currency%20converter&WT.srch=1]

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1. INTRODUCTION

1.1 Conservation and Sacred Sites

Natural resources and people are intrinsically linked. Religious, moral, cultural, political, economic and ecological boundaries have all shaped environmental use and perceptions (Gosling, 2001). Historically, attitudes and behaviour towards the environment and sustainable use of resources have been greatly affected and determined by nature worship and spiritual values (Khumbongmayum et al., 2004, Byers et al., 2001)). To understand the fundamental meaning of life and develop moral standards towards the community and local habitats cultures have formed values and beliefs to control acceptable behaviour (Goldstein and Kapstein, 1998, Laird, 1993). Conceptual traditions have, as a result, placed high values on protecting the environment and biodiversity.

Various entities can be considered to be sacred and are found throughout the world (Jayarajan, 2004). They can be defined as sacred places such as mountains, lakes, rivers etc; sacred objects such as stones, religious scripture; sacred images of the supernatural; and living things themselves including animals and forests (Xu et al., 2006, Laird, 1993). The practice of religious rituals, ceremonies and sanctions by specific cultural groups allow such sacred landscapes to be maintained, emphasising that humans are intrinsically part of the ecosystem in this life and the next (Xu et al., 2006).

Woods, forests and trees that are dedicated to ancestral spirits or deities are found in all major religions of the world (ARC, 2006, Bhagwat and Rutte, 2006). These sacred groves are protected by local communities as a result of religious beliefs and long standing traditional rituals, assuming spirit in nature (Bhagwat et al., 2005). Such sites, although dispersed may cover a variety of habitats creating patches of semi natural forest cover within cultivated landscapes ((Bhagwat and Rutte, 2006; Bhagwat et al., 2005).

Sacred forest sites share many comparable characteristics. Each are composed of specific forest areas that are considered to hold supernatural powers. It is believed that these sites are home to deities that can control the balance of life and death (Laird, 1993). Taboos, codes and customs specific to activities and community members restrict access to most

sacred groves (Laird, 1993, (ARC), Date unknown). For example, in Magarashtra, India, religious customs set down by local priests regulate the use of sacred groves through ancient folklore. The Dai in China believe that activities such as cultivation, hunting, logging and gathering will anger deities in the groves and bring misfortune and disaster upon the community. Consequently sacred groves have been protected for many generations and as a result have a high biodiversity value and unique undisturbed forest structure (Laird, 1993, Gosling, 2001).

Environmental Values

Sacred groves, protected over centuries are often located in regions rich in biodiversity (Bhagwat and Rutte, 2006). Consequently they are of great ecological significance and have the potential to provide a variety of ecosystem services (Mourato and Smith, 2002). Regulatory functions such as carbon sequestration, nutrient retention, biodiversity, soil conservation, pollination and hydrological cycling can be beneficial not only to local communities but also at national and international levels.

In addition, the long-standing traditional beliefs linked to the sacred forests have a significant cultural, spiritual and heritage value. People's perception of forests are important considerations in terms of both resource value and management options (Sullivan, 2002). These values have previously protected forests and biodiversity without the need for regulations or governmental control. Consequently, the cultural and spiritual values are highly significant in working with communities to conserve natural resources.

Economic valuation of the environment has many uses (Pearce et al., 2002). It has been argued (Adger et al., 2002) that failing to demonstrate economic values of the environment has led to the systematic loss and degradation of the world's ecosystems. Non-market benefits, i.e. non-consumptive use such as the option (future) value for example for genetic resources, existence value and functional value, are often undervalued and can distort economic worth and consequent management policies (Adger et al., 2002).

Using the concept of total economic value (TEV), comprising both direct use (consumptive) and non-use values of resources, an estimation of monetary value can be placed on the environment. Difficulties in applying quantitative values to option and existence values can however arise (Adger et al., 2002), limiting the application of TEV to certain environmental resources or providing a conservative estimate of environmental value.

Threats to Sacred Groves

In the face of rapid development in countries such as China great pressure is being placed on environmental and cultural diversity (Xu et al., 2006). The Convention on Biological Diversity (1992) (Article 10) acknowledges the protection and encouragement of customary biological resources use in accordance with traditional cultural practices compatible with conservation is necessary (Githitho, 2003). However, as a result of uncertainties in rural livelihoods and market expansions cultures are changing. Consequently the abandonment of associated traditional management practices are increasing the vulnerability to depletion of the many biological resources connected with these cultures (Xu and Wilkes, 2004). The disintegration of traditional cultural resource management institutions have often been linked to socioeconomic factors *(Chandrakanth et al., 2004).* Studies in India have identified demographic changes, agriculture commercialisation and weak land tenure to be underlying contributory factors.

China is exhibiting rapid rates of both environmental and sociological change (Kontoleon et al., 2002, Xu et al., 2006). Southwest Sichuan Province is becoming increasingly popular as a national tourist destination (Wang et al., In press). In particular, a Buddhist pilgrimage site, Yading, has become a recreational park and National Nature Reserve. Development of roads and increasing tourism has had many impacts on rural communities. Increasing urbanisation has increased pressure for grazing and firewood collection. Development of road and tourism is also seen to have a significant impact on cultural values, eroding the traditional belief systems fundamental to the existence of sacred groves (Wang et al., In press). In addition, the market for NTFPs has shifted from subsistence and local market system to a more commercial exploitation, income

generating activity. This shift in wealth is coinciding with shift in aspirations for a higher standard of living (Wang et al., In press).

Rural populations in Daocheng County, southwest Sichuan have traditionally felled trees for individual needs then allowed for regeneration, creating groves of varying successional age structure (Khumbongmayum et al., 2004, Wang et al., In press). Currently, rapid development of the region, improved transportation and local livelihood changes are modifying land use and weakening cultural beliefs, placing increasing pressure on sacred groves previously protected by communities' positive environmental attitudes.

Logging activities in the region are responsible for widespread deforestation (Xu et al., 2006). Demand for traditional Tibetan housing design (associated with important cultural beliefs and practices) remains the main driver behind timber extraction (Xu and Wilkes, 2004). The commercialisation of non-timber forest products (NTFP) markets such as the collection of mushrooms, animals, ornamental and medicinal plants is a growing environment and cultural concern in many parts of southwest China (Xu, 2006, Xu and Salas, 2003). Increased market awareness of NTFPs, traditional products and tourism may see traditional management practices abandoned. This has been exemplified by a study by Li (2003), demonstrating the difficulties of community-supported ecotourism in Tibetan communities

In the face of socioeconomic development aspects of indigenous culture are vulnerable to the erosion of many local institutions. State policies often override indigenous resource management and practices of biological resource use for medicine, food and shelter, land use practices and customary institutions for governing access to natural resources may be threatened (Xu et al., 2006). Such attributes are a valuable social capital source; benefiting ethnic minorities, the state and the region (Xu et al., 2006). However, lack of flexibility and local relevance of state management policies may disassociate indigenous people from their dependence upon their immediate environment for their livelihoods, losing both cultural and biological diversity in the region (Xu, 2003, Xu et al., 2006).

1.2 Aims

- To gain an understanding of factors influencing environmental values to produce a framework for the valuation of Sacred Groves, southwest Sichuan.
- To quantify the value of local direct use of NTFPs

1.3 Objectives

- To identify the perceptions of and value attached to the presence of sacred groves and the reasons behind these perceptions and values
- Quantify direct use values of non-timber forest products to rural communities for both subsistence and commercial use through different seasons.
- To identify socio-economic characteristics influencing attitudes towards, perceptions and use of sacred groves
- Identify institutional actors and stakeholders of a sacred grove conservation management strategy.
- Predict the impact of increased development and land use changes on values placed on sacred groves

2. BACKGROUND

2.1 Southwest Sichuan

2.1.1 Political History

The remote frontiers of Southwest China has historically been populated by a diversity of nomadic indigenous people (Daocheng County Government, 1995, Xu et al., 2006), reflecting the regions biological diversity through distinctive socioeconomic systems between these ethnic minority groups. Environmental conditions dictate rural livelihood strategies with a general trend towards pastoral grazing at high altitudes.

Developments in China's recent history have aimed to consolidate and centralise political and economic power in Beijing but in many ways have effectively repressed ethnic minority rights and cultures (Goldstein and Kapstein, 1998). Indigenous knowledge and practices have, in some cases, been devalued or even eliminated (Xu et al., 2006). The majority Han Chinese represent this "civilising centre", often regarding themselves as economically and socially advanced whilst considering the ethnic minorities to be primitive.

The hostile intervention of the People's Republic of China into Tibet in October 1950 initiated the integration of Tibet and Tibetan Buddhism into the Chinese National System through Chinese Sovereignty over Tibet and a period of repressive domestic policies (Xu et al., 2006). Restrictions terminated traditional socioeconomic systems which funded monasteries, rapidly disintegrating monastic life; crushing their power and influence (Goldstein and Kapstein, 1998). The Great Proletarian Cultural Revolution (1966-1976) launched by Mao Zedong to promote "thought reform" had an even more profound impact on ethnic people in southwest China (Xu et al., 2006). All religious practices were forbidden and most religious buildings were destroyed. Indigenous knowledge was considered primitive and merely superstition. Deeply held values and customs of the Tibetans were forcibly abandoned. Consequently a generation gap of resource management knowledge and cultural identity was lost and deforestation in mountainous and ecologically-sensitive regions increased (Xu et al., 2006, Goldstein and Kapstein, 1998).

Following the death of Mao and rise of Deng Xiaoping in 1978 religious policy shifted in the Chinese Communist Party to a more relaxed and pragmatic viewpoint; making beliefs and practices again possible and acceptable. These recent reforms have revived indigenous knowledge, values and practices in rural China (Xu et al., 2006), demonstrating the strength of these cultural beliefs.

The cultural history of southwest China is an example of how indigenous knowledge can be fundamentally dynamic, continuously evolving and non-culturally specific (Zhang, 2000). Variation in socio-political conditions has cultivated different adaptations of cultural traits. Some have re-emerged identical with the past, others are moderately changed and others have yet to re-emerge, if at all (Goldstein and Kapstein, 1998).

2.1.2 Geography

Situated on the Qinghai-Tibet Plateau (3000-5000m) of the southeast Himalayas the southwest province of Sichuan, China is culturally varied and ecologically diverse (Xu, 2006). Forming the headwaters of important river systems such as the Yangtze, Mekong and Irrawaddy, this variety of habitats in this region at various latitudes and altitudes generate high biological and cultural diversity. Its high conservation value has been recognised by international conservation organisations such as Conservation International with its designation as a global biodiversity hotspot (Xu et al., 2006, Mittermeier et al., 2005).

Daocheng County (27°58'29.40 N, 99°58'100.36E) is situated at an average altitude of 3800m in the southwest of Sichuan province close to the borders of Tibetan Autonomous Region (TAR) and Yunnan Province. Covering an area of 7,323km² the country is comprised of 3 distinct geographical areas:

- North: dominated by relatively flat plateau meadows and hills in the north at an altitude of 3600-4200m. Approximate 54.86% of the County population live in this region.
- Middle: dominated by mountainous at an altitude of 2500-3500ml and inhabited by 25.40% of the population

- South: dominated by high mountains (Yading, 6032m) and deep valleys (1900m); inhabited by 19.75% of the population.

(Daocheng County Government, 1995).

Tibetan ethnic groups have dominated the County for hundreds of years with only 5.04% of the current total population Han Chinese. The growth of opportunities in the expanding commercial NTFP market has led to a higher population growth in the highlands than the lowlands of ethnic minority areas (Xu, 2006).

Approximately 208,000 ha (32.13%) of land in the County is covered by forest and shrub species (Daocheng County Government, 1995). The study area was situated in the north of the County. This was covered with alpine and sub-alpine conifer shrub and grassland areas dominated with rhododendron and cypress species (Daocheng County Government, 1995). Most food crops grown in Daocheng County are produced for household consumption, either as food grain or as livestock fodder. Livestock are central to indigenous people's lifestyle, living a semi-nomadic existence and moving livestock herds seasonally.

Monasteries in Daocheng have only begun to recover from the 1966-1976 Cultural Revolution, and many are still in the process of being rebuilt (Daocheng County Government, 1995). Monasteries are utilised by local people as sacred sites for prayer and circumambulation. As with most Tibetan communities, each village has its own sacred site and communication with deities is conducted through sacred objects such as *mani* stones, pagodas and incense burning podiums. Females are not permitted to climb over the top of such sacred sites, with the belief that this will anger deities (Wang, 2007). Previously females were also not permitted to even pilgrimage to other sacred sites. However, with the development of easier transportation this has now changed.

2.1.3 Tibet

The link between cultural and biological diversity is clearly demonstrated in southwest China with cultural and historic ties to mountain landscapes and ecosystems (Xu et al., 2006). With more than 30 different ethnic minority groups in southwest China many

landscapes are regarded as sacred, in particular those of the Tibetan people (Xu et al., 2006). As mountain dwellers the most distinguishing cultural belief and practice for Tibetan people is mountain worship. It is believed that local people, animals and the land are governed by deities residing on the mountain. Buddhist lamas believe that in order to avoid disturbing and angering the spirits expansive areas around sacred mountains should be protected. This protection is largely from overuse (Xu, 2006, Goldstein and Kapstein, 1998).

In order to understand the context of sacred groves in southwest Sichuan it is important to clarify the definition of 'Tibet'. Distributed over an area the size of Western Europe ethnic Tibetans include a population of 4.6 million in China and in neighbouring countries such as Nepal, India and Bhutan (Goldstein and Kapstein, 1998). There are two geopolitical categories of Tibetan inhabitants within China: political Tibet which is equivalent to the current Tibet Autonomous Region (TAR); and ethnographic Tibet which refers to the ethnic Tibetan areas of Qinghai, Sichuan, Gansu and Yunnan Provinces (Goldstein and Kapstein, 1998). Religion is the unifying force between the two.

Tibetan society is dominated by the central role of Buddhism. Through the core notions of karma, reincarnation and enlightenment it defines the basic meaning of life and morality with various religious practices (Goldstein and Kapstein, 1998). Buddhism also influences daily life, with religious practices such as such as counting rosaries, turning prayer wheels, circumambulations, and maintaining altars in homes. In addition Tibetan Buddhism incorporates many local deities and spirits. Prevention of the potential negative powers of angered local deities such as misfortune or illness is a primary concern (Goldstein and Kapstein, 1998).

Tibetan life is considered to be a non-material cycle of cause and effect; with reincarnation determined by human behaviour (Xu, 2006). Consequently humans are considered to be intrinsically part of nature and biodiversity. This positively influences the conservation of wildlife and the natural environment, protecting resources subconsciously (Xie et al., 2000).

2.2 Indigenous Knowledge

Indigenous peoples have adapted to their local environment and ecological conditions over many generations, placing a high value on their protection. Indigenous knowledge and values, developed through generations and transmitted through collective memories in stories, myths, rituals and practices, are a holistic approach, enabling survival in diverse and harsh environments (Xu et al., 2006, Xu, 2003). Such values are maintained through the development and practice of lifestyles and belief systems and utilises their deep understanding of the external world and local biodiversity (Xu et al., 2006).

Indigenous communities subjective understanding and values of the natural world is manifested through the management of their environment and natural resources with hunting taboos, religious beliefs and protection of sacred sites (Xu et al., 2006). Socialisation of ecological phenomena often occurs within such cultures, for example perceiving sacred mountains as deities with human personalities in Tibetan society (Xu et al., 2006). Dependence of Tibetan semi-nomadic pastoralists upon mountain ecosystems for environmental goods and services have helped maintain cultural and biological diversity over centuries in China. Consequently landscapes in this region are preserved through a combination of indigenous strategies for natural resource management and traditional perceptions and cultural beliefs of ethnic minorities in southwest China (Xu et al., 2006) In addition, cultural diversity, indigenous knowledge and skills are valuable social capital, benefiting ethnic people, the state and the region *(Xu and Salas, 2003).*

2.3 Attitudes and Environmental Values

Realisation of natural ecosystem values is essential for effective conservation and increasing our knowledge of environmental importance (Pearce and Turner, 1990, Pagiola et al., 2004). Ecosystems provide both a production, such as resources, and regulatory function, such as carbon sequestration (Sullivan, 2002). Unlike other economic valuation such as cost-benefit analysis which is concerned with benefit equity, TEV attempts to assign monetary values to ecosystems in addition to the sum of its parts; combining use value (direct and indirect), option value and existence value (non-use). This framework encompasses the total range of environmental benefits of natural resources and ecosystems (Adger et al., 2002).

TEV can be highly beneficial for efficient conservation policy. Identifying economic benefits and revenue flows of natural resources for owners and users of environmental assets can provide incentives for behavioural change (Adger et al., 2002). Inclusion of non-use values can help to prevent undervaluation of the environment and marginal economic activities conducted at the cost of vulnerable natural resources (Adger et al., 2002, Sullivan, 2002). This could cause economic distortions and inevitably lead to market failure.

However calculation of TEV frameworks are complex and its application limited (Adger et al., 2002). Environmental goods and services are often non-marketed or ill-defined, consequently the quantification of their components is difficult and the application of linear econometric models unrealistic (Adger et al., 2002). Economic estimates made through TEV should therefore be considered conservative and conservation policy should account for this accordingly.

Sacred Grove Valuation

The role and values of indigenous cultures and beliefs in the protection of sacred landscapes have been studied in numerous publications, placing emphasis on the importance of these sites in habitat and biodiversity conservation (Salik et al., 2007). However, few studies have tested this quantitatively. Quantitative studies that have been conducted have recognised the importance of sacred groves for conservation along with their biological value (Zhang, 2000, Miehe et al., 2003). It has been suggested that in order to successfully manage local resources a combination of economic incentives and government action would strengthen traditional village institutions. As a result this may encourage greater resource efficiency and long-term sacred grove protection (Chandrakanth et al., 2004).

Despite studies assessing forest values, there is great difficulty in estimating this in monetary terms (Murithi and Kenyon, 2002). The way in which the environment is perceived by people is an important factor when considering values (Sullivan, 2002). What one individual feels is important may not be of value to others. This has

implications for policy planning. Quantification of cultural/ attitudinal and non-use values, derived from the continued existence of a resource rather than its utilisation (both direct or indirect), are however important considerations in assessing TEV and may also have significant effect on conservation policy (Crowards, 1995). The large scale distribution of non-use value benefits of the environment could also construe a substantial proportion of the TEV. Monetising both the environmental and social benefits of sacred groves could therefore have significant impact upon future uses and conservation.

2.4 NTFP Collection

NTFP collection in southwest Sichuan constitutes a significant proportion of household incomes. Traditional collection of NTFPs such as plants and mushrooms for medicinal and culinary purposes has increased significantly over the last decade, with a large shift towards commercial market demand (Wang et al., In press). In particular, Chinese caterpillar fungus (*Cordyceps sinensis*) (CCF) (Figure 2) and matsutake mushrooms (*Tricholoma matsutake*) which occur in Sichuan, Qinghai, Tibet and Gansu Provinces. One of the most valuable medicinal fungi in East Asia, CCF has been used for centuries and is collected from late April to the beginning of June (Guo et al., 2003). Opportunity costs to collect CCF are low as crops have already been sown at this time. Collection of mushrooms occurs in July.

Historically a prized edible mushroom in Japan, matsutake mushrooms are found in high altitude pine-oak forest have, in the past few decades, witnessed a vast increase in both price and demand. Studies by Xu and Salas (2003) in Yunnan have identified that the species are beginning to disappear following increased harvesting pressure. CCF, one of the most valuable medicinal fungi in Asia (Wang et al., In press), has seen a similar rapid increase in both price and demand; creating an expanding commercial market. Outsiders are often associated with this overexploitation, driven by both mushroom and CCF high response to market demand and changes in procurement prices (Figure 1) (Xu and Wilkes, 2004, Xie et al., 2000).

Figure 1. Traders selling Chinese caterpillar fungus, Daocheng County, Sichuan (Photo: L. Garrett 2007)

Figure 2. Chinese caterpillar fungus (Photo: L. Garrett 2007)

Socioeconomic Problems Associated with the Commercialisation of NTFPs

NTFPs are a very important component of subsistence livelihoods. In southwest Sichuan income from NTFP trading can far exceed those from logging or yak herding. Many people therefore depend upon NTFP collection for cash income.

Market demand for local products has a number of impacts on biodiversity. Controlled changes in market prices can positively impact biodiversity. However, NTFP markets are often classic open markets for common pool resources with procurement information mainly supplied by outsiders with little regard about the sustainability of harvesting (Xu et al., 2006). Available to everyone, common pool resources are difficult to protect and easy to access. Most however, usually have a defined set of users and management systems in place (Dasgupta, 1996) and are only open to those having historical rights through kinship/ communal membership. Overexploitation occurs when such management systems breakdown allowing free riders and the 'tragedy of the commons' (Hardin, 1968). Consequently the collection of NTFPs may also lead to conflicts over resource tenure, benefit distribution and resource depletion

Resources can however be unpredictable and seasonal which may further drive individuals to exploit the harvest as much as possible, therefore leaving little to remain

for natural regeneration and profit. Marginal groups such as ethnic minorities are also at risk to become disadvantaged as commercial interests gain control over resources.

