

STONGDE REVISITED: LAND-USE CHANGE IN CENTRAL ZANGSKAR

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With 4 figures, 2 tables and 2 photos

Received 08. August 2010 · Accepted 20. November 2010

Summary: Modifications of the mostly subsistence-based economy and a general trend towards livelihood diversification are characteristic dynamics in high mountain regions. Using a case study from the Himalayan village of Stongde in Zangskar (Northern India), current trends in land utilization, work patterns and livelihood strategies are presented and discussed. The assessment of persistence and change of land-use patterns and strategies over a period of almost three decades is based on a comparative analysis of HENRY OSMASTON'S studies in the case study village in 1980 and recent field research by the authors. The study shows a high persistence of field structures fostered by a set of environmental, political and social factors. At the same time, the survey illustrates a diversification of the cropping pattern and recent agricultural trends. High mountain livelihoods are modified by a number of internal and external factors, including new agricultural practices, rural development initiatives, food subsidies and off-farm income.

Zusammenfassung: Veränderungen einer vorwiegend subsistenzorientierten Wirtschaftsweise sowie die Diversifizierung von Lebenssicherungsstrategien gelten als wesentliche Dynamiken in Hochgebirgsregionen. Am Beispiel der Siedlung Stongde in Zangskar (Nordindien) werden aktuelle Entwicklungen in der Landnutzung, der Arbeitsorganisation und den Lebenssicherungsstrategien vorgestellt und diskutiert. Anhand einer vergleichenden Analyse von HENRY OSMASTON'S Arbeiten in der als Fallstudie ausgewählten Siedlung im Jahr 1980 und aktuellen Feldforschungsarbeiten der Autoren, werden Persistenz und Wandel der Landnutzungsmuster und -strategien über einen Zeitraum von knapp drei Jahrzehnten analysiert. Hierbei wird ein hoher Grad an Persistenz in den Feldstrukturen deutlich, der durch ein Zusammenspiel ökologischer, politischer und sozialer Faktoren begründet ist. Zugleich zeigt die Untersuchung eine Diversifizierung der Anbaufrüchte sowie aktuelle agrarwirtschaftliche Entwicklungen auf. Lebenssicherungsstrategien im Hochgebirge werden durch eine Vielzahl interner und externer Faktoren, zu denen neue landwirtschaftliche Praktiken, Entwicklungsprogramme, Subventionen von Grundnahrungsmitteln und außeragrarisches Einkommensmöglichkeiten zählen, geprägt.

Keywords: Land-use, mountain livelihoods, agricultural change, Ladakh, Zangskar, India

1 Introduction

High mountain regions are generally characterized by remoteness, political marginalization, a low level of market integration and limited agrarian resource potential. Rural communities in these areas often subsist to a large extent on agro-pastoral land-use systems. At the same time, it has been demonstrated that local strategies and choices are embedded into multiple external forces including national policies, development interventions as well as market constellations and global economic networks (KREUTZMANN 1998, 2006a; FUNNELL and PRICE 2003; PARVEZ and RASMUSSEN 2004)

The transformation of the “traditional” economy with a trend towards livelihood diversification¹⁾ is one

¹⁾ Diversification with a shift towards off-farm employment has become a common trend in the rural South thus

of the key issues in current debates in high mountain research (for South Asia see e.g. BANSKOTA et al. 2000; NÜSSER 2000; HAFFNER et al. 2003; KREUTZMANN 2006b; AASE and VEETAS 2007; DAME and NÜSSER 2008; KREUTZMANN et al. 2008). Against the background of a study from Kyrgyzstan, SCHMIDT (2008) has argued for a *Political Ecology in High Mountains* that offers an interdisciplinary approach on human-environmental interactions from an actor-oriented perspective across different geographical scales. For a better understanding of the driving forces of social and environmental change, non-place-based actors and processes need to be integrated into the analysis of mountain livelihoods. Moreover, the inclusion

dissolving ties between land-use and rural livelihoods (RIGG 2006). See ELLIS (1998) on the heterogeneity of livelihood diversification in rural areas and SCOONES (2009) on a recent overview of livelihood perspectives.

of the historical dimension, especially with regard to local practices, institutions and land-use strategies, offers insights into regional development paths (SCHMIDT 2008, 142–143).