Little is know with regards to the ecology and conservation status of CCF or mushrooms in this region; therefore the extent to which the current rate of extraction is having on species abundance is unknown (Zhang, 2000, Wang et al., In press). Nonetheless, market demand and procurement prices are rising so high that pressure to collect CCF for income by local people may increase pressure on sacred groves in the instance that CCF abundance falls (thus increasing price) as a result of overexploitation in the mountains and local people fall to pressure and extract resources from the sacred groves.

For NTFP markets to be sustainable it is also necessary to recognise and legalise resource tenure (Sullivan, 2002, Xu, 2003). This is evident in rural Daocheng with violent disputes erupting over CCF resources (Beattie, 2007). Much of the values generated from this NTFP collection, such as the processing and sale of CCF, are captured far from the forest, therefore decreasing incentives for local people to conserve the habitat. Sustainable management of the wild species also has opportunity costs involved.

In theory its presence should raise the economic value of the forest, but the CCF holds far greater value out of the forest than remaining within it. Market prices seldom reflect all the environmental values and selective market demand does not facilitate the conservation of biodiversity (Sullivan, 2002). Conservation within small scale NTFP markets can be promoted but if the market becomes commercialised pressure on the environment increases and reduces any economic incentives to conserve the forest or sacred grove (Adger et al., 2002).

2.5 Impact of Conservation Policy in China

Tibetans, headed by the Dalai Lama, were traditionally governed in a 'theocratic' manner, whereby politics and religion were intimately intertwined (Goldstein and Kapstein, 1998). Since integration under Chinese Sovereignty the TAR has been controlled through central powers in Beijing. Such central control may however have inadvertent impacts on the environment, decentralising decision making processes (Xu et al., 2006) and government

priorities to protect ecosystems for environmental services affecting larger (national) populations.

Centralization and standardisation of Chinese society across China is also evident in environmental legislation. Some modern conservation policies in China such as the 1999-2000 Natural Forest Protection Programme have however placed additional stress on natural resources and indigenous livelihoods in politically and economically peripheral areas such as Tibet. This programme banned all logging in upper reaches of river basins to prevent flooding and restricted the quantity of timber that could be extracted. This resulted in a loss of a valuable employment, forcing communities to seek new sources of revenue such as tourism and NTFP collection (Xu and Salas, 2003).

However, indigenous people are increasingly recognised as a valuable cultural resource which is having significant implications for environmental management and livelihoods (Xu, 2006). Institutions are emerging at local community levels in China following the 1998 Organic Law of the Village Committee (Government, 1995). This allowed villages self-governance and gave indigenous communities greater responsibility for land and resource use (Xu et al., 2006). Nonetheless, in practice land tenure is insecure and natural resource user rights are not fully acknowledged.

Many generations of human management and cultivation have influenced the current state of most, if not all forest in China (Xu et al., 2006). Ecosystems have also contributed to human wellbeing, supporting a range of cultural services, such as spiritual wellbeing, recreation and aesthetic values. China's forests can therefore be considered both a product of nature and culture. If forests are present as a result of the actions of local people living in and around them, their future protection requires the encouragement and inclusion of the very cultural practices that have shaped them.

3. METHODS

3.1 Background to Methodology

A combination of Rapid Rural Appraisal (RRA) and questionnaire based interview techniques were used in this study. Consequently data on both the attitude and perceptions of the sacred groves and the direct use of NTFP resources could be collected in both quantitative and qualitative formats.

3.1.1 RRA

Developed in the late 1970s Rapid Rural Appraisal (RRA) is a social science data collection method which aims to learn from and with communities through interaction (Theis and Grady, 1991). Participation with the community creates a more qualitative understanding of the complexities of a topic, particularly perspectives and motivation for certain behaviours. Unlike RRA where the primary focus is rapid data extraction, the later development of Participatory Rural Appraisal (PRA) specifically requires the collection of information and the utilization of local people's capabilities to effect change at ground level, thus creating a greater degree ownership and empowerment of communities.

Flexible and open-ended, both PRA and RRA enable hypotheses to evolve through continual revision and feedback from on the spot analysis. The multiple perspectives sought in exercising RRA and PRA also enable less vocal groups such as women and the poor to be acknowledged and participate (Theis and Grady, 1991).

Triangulation is an important process used to determine the credibility of information gathered through PRA and RRA (Mukherjee, 1994). Cross checking to determining the reliability of information given and decrease bias can be achieved through:

- a multidisciplinary team
- gathering responses through a combination of techniques and sources
- and, the presentation of information gathered back to the communities, ascertaining if conclusions drawn by the investigator(s) are correct.

(Theis and Grady, 1991)

Other core tools of RRA and PRA include semi structured interviews, transect walks, focus groups and participatory mapping (Mukherjee, 1994; Chambers, 1992; Theis & Grady, 1991). Maps made by communities can be very useful in identifying local perceptions of areas in question. Information elicited through questioning of the maps post completion and through observations of how the map is drawn and by who is also particularly useful. In addition observations from focus groups of individuals with similar characteristics such as age, sex or occupation enables these homogenous groups to convey their perspectives, knowledge and opinions in relaxed discussion (Chambers, 1992). This can be used to triangulate information obtained through individual questionnaires and gain a further insight into the topic outside of the potential restrictions of the questionnaires.

The advantage of RRA as a social research methodology is that it involves high levels of local participation, low costs and can be conducted in a short duration (Theis & Grady 1991). Nonetheless, there are a number of limitations with this methodology. Rapid appraisal of communities may not be appropriate in understanding long term social change (Mukherjee, 1994). Although triangulation may work to reduce some of the bias, there is a large presumption that informants' responses are truthful. Outsider behaviour may have a significant influence on these responses and ability to conduct certain RRA and PRA exercises.

3.1.2 Questionnaire-based Interview Surveys

Individual questionnaire-based interviews can be useful to gain a qualitative and quantitative understanding of underlying motivations behind behaviours, attitudes, values and beliefs (Arksey and Knight, 1999). Structured closed questions can be used to obtain quantitative data which can then be analysed to give a numerical description of the data. Qualitative data can be obtained through less structured, more open-ended questions and can also be used to follow up more closed questions. Focusing on informants' understanding this can uncover and explore meanings and contexts of behaviours and beliefs. Scales such as the Likert scale (where 1=strongly disagree, 2=disagree,3=neither agree nor disagree, 4=agree, 5=strongly agree) (Arksey and Knight, 1999) are often used

in the collection of attitude and belief data. Respondents can either be asked to evaluate each entity independently or comparatively, directly against each other.

Piloting of questionnaires is essential in questionnaire-based interview surveys to identify areas of the questionnaire that are not clear to respondents and ensure that data collected will be quantifiable for later interpretation. The ordering of questions should be logical, grouping related topics together and funneled, with general questions preceding specific questions (Saunders et al., 2003).

However, there is bias involved in questionnaire-based interview surveys. Questions, particularly closed questions, are structured by an outsider's (the interviewer) perception of the study social group and their understanding of a situation should be considered objective (Mukherjee, 1994). In addition, this may also result in the omission of information outside of that requested within a more structured questionnaire approached.

3.1.3 Environmental Valuation

Valuation of the environment can evaluate 'the state of the environment in terms of how people feel about their surroundings, assessing the causes of environmental degradation and designing incentive based policies for improving the environment ' (Pearce, 2002) (Table 1). The total economic value (TEV) of the environment comprises its use value (both direct (consumptive) and indirect (non-consumptive), option value and existence value and can provide an estimation of monetary value can be placed on the environment. (Xu and Wilkes, 2004)

Total economic value (TEV) = Direct-use value + indirect use value + option value +existence value

(Adger et al., 2002)

Difficulties in applying quantitative values to option and existence values can however arise (Adger et al., 2002), limiting the application of TEV to certain environmental resources or providing a conservative estimate of environmental value.

Valuation in this study was conducted using the survey-based methodology of contingent valuation method (Table 1). Although utilised for both use and non-use valuation, this is particularly useful to measure non-use values where markets do not exist and therefore do no have a price (Swanson et al., 2002). A hypothetical but consequential scenario and market can be constructed in which goods can be traded. This provides a stated preference of intended future actions and behaviours expressed through a willingness to pay (WTP) or willingness to accept (WTA), explicitly asking individuals to place economic values upon the goods in question (Garrod and Willis, 1999).

Table 1. Microeconomic values and methods of valuation. (Garrod and Willis, 1999, Pearce and Turner, 1990, Pagiola et al., 2004). CV=Contingent valuation. Indirect use valuation was not conducted in this study.

Type of value		**Examples**	**Valuation Method**	**Method used in this study**
Use value	**Direct Use:** **Extractive**	Hunting, NTFP collection, firewood collection etc	Travel Cost Method, Hedonic price method, CV, Payment for environmental services	Use value & attitudinal survey, CV, informal interviews
	Non-extractive	Recreation, cultural, spiritual, tourism, education, aesthetic		
	Indirect Use	Ecological functions – soil/ water protection, carbon storage	Replacement cost, CV	
Non-use value	**Option**	Future direct and indirect use	CV	Attitudinal survey, CV
	Bequest	Existence for future generations	CV	Attitudinal survey, CV
	Existence	Intrinsic value	CV	Attitudinal survey, CV

However the creation of a hypothetical scenario and market may elicit strategic behaviours in respondents through hypothetical bias, deviating from actual WTP. Further compromises may arise through differentiation in interpretation of the scenario or insensitivity to the scope of the good being valued (Garrod and Willis, 1999).

3.2 Application of Methodology

Two separate surveys were conducted with each household sampled:

1. Valuating the uses of NTFP in both the sacred grove and surrounding forests
2. Examining the attitudes towards and values of the sacred grove

Triangulation, where possible, was used between questionnaires, focus groups and key informant interviews to cross check answers and reduce potential bias.

3.2.1 Study Site

Two villages were used as case studies: Sangdui (29°21'47.9N, 100°06'08.6E, 3911m) and Souchong (29°08'00.9N, 100°10'19,3E, 3889m). These were chosen due to the ease of access from Daocheng, the principal town in the county, and the comparative population sizes and contact with outsiders. Both villages were situated along the main road from Lǐtáng to Daocheng and were part of a hamlet of five villages, the largest of which was Sangdui. Local government offices and the primary school were based in Sangdui. Semi-structured interviews of key informants, questionnaire-based interview surveys and informal focus group discussions in villages and the mountain summer camps were used to gather information. Data collection was carried out for 15-20 days in each village between May and June 2007 with two translators.

Both Sangdui and Souchong had an associated monastery situated approximately 0.5km from the village. There were two sacred groves in each village, each varying with species type and size. In Sangdui the two sacred groves consisted of one of predominantly oak forest, and a smaller grove of varying larch species (Figures 27 and 28, Appendix VI). The larger south-facing sacred grove in Souchong contained the monastery and was also predominantly oak. The other sacred grove was north-facing and consisted of fir species (Figure 29, Appendix VI)

3.2.2 RRA

Semi-structured interviews

3 semi-structured interviews were conducted with key informants in both Sangdui and Souchong. The forest managers in both villages were interviewed in addition to a key informant at the mountain campsite.

Focus groups

Four focus group discussions were conducted. In Sangdui with 3 focus groups of men, women and monks and in Souchong with 1 group of monks. Individuals chosen were separate from individuals previously interviewed to prevent fatigue and questions developed from a set of questions shown in (Appendices VII-XI). However, the emphasis on group discussion often proved to be problematic and often ended up with only one individual answering for the remaining group. Frequently when conducting a questionnaire with an individual it would not be long before this would spark interest with other nearby local people and it would be difficult to prevent others adding to the respondent's answers. Conversely, when conducting focus group discussions it proved very challenging to maintain a discussion or to obtain more than one individual's opinion, with the other group members merely stating that they agreed and would follow what this individual said. In order to overcome this, focus groups were kept small to reduce people's shyness and allow for greater participation.

3.2.3 Questionnaire-based Interview Surveys

Questions were translated into Mandarin with the help of students at the University of Sichuan, Chengdu and Wang Nan of the University of Beijing and WPA in Daocheng. It was also necessary to have a second translator, Xiāo Hóng Yàn, who translated the Mandarin questionnaire into Tibetan and conducted the interviews. It was ensured that the information required from the survey was understood by both Wang Nan and Xiāo Hóng Yàn. In translating the questionnaires twice it was apparent that a large proportion could be lost in translation and cultural interpretations. However an English-Tibetan translator was not available at this time. In addition there was also an additional influential bias with the presence of Wang Nan, known locally as "Uncle White-eared Pheasant" as a result of his long-standing research into the species. However, it was

essential to have both translators present during the interviews and this bias could not be reduced.

With each interviewee the translator introduced the team (myself, Wang Nan and Xiāo Hóng Yàn) and the purpose of study in addition to explaining the anonymity of the questionnaire. Usually the interview was conducted with only one member of a household or a few members present. Only 2 interviews were terminated due to lack of time or inappropriate circumstances and only 1 respondent refused to be interviewed.

Use Survey

In order to establish the context in which the sacred grove was used and perceived its meaning to the respondent, frequency of use, time spent, and reason for last visit were first recorded. Information regarding direct uses from NTFP collection was then collected per household unit. Due to the nature of the collection of NTFPs in the region it appeared to be easier to record the total number of NTFP collection per household for the previous collecting season. NTFPs such as mushrooms and CCF are intensively collected during the spring and summer months which made it simpler for respondents to recall the amount of NTFPs collected. Quantities of items collected were not usually remembered and so this data was extrapolated from price per unit (mushrooms, RMB per 500g; CCF, RMB per piece; and Beimu, RMB per kg) and total income received.

Data were also collected on which household member(s) were involved, input costs (such as food supplies for time spent in the mountains), transport and equipment used. In addition, perceptions as to NTFP availability and active responses to this availability were also recorded.

The initial objectives of the study to investigate the direct use of the sacred grove were adapted following the pilot study which identified that very few people, if any, utilize the sacred grove for extractive purposes. Consequently the questionnaire was modified to collect data on NTFP use in both sacred groves and other forest types to identify the potential extra cost of not using the sacred grove to collect NTFPs from non-sacred forests. Although species type between sacred and non-sacred forests were similar a

direct comparative study between sacred and non-sacred forests was not possible due to size and altitude differences. However, from the direct use values calculated, an estimation of the extent that the sacred groves were used for extractive purposes was made, inferring the potential contribution of sacred grove resources to local livelihoods.

Attitudinal Surveys

This section of the questionnaire focused primarily towards the individual as the response unit rather than the household. Benefits received from the sacred grove were ranked in order of perceived importance. Further to the use questionnaire, respondents were asked how the sacred groves were viewed in their religion and beliefs to ascertain the extent of cultural and spiritual values held. Other areas of investigation included:

- Attitudinal scales on the sacred groves benefits (using the Likert scale) and reasons to protect it
- Opinions on condition of sacred grove
- Availability of NTFP products and household responses to this change in availability
- Responsibility towards the sacred grove and restrictions of use, rights of animals and plants to protection
- Species of plant and animals seen in the sacred grove, focusing on pheasant species (this was conducted using a visual aid (Appendix V)
- WTP and opinions on WTP scenarios

Socioeconomic information was gathered at the end of the questionnaires and finally respondents were asked what occupations they would most like their children or grandchildren to have. This would indicate future aspirations/ values and what aspects of the environment, if any, they viewed as an important part of their heritage i.e. bequest values associated with the sacred grove.

Wealth Ranking

Wealth ranking and wealth mapping can be utilized to group households on the basis of their wealth, incomes and other local perceptions of affluence (Mukherjee, 1994). It was not feasible to conduct this ranking with local people due to time constraints.

Consequently it was decided that a proxy for wealth would be used to rank households socioeconomic status. During household interviews data on assets within the house were recorded to be valuated at a later stage with a key informant and used as a proxy for wealth. In addition, house size (m^2) was also used as a substitute for wealth indication, under the assumption that the greater the wealth the larger the house constructed. Utilising house size as an indication of wealth was also verified by a key informant who suggested that people within the community often demonstrated their wealth by building larger homes. Houses in the villages were built in the same format and technique. Timber pillars holding up the roof were spaced equally at $3m^2$ intervals; consequently enabling ease of assessment of house size. Coinciding with mapping households interviewed this data could then also be used to identify wealth zones, if any, in the village.

3.2.4 Pilot Study

Five randomly selected pilot interviews were conducted with a draft questionnaire. This helped to identify sections of the questionnaire that could be modified and areas that required further clarification or information. Several questions were rephrased to allow for greater respondent comprehension. The interview was also shortened to keep the questionnaire within 60 minutes. Although the questionnaire was lengthy people were willing to spare time to chat or were willing to respond whilst working in the fields. If, however, the interview took longer to conduct we arranged to return at a later date, but this often proved difficult due to the time of year as many people traveled to and from summer mountain yak herding and NTFP collection sites. Consequently interviews were often conducted whilst people worked, during the evenings or with individuals who remained in the village who had a greater amount of time to spare. The full questionnaire is shown in Appendices II-IV.

3.2.5 Sampling

Households for the surveys were selected at random from a village photograph, taken from a mountain view point (Figures 26 and 27, Appendix VI) This ensured that all areas were represented in the sample population in the absent of the availability of a village member to conduct transect walks. From this the village was split into sections, houses

were numbered and then randomly drawn to be interviewed. If a target household were not available for interview the nearest house to the right was then approached. Unfortunately during the period May-June the majority of community members in both Sangdui and Souchong were not in the villages and were working in the mountains, either herding yak for the summer or collecting NTFPs, leaving either elderly relatives to look after homesteads or merely locking their homes. Consequently there was some bias in selecting households to interview as there were a limited number of people to be found in the village. . Despite also traveling to conduct surveys in the mountains, bias was greatly evident in respondent selection due to the feasibility of locating individuals distributed over a large mountainous region and the predominance of age bias in both the villages themselves (elder bias) and the mountain camps (youth bias).

Over the survey period May - June 2007 65 questionnaires were conducted, 38 in Sangdui and 27 in Souchong.

3.2.6 Data Analysis

Questionnaire data was coded and recorded in Microsoft Excel. Stata 9.2 and Excel were used for all statistical analysis and data was suitably transformed where necessary. Parametric tests were used where possible to analyse normally distributed data of continuous (regression, t-test) variables. However the stringent assumptions made by parametric tests may not always be suitable, particularly with analysis of biological data (Fowler et al., 1998). Consequently 'distribution free' data were also analysed using non-parametric tests for rank and categorical variables (Mann-Whitney U test, Spearman rank correlation coefficient, Chi-squared) (Fowler et al., 1998). General Linear Models were used for multivariate analysis where multiple factors were involved as the explanatory variable**.** All statistical tests were two-tailed with a critical probability value of 0.05. Critical probability values quoted are represented as follows: '***'=P<0.001, '**'=P=<0.01, '*'P=<0.05, and '>0.05'= Non-significant (P=≥0.05) (Fowler et al., 1998). Number of data points for each test are represented as follows: 'degrees of freedom' are quoted as 'd.f.' and when using Mann-Whitney U tests sample size is denoted by 'n_1,n_2…'. Monetary units are stated as Chinese Yuan Renminbi (RMB). All conversions

of RMB to USD are at the rate of 1RMB : 0.13USD/ 1USD : 7.55RMB as taken on 2 September 2007. Online source: Reuters UK. Available at: http://investing.reuters.co.uk/Investing/Currencies.aspx?WT.mc_id=ext_SEM_Google_currency%20converter&WT.srch=1

4. RESULTS

4.1 Demographics

Despite differences in population and economic development between Sangdui and Souchong, both villages exhibited similar socioeconomic and demographic characteristics and the dominance of traditional Tibetan culture in the area was observed to infiltrate many of these.

22.41% of households in both Sangdui and Souchong were sampled for direct use of NTFPs and 3.85% of the population were sampled for attitudes towards the sacred groves. Although communities in the region are predominantly subsistent, there are 3 main sources of income in the area (Wang, 2007): CCF and mushroom collection and 'home stays' for local tourism. Two distinct ethnic groups and ways of life were identified in the villages. Out of the population sampled, 3 were Han Chinese. All other respondents were of Tibetan ethnicity, which, according to government records, made up 97% of the population in the villages. There was no significance difference between the proportion of Han Chinese and Tibetans in Sangdui and Souchong (Table 3).

The mean age of respondents was in 40.11 years in Sangdui and 46.04 years in Souchong, the youngest being 17 years and eldest, 73 years old. The variation between the two villages was not significant (Table 3). However, variation between the two village samples ($T=1.584$, $d.f.=64$, $p=0.059$) was almost significant on a one-tailed sample. This is likely to be a result of the bias in the sample due to the availability of predominantly elder respondents during May-June. Men were also slightly overrepresented in the sample.

Four monks were interviewed in both Housie monastery, Souchong and Benbu monastery, Sangdui. Each monastery consisted of 100-150 monks, dependent on the time of year. Of the other 61 households interviewed, each consisted of on average 1.92 males, 2.03 females and 1.48 under 16s (Table 2). According to key informant discussions, houses are often inherited to keep land and homes in families. Often grandparents live with their children.

Table 2. Summary of demographic characteristics of sample population in both Sangdui and Souchong. n=65 except no. of people in household (n=61) which does not include respondents living in the monasteries. SD=Standard Deviation

	No. of People in Household			House Size (M^2)	Years at School
	Male	**Female**	**<16**		
Mean	1.92	2.03	1.48	14.83	1.86
Max	4	5	4	220	17
Min	0	0	0	10	0
S.D.	0.94	1.06	1.13	34.69	3.76
n	61	61	61	65	65

Years in education of the respondents surveyed ranged from 0-17 years (Table 2), with a mean of 1.9 years. There was no significant difference of time in education between Sangdui and Souchong (Table 3). Years in school was significantly correlated to ethnic background (r^2=0.13, d.f.=1, p**), with Han Chinese spending the greatest time in education. House hold size ranged from 10m^2 to 220m^2 and was similar in both villages (Table 3).

The time each respondent lived in Sangdui and Souchong varied between being born in the village to less than 5 years. There was no significant difference between time spent living in Sangdui or Souchong (Table 3). 78.46% of the sample population were born in the village and only 1.54% had lived in the village more than 30 years, having been born outside of the community. 10.77% had lived in the villages for 20-30 years and 3.08% for 10-19 years 6.15% of respondents had lived in the village less than 5 years, including the 3 individuals with more than 12 years of education. None of the 3 Han Chinese interviewed had lived in the village for more than 30 years. Respondents who were not born in the villages all came from surrounding villages within Daocheng County.

Table 3. Differences in socioeconomic factors relating to respondents and their households between Sangdui and Souchong (n=65**).** T-tests were used for continuous variables, Spearman Rank correlation tests were used for categorical data.

Variable	d.f.	Statistical test value	Significance level
Years in Education	64	1.105	>0.05
Ethnicity	64	0.896	>0.05
Age	64	1.584	>0.05
Occupation	64	1.451	>0.05
House size	1	1.171	>0.05
Time lived in village	10	0.319	>0.05
Asset value	64	3.030	*
Income from NTFPs	64	1.100	>0.05

4.1.1 Wealth Ranking

The largest asset values were seen in farmers and livestock herders. According to key informants this is typical of this area of Daocheng County whereby yak products (such as milk, cheese, butter, skin and dried meat) and small crop yields of Tibetan barley, turnip and potato provide subsistence, reducing the need to purchase such products at market levels. Collection of NTFPs for sale provides what is usually the sole additional monetary income.

Asset values ranged from 100RMB to 22,2500RMB and were significantly different between in Sangdui and Souchong (Table 3). House size was found to positively correlate with asset value (r^2=0.078, d.f=61, p*) (Figure 3). Consequently house size was used as a proxy for wealth ranking in further analysis when comparing variables between the two villages.

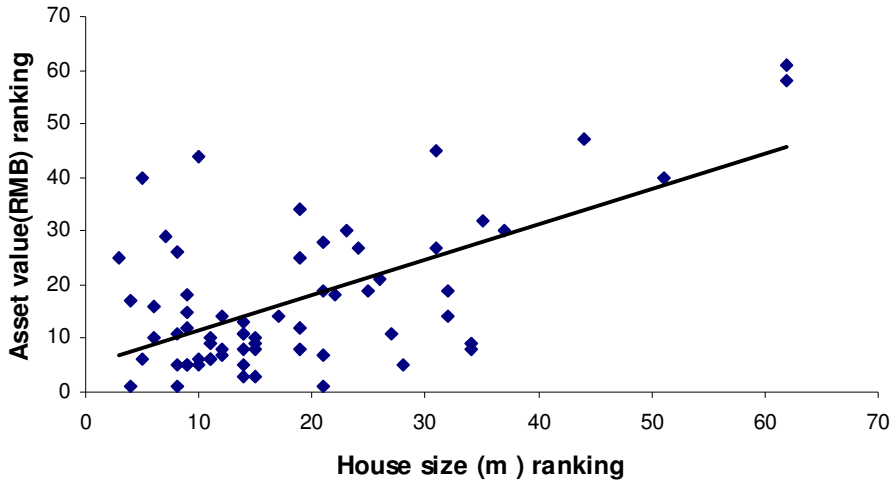

Figure 3. Regression of asset value ranking and house size ranking showing positive correlation (n=65)

There was no apparent differentiation between wealth status and house size within the villages.

4.1.2 Occupation

Respondents were predominantly subsistence farmers and/or yak herders. Monks made up 13.85% of the sample population, correlating with 14.79% of the total population in this occupation. Other occupations such as village government, traders, nurse, tailor etc were not sampled according to their proportion of the total population but as part of the random sampling (Figure 4). Due to the large number of occupation types, further analysis categorized occupations into 'monk', 'farmer/ livestock' and 'other'. There was no significant difference between occupations in Sangdui and Souchong (Table 3) and no correlation between wealth ranking (house size) and occupation type. However, occupation was highly positively significantly correlated to ethnicity (χ^2=10.484, d.f.=2, p***), with more Tibetans working as monks and farmers.

Income was positively correlated to asset value using regression (r^2=0.009, d.f.=61, p*) but showed no significant relation to wealth ranking (house size). Regression between

occupation and house size (wealth ranking) and between occupation and income from NTFPs also showed no significant correlation.

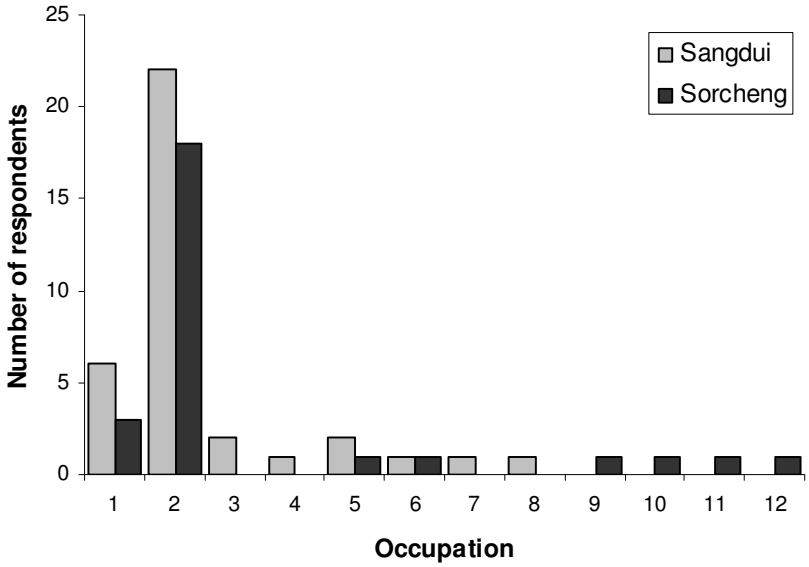

Figure 4. Occupations of respondents in Sangdui and Souchong (n=65). The 3 Han Chinese sampled worked as a mason, shop trader and in road construction.

Key to Figure 5**:**

1	Monk	7	Tailor
2	Farmer/ Livestock	8	Painter
3	Trader (shop)	9	Trader (wild products)
4	Nurse	10	Forest Manager
5	Village Government	11	Mason
6	Retired	12	Road Construction

4.1.3 Ethnicity

Data from the local government which stated that 3% of the population in Souchong and 10% of the population in Sangdui were of Han Chinese ethnicity. 4.62% of the sample population were of Han Chinese ethnicity (3 individuals) with the remaining sample population of Tibetan ethnicity. Ethnicity was significantly correlated with wealth ranking of house size (T=7.589, d.f.=63, p***), with Tibetan respondents having larger houses, but not with asset value. Han Chinese in the villages were often in seconded

salaried occupations such as health workers, teachers or local government. Consequently their accommodation was government owned and small scale.

4.2 Uses of the Sacred Grove

Pure religious belief appears to regulate environmental use in the area. Both communities were familiar with the sacred groves as highly significant in a religious context, even if the respondents did not believe in it themselves. It was not seen as a site of importance for direct extractive use and was perceived as important to preserve to prevent bad karma and misfortune. However, monasteries do not have the power to control sacred groves as there are still bureaucratic problems both within and outside of monasteries. There appear to be different levels of management and rights with regard to sacred groves. Local governments have greater management rights but in this region religion holds a greater influence over communities than national laws.

In order to understand the uses of the sacred grove in context respondents were asked in the Use Survey what the sacred grove meant to them and in the attitude survey what the sacred grove meant to them in the context of their religion and beliefs. In the use survey all but the 3 Han Chinese placed the sacred grove's main purpose to be religious; stating that it brought luck and protection to the community if they showed respect to Buddha. 2 Tibetan individuals who had more than 10 years education and were employed in salaried occupation stating that even though it had no personal significance to them it was important for locals, although they felt that this was "blind faith" or "superstition".

In the context of religion and beliefs again the 3 Han Chinese interviewed stated that they found no personal specific religious meaning in the sacred grove but they respected the local traditions and would follow them to avoid conflict. This was a view also held by the two Tibetans who had previously stated that the sacred grove had no personal significance. The remaining sample population gave similar answers stating that it was important for their beliefs to show respect to the mountain and sacred grove as part of the Tibetan tradition to ensure good harvests, good health, happy lives as a result of the luck and protection from the sacred grove. They felt that the sacred grove and sacred

mountain were symbols of Buddha and so were just like God. If they were destroyed they would receive bad karma.

Only 2 individuals did not think that animals and trees in the forest had a right to be protected from over-harvesting or reduced habitat availability; stating that they [the animals and trees] would naturally increase and decrease in numbers and so did not need protecting.

'Male' and 'Female' Sacred Groves

Focus groups in Sangdui and Souchong with monk, male and female groups identified that sacred groves could be considered male or female (Appendices VII-XI). The focus groups or monastery did not know what determines whether a sacred grove is male or female. There were also discrepancies between opinions in focus groups as to the meaning of male and female sacred groves. Some suggested that females could not enter the male sacred grove and visa versa, particularly in summer when such activity would result in hail and damage crops. Some suggested that conservation of sacred groves was "man's work". It was strongly implied by some respondents that females could not go to the top of sacred mountains.

Frequency of visit

On average, people lived 77.23 minutes, 2.26km from the sacred groves and spent an average of 161.4 minutes in the sacred grove. 12 respondents never visited the sacred grove at all, including 2 of the 3 Han Chinese interviewed. 1 individual visited at least once a month and 6 visited every day. 46 respondents visited the sacred grove 2-4 times per year, stating important religious festivals and dates, such as Tibetan Spring Festival in February, as the reason for visiting.

Use of the Sacred Grove for Religious and Recreational Activities

More people used the sacred grove for religious than recreational purposes. Of the sample population that did not use the sacred grove for religious purposes all were Han Chinese. 56.92% of the population sampled used the sacred grove for recreational purposes. Chi squared test results showed that this was highly significantly positively

correlated with ethnicity (χ^2=4.16, d.f.=1, p*), with more Tibetans using the sacred grove for recreation than Han Chinese. Occupation was also highly significantly positively correlated (χ^2=10.484, d.f.=2, p**), with more monks and farmers using the sacred grove for religious purposes than other occupations. Wealth ranking, years in education or age did not significantly influence the utilization of the sacred grove for religious or recreational purposes. Those who collected mushrooms and CCF were also highly significantly positively correlated to those who used the sacred grove for recreation (Table 7).

5. Local man making smoke to show admiration to Buddha (Photo: Wang Nan)

Focus groups confirmed that religion was the predominate activity in the sacred groves (Appendices VII-XI). Religious activity was part of daily Tibetan life and included counting rosaries, circumambulations (clockwise), turning prayer wheels, and keeping shrines and altars in their homes. Religious activities in the sacred grove included circumambulations, making smoke (Figure 5) and placing prayer flags to show admiration to Buddha and the sacred mountain.

Predominant Reason for Visiting the Sacred Grove

Of the respondents interviewed no-one thought that people visited the sacred grove predominantly for hunting, farming, firewood or timber collection. Of the 3 Han Chinese, 2 felt that people visited the sacred grove for recreational purposes and 1 for NTFP collection. 90.16% of the respondents thought that people in the community visited the sacred grove mainly for religious purposes. 3.28% felt that recreation and only 1 individual thought that grazing livestock was the main reason to visit the sacred grove.

4.3 Income from NTFPs

4.3.1 Products Collected

56 respondents collected NTFPs. Two main NTFP products were collected in the two communities sampled: CCF (*Cordyceps sinensis*) and matsutake mushrooms (*Tricholoma matsutake*). In addition, Beimu, another medicinal herb, and firewood were also collected. However the market for Beimu was not as commercialized or as large as the two dominant NTFPs. There was a single method of extracting both mushrooms and CCF, using a small metal pick for CCF and wooden stick for mushrooms.

81.54% of households collected CCF, and 86.15% of households collected mushrooms. 96.43 % collected both NTFPs. Of the 9 households sampled which didn't collect any NTFPs, 8 obtained income from other occupations such as trading (shops), trading (wild products), tailor, nurse, village government or monks.

2kg of Beimu, a medicinal plant, was collected by one household sampled in non-sacred forest and sold for 60.00RMB per kg. A total of 10,778 CCF pieces and 1,755.27kg of mushrooms were collected during one season.

4.3.2 Seasons Collected

It was apparent from questionnaires, informal interviews with key informants and focus groups that NTFP collection was seasonally driven. Species availability and weather were obviously influencing factors in NTFP harvesting, with spring and summer months (May-August/ early September) being the only time that wild products were collected. CCF was collected intensively between May and June, and matsutake mushrooms were collected during July through to early September.

Timber for firewood collection was permitted in winter during the month of October only following Tibetan rice harvest. This is a particularly cold yet dry period of the year and consequently leaves forest vulnerable to fires from religious activities and logging camps. There is no limit as to where firewood is collected but key informants suggested that the majority of people collected in the nearest forest 1-3km from the villages. Permits from the Forestry Bureau must be obtained at a cost of 10RMB per tractor load. There is no

limit as to the number of permits allowed per household per year, but the principle of self limitation assists with the self-management of firewood collection. However, current house sizes are much larger than in previous years and therefore require a greater quantity of firewood to provide heat. In addition, it was suggested that some local people would cut more than they needed in order to sell to other villages, but this was not a common practice.

People collecting NTFPs were predominantly farmers and yak herders. Those who ran shops, were monks or worked in local government did not partake in NTFP collection, presumably as their income was already sufficient and consistent.

Table 4. Mean Distance Traveled to collect NTFPs (km) (n=56)

	CCF (km)	**Mushroom (km)**
Mean	17.13	10.50
Min	1.00	0.00
Max	50.00	50.00
SD	13.33	14.10
Sangdui	15.69	14.94
Souchong	18.69	6.23

Distance traveled to collect NTFPs varied between NTFP collected and village sampled. People were willing to travel further for caterpillar collection – 15.69km in Sangdui and 18.69km in Souchong (Table 4). Comments made by respondents indicated that collection of NTFPs coincided with the summer grazing of yak herds during the spring and summer months, living in camps high in the mountains. Mushroom collection appeared to be conducted closer to the villages (14.94km on average from Sangdui and 6.23km on average from Souchong). On average people spent 39.52 days collecting NTFPs away from the village.

The NTFPs were predominantly sold following collection, with only spoilt items, such as open mushrooms, consumed in the household (9%) (Figure 6). Of the items sold, these were mostly sold to traders from outside of the villages. During CCF season traders would buy pieces from the collectors every day at 6pm in the mountain camps traders, these would then be sold in larger towns such as Daocheng city. Only a small proportion was given to families either in the village or outside of the village, presumably to be sold

on to traders. Selling to families or traders in the villages was also infrequent (1% and 5% respectively).

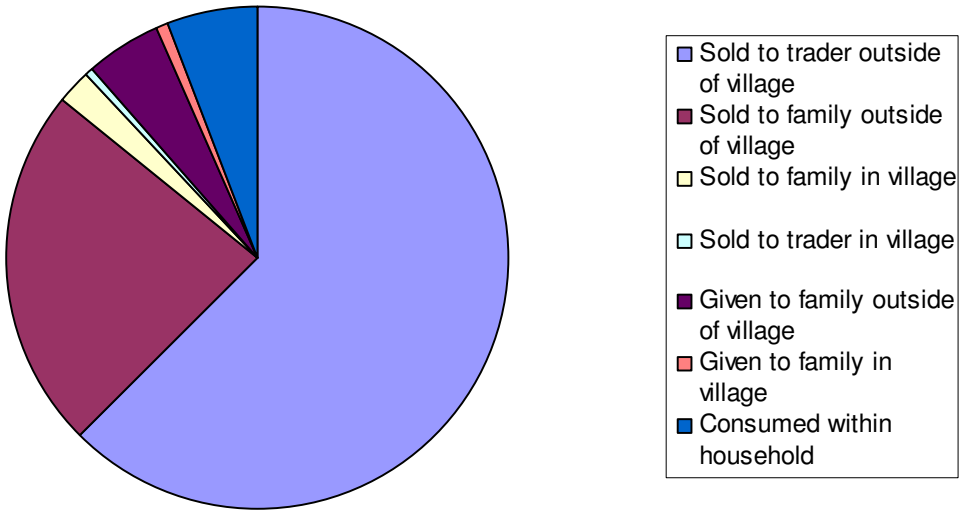

Figure 6. Outcome of NTFP collection (n=56)

4.3.3 Income per Household

Table 5. Average price for NTFPs as sold (CCF, per piece; mushrooms, per kg) (RMB) (n=56) (SD= standard deviation)

	CCF (per piece)	Mushrooms (per kg)
Mean	14.27	36.08
Min.	7.50	14.00
Max.	22.50	60.00
SD	3.88	10.10

Prices for both CCF and mushrooms varied greatly throughout the collecting season, according to quality of the product collected (Table 5). Towards the end of the CCF collecting season, the fungus would have destroyed a large part of the caterpillar body, reducing its market value. At the peak of the season, prices per piece could reach up to 22.5RMB per piece. Similarly with mushroom collection, the quality of the product collected determined the price, which also varied throughout the season.

NTFPs were predominantly collected in non-sacred forests, with only 0.98% of CCF and 5.77% of mushrooms collected from sacred groves (Table 6). Those who collected mushrooms in the sacred grove were significantly more likely to also collect CCF in the sacred grove (Figure 6). There was also a highly positive correlation with both mushroom and CCF collection in the sacred grove and the village of Sangdui and with respondents who utilised the sacred groves for recreation. Collection of NTFPs was not significantly related to ethnicity. Those with a lower value of household assets were also highly significantly positively correlated with those who collected CCF and mushrooms in the sacred grove.

Table 6. Quantity of NTFPs collected per household per year in both Sangdui and Souchong (SG=Sacred Grove, F=Non-Sacred Forest, SD=Standard Deviation) (n=56)

	CCF (pieces)		**Total**	**Mushrooms (kg)**		**Total**
	SG	**F**		**SG**	**F**	
Average per Household per year	53	213	266	20.26	33.75	32.50
Min.	5	2		0.33	1.67	
Max.	100	1,120		83.33	83.33	
SD	67	179		35.42	21.12	
TOTAL	**105**	**10,673**	**10,778**	**101.29**	**1,653.98**	**1,755.27**
% of Total Collected	0.98	99.02		5.77	94.23	

Table 7. The socioeconomic and associated use factors relating to respondents who collect NTFPs in the sacred grove. N=65 for all tests. SL=Significance Level. Chi-squared tests (χ^2), Spearman rank tests (ρ) are used as appropriate with continuous and categorical data respectively. Significant variables influencing NTFP extraction from the sacred groves are shared grey.

Variable	CCF			Mushrooms		
	d.f.	Statistical value	SL	d.f.	Statistical value	SL
Village	1	χ^2=35.402	***	1	χ^2=49.716	***
Ethnicity	1	χ^2=1.507	>0.05	1	χ^2=2.198	>0.05
Use of Sacred grove for recreation	1	χ^2=5.581	**	1	χ^2=6.213	**
Use of sacred grove for religious purposes	1	χ^2=1.507	>0.05	1	χ^2=2.197	>0.05
Asset value	64	ρ=0.326	**	64	ρ=0.263	*
Wealth ranking (House size)	64	ρ=-0.212	>0.05	64	ρ=-0.119	>0.05
Collect mushrooms/ CCF in the sacred grove	1	χ^2=49.716	***	1	χ^2=49.716	***
Occupation	2	χ^2=2.764	>0.05	2	χ^2=4.123	>0.05

On average income per household for NTFPs collected in the sacred grove were 131.32RMB per year, in comparison with 1,820.55RMB per year in non-sacred forest and an average of 1,355.41RMB per annum in total (Table 9). Of this amount, the majority (71.67%) was generated from CCF collection, 28.07% from mushroom collection and 0.26% from Beimu collection. Income generated from the sacred grove was greater for mushroom collection than CCF (Table 8). Income generated from NTFPs was not significantly related to other variables such as ethnicity, occupation or wealth ranking.

Table 8. Income (RMB) per house hold per NTFP item in both the sacred grove and non-sacred forest. (SG=sacred grove, F=non-sacred forest) (n=56)

	CCF		Total	Mushrooms		Total	Beimu
	SG	F		SG	F		F
Average per Household sampled per year	**650.00**	**2,662.06**	**2,584.67**	**738.00**	**979.06**	**957.15**	**480.00**
Min.	50.00	15.00		10.00	50.00		480.00
Max.	1,250.00	13,450.00		2,500.00	3,050.00		480.00
SD	848.53	2,324.32		1,065.75	714.64		0.00
TOTAL	**1,300.00**	**133,103.00**	**134,403.00**	**3,690.00**	**48,953.00**	**52,643.00**	**480.00**
%	0.69	70.98	71.67	1.97	26.10	28.07	0.26

The projected value per annum for both the sacred grove and non-sacred forest was generated from multiplying the number of households per village with the average income per household (Table 9). Overall, the current extractive value of the sacred grove for both Sangdui and Souchong is 2.67% of the total value of the forests in each village.

Table 9. Income (RMB) generated from and projected value of NTFP collection in Sacred Groves and Non-Sacred Forests (n=56)SHADED AREA=

	Sacred Grove (RMB)	Non-sacred Forest (RMB)	TOTAL
Average per household sampled per year	76.77	2800.86	2877.63
Total	4,990.00	182,056.00	187,046.00
Projected extractive value per annum:			
Sangdui (200)	**15,354.00**	**560,170.00**	**575,524.00**
Souchong (90)	**6,909.30**	**253,077.40**	**258,986.70**

4.3.4 Availability of Wild Products

89.09% of those interviewed that collected NTFPs felt that the availability of wild products had declined over the last 10 years. 5 individuals felt that the availability remained the same. Only 1 individual felt that availability had increased, stating Tibetan culture and government activity had helped to conserve resources. This individual was a trader who may have perceived such an increase due to more people collecting NTFPS.

The main reason for this changed was due to the vast increase in numbers of people collecting wild products (Figure 7). Comments from respondents indicated that 10 years ago commercial markets for NTFPs such as CCF did not exist so few individuals collected as the price was too low to justify its collection. As little as 4 years ago price for CCF was 15RMB per 500g, it now currently stands at nearly 15RMB on average per piece. Some suggested that CCF and mushroom availability was decreasing year by year, but others felt that this was merely a result of the amount collected distributed across a larger number of people. However, it was concerning to hear that it was thought that in some areas CCF and mushrooms had disappeared.

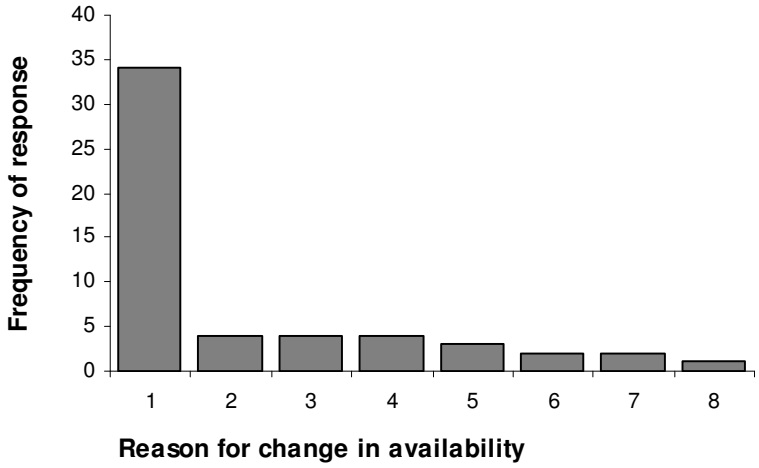

Figure 7. Reason for change in wild product availability over the past 10 years (n=56)

Key to Figure 7:

1	More people collect NTFPs now than previous years
2	Weather
3	No market for NTFPs previously
4	Habitat destroyed
5	Price now so much higher than previously
6	Don't know
7	People from other counties come to Daocheng to collect NTFPs
8	Tibetan culture & government conserves

Response to change

There were three main responses to this change in wild product availability. Households predominantly responded by reducing the household need for the use of wild products for consumption, medicinal and constructive purposes (74.51%). Collection time was also increased by individuals, traveling further away from homes and spending longer in mountain camps specifically for NTFP collection (23.53%). Only one individual responded with the more conservative use of wild products.

4.4 Attitude towards the Sacred Groves

4.4.1 Perceived Benefits

There was little variation between the villages of the perceived benefits of the sacred groves. The most important benefit from the scared grove was deemed to be that of religious/ spiritual well being (Figure 8). Utilising the sacred grove as a source of firewood was not perceived as important. This may be related to the fact that firewood is collected annually during one month of the year from another source, reducing the need to rely on the sacred grove for firewood. However there was a significant positive correlation between respondents who felt that the sacred grove was an important source of firewood occupation (χ^2=7.284, d.f.2, p*), with monks positively associated with perceiving that the sacred grove was an important firewood source.

7.69% of people felt that the sacred grove was not important in making them happy. This was significantly related to wealth ranking (ρ=0.298, d.f.=62, p*), with those with higher wealth placing greater importance upon happiness as a benefit from the sacred grove. This may be linked to the inference that the sacred grove gives luck to the community who may relate this luck with increasing their wealth and, as a result, happiness. However, this would be difficult to ascertain.

Nearly three quarters of all respondents (73.85%) did not think that the sacred grove as a source of income was an important benefit. This did not show any dependence upon factors such as whether respondents collected NTFPs (χ^2=0.0003, d.f=1, p>0.05) or whether they used the sacred grove for religious purposes (χ^2=0.084, d.f.=1, p>0.05). In addition there were no significant variables between those individuals who felt the sacred grove was an important source of income.

This may also be seen with the response to the importance of the sacred grove is in protecting the community form natural disasters (10.77% of respondents did not think this was an important benefit). Key informant interviews, focus groups (Appendices VII-XI) and many qualitative responses suggested that it was felt that the sacred grove provided luck which protected the community from natural disasters such as hail, floods and droughts. Consequently this question may be demonstrating responses interpreting such

protection to be the perceived luck that the sacred grove provides rather than the potential for environmental services.

There was greater variation between responses on whether the sacred grove is important in providing habitat for plants and animals; 23.08% with not perceiving it to be important, 50.77% important, and 26.15% very important. This was not significantly related to other variables.

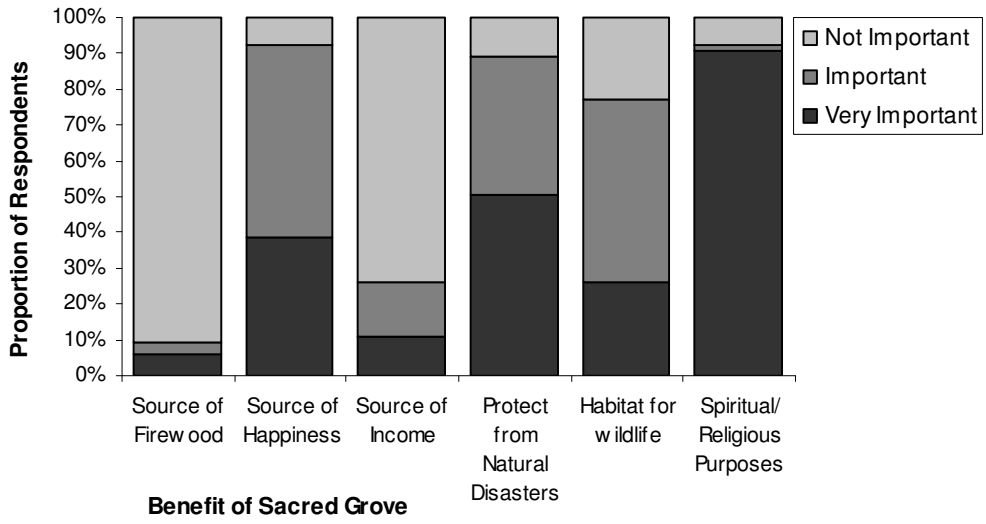

Figure 8. Perceived benefits from the sacred grove in both Sangdui and Souchong (n=65)

Overall it may be difficult to clearly analyse the importance of benefits such as whether people perceive benefits to be a result of direct use of the sacred grove or as a result of the luck that the sacred groves brings to individuals in the village and therefore the potential for this luck to increase benefits such as income, happiness or disaster protection indirectly via other means**.**

4.4.2 Responsibility to Protect the Sacred Grove

Respondents gave multiple answers as to who they felt were responsible for protecting the sacred grove from threats and in dealing with problems (Figure 9). 89.23% felt that it was the responsibility of the local community. This is reflected from the focus groups who suggested that the local communities would be more likely to listen to the monasteries regarding activities within the sacred groves (Appendices VII-XI). Community leaders and government were both thought to be responsible by 41.54% of the sample population. Community leaders are often members of the local government so further clarification in this question, such as national or regional government for instance, may be required. People from developed countries were thought to be responsible for 43.08% of the population.

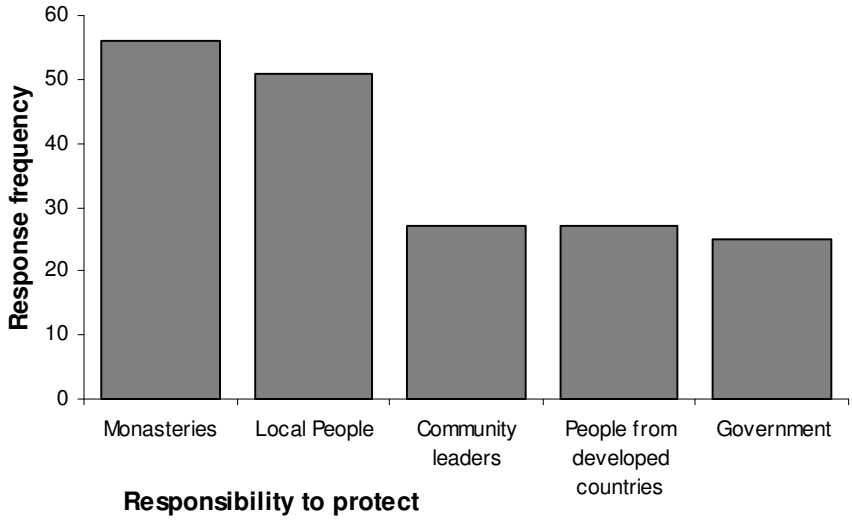

Figure 9. Respondent's perception of which bodies are responsible to protect the sacred groves

Those who felt that protection of sacred groves was the responsibility of community leaders were positively significantly correlated with age (ρ=0.312, d.f.62, p**) village (χ^2=7.09, d.f.1, p**) and years in education (ρ=0.262, d.f.65, p*). With younger respondents and respondents with more years in education on average tended to think that it was the responsibility of the local community. There was a positive correlation with respondents from Sangdui and negative correlation in Souchong respondents. This is likely to be a result of the community leaders acting as part of the government which is

based in Sangdui. Consequently the community in Sangdui may perceive the local government and community leaders to have a greater responsibility as their presence is more known.

Years in education also significantly affected whether respondents perceived the government to be responsible for the sacred grove (ρ=0.459, d.f.65, p***), with a greater number of respondents having, on average, a greater number of years in education. Occupation was also highly significantly related with the belief that the government were responsible for the sacred grove protection (χ^2=7.170, d.f.=2, p*), with monks and other occupations showing positive correlation.

All respondents believed that the sacred grove needed protection, but no-one felt that it was important to protect for people merely to enjoy visiting for recreation (Figure 10). The most important reason (89.23% of respondents) to conserve were religious/ spiritual reasons. Both protection of wildlife (3.08% of respondents) and religious reasons for protecting the sacred grove were highly significantly positively correlated to individuals who use the sacred grove for religious reasons (χ^2=16.176, d.f.3, p***) and to ethnicity (χ^2=16.176, d.f.=3, p***). This would be expected considering the link between traditional Tibetan beliefs and the sacred grove. Only 1 of the 3 Han Chinese felt that religion was the most important reason to conserve the sacred grove. Ensuring that there would be sufficient forest and wildlife for the future was important for 4.62% of respondents and protection for educational and historical reasons was important for 3.08% of respondents.

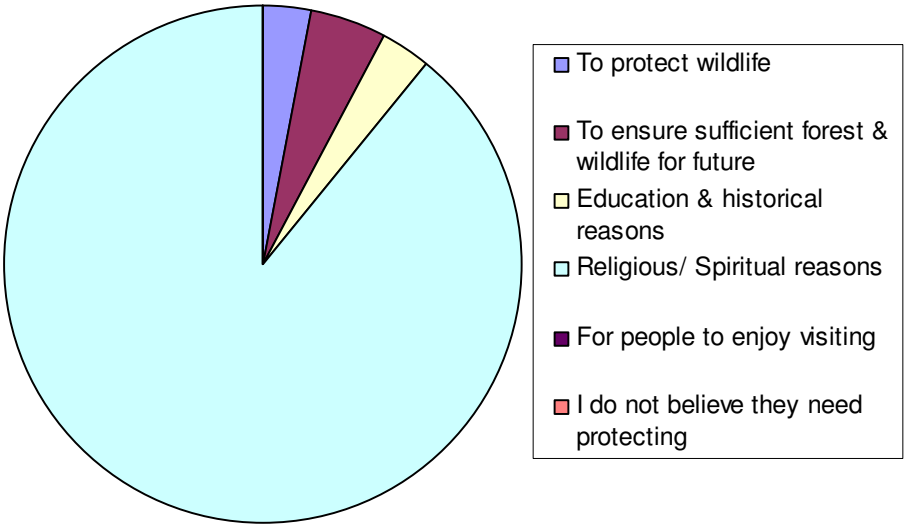

Figure 10. Respondents' most important reason to protect the sacred groves (n=65). No respondents answered categories 'for people to enjoy visiting' or 'I do not believe they need protecting'.

Responses were also dependent upon respondents' wealth ranking (house size) (ρ=0.254, d.f.62, p*) and years in education (ρ=0.285, d.f.65, p*). Those with fewer years in education felt that religion was the most important reason to conserve the sacred grove. This may also be linked to ethnicity, as those with fewer years in education were predominantly of Tibetan ethnicity. Wealth ranking also had a similar effect upon responses. Respondents with larger homes also felt that religion was the most important reason. Again, large house size significantly correlates with ethnicity (ρ=0.251, d.f.63, p*), with Tibetan respondents having larger homes. Therefore ethnicity is most likely to be influencing reasons for sacred grove protection.

There was no significance between those individuals who collected wild products and those who did not in their responses.

4.5 Biodiversity

4.5.1 Wildlife Abundance in Comparison to Non-Sacred Forests

Many respondents (64.6%) stated that they observed a greater number of animals in the sacred grove than in non-sacred forests (Figure 11). Only 1 respondent thought that there were more animals in the non-sacred forest. 20% perceived there to be a similar number of animals in both non-sacred and sacred

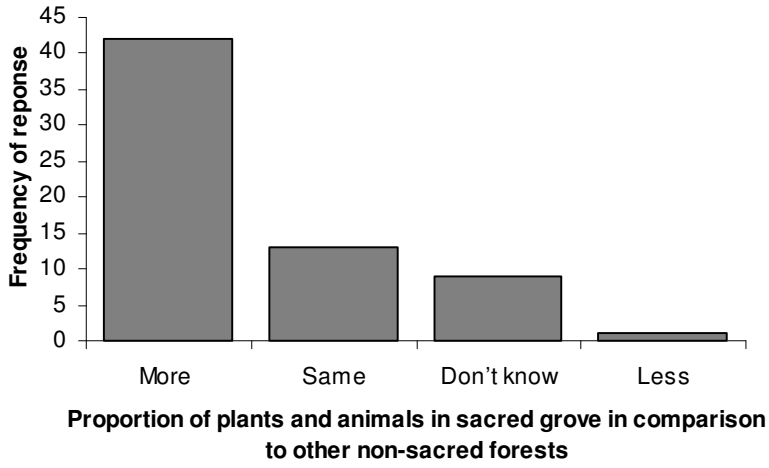

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Figure 11. Number of animals seen in the Sacred Grove compared with sightings of similar species in non-sacred forests (n=65)

4.5.2 Species Identified

Of the species identified, 90.8% of all respondents said that White-eared Pheasants were most frequently seen in the sacred grove (Figure 12). This could potentially be linked with the presence of Wang Nan during interviews but would also correspond with previous studies in the area, recording high frequencies of White-eared Pheasant observations (Wang et al., In press). Common species such as rabbits were also frequently observed in the sacred grove by 49.2% of respondents. Other galliforme species also see frequently in the sacred grove were Blood pheasants (13.8%) and Tibetan partridge (1.5%).

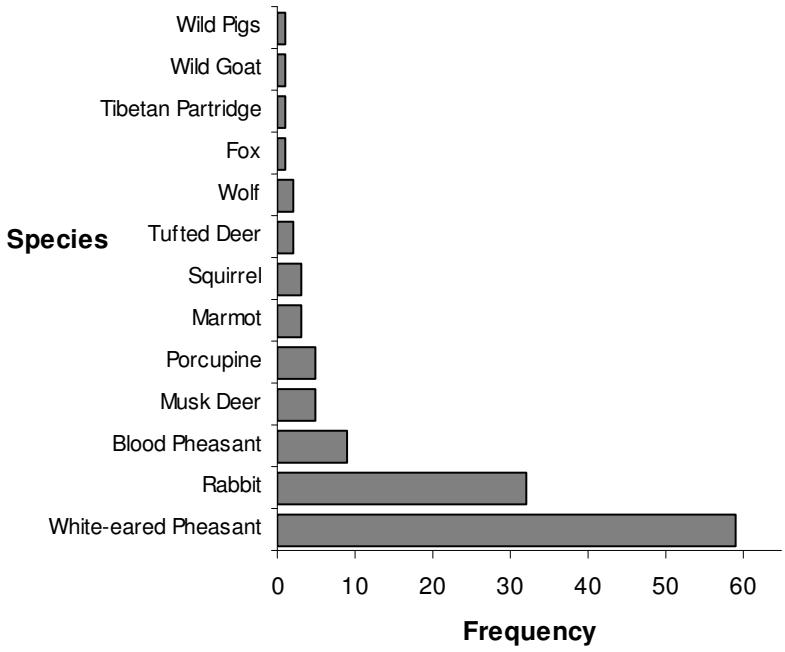

Figure 12. Animals seen most frequently in the sacred grove

4.5.3 Pheasant Species Observed

Pheasant species observed between Sangdui and Souchong (Figure 14) did not significantly differ (χ^2=0.86, d.f.=1,p*). The inclusion of the Taiwan Partridge (*Arborophila* crudigularis), endemic to Taiwan, in the pheasant species identification was to test for bias in respondents' identification. This was successful, with no respondents identifying the species' existence within the area. Consequently this species was removed from any further analysis.

Figure 13. White-eared Pheasant, Souchong (Photo. L. Garrett)

94.1% of all respondents had observed White-eared Pheasants (*Crossoptilon crossoptilon*) in the area (Figure 12 and Figure 14). This corresponds with a higher frequency of sightings of this

species recorded during previous studies (Wang, in press). A common species in the south eastern Tibetan Plateau, White-eared Pheasants are widely distributed at tree line between 3000-4000m, usually within scrubland habitat (MacKinnon & Phillipps, 2000) It should be noted however that this survey was conducted in the presence of Wang Nan, known locally due to his long-term pheasant surveys in the area. This may have influenced the answers of some individuals.

The Koklass Pheasant (*Pucrasia macrolopha*) was observed by only 1.5% of respondents. This is likely to be a result of its range predominantly found in pine forest in close proximity to agricultural and cultivated land below 3700m (MacKinnon & Phillipps, 2000). Both sample villages were situated at altitudes of 3850m and above with low pine forest cover.

There were no sightings of the Buff Throated Partridge (*Tetraophasis szechenyii*) in either Sangdui or Souchong. This species is Globally Near-threatened, preferring extensive fir forest cover (MacKinnon & Phillipps, 2000). No sightings of this species were made in a study by Wang (In press).

54.4% of respondents had observed Tibetan Partridges (*Perdix hodgsonia*) and 55.9% Blood Pheasants (*Ithaginis cruentus*). Both species are found throughout the Himalayas and Tibetan Plateau. Tibetan Partridges are common residents in scattered shrub (2700-5200m). Bloody Pheasants are often found in sub-alpine conifer forest between 3200-4700m.

Lower recognition of Tibetan Snowcock, 8.8% of respondents, is likely to be attributed to their range moving from 2500m in winter up to 4500m in summer to sub-alpine shrub and meadows and mountain scree (Wang, in press; MacKinnon & Phillipps, 2000). On discussion, many respondents noted that this species was usually only seen when they were in the mountains rather than close to the village or the sacred groves.

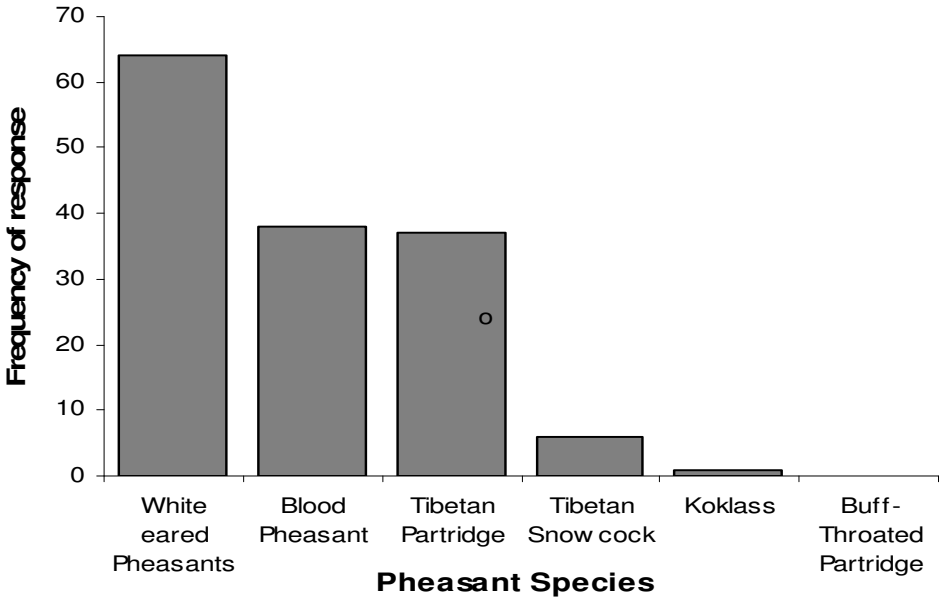

Figure 14. Pheasant species observations in both Sangdui and Souchong (n=65)

4.5.4 Birds in the Past and the Future

Few respondents believed that there were fewer birds in the past than there were at this current time (7.6%) (Figure 15). Responses could be influenced by the subjective understanding of defining the past. In addition, clarification may have been needed in the question to define to what the past (or future) was being compared to. 63.1% of respondents believed that there were a greater number of birds in the past. However 87.7% of respondents also believed that there would be more birds in the future, implying that current numbers of birds were relatively low. Nonetheless, 4.6% believed there would be fewer birds and 3.1% believed that there would be the same number of birds in the future.

This correlates with reasoning behind the responses as illustrated in Figure 16. Many respondents (15.4%) felt that there would be a natural increase in bird numbers in the future as they bred. This may also be linked to the belief that low or no incidences of egg collection would also increase bird numbers in the future. The absence of hunting was seen to be the predominant influence on bird numbers, although this is perceived to have a greater impact on bird numbers in the past than in the future. One respondent who

worked in the village government felt that hunting was still being conducted by Han Chinese and so bird numbers would not increase in the future as a result. The impact of conservation on bird numbers was perceived to be greater in the past than in the future. Religious reasons were not perceived to have a significant affect on bird numbers either in the past or the future. Laws, weather, improved environment, and the absence of logging were also mentioned as positive influences on bird numbers in both the past and the future.

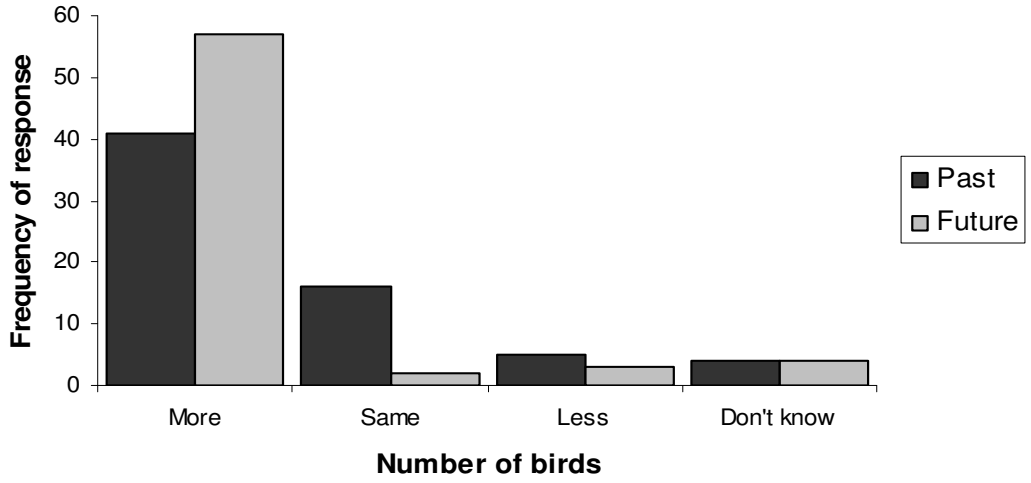

Figure 15. Respondent opinion on the number of birds seen in the past and prediction for the number of birds in the future (n=65)

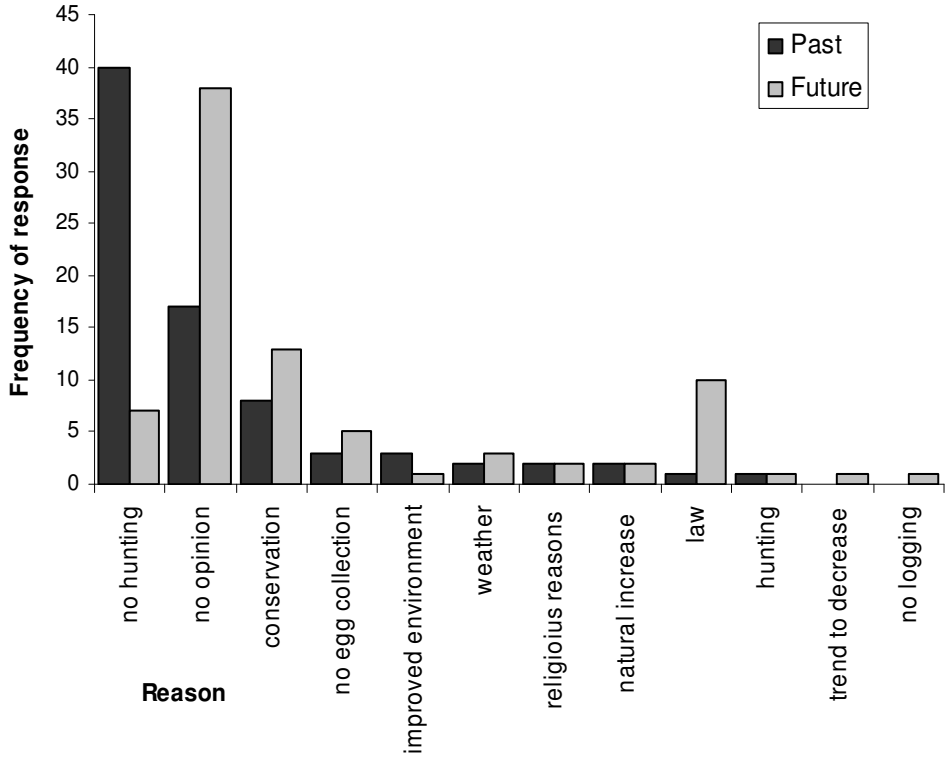

Figure 16. Reason for number of birds appearing in the past and future (n=65)

4.5.5 Frequency of Pheasant Sightings

Respondents who came across nests or pheasants were significantly more likely to know others who came across nests or pheasants in the sacred grove (χ^2=13.4750 d.f.=1 p=***), with a positive correlation between the two. Few respondents (6.15%) observed pheasants each time they entered the sacred grove. 49.23% occasionally and 44.62% never saw pheasants in the sacred groves (Figure 17). Frequency of pheasant or pheasant nest observations were not significantly related to any other variables. However frequency of observations may be related to the low frequency of visits by respondents to the sacred grove**.**

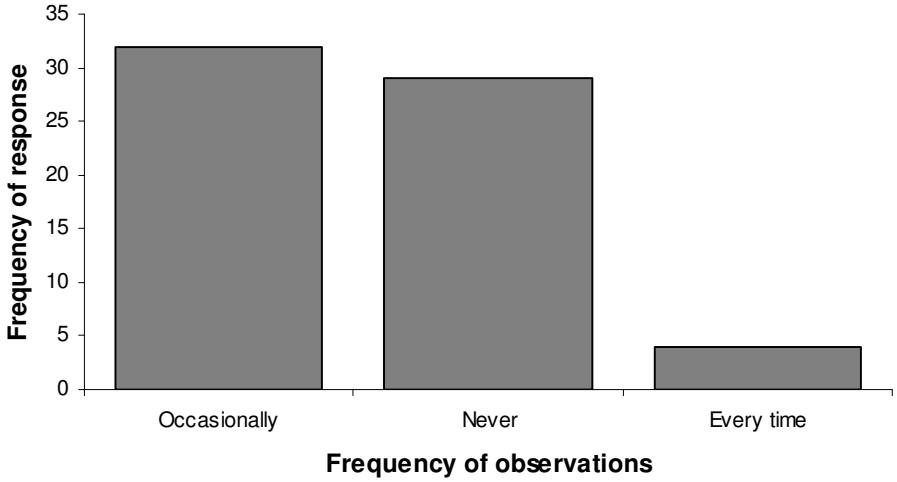

Figure 17. Frequency of pheasant and pheasant nest observations in the Sacred Grove (n=65)

4.6 Conservation Attitudes

Respondents predominantly felt positively towards the statement that developed countries should assist developing countries in financing wildlife and ecosystem protection (Figure 11). No respondents strongly disagreed with this statement in Sangdui.

T-test showed that there was a positive significant difference between opinion in Sangdui and Souchong in strong agreement with the statement that (T=2.532, d.f.=65, p**). This may be due to the more developed nature of Sangdui village, acting as a stop over village for people to pass through en route to Yunnan province and the city of Yading, 275km north. In comparison, Souchong has little regular contact such as this with people outside of the village and little engagement with commercial markets.

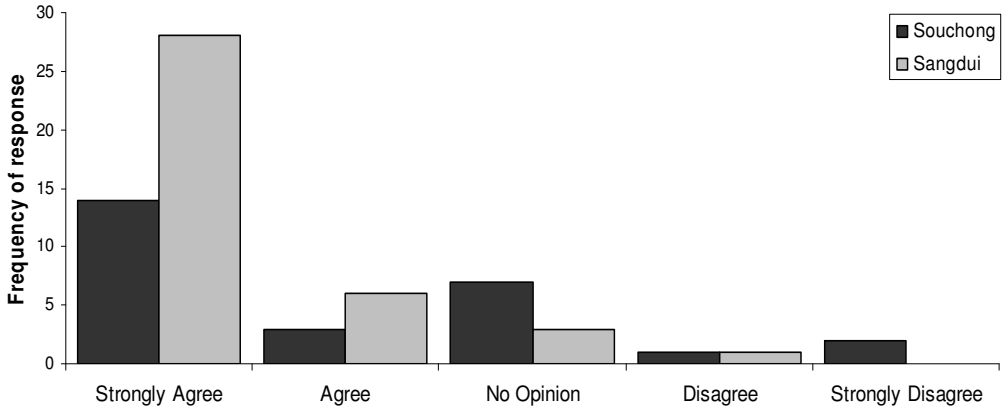

Figure 18. Response to the statement 'Developed countries such as the UK should give money to developing countries like China to help pay for the protection of their wildlife and ecosystems' (n=65)

There was a greater range of positive and negative opinions with regards to whether the protecting the sacred groves would be negative as this would reduce the amount of land for local communities to use (Figure 19). 38.46% of respondents overall disagreed with this, although 24.62% agreed. Variation in responses between Sangdui and Souchong were compared using the Wilcoxon-Mann-Whitney U two-sample rank-sum test which confirmed that respondents from Sangdui felt significantly more negative towards this statement than those from Souchong (U=-2.262, n=65, p*).

Spearman rank tests between responses to the statement illustrated in Figure 19 and high levels of income from NTFPs was almost positively significantly correlated to stronger agreement (ρ=0.2475, d.f.=62, p=0.053). Due to the small sample size in this study this correlation would benefit further investigation. The independence of responses to variables such as ethnicity, occupation or wealth ranking may be a result of confusion over the wording of the question. Perception of which land the protection implies could be interpreted as land either near the village or in the mountains close to NTFP collection sites for local community use. During the time of conducting the interviews there were violent conflicts in other villages near NTFP collection sites in the mountains over land and resource rights which may have heightened defensive responses to the protection of

land having preference over local community use, and therefore 'disagree' statements. In addition, comments made by respondents indicated that the Tibetan idea of 'self-limitation' influenced people's use of land and some stated that they did not need any more land than they currently had for their subsistence crops, influencing 'agree' statements.

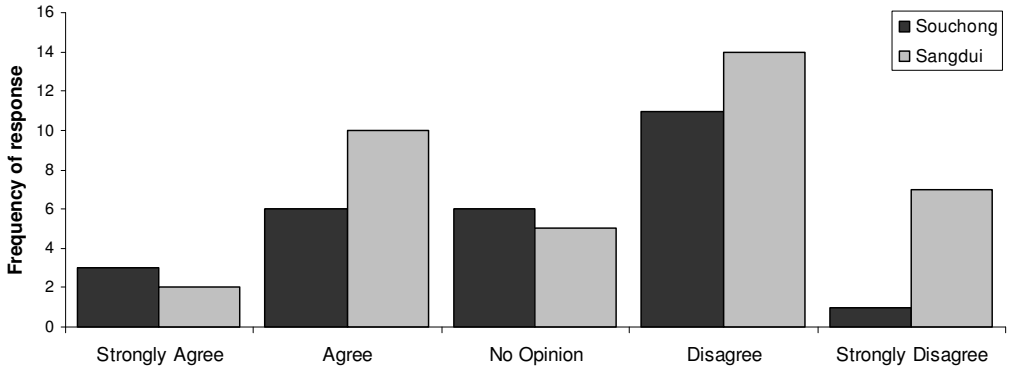

Figure 19. Response to the statement 'Protecting the sacred grove area for plants and animals would be negative because there would not be enough land for the local communities to use' (n=65)

Respondents almost unanimously stated that they strongly agreed that sacred groves were important in their religions or beliefs (Figure 20). No-one strongly disagreed and there was no significant pattern for the two respondents who disagreed, although one was of Han Chinese ethnicity. However, there was a significant correlation with those who strongly agreed with this statement and occupations (ρ=0.3064, d.f.=62, p**). This is likely to be in relation to the fact that the majority of the community were farmers/ yak herders and all sampled in this occupation were of Tibetan ethnicity. Consequently it would be expected that the role of the sacred groves in their religion or beliefs would be very important. Asset value was also significantly correlated with disagreement correlated with lower asset value (ρ=0.299, d.f.65, p*).

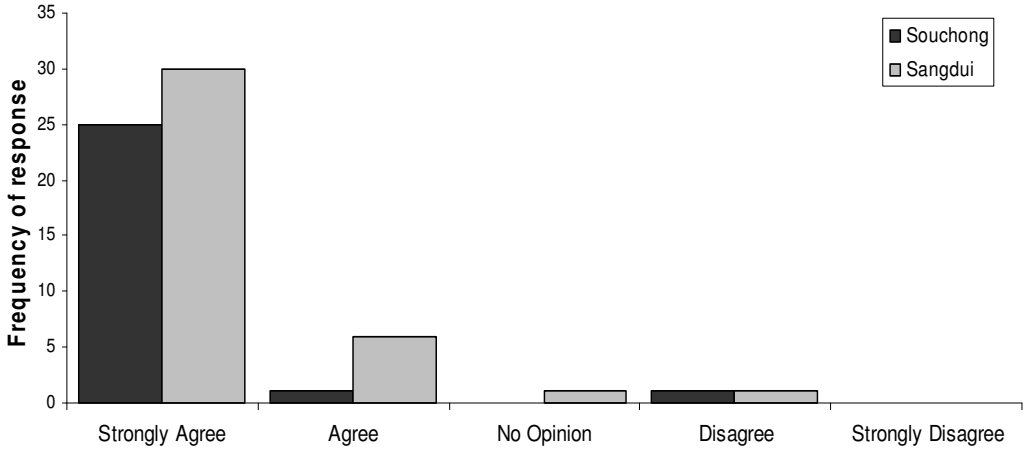

Figure 20. Response to the statement 'Sacred groves are important in my religion or beliefs' (n=65)

4.7 Contingent Valuation

It was very difficult to analyse data from the willingness to pay questions. During the pilot it became apparent that the question "How does this make you feel: a) Very Concerned b) Concerned c) Not concerned" was difficult for the respondents to understand, either as a result of translation (from English- Chinese- Tibetan) or due to cultural differences in comprehension of the idea of scenarios. Consequently, during the pilot study I adapted the questionnaire to try to use simpler wording such as "worried or sad", but this still seemed to create confusion from the respondents who assumed that I was asking whether they agreed with the scenarios presented. In addition, in asking how a specific scenario would affect their household's income it became apparent that the idea of the sacred grove bringing luck would also influence this response. It is therefore unclear from a respondent's answer whether they felt that a scenario would affect their income directly or whether it would affect their income as a result of affects on the sacred grove, which in turn would influence the luck of the local people.

In addition if the respondent believed they were showing agreement rather than levels of concern for the scenarios, their estimation as to whether this would increase, decrease or not affect their income would hold very different meaning in analyzing the two questions together.

Nonetheless, the Scenarios were analysed according to levels of concern, rather than agreement, for the proposed management option of the sacred grove.
Respondents showed greatest concern for Scenario 3 where all activities within the sacred groves are restricted for tourist and spiritual uses only (Figure 21). Respondents were least concerned about Scenarios 1 and 2, whereby the sacred groves are cut down to provide increased land to farm and build on (1) and the sacred groves are under stricter management to ensure wildlife protection. This does not appear to correlate with principles and beliefs seen in prior responses but is likely to be a result of confusion over the meaning of 'concerned' as previously discussed.

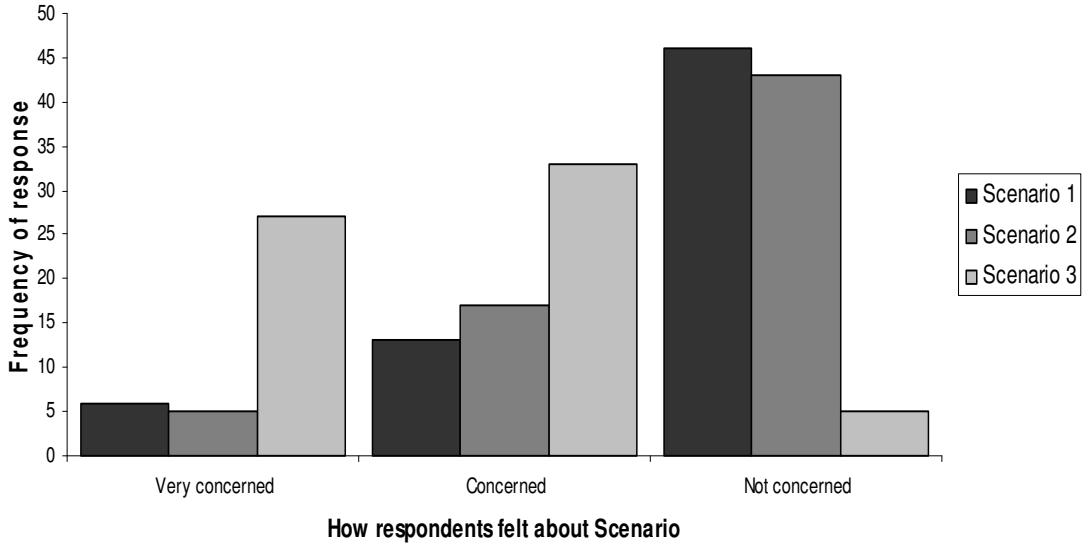

Figure 21. How respondents felt towards Scenarios 1 (extractive use of the sacred grove), 2 (managed extractive use of the sacred grove with permits) and 3 (non-extractive use of the sacred grove) (n=65).

Respondents predominately felt that all 3 Scenarios would not affect their household incomes (Figure 22). 10.77% of respondents felt that Scenario 1 would increase their income, 76.92% felt that it would have no affect and 12.31% felt that this would have a negative effect upon their income. Few individuals (4.62%) thought that increased management of the sacred groves in Scenario 2 would increase their income. However, 23.08% felt that this would decrease their income. 72.30% did not think that Scenario 2

would affect their income. 15.38% of respondents, including all 3 Han Chinese, believed that Scenario 3 would increase their income, mainly stating that they felt that they could make money from tourists visiting the sacred groves. Only 3 individuals felt that ceasing all activity within the sacred grove bar religious and tourism would decrease their income. 80% felt that this would have no affect at all on their income.

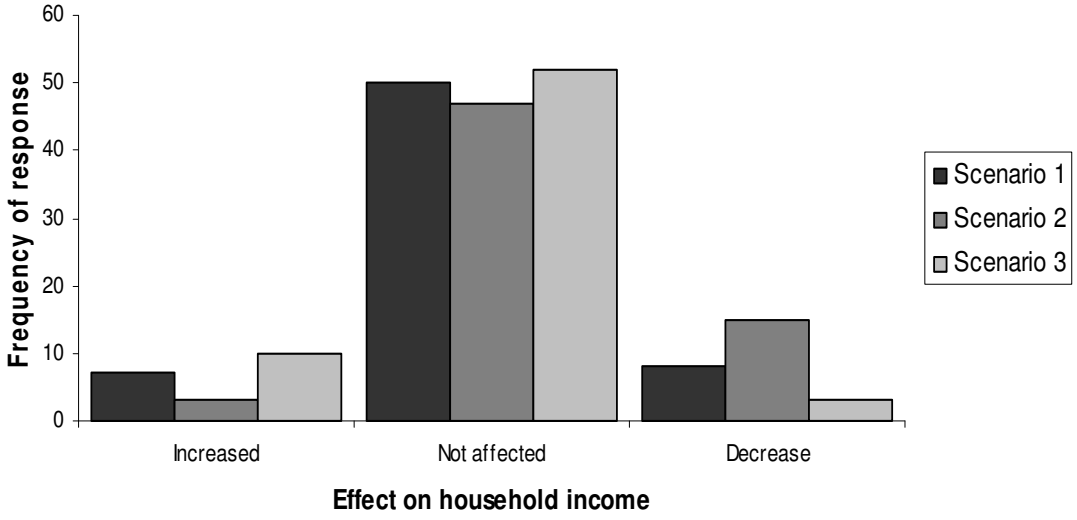

Figure 22. Respondent estimation of the effect of scenarios 1,2 and 3 on household income. Differentiation between material and non-material effects on incomes is difficult to clarify (n=65)

Scenario 1: Extractive Uses of the Sacred Grove

In Scenario 1, respondents who previously stated that they used the sacred grove for religious purposes were significantly more likely not to feel concerned about the proposed management option of cutting the sacred groves down (ρ=0.366, d.f.61, p**). Years in education were also a significant factor in determining how people felt about Scenario 1 (ρ =0.291, d.f.61, p*). However, it should be noted that there may be some variation between respondents' understanding of the question according to the number of years in education. For example a respondent with more than 7 years in education may understand the question to identify how they felt whereas a respondent with 0 years in education may understand the question as to whether they agreed with the Scenario proposed. Consequently different results can be inferred from these responses.

Ethnicity was highly significantly correlated to respondents estimated impact of Scenario 1 on their income (χ^2=10.289, d.f. 2, p**). This showed positive correlation for an increase in Han Chinese increase income but a negative correlation for Tibetan income to increase. If respondents collected NTFPs it was highly significantly positively correlated that their estimated income would decrease (χ^2=8.102, d.f. 2, p*) than if they did not collect wild products.

Scenario 2: Controlled Extractive Uses with a Permit

There were also significant differences in Scenario 2 between ethnic groups of respondents, with a positive correlation between Han Chinese to be very concerned and Tibetans to not feel concerned regarding the proposed stricter management of the sacred groves (χ^2=6.743, d.f. 2, p**). Differences in income from NTFPs also significantly influenced how concerned respondents felt about Scenario 2 (ρ =0.334, d.f. 61, p**). The few individuals with larger incomes from NTFP collection showed the least concern. There was a significant difference in respondents of different occupations (χ^2=10.407, d.f.=2, p*), with a positive correlation between monks and farmers stating that this scenario would not concerned them more than other occupations.

Again, ethnic group significantly determined how respondents estimated how Scenario 2 would affect household income (χ^2=6.42, d.f. 2, p*). There was a positive correlation with Tibetan ethnicity for not affecting income and a positive correlation for this scenario to either affect (increase or decrease) income for Han Chinese, either. Age also influenced estimated effect upon household income (ρ =0.3.8, d.f.61 p*), with older respondents estimating an increased income.

4.7.1 WTP

83.08% of individuals were willing to pay a proportion of their income to purchase a permit in order to harvest wild products in the sacred grove, as presented in Scenario 2. 34 of these respondents provided an indication of what they would be willing to pay, although it was not clarified whether this was per annum or a one off payment. On average these respondents were willing to pay 41.03RMB. The minimum respondents

were willing to pay was 10RMB and the maximum 100RMB. None of the 3 Han Chinese interviewed were willing to pay for a permit stating that they did not collect wild products there and that a permit would not help their household. 14 individuals gave reasons for not willing to purchase a permit to harvest wild products in the sacred grove. Of these 14, 8 said that they did not harvest wild products there and therefore wouldn't need a permit, 3 felt that their income was limiting their ability to pay, 1 felt that the government should pay. The amount people were willing to pay for the permit was significantly correlated to wealth ranking (house size) (r^2=0.308, d.f.31, p***), with wealthier respondents willing to pay a greater amount for the permit.

Respondent's willingness to pay for a permit was affected by their response to how they felt about Scenario 2. Those who were not concerned about this management option were highly significantly positively correlated with willing to purchase a permit to collect NTFPs in the sacred grove (χ^2=7.384, d.f.1, p**). There was also highly significant positive correlation between those who felt concerned about the Scenario 2 and those who were not willing to purchase a permit (χ^2=5.253, d.f.1, p**)

Scenario 3: Non-extractive and Non-use Benefits

Variation in how respondents felt towards and estimation as to the impact upon their income from the proposition of restricting activities in the sacred groves for tourist and spiritual uses only in Scenario 3 was not significantly related to other variables previously investigated in Scenarios 1 and 2, and appears to vary through chance alone.

4.8 Current Management of the Sacred Groves

Informal interviews were conducted with forest managers from both Sangdui and Souchong. 1 individual per village was employed to manage the surrounding forests and was paid 1000-3000RMB ($131.66-$409.80) per year by the Forestry Bureau. In Sangdui this job was conducted by a monk. They were employed to oversee both sacred and non-sacred forests. It was felt by the manager in Sangdui that the monastery should conserve the sacred forests, but because they do not own them they required the right to conserve them from the Forestry Bureau. Each forestry manager was required to spend at least 25 days per month monitoring the forests. This included monitoring for fires

(particularly in winter when the dry conditions increase the risk of forest fires), hunting and logging activity, illegal use of forest land and publicising forestry conservation. Various pay cuts would occur if such activity occurred or was misreported.

Although there were no specific management differences between sacred and non-sacred forests, both individuals deemed it to be more important to conserve the sacred grove but there were no regulations regarding the collection of NTFPs in the sacred grove. In Sangdui the manager stated that the sacred grove was only used for religious and recreational purposes. However, in Souchong the forest manager knew of the collection of mushrooms in the sacred grove. He was aware of the existence of CCF in the sacred grove but did not think that many local people collected it as it was found at higher altitudes and people would not climb to the top of sacred sites.

Both managers felt that there were more trees in the sacred grove than in non-sacred forests. However, previously local governments allowed local people the right to log in the sacred grove. It was not until the head of Sangdui government stated that people shouldn't cut trees in the forest 17 years ago that such activity stopped.

Currently the biggest threat to the sacred groves in Sangdui was deemed to be people who shoot animals. It was suggested that some Han Chinese working in Sangdui participate in this. In addition, the local monastery in Sangdui was well known for monks hand feeding fish but they noted that fish numbers had greatly declined in recent years, blaming Han Chinese fishing in the village. This was witnessed on a number of occasions during the study. However, there was evidence of fires destroying a large part of the 'male' sacred grove in Sangdui.

In Souchong both the forest manager and the monks in the focus group did not think that there were any threats facing the sacred groves. However there was evidence of destruction of the sacred grove by fire in the male sacred grove in Sangdui (Figure 23). There was a strong belief that people's faith would be sufficient to protect the sacred grove and that local people would adhere to instructions from the monastery rather than local government regarding sacred grove activity.

Figure 23. Evidence of fires in the male sacred grove, Sangdui. (Photo L.Garrett)

Punishments for illegal activities in the sacred groves were often thought to be the occurrence of bad karma through misfortune, disease or the bringing of disaster to the village. If however an individual was caught conducting illegal activity within the sacred grove the local people had the right to catch the culprit and instigate a physical punishment.

5. DISCUSSION

Sacred groves in these two communities have persisted as a result of behavioural choices. This strongly suggests that traditional cultural values and beliefs have influenced local people's behaviour towards the sacred groves, preventing forest loss and fragmentation.

5.1 Utilisation of the Sacred Groves

Recognition of sacred groves as a site of religious importance and not for direct extractive use is evident in many sacred sites across the world. Fear of bad karma and misfortune through inappropriate use of such sites often prevents activities deemed as taboo such as hunting or logging within them occurring (Laird, 1993). As expected, in accordance with Buddhist beliefs in the region, hunting does not take place in either the sacred or non-sacred forests. Other studies such as Xie et al. (2000) have also illustrated the emphasis on the non-extractive use of sacred groves as part of Tibetan culture; the worship of deities ensures that local people do not fell trees or hunt in the sacred groves; using natural resources to obtain optimal satisfaction of basic needs rather than satisfaction. This is also evident in other cultures such as ancient religion in Okinawa, Japan (Reichl, 1993) where sacred groves are considered to be natural shrines only used for worship and certain rituals; and sacred groves in northeast India which are neither logged or grazed (Farooquee et al., 2004).

5.1.1 Sacred Groves and Religion

Religion plays a central role in Tibetan society (Goldstein and Kapstein, 1998, Xie et al., 2000). This is confirmed with religious activities and spiritual wellbeing as the primary functions of the sacred groves, placing high value on the environment, even if resources are not used directly. Participation in religious activities such as rosary counting, turning prayer wheels and circumambulations are all part of daily life for many Tibetans (Tucker and Williams, 1997). In addition, the ideological framework of Buddhism provides a basis for defining morality through its core notions of karma, rebirth and enlightenment (Goldstein and Kapstein, 1998). The notion of karma is highly evident in relation to the sacred groves; fearing that angering deities and spirits connected with the sacred grove would result in bad karma not only for individuals but for the community from natural disasters, ill health or misfortune. This fear prevents activities that would potentially

threaten the sacred groves, such as logging, but also encourage religious activities to show their admiration to these deities and ask for positive karma such as good fortune. Consequently this encourages indirect conservation of the sacred grove and its resources (Xie et al. 2000)

The strength of these beliefs and values has enabled the recovery of sacred grove health following its destruction during the Cultural Revolution (1966-1978) (Daocheng County Government, 1995, Goldstein and Kapstein, 1998). This demonstrates that even though the communities had previously utilized the sacred grove, religious revival after 1978 and the rebuilding of monasteries have strengthened beliefs to once again protect these areas, without enforced governmental action or legislation

'Male' and 'Female' Sacred Groves

Allocation of sacred groves as either male or female is evident in many cultures and religious practices. For example, sacred groves in India and Japan have been documented to be dedicated to male or female gender, animal or ancestral deities etc (Pandey and Rao, 2002). In Okinawa, Japan females dominate ritual life due to the belief of their ability to communicate with and control supernatural spirits. Consequently sacred groves were previously taboo to male entry. In North Malabar, India 3 types of sacred grove exist where either male gods, female gods or snakes are worshiped (Jayarajan, 2004). Each sacred grove has its own folklore regarding its origin and strength of taboo varied accordingly. The origin of the sacred groves or their allocation as male or female in Sangdui and Souchong were not known by either the local people or the monasteries, although variation in taboos between the different sacred groves was acknowledged, albeit with discrepancies. Some of these taboos can however be linked to traditional Tibetan culture such as the taboo of females climbing to the top of sacred sites (Appendix VIII) However, further research to identify the origin of the sacred groves and their associated deities would clarify this understanding.

5.1.2 NTFP Collection

Sacred groves have a high non-use value with little local use of sacred groves for NTFP extraction (Khumbongmayum et al., 2005, Byers et al., 2001). NTFPs are the dominant source of income in these subsistence communities, yet the sacred groves are not used for firewood, mushroom or CCF collection by the majority of the community, ensuring that these sections of forests are consequently conserved for both wildlife and environmental services.

In comparison, uses of non-sacred groves are potentially reaching unsustainable levels. The rapid growth of the NTFP market for CCF in particular, with prices dramatically increasing from 15RMB per 500g in 2003 to 15RMB per piece in 2007, has encouraged much of the community to become involved in its collection. Intensive collection of this wild product has led to a recognized decline in resource availability (Xie et al., 2000). This is either as a result of resource depletion or the distribution of the resource over a larger number of people. The importance of this resource as an income source is demonstrated in household response to decline; spending longer and traveling further to search for CCF.

NTFPs were predominantly sold to traders from outside of the villages, implying that this trade is driven and prices controlled from sources external to the village, a common aspect of open resources (Xu, 2006). This also has implications with regards to the sustainability of these resources. Traders from outside of the village or region are unlikely to be concerned as to the sustainability of the resource (Xu et al., 2006). In addition the open access nature of the resource places the product sustainability at greater risk from over exploitation driven by outsider demand.

However, if CCF is such an important NTFP in providing large incomes to otherwise subsistence communities and the demand for this product is increasing prices rapidly, conflicts over resource rights in collecting this habitat may drive local communities to collect in other forests such as sacred groves. It was difficult to ascertain the opportunity cost of not using the sacred groves for direct extractive uses as there were a number of differences between both the sacred grove and non-sacred grove that could not be

assessed in this study. The sacred groves and non-sacred forests were of different sizes, altitudes and biological status which without detailed study to standardize any correlations between the two forests do not allow for this assessment. Although both forests consisted of the same species, it would be difficult to make direct comparisons and there was a preference for higher altitudinal sites for the collection of higher quality CCF.

Nonetheless, although less valuable in terms of extractive use than non-sacred forests (2.67% of total income) it is exemplary of the potential reduction in cultural values in the region. Methods of managing and utilizing forests in Tibetan traditional culture are predominantly spirit based, conserving resources subconsciously (Xie et al., 2000). If individuals are beginning to utilize the sacred groves for extractive purposes this would raise concern for the decline of both cultural and biological diversity in the area. Indeed, it has been suggested (Melick et al., 2007) that socioeconomic changes are driving great changes within communities and threatening indigenous practices (Zhang, 2000). If cultural values weaken sufficiently this may have practical implications for the management of extractive uses of sacred groves.

5.2 Local Perceptions of and Attitude Towards the Sacred Groves

5.2.1 Perceived Benefits

Sacred groves are documented to provide numerous benefits, providing an indication of the high value of these habitats (Bhagwat et al., 2005; Khumbongmayum et al., 2005). Perception of certain benefits from the ecosystem are likely to influence behaviours toward the environment (Adger et al., 2002). Direct-use values of the sacred groves such as firewood extraction or as a source of income were not believed to be important, whereas the role of the sacred groves in benefiting spiritual wellbeing and religion were considered to be the most important benefit. This further emphases the importance of religion in particular influencing perceptions and behavioural choices (Bryers et al., 2001).

Interviews and focus groups suggested that maintaining good karma often influenced responses. It was important for many people to show admiration to the sacred grove to prevent bad karma such as drought, poor crops, floods or hail (Goldstein Kapstein, 1998).

Therefore the perceived importance of benefits such as environmental protection from natural disasters may be linked to the inference that showing respect to the sacred grove prevents bad karma and angering deities to bring natural disasters rather than recognition of the sacred grove and as a source of environmental services.

Sacred groves also were perceived as important as a source of happiness for the communities. However happiness is a subjective concept difficult to define and it would be difficult to ascertain as to what aspect of the sacred grove brought them happiness. For example it may be the existence value of the sacred grove, or the good karma that the sacred grove is believed to bring. Differentiating between whether the sacred grove directly or indirectly (i.e. via good karma) affects happiness would however be difficult to ascertain.

Sacred groves were also predominantly viewed as important as a source of habitat for wildlife. This may be a reflection of Buddhist belief in reincarnation and compassion towards all life (Tucker and Williams, 1997) and the recognition of intrinsic value of humans and nature, that all species have an inherent right to exist. However, it should be noted that data from the questionnaires may have be bias towards a more conservation-aware response.

5.2.2 Responsibility for Protection of the Sacred Groves

In traditional Tibetan society monasteries and monks were at the heart of Tibetan Buddhism (Goldstein and Kapstein, 1998). The revival of Tibetan Buddhism since 1978 and the rebuilding of the monasteries in Daocheng County are still ongoing. The strength of this culture and religious beliefs is evident in the recognition of the monastery responsibility over the sacred groves. In addition, the central role of Tibetan Buddhism in daily life through the notion of karma may further influence local people responsibility for the sacred grove (Goldstein and Kapstein, 1998). Fear of angering deities and misfortune if the sacred groves were destroyed or misused appears to ensure that local people do not use the sacred groves for activities other than religious. This also echoes local people's "self-limitation" in their use of resources in non-sacred forests. Tibetan Buddhism encourages individual limitation of their resource consumption rather than

emphasizing that natural resources are limited (Sponsel and Natadecha-Sponsel, 1993), focusing on satisfying basic needs rather than maximal satisfaction of needs, wants and desires (Sponsel and Natadecha-Sponsel, 1993).

Government, community leaders and people from developed countries were also felt to hold some responsibility to protect the sacred groves. Community leaders and government were often connected and viewed as responsible for the community as a whole. Recent national legislation such as the 1999-2000 Natural Forest Protection Program and the 1998 Organic Law of the Village Committee have also strengthened the perception of bureaucratic responsibility for the area. However, it has been suggested (Melick et al., 2007) that governmental action such as conservation policies have in fact placed greater pressure upon forests in this region due to lack of local level considerations.

Informal discussions in both Souchong and Sangdui indicated that the communities felt that as the sacred groves were important to them they should also be important to outsiders. However, people from developed countries and even national tourists are infrequent to the region and responses to this question may have also been strongly influenced by the presence of an investigator from a developed country.

5.2.3 Motivation for Sacred Grove Protection

It was universally recognized that it was necessary to protect the sacred groves. Non-material reasons such as religion and spiritual reasons were the predominant motivation behind the protection of sacred groves, linking with the identification of the sacred groves' primary function: religion (as discussed in section 5.1.1). This also highlights the high value of the sacred grove to local communities and the importance of its role in their traditional Tibetan culture and daily life (Xie et al., 2000).

Respecting the intrinsic value of wildlife and the environment is an important aspect of Tibetan religious beliefs (Tucker and Williams, 1997); encouraging protection of sufficient forest and wildlife for the future and continuing traditions through education.

Maintenance of the important role of the sacred groves to local culture and traditions would also motivate conservation behaviours.

Consequently, the non-material benefits of the sacred grove and motivations for its protection challenges traditional assertions that such benefits can only act as incentives for behavioural choices if there are economic benefits from doing so (Bryers et al., 2001). This has practical implications with regards to conservation of sacred groves.

5.3 Contingent Valuation and WTP

The complexity surrounding responses to the contingent valuation and WTP questions were not anticipated, even during the pilot study. Although data collected did not give the results expected from a WTP survey it did provide a valuable insight into the cultural perceptions and understandings of the environment and meaning of the sacred grove.

Although there were many limitations with the contingent valuation analysis in this study a number of conclusions can be drawn. Of the three scenarios presented, local communities felt strongest about the sacred grove being cut down to increase timber and land availability. This could be inferred as a further indication of the importance and intrinsic value of the sacred groves to the local community.

The minimal extractive use of the sacred grove for NTFP collection (the predominant income source) may reduce the effect any management changes would have upon income (Xie et al., 2000). The predominant subsistence nature of Tibetan communities, relying on a few basic crops and livestock for their survival, placed nearly all activities, bar religious and recreational, outside of the sacred grove (Xu et al., 2004). Consequently management aimed specifically at sacred groves and excluding non-sacred forests may be less effective for sustainable resource harvesting and conservation.

It is difficult to ascertain whether motivation behind responses are the direct impact of the scenarios created or the indirect impacts of perceived misfortune or bad karma from angered deities as a result of destruction or misuse of the sacred grove (Gosling, 2001, Byers et al., 2001). In addition, as with any survey data there are limitations that the

respondents may not always be truthful or that statements given many not be congruent with actions and behaviours (Bryers et al., 2001). This is particularly problematic for WTP surveys, as stated in the methodology, which can lead to incorrect valuations.

In addition the WTP survey identifies the differences between direct and indirect uses between a modern Western perspective and other cultures (Bryers et al., 2001). For example, in traditional Tibetan beliefs protection of the sacred groves to please inhabiting deities and spirits and is believed to bring real, direct economic benefits: protecting crops from hail and drought to provide a good harvest (Goldstein and Kapstein, 1998). Conversely, from a Western viewpoint benefits of respecting the sacred groves would be seen as an indirect, spiritual benefit. Future studies should take account of such cultural dichotomies.

Many respondents were willing to pay for a permit to harvest NTFPs from the sacred groves. However, it was difficult to ascertain from the data whether they were willing to pay for a permit to harvest as they actually want to harvest in the sacred grove and feel that this would give them permission to do so or whether this is a reflection of the value of sacred grove to them. Nonetheless, people were willing to pay an average of 41.03RMB (5.43USD) per permit, subjectively a feasible amount of the average annual income 2,877.63RMB (381.77USD) per household, purely generated from NTFP collection. It is however difficult to translate indirect use values such as culture and religion into monetary values (Murithi and Kenyon, 2002, Brown, 1995), consequently this may not be an accurate representation of the communities' true valuation of the sacred groves.

5.4 Wildlife Species in the Sacred Groves

The role of the sacred grove as a high biodiversity habitat is well documented in many different cultures and regions (Bhagwat et al., 2005, Bhagwat and Rutte, 2006, Byers et al., 2001, Jayarajan, 2004, Khumbongmayum et al., 2004, Khumbongmayum et al., 2005). Evidence of the importance of the sacred grove for biodiversity conservation was demonstrated with greater observations of species in the sacred groves than in non-sacred forests. Protected from overexploitation and extractive use through cultural taboos and

reverence, often sacred groves have survived despite high economic pressure on forest resources in surrounding regions (Laird, 1993).

Cultural practices in the region have also been recognized to have protected species of pheasant (Wang et al., In press). White-eared pheasants were the most frequently observed wildlife and pheasant species. Of the 7 pheasant species recorded in Daocheng County, White-eared pheasants and Blood pheasants were observed in 84.62% of sites studied (Wang et al., In press). This is reflected in respondent's observations of pheasant species seen in the sacred grove. Although some cultures allow hunting in sacred groves (Byers et al., 2001) Tibetan Buddhist culture has strict taboo that animals should not be harmed, especially within sacred sites is (Xie et al., 2000). Consequently respondents expected pheasant species abundance to increase in the sacred groves predominantly due to the lack of hunting in the area. Local awareness of conservation as an important tool may also play a role in increasing future bird numbers (Kaiser et al., 1999). This may have significance in generating support for future protection measures, although association of the team with conservation organizations may have influenced responses.

A number of questions within the questionnaires may have led to subjective interpretation. Questions involving the concept of 'the past' may be dependent upon when respondents felt 'the past' to be; with some idealizing 'the past' to be pre-Cultural Revolution and others 5-10 years previously. Further research would benefit from clarifying such points with specific timelines and incorporating cultural perceptions and ideas into the questions.

5.5 Factors Influencing Perception, Attitude and Uses of Sacred Groves

5.5.1 Socioeconomic Characteristics

Ecological behaviours are determined by a wide range of influences (Kaiser, 1999). Environmental attitudes, perceptions and uses have been identified in previous studies to be strongly influenced by factors such as socioeconomic and demographic variables and receipt of benefits from ecosystems (Infield and Namara, 2001, Infield, 1988).

5.5.2 Utilisation of the Sacred Groves

Analysis confirmed that ethnicity and occupation significantly affected attitudes towards and uses of the sacred grove (Bryers et al., 2001). It would be expected that deeply ingrained traditional Tibetan cultural traditions and religious beliefs would be strongly reflected in a region of predominantly Tibetan ethnicity (97%) (Daocheng County Government, 1995) and consequently influence attitudes towards and uses of the environment and sacred groves . Less education and subsistence farming occupations strongly correlated to Tibetan ethnicity and consequently were also more likely to use the sacred grove for religious purposes. Han Chinese were the only individuals utilising the sacred groves for recreational purposes, although it should be noted that due to the small sample size of Han Chinese further study would be required to quantify this.

NTFP Collection in the Sacred Groves

Findings in this study support the idea that the extractive use of the sacred grove is related to cultural beliefs (Bryers et al., 2001). Households with lower asset values and individuals who utilized the sacred grove for recreation were also more like to collect both CCF and mushrooms in the sacred groves and were more likely to be Han Chinese. As expected (Kaiser, 1999), individuals collecting CCF within the sacred grove were more likely to collect mushrooms in the sacred grove and vice versa. NTFP collection in sacred groves was significantly greater in Sangdui, perhaps indicating a larger Han Chinese influence in this community (Table 7). This would reinforce the idea that Tibetan beliefs and spiritual identification with the sacred grove conserves resources subconsciously (Xie et al., 2000).

5.5.3 Perceptions

Perceived Benefits of the Sacred Groves

Although religious association with the sacred grove was a widely held belief, spiritual wellbeing, as with other studies of sacred sites, was recognized universally as a benefit (Bryers et al., 2001).. However, knowledge that the groves are considered sacred may not be sufficient to protect them. For example as Zhujie monastery, Souchong was situated directly within the sacred grove, the direct association of the sacred grove as a firewood source may be expected, as identified by respondents who did not collect NTFPs and

monks. Those who did not collect NTFPs were more likely to work in salaried employment or run trading stores, often reducing their association with the sacred groves and increasing the likelihood of Han Chinese ethnicity. Difficulties in separating Western and Tibetan cultural perception of benefits were also apparent in analysis (Bryers et al., 2001). Higher wealth ranking was linked with the sacred groves perception as a source of happiness presumably because of the relationship between wealth status and welfare (Kaiser, 1999). Yet determining whether this happiness was a result of wealthier individuals having a higher non-use value of the sacred grove or a result of the good fortune that the sacred grove provided in order to obtain greater wealth is unclear (Infield and Namara, 2001, Infield, 1988, Byers et al., 2001). Nonetheless this strongly suggests that traditional religious beliefs motivate behaviours towards the environment.

Responsibility for the Protection of the Sacred Groves

Traditionally monasteries held a powerful authoritarian role within Tibetan communities and were recognized as being responsible to protect the sacred grove, in particular by less educated people. Conversely higher educated people and those in occupations other than farming (predominately non-Tibetan) felt that the government was responsible. These findings support the idea of traditional cultures influencing attitudes towards the sacred groves (Xie et al., 2000, Zhang, 2000).

Higher levels of education and youth were also determinants of perceiving community leaders to be responsible protect the sacred grove. Those more educated in the community were also more likely to be of Han Chinese ethnicity and have closer ties and understanding of the role of community leaders. Higher education levels are more likely to be linked with understanding of national policies such as the 1998 Organic Law of the Village Committee providing communities with greater responsibility for land and resource use (Zhang, 2000). Nonetheless, it is interesting to note that younger individuals recognised the important role of community leadership over monasteries in sacred grove conservation. It is essential to understand the extent and nature of attitudinal and cultural change. In particular the loss of traditional beliefs among younger generations in the face of exposure to market commercialization and rapid development has a direct influence on present resource management practices and the sacred groves themselves (Li, 2003).

Motivation for the Protection of the Sacred Groves

Traditional spirit values have motivated the conservation of sacred groves in many cultures (Chandrakanth et al., 2004). This is reinforced with socioeconomic variables associated with Tibetan ethnicity, namely wealthier individuals and poorer education, more likely to be motivated by religion to protect sacred groves. Recognition of the intrinsic value of wildlife and the notion of reincarnation (Xie et al., 2000, Goldstein and Kapstein, 1998) in traditional culture also appeared to motivate protection of the sacred groves, showing correlation with Tibetan ethnicity and individuals utlilising sacred groves for religion. Understanding of these motivations behind conservation of sacred sites may also be valuable in promoting larger conservation goals and reducing factors leading to environmental degradation.

5.5.4 Contingent Valuation and WTP

Scenario 1: Extractive Use of Sacred Groves

The concept of cultural values protecting environments was reinforced in the contingent valuation study. Levels of concern of total clearance of the sacred groves strongly influenced by religious use of the sacred grove and level of education (Xie et al., 2000, Byers et al., 2001). Yet again differential between cultural concepts of material and non-material benefits create difficulties in determining the impact of this scenario on income. Estimation of income reduction from Tibetans and individuals who collected NTFPs may be a direct result of the loss of the use of the sacred grove or indirectly as a result of misfortune brought upon the community as a result of angering resident deities (Laird, 1993). Nevertheless, recognizing that this scenario would result in a reduction in income confirms that there is understanding of the sacred groves importance, either material or non-material, and has positive ramifications for conservation.

Scenario 2: Controlled Extractive use of Sacred Groves with Permits

Cultural understanding of the benefits from conserving these environments may further influence intended behaviours proposed in Scenario 2 (Bryers et al., 2001). Interaction of Tibetan culture (ethnicity, farmers, monks and high income from NTFP collection) has significant effect on low levels of concern over stricter extractive management of the

sacred groves. Nonetheless, it should be noted that several assumptions were made in analysis of CV data in this study and inferences made should take this into account.

WTP for Permits to Extract NTFPs from the Sacred Groves

As expected, wealthier individuals were willing to pay a great amount for permits to collect NTFPs in the sacred groves. A higher WTP indicates a higher existence value (Abaza and Rietbergen-McCracken, 1998). Since most households of greater wealth rank were Tibetan and no Han Chinese were WTP for a permit this emphases the significance of the sacred groves in traditional cultural values (Zhang, 2000).

Scenario 3: Non-extractive and Non-use Benefits of the Sacred Groves

Lack of significant variables influencing responses to Scenario 3, promoting religious and recreational uses of the sacred groves may be due to the relatively small sample size. A larger sample would provide more statistical power to identify significant variables.

There are some limitations associated in using the CV method to monetize the environment as discovered in this study (Abaza and Rietbergen-McCracken, 1998). Prone to bias and credibility of scenarios it is often difficult for respondents to separate environmental values from other external values. Nonetheless use of valuation techniques could be pivotal for future studies to estimate extensively non-use values such as carbon sequestration and other environmental services from the sacred groves which could have far reaching benefits.

Constraints identified with conducting and analyzing this study were largely apparent in the CV data. Throughout the data collection many translational difficulties became apparent. The three-way translation of English – Chinese – Tibetan may have led to a large amount of detail becoming lost in translation. In addition the translation of the questionnaire and cultural interpretations of questions were identified. This was very significant in the WTP questions as previously discussed. Despite changes in the wording of the WTP questions to identify how people felt about the scenarios people would only respond with their agreement or disagreement. Nonetheless, this does provide an important insight into cultural understandings and would prove useful in future studies.

6. RECOMMENDATIONS

Findings in this study support the idea that cultural values are highly significant in the perception and use of sacred groves in this region. It has been suggested that attitudes towards the environment are strong predictors of ecological behaviour (Kaiser et al., 1999) and local people are more likely to protect the sacred grove than destroy it on the basis of spiritual and religious connections; this has great implications for conservation. The main threat to the sacred groves appears to be the potential for future decline of cultural values and traditional religious practices accentuated by the commercialization of NTFP markets (Xu, 2006). Consequently an interactive approach involving both local people and government is require to create effective environmental policy to address this decline and determine the long-term viability of this environment.. Economic development and the needs of traditional cultures can coexist with the acknowledgement of cultural values of the environment and natural resources.

- *Environmental and Cultural Education*

  Education of local people could benefit the sacred grove and community twofold. Education of traditional cultural beliefs in both Tibetan dominated regions and larger towns such as Daocheng city would perhaps strengthen cultural values and pride whilst developing greater empathy for and interest in Tibetan culture from the Han Chinese (Githitho, 2003). In addition, education as to the conservation benefits of the sacred grove and ecosystems may inform and promote positive attitudes and behaviour towards the environment (Hackel, 1999). However, current legislation in the PRC is predominantly focused on centralizing and standardizing peripheral areas such as southwest Sichuan, potentially creating difficulty for such education.

- *Address Resource Rights*

  NTFPS

  The implications of the lack of resources rights over NTFPs, albeit in non-sacred forests, were highly apparent during the study. The high demand and high prices of NTFPs has driven intensive collection during the CCF season in particular, leading to violent disturbances between and within villages and decline in NTFP availability (Xie et al., 2000). Forests with poor institutional arrangements and management are

more likely to suffer greater depletion (Pandit and Thapa, 2003). Allocation of resource rights over NTFPs may begin to address the issue of sustainable harvest of wild products, as little is presently known about the impacts of current levels of exploitation.

Sacred Groves

In addition, there are no official rights associated with the sacred areas which are merely protected through local beliefs and cultural values and managed via national governmental policies. With rapid development in the region, in particular businesses of Han Chinese traders and increased wealth obtained from seasonal NTFP collection, there is potential for future conflicts of interest with non-Tibetan individuals to exploit the sacred sites. Given the value of this natural resource, the business that it brings to the area and the unknown long-term viability of such harvesting levels continuing, there is potential for the sacred groves to become threatened as remaining forest areas as yet not harvested to their full potential. Consequently official measures should be taken to strengthen the cultural protection that currently prevents extractive use of these forests.

- *Institutional Development and Capacity Building for Indigenous Knowledge*

Sacred groves are a prime example of indigenous practices helping to maintain cultural and biological diversity. Long-standing behaviours of local people living in and around these forests have protected their existence. Conservation policies of these areas that exclude local people may in fact create resentment among those who have cultivated this environment and lead to their destruction *(Xu, 2006)*.

Conservation of traditional practices will require institutional development and capacity building at national and local level. Empowerment of local people within a modern system, increasing the flexibility and local relevance of national conservation policy would enhance the capacity of Tibetan people to strengthen their cultural heritage whilst develop their livelihoods in the emerging commercial markets *(Xu, 2006, Xie et al., 2000)*. This will, in turn, help conserve local biodiversity.

Capacity for this protection can also be built through local level community participation. It is well documented that where there is greater community control benefits for local people and conservation initiatives are more likely (Wells and Brandon, 1992). Effective and cohesive community management institutions can also help advocate sustainable NTFP exploitation and the long term conservation. Generation of positive intrinsic environmental values is vital in any conservation project (Kaiser et al., 1999). Sacred groves are already highly valued by local people. Consequently decentralization of responsibility, emphasizing local level policies and control would further empower local communities to actively conserve the sacred groves (Whelan and Oliver, 2004).

- *Provision of Alternative to Forest Exploitation – The Potential For Tourism*

Promoting alternative income sources to potentially damaging utilization of natural resources can be a key strategy in conservation (Moukala, 2003). One such non-consumptive economic activity is tourism. National tourism in China is rapidly developing, including tourism within Daocheng County at Yading (Zhang, 2000, Xie et al., 2000, Wang et al., In press). There is potential for cultural tourism in the region which could be used to further promote indigenous values and the conservation of the sacred groves. There is already capacity in Sangdui for 'home-stays' and tourism would allow tourists a glimpse of traditional Tibetan and monastic lifestyles outside of the TAR. Associated trade in traditional crafts and artifacts are equally important as tourism itself, and can encourage minority demographics in the community such as women's groups (Moukala, 2003). However, high income levels from tourism alone are unlikely and additional costs such as marketing should be taken into consideration.

- *Further Research into Perceptions and Behaviours*

Time constraints greatly influenced the scope of this study. Due to the particular season during the data collection only a small sample population was surveyed. A larger sample population would perhaps have assisted identifying with greater clarity

variables that may have affected people's perceptions and attitudes towards the sacred groves. In addition further research would benefit from being conducted during the winter months when the majority of the community would have returned from the mountains, have more free time and be available to answer questions.

This study would also benefit from further research into understanding the relationship between cultural perceptions and behaviour. Perceptions and use of sacred groves may be quite different outside of the two villages sampled. Consequently further research into other villages within Daocheng County and southwest Sichuan would be useful to identify whether a county-wide framework could be utilized to promote cultural diversity, indigenous knowledge and sacred grove conservation. In addition, greater understanding of the complexities of attitudes and perceptions and resultant behaviours would aid the development of future conservation policy to realize whether environmental attitudes directly predict (White et al., 2005, Waylen, 2005).

7. SUMMARY

The findings in this study highlight the necessity to consider cultural values and indigenous knowledge when developing conservation policies. It identifies the importance in conservation planning for acknowledgement of cultural attitudes and perceptions that drive natural resource use behaviours and environmental values and understanding of the socioeconomic factors that influence them. Advocating the utilization of these cultural values in a framework to encourage conservation at local levels also has practical implications for sacred grove protection. Ultimately there is a need to balance rural development with the complexities of these long-standing traditional cultural values, beliefs and practices. Nonetheless the sacred groves in this study are the result of Tibetan cultural practices within the PRC, a nation which is actively promoting the centralization and standardization of Chinese society across the country, discouraging cultural diversity. For the sacred groves to remain it is necessary that they remain sacred and thus require the maintenance of the cultural values that currently protects them. Conservation policies should therefore acknowledge and incorporate these values and local practices or risk losing both cultural and biological diversity in the region**.**

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APPENDIX I **USE SURVEY**

Hello, my name is Lucy and I am a student form England. I am carrying out research in Daocheng on local people's views and uses of sacred groves. This will help the future work both in nature conservation and in helping the community. I would be very happy if you would participate in the research by answering some questions. Everything that you say will be confidential.

Please feel free to ask me any questions you may have too.

Forest Resource Base

1. Are you familiar with the sacred grove? Yes/No
2. What does the sacred grove mean to you?

3. Do you use the sacred grove for the following:
    a. Religious/ spiritual purposes Yes/No
    b. Recreation Yes/No
    c. Other Yes/No
4. How far is it from the house/ homestead to the edge of the nearest sacred grove that you have access to and can use?
    a. Measured in terms of distance km
    b. Measured in terms of time (minutes walking) mins
5. How often do you go into the sacred grove?
    a. >once a day
    b. Every day
    c. 2-3 times per week
    d. At least once a week
    e. At least once a fortnight
    f. At least once a month
    g. Other
    h. Never
6. How long do you usually spend in the sacred grove? Mins

7. From the following for what reason would you visit the sacred groves? Please also rank starting with the most important reason:

Hunting			
Farming			
Firewood collection			
Timber collection			
Other plant (non-timber) collection			
Grazing animals			
Recreation			
Religious/ spiritual			
Other (specify)			

8. When did you last go into the sacred grove?
9. For what purpose did you go into the sacred grove?
10. How long did you spend in the sacred grove during your last visit?

Collection & Use

11. Do you collect wild products? Yes/No
12. If not, does anyone in your household/ monastery collect wild products? Yes/No
13. If yes, what wild products do your household collect from the sacred grove and surrounding forests and for what purpose?

Product	Sacred grove/ Forest	Use

14. Are there any particular wild products that you would not collect? Why?
15. Using these 10 stones, can you tell me from the products that you collect from the sacred grove, what proportion are eaten/ used at home with your family and what proportion are sold or traded? %

16. Using these 10 stones, can you tell me from the products that you collect from the non-sacred forest, what proportion are eaten/ used at home with your family and what proportion are sold or traded? %

17. Can you tell me all the things that all the members of your household/ monastery collected that last season in the sacred grove and the non-sacred forest?

a. What was collected b. Who in the household collected it c. How much was collected d. Unit e. Time taken f. Transport/ marketing costs g. State h. Consequences (eaten, sold, given – see code below) i. Price sold per unit j. Distance travelled

Product	Who in the household collected	Quantity collected	Unit	Time taken (days)	Purchased inputs & hired labour	Transport/ marketing costs	State	Consequences	If sold, at what price	Distance travelled

(g) State: A (Alive), Fr (Fresh), R (Rotten), S (Smoked), D (Dried), O (Other, specify)

(h) Consequences: EF (Eaten in forest), GPV (Given to person in village), SPV (Sold to person from village), EH (Eaten in home), GFO (Given to person from elsewhere), STV (Sold to trader in village), STO (Sold to trader from elsewhere), A (Abandoned in forest)

18. During your last visit to the sacred grove, was the collection typical of that season?
    Yes/No
19. If no, how was it different?
20. How has the availability of wild products changed over the past 10 years?
    Codes: 1= Declined; 2= About the same; 3= Increased
21. If declined (*code 1* in question 19), how has the household responded to the decline in the availability of wild products? *Please rank the most important responses, max. 3.*

Response	Rank 1-3
1. Increased collection time (e.g. from further away from the house)	
2. Planting of preferred wild products on private land	
3. Planting of wild products on public land	
4. Buying (more) wild products form other families within the village	
5. Buying (more) wild products from traders outside the village	
6. Reduced the household need for use of wild products for consumption, medicinal and constructive purposes	
7. More conservative use of wild products when available	
8. Other, specify	

22. Who owns the sacred groves?
23. What restrictions, if any, are there on people's use of wild products in the sacred groves?

Restriction	Wild product type
1. There are no restrictions	
2. Seasonal restrictions	
3. Quota restrictions	

4. Restrictions on type of wild product (specify)	
5. Other, specify	

24. From a personal point of view what is your opinion on these restrictions? (*circle*)

a. Very good b. Good c. No opinion d. Bad e. Very bad

25. Why?

26. When you are in the sacred grove, what proportion of people that you see do you think are from outside of the village?

APPENDIX II **ATTITUDINAL SURVEY**

1. From the following what do you feel is the most important benefit you receive from the sacred groves? *Please rank their importance 1=Very important, 2=Important, 3=Not important*

Reason	**Ranked Importance 1-3**
It provides a source of firewood/fuel	
It makes you feel happy	
It provides you and your family with money	
It protects you from natural disasters such as flooding and landslides	
It provides habitat for plants and animals	
It provides spiritual wellbeing/ is important for religious purposes	
Other (specify)	

2. How are the sacred groves and mountains viewed in your religion/ belief?
3. Do you think that the animals and trees in the forest have aright to be protected form over harvesting or reduced habitat availability? Yes/No
4. Why?
5. Whose responsibility do you think it is to protect them form threats and deal with problems of the sacred groves?
    a. Local people
    b. Community leaders
    c. Monasteries
    d. Government
    e. People from developed countries
    f. Other, specify
6. What do you think is the most important reason to protect the sacred groves?
    a. For the sake of the animals and trees

b. To ensure we have enough forests and wildlife to use in the future
c. For education and historical reasons
d. For religious/ spiritual reasons
e. For people to enjoy visiting
f. I do not believe that they need protecting

7. Are there more, less or about the same numbers of wild animals, wild birds and wild plants in the sacred groves than in other areas?
8. Which animals most appear in the sacred grove?
9. How would you feel if those plants or animals no longer existed?

a. Very concerned b. Concerned c. Not concerned

10. Why?
11. Which of these birds live in your area? *ID card with pheasants*
12. Do you ever look for or come across pheasants or their nests in the sacred grove?

Yes/No

13. Has anyone else you know come across them? Yes/No
14. How often do you come across pheasants and/or their nests in the sacred groves?
    a. Every time I visit the sacred grove
    b. Occasionally
    c. Rarely
    d. Never
15. Were there more, less or about the same number of birds in the past?
16. Why do you think this is?
17. Do you think that there will be more, less or about the same number of birds in the future?
18. Why?
19. Using these 10 stones as the area for the sacred grove 10 years ago, can you tell me about the size of the sacred grove today?
20. Why?
21. From a personal point of view, what is your opinion on this?

a. Very good b. Good c. No opinion d. Bad e. Very bad

22. Why?

23. Has the condition of the sacred groves changed in the last 10 years? Yes/No

    a. How

    b. Why do you think that is?

    c. What is your opinion on this?

    a. Very good b. Good c. No opinion d. Bad e. Very bad

24. Using this scale please can you tell me whether you agree or disagree with the following statements:

    a. Strongly agree b. Agree c. No opinion d. Disagree e. Strongly disagree

Developed countries like the UK should give money to developing countries like China to help pay for the protection of their wildlife and ecosystems	
Protecting the sacred grove area for plants and animals would be bad because there would not be enough land for the local communities to use	
Sacred groves are important in my religion or beliefs	
Forests protect the soil from erosion	

APPENDIX III **WILLINGNESS TO PAY**

I am going to present three scenarios regarding the future of the sacred groves. Please consider the scenarios carefully and try to imagine how each would affect you and your household.

Scenario 1

In order to increase the amount of land available to farm and build houses the sacred groves were cut down.

This would provide some timber to build with, more land available to farm/ build on.

There are fewer birds and animals in the forest.

There are fewer wild plant species available to harvest

1. Using this scale please can you tell me how you would feel about Scenario 1: (*circle*)

1	2	3
Very concerned	Concerned	Not concerned

2. How would this affect your household income? (*circle*)

Increase	Not affected	Decrease

Scenario 2

Activities within the sacred groves are managed to ensure that the number of plants and animals in the sacred groves do not decrease for future use.

Consequently the amount and times of year when certain plant and animal species can be harvested is monitored and may be restricted.

The size of the sacred groves remains the same.

The sacred grove continues to provide the same number of wild plants and species.

1. Using this scale please can you tell me how you would feel about Scenario 1: (*circle*)

1	2	3
Very concerned	Concerned	Not concerned

2. How would this affect your household income? (*circle*)

Increase Not affected Decrease

3. Now, imagine that in order to use the sacred grove you had to purchase a permit to harvest wild plants and collect firewood. Considering the importance of using the sacred grove for both your household use and for income generation, would you be willing to pay a proportion of your income towards a permit to continue to collect wild products from the sacred grove? Yes/No
4. If no, which of the following best explains why not:
    a. My income is limiting my ability to pay
    b. The government should pay
    c. It will not help y household
    d. Other, specify

Scenario 3

Activities within the sacred groves are restricted for tourist and spiritual uses only. Consequently no wild products can be collected from the sacred grove for household consumption or trade.

The size of the sacred groves remains the same.

The number of birds, plants and animals in the sacred grove increases.

The sacred grove is available to anyone who wants to visit, including tourists from outside the village or province.

1. Using this scale please can you tell me how you would feel about Scenario 1: (*circle*)

1 2 3

Very concerned Concerned Not concerned

2. How would this affect your household income? (*circle*)

Increase Not affected Decrease

APPENDIX IV **HOUSEHOLD SURVEY**

1. Household code
2. Household head M/F AGE
3. Primary respondent M/F AGE Relation to household head
4.
5. Secondary respondent M/F AGE Relation to household head
6. How many people live with you?
    a. Men
    b. Women
    c. Children (<16)
7. How long have you lived in the village?
    a. Born here
    b. >30 years
    c. 20-30 years
    d. 10-19 years
    e. 5-9 years
    f. <5 years (specify)
8. Where did you come from before?
9. Which ethnic group/ caste do you belong to?
10. How many years have you spent at school?
11. What is your main occupation?
12. Please indicate the type of house you have:
    a. What is the type of material of (most of) the walls?
    b. What is the type of material of (most of) the roof??
13. How many pillars and floors does your house have?
14. Please indicate the number of implements and other large household items that are owned by the household:

Car/ truck

Tractor	
Motorcycle	
Bicycle	
Yaks	
Pigs	
Sheep	
Chickens/ ducks	
Dogs	
Telephone/ mobile	
Electricity	
TV	
Radio	
Cassette/ CD/ VHS/ VCD/ DVD player	
Stove for cooking (gas/ electric)	
Refrigerator/ Freezer	
Chainsaw	
Plough	
Cart	
Shotgun/ rifle	
Water pump	
Other, specify	

15. What are you hopes for the community in the future?

16. Where do you see yourself in 10 years time?

17. What jobs/ businesses would you like to see your children/ grandchildren to have?

APPENDIX V **PHEASANT SPECIES IDENTIFICATION CARD**

Figure 24. Pheasant Species Identification Card as used in the Attitudinal Survey

Key:

A- White-Eared Pheasant (*Crossoptilon crossoptilon)*

B- Koklass Pheasant (*Pucrasia macrolopha)*

C- Buff-Throated Partridge (*Tetraphasis szechenyii*)

D- Tibetan Partridge (*Perdix hodgaoniae*)

E- Taiwan Patridge (*Arborophila crudigularis*)

F- Blood Pheasant (*Ithaginis cruentus*)

G- Tibetan Snowcock (*Tetraogallus tibetanus*)

All illustrations taken from McKinnon & Phillipps (2000)

APPENDIX VI **VILLAGE AND SACRED GROVE PHOTOGRAPHS**

Figure 25. Aerial view of Souchong village from which households were randomly selected for interview. (Photo: Wang Nan 2007)

Figure 26. Aerial view of Sangdui village from which households were randomly selected for interview. (Photo: Wang Nan 2007)

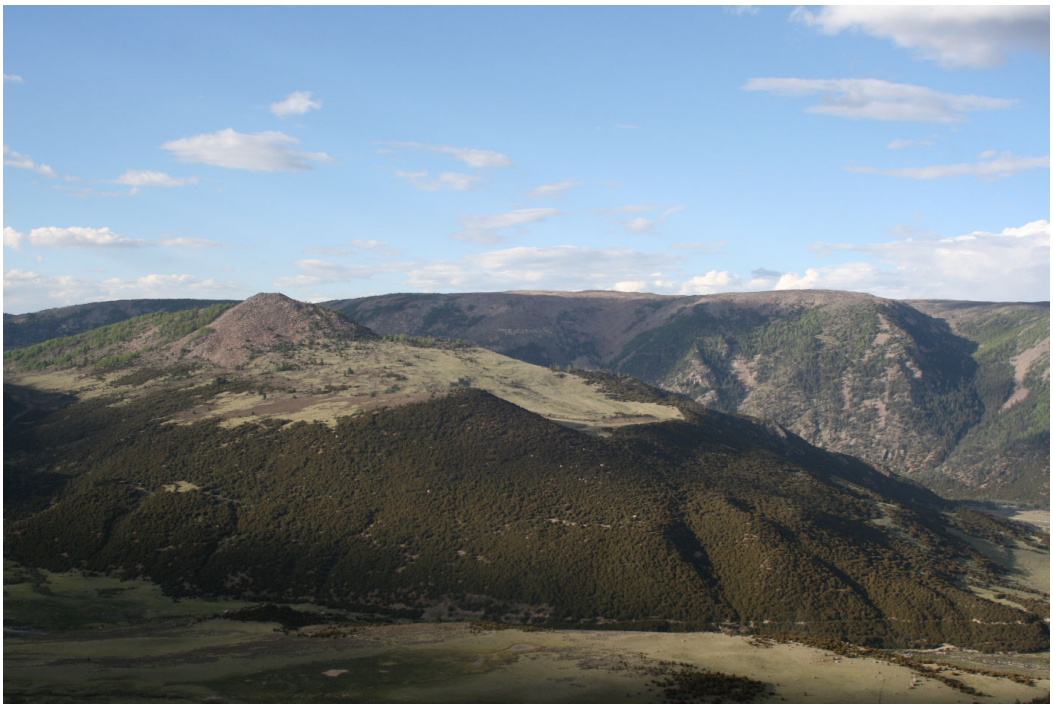

Figure 27. Male sacred grove, Sangdui (Photo: Wang Nan 2006)

Figure 28. Female sacred grove, Sangdui (Photo: Wang Nan 2007)

APPENDIX VII **FOCUS GROUP: MONKS, SOUCHONG**

1. *Can you tell me about the ways that you connect with the sacred grove? What does the sacred grove mean to the people living in this village?*

Mainly to give luck and protect everything. The sacred grove and sacred mountain closest to the monastery give luck and protect the monastery.

2. *What are the main benefits of the sacred grove to the village?*
If people show respect to the sacred mountain it will ensure all goes well and people will travel safely.

3. *If there was a bit problem with the sacred grove, who would you trust to resolve it?*
Local people would make smoke and place prayer flags.

4. *Does the monastery have a special position on sacred grove conservation?*
We chant and pray for the sacred grove and show respect to the sacred grove and sacred mountain.

5. *When local people go to the sacred grove for religious purposes what do they do? Why? How often?*
Local people go to the sacred grove about 1 or 2 times per year. Monks visit the sacred grove mainly in January/ February in the Tibetan Spring Festival and on the 10^{th}, 15^{th} and 30^{th} of each Tibetan month.

6. *What determines a sacred grove? And male and female sacred groves? What are the differences between them?*
We don't know. People are just afraid to destroy the sacred grove. There is no difference between the male and female sacred groves as to what men and women can do in them. Females can also circle the sacred grove and place prayer flags but cannot make smoke.

7. *What are the greatest threats to the sacred grove here?*
Previously logging was permitted but now it is forbidden. The greatest threat is in summer with fires.

8. *Please discuss when the sacred grove has been in its best condition, with the most produce?*
Now.

9. *If you could pay towards a fund that would definitely bring the sacred grove back to this condition would your household pay anything and if so, how much and how often?*
Just showing respect, placing prayer flags, prayer and chanting is enough to protect the sacred grove, a permit is not necessary.

APPENDIX VIII **FOCUS GROUP: MONKS, SANGDUI**

1. *Can you tell me about the ways that you connect with the sacred grove? What does the sacred grove mean to the people living in this village?*
To show admiration to the sacred grove and to give luck to them and protect everyone in the village from suffering [natural disasters such as] hail and disease. What the sacred grove has done has never been seen. It is different to a living Buddha who can do special religious things for people. The living Buddha asks them to show respect to the sacred grove and it is Tibetan tradition to show this respect. We know that we can not see what the sacred grove can bring but we still believe in it.

2. *What are the main benefits of the sacred grove to the village?*
The sacred grove can ensure that crops can grove and that local people do no suffer from disease but have good luck and protection.

3. *If there was a bit problem with the sacred grove, who would you trust to resolve it?*
No, there would never be a problem with the sacred grove as nobody will destroy the sacred grove. [*What about in the instance of outsiders destroying the sacred grove or fires?*] If the destruction is so serious all the monks and villagers will stop it. If anyone tries to cut trees in the sacred grove he will suffer feedback. Therefore we do not see the problem of destroying the sacred grove as so serious. No one goes to the sacred grove to destroy it therefore there are no threats, although some Chinese people may hunt in the sacred grove.

4. *Does the monastery have a special position on sacred grove conservation?*
The monastery has a conservation role towards the sacred grove and will ask villagers not to collect stone, mud, timber or firewood in the sacred grove. The forest manager from the monastery will also go to the sacred grove to look for fires and stop hunting etc. The monastery will also tell local people what will be the feedback from the sacred grove if they do this. This could be drought, hail, flood, disease, poor crops.

10. *When local people go to the sacred grove for religious purposes what do they do? Why? How often?*
They circle the mountain, make smoke in the sacred grove and place prayer flags asking Buddha for good luck. When they do this they are thinking about what they want. People mainly go to the sacred grove in Tibetan Spring Festival [February] at the beginning of the year.

11. *What determines a sacred grove? And male and female sacred groves? What are the differences between them?*

We do not know, this is from a long time ago. A long time ago a crazy person who local people thought could contact Buddha said that this is the male and this is the female sacred grove. Many villages have crazy people like this. He can see things we cannot see. The whole of the sacred grove can be separated to male and female. Here the male sacred grove is relatively bigger than the female sacred grove as there are mostly males in a family who are head. Both males and females can circle the sacred mountain, but only men can climb to the top and go inside to place prayer flags and make smoke. We are not aware of what females can do in the female sacred grove, but females do not go to the male sacred grove to show admiration. If they did this it is the same as if women wore men's clothes or if men wore women's clothes. Men can go to the female sacred grove as men are the head of households.
In the Tibetan calendar people go to the sacred grove on the 10th, 15th and 30th of each month. These are important dates of the births and deaths of Buddha's.

12. *What are the greatest threats to the sacred grove here?*
No, there would never be a problem with the sacred grove as nobody will destroy the sacred grove

13. *Please discuss when the sacred grove has been in its best condition, with the most produce?*
The sacred grove is in its best condition now as people ask for luck and protection and there is no hunting or logging.

14. *If you could pay towards a fund that would definitely bring the sacred grove back to this condition would your household pay anything and if so, how much and how often?*
Pay for what?! We believe in the sacred grove in our hearts therefore everyone may be different in what they pay. They show their respect in their heart therefore they needn't pay anything, just for prayer flags and things to make smoke.

15. *If you could manage the environment in the sacred grove, what would you do? Why?*
The monastery will not manage the sacred grove specially; just pass on to local people what they are thinking. We will not ask for anything [money] from local people but just tell tem or make them away what they can do.

16. *Where do you collect most of the wild products your household uses? How far do you go each time to collect?*
Small dead trees of the sacred grove can be collected. In the non-sacred grove firewood is collected. This is decided by the Forestry Bureau about 40-50km from here towards Litung.

17. *Has the condition of the non-sacred grove/ surrounding environment changed in the past 10 years? If so, how?*
Some. We do not know.

APPENDIX IX **FOCUS GROUP: WOMEN, SANGDUI**

1. *Can you tell me about the ways that you connect with the sacred grove? What does the sacred grove mean to the people living in this village?* To show admiration to the sacred
The sacred forest means to give luck and protect everything. It will ensure no heavy snows and farmland plants will grow well. It will also ensure that they will collect more caterpillar fungus and make a lot of money. The sacred grove also means that they will feel comfortable

2. *What are the main benefits of the sacred grove to the village?*
Sacred grove has no special use for them, they just respect it in their heart and no benefit can be seen.

3. *If there was a bit problem with the sacred grove, who would you trust to resolve it?*
First they hope that the village government would deal with any problems in the sacred grove. The village government said that they should not kill animals or log in the sacred grove. On the television they also see related information. If anyone is seen to hunt or log in the sacred grove anyone in the village will stop them when they are spotted. The monastery also said that the sacred grove gives luck and protects everything. Even no one says to conserve the sacred grove directly there will be no-one destroying the sacred grove. The monk will circle the mountain every 15th of Tibetan month. The women do not know what the monk are thinking but they think that the monks were asking for luck for the village. Young people also go to circle the sacred grove, but older people will stay in the family because they are too old to do so. 10th and 15th of each month people will not kill life [i.e. yak], they go to circle mountain, chant/ pray, make smoke, place prayer flags and ask for good luck in the sacred grove. Nearly all the people who circle the sacred mountain their hope is no illness and hope to have a good life. When circling the mountain they only circle once. There is a male and female sacred grove. From as long as they can remember there have been two types of sacred grove. If male circle the female sacred grove in summer there will be hail. If females circle the male sacred grove in summer there will also be hail. Female sacred grove can make women more beautiful. If men circle the mountain at the wrong time or do bad things in the female sacred grove, women will be ugly.

4. *What are the greatest threats to the sacred grove here?*
There are no threats to the sacred grove now.

5. *Please discuss when the sacred grove has been in its best condition, with the most produce?*
In summer the environment of the sacred grove is best with a greater number of mushrooms. Local people will not log in the sacred grove. Previously no-one traded the

mushrooms and the mushrooms were collected just to eat. Now some people buy them so more and more people go to the mountain to collect. The sacred grove from outside is the same to previously but inside the sacred grove it has become more dense than before. No-one will go to the sacred grove except on the 10th and 15th of the Tibetan month.

6. If you could pay towards a fund that would definitely bring the sacred grove back to this condition would your household pay anything and if so, how much and how often?
Yes we would – 4-5 Yuan only once.

7. If you could manage the environment in the sacred grove, what would you do? Why?
We feel we are too old to be able to manage the sacred grove. If they managed it they will stop logging in the sacred grove and yak herd will be allowed to roam through the sacred grove.

8. Where do you collect most of the wild products your household uses? How far do you go each time to collect?
We will go much farther away to collect, if so far we will stay there. On the way we will spend nearly half a day to travel and if we find the product we will sell it.

9. Has the condition of the non-sacred grove/ surrounding environment changed in the past 10 years? If so, how?
It is much less than before, previously the forest is very dense and now much has been logged.

APPENDIX X **FOCUS GROUP: MEN, SANGDUI**

1. *Can you tell me about the ways that you connect with the sacred grove? What does the sacred grove mean to the people living in this village?*
Tibetan people have a tradition to show their admiration to the sacred grove such as circling the mountain, placing prayer flags. We believe that the sacred grove will help us and give us luck and protection.

2. *What are the main benefits of the sacred grove to the village?*
What is in the sacred grove and the sacred mountain people cannot see, but if we fight with others for example and have circled the mountain before hand it will save us. When people travel far away if they show admiration to the sacred grove it will protect their journey.

3. *If there was a bit problem with the sacred grove, who would you trust to resolve it?*
Every village has their sacred mountain and if there is some problem the village will deal with it. It is the same for the sacred grove.

4. *Does the monastery have a special position on sacred grove conservation?*
The monastery conserves the sacred grove and sacred mountain. Therefore the sacred grove and sacred mountain will save local people. They stop logging, hunting and ask people not to destroy the sacred grove.

18. *When local people go to the sacred grove for religious purposes what do they do? Why? How often?*
People mainly go to the sacred grove during Tibetan Spring Festival [February] and on the 10th, 15th and 30th of the month. They go to circle the mountain and ask for luck.

19. *What determines a sacred grove? And male and female sacred groves? What are the differences between them?*
Females can circle the sacred mountain but not go into the male sacred grove. Females can circle the female sacred grove but cannot go to the top of the mountain to place prayer flags or make smoke. There are no restrictions for men going to the female sacred grove – they can put prayer flags and make smoke at any time of year.

20. *What are the greatest threats to the sacred grove here?*
If people log or hunt in the sacred grove this is very bad, but no one does this. If they are caught doing this they will be beaten and fined.

21. *Please discuss when the sacred grove has been in its best condition, with the most produce?*
Before New China was established (1949) no one conserved the sacred grove or sacred mountain. After that conservation began and the recent forestry laws (1999-2000 Natural Forest Protection Programme) have helped. Tibetans shouldn't steal or tell lies therefore in their life Buddhism is the most important thing in their lives.

22. *If you could pay towards a fund that would definitely bring the sacred grove back to this condition would your household pay anything and if so, how much and how often?*
Yes we would, though we think that people would pay as much as they liked.

23. *If you could manage the environment in the sacred grove, what would you do? Why?*
We would conserve by showing admiration to the village mountain by circling the mountain, make smoke and placing prayer flags.

24. *Where do you collect most of the wild products your household uses? How far do you go each time to collect?*
Here in the mountains, Chinese caterpillar fungus is here. We travel about 10km to collect firewood. Most people collect about 2 tractors of firewood each year.

25. *Has the condition of the non-sacred grove/ surrounding environment changed in the past 10 years? If so, how?*
There is less non-sacred grove than before, but it is cut in different places each year to allow it to recover.

APPENDIX XI INFORMAL INTERVIEW, FOREST MANAGER, SANGDUI

Time in job: 6 years (also a monk)

1. What is your role as a forestry manager

10km from here along the valley/ road towards Litung. Monastery should conserve but it is not owned therefore the Forestry Bureau give the right to conserve the forest and pay a manager 1000Y per year.

Every month he must spend at least 25 days for monitoring the forests. This includes:

- Publicising forestry conservation
- Finding fires
- Finding hunters
- Finding illegal use of forest land – e.g. building
- Find illegal wood cutting

If there is a fire/ illegal activity in the forest this money will be cut by 5% each time. Any such event must lead to the forestry Bureau being informed. A large fire results in a 10% reduction or 20% reduction if the Forestry Bureau was not informed. If selling wildlife products occurs, 5% will be cut and if they do not inform the Forestry Bureau a 10% cut. In winter he must prevent people using/ starting fires in the forest.

2. What changes have you seen in the way people use the forest?

The sacred grove has more trees than non-sacred forests. Previously the local government allowed local people the right to cut trees in the sacred groves. 17 years ago the head of the Sangdui government stated that the sacred grove should not be logged and so people no longer cut trees there.

3. What do people use the sacred grove for now?

Now no one logs trees but just circle the sacred grove to show respect to the mountain and for recreation.

4. Is the sacred grove managed differently to non-sacred forests?

No, the Forestry Bureau pays the Forest Manager to manage a set amount of forests which includes sacred and non-sacred groves, so each are managed the same. I manage the male sacred grove and the village government manages the female sacred grove on the other side of the village.

5. What determines whether a sacred grove is male or female?

I do not know. However, if anyone cuts the male or female sacred grove it will result in disease. Anyone can use the male and female sacred groves. However, in summer men cannot circle the female sacred grove and visa versa as this will result in hail. In the Tibetan Spring Festival [February] only males make smoke and put flags in both the male and female sacred grove, never females.

6. What is the biggest threat to the sacred grove now?

People shooting animals. Although now few people do this. There are some Chinese people who work in Sangdui such as carpenters and masons.

7. Who do people listen to regarding the management of the sacred grove?
Local people tend to follow the monastery more, for example if 2 people are fighting and a living Buddha comes to stop the conflict they will stop.

8. Does the younger generation believe as strongly as the older generation in the sacred grove?
Circling of the mountain and sacred groves is mainly done by the younger generation. The older generation have a stronger belief but this is passed on to the young.

9. Who determines what a sacred grove is?
I do not know.

10. What is the punishment for illegal activity in the sacred grove?
Usually if someone is found in the sacred grove cutting trees or hunting they are beaten by local people and their tools are confiscated. Local people have the right to give this punishment to some degree, [i.e.] how they see fit.