In the north Indian mountain region of Ladakh, rapid socio-economic transformation has been observed (SINGH 1998; VAN BEEK and PIRIE 2008). Due to its geopolitical importance, Ladakh has been the focus of government interventions over recent decades. Besides these government programmes, market constellations are a key driver of change. Although the impacts have primarily centred on the Indus, Nubra and Lower Suru Valleys, the government's ambitious road-building programme has encouraged a shift to a growing dependence on imported and subsidised goods, services and generously funded development initiatives in these remote high-mountain communities. At the same time, the local land-use system still continues to constitute the economic mainstay and basis of rural livelihood security. In this context, strategies of local actors result from an interplay of their choices and external influences. Using Zangskar²⁾ as a case study, it is the objective of this paper to investigate how land-use patterns in remote high mountain villages are framed by development interventions. Central to this analysis is the need to depict in what respect land-use practices show a high degree of continuity in the context of dynamic political and economic processes.

Soon after the opening of this border region to foreigners in 1974, extensive research was undertaken in Zangskar (CROWDEN and LUMSDEN 1976; CROWDEN 1977; FRIEDL 1983; CROOK and OSMASTON 1994). Among the resulting publications, CROOK and OSMASTON (1994) provide accurate and comprehensive data on regional land-use practices. With particular reference to the village of Stongde – a largely subsistence agricultural community 15 km to the north east of Padum, the administrative centre of Zangskar – the study on the farming system in 1980 continues to provide an invaluable baseline for comparative analysis (OSMASTON 1994).

Following an introduction to the study area, our paper assesses both the change and persistence of the land-use system over almost three decades. Based on

²⁾ Zangskar is an administrative subdivision of Ladakh, the latter comprised of Leh and Kargil districts, in the State of Jammu & Kashmir. The use of Zangskar, the etymologically correct spelling, is largely restricted to academic research. Zangskar is the more popular spelling used both locally and internationally. In some atlases and dated maps the region is also referred to as Zaskar. All three spellings refer to the same geographical area.

mapping and qualitative research from field visits, we illustrate trends in the cropping pattern in Stongde. Discussed in the context of data from several neighbouring settlements, dynamics affecting the wider Central Zangskar area, such as shifts in cropping patterns, are also identified. We show that despite 30 years of seasonal connectivity, there is, perhaps surprisingly, not one household that has completely severed links with traditional agricultural production. A range of modified, adapted or even unaltered practices employed by Zangskar's communities to suit new socio-economic circumstances are analysed and discussed in the final section of the paper.

2 Study area and land-use practices

2.1 Geographical setting

Situated in the Himalayan rain shadow, on the northern fringe of the Greater Himalayan Range, Zangskar subdivision encompasses 7000 square kilometres of arid, mountainous terrain. While the region was a semi-independent kingdom until the middle of the 19th century, it is today politically a part of the Indian State of Jammu and Kashmir and thus of a borderland of geopolitical importance. Despite occupying 60% of Ladakh's Kargil District, Zangskar is one of the least populated blocks with less than 13,000 inhabitants³⁾. Permanent habitation is found between the altitudes of 3500 m and 4200 m and is largely restricted by the rough topography to alluvial fans, benches and the vast river plain south of the confluence of the Stod and Lungnak Rivers (Fig. 1). Zangskar is dominated by an arid climate with an estimated annual precipitation rate of 200 mm to 250 mm in its central valley (OSMASTON et al. 1994b, 42). Winter temperatures are generally below zero, with lowest minima of between - 20°C and - 30°C. Summers are mild and warm with mean maximum temperatures above + 20°C (ibid., 45). Vegetation of this desert steppe-ecosystem is sparse. Cultivation is productive yet limited by the short growing season of just four months and the availability of irrigation water.

Situated on a bench between rugged mountainside and the east bank of the Zangskar River, Stongde is one of Central Zangskar's larger settle-

³⁾ In 2001 Zangskar's total population was 12,169 (Census of India 2001; online access: Office of the Registrar General & Census Commissioner, India, viewed 10th March 2010: <http://censusindia.gov.in/population_finder/Sub_Districts_Master.aspx?state_code=01&district_code=08>)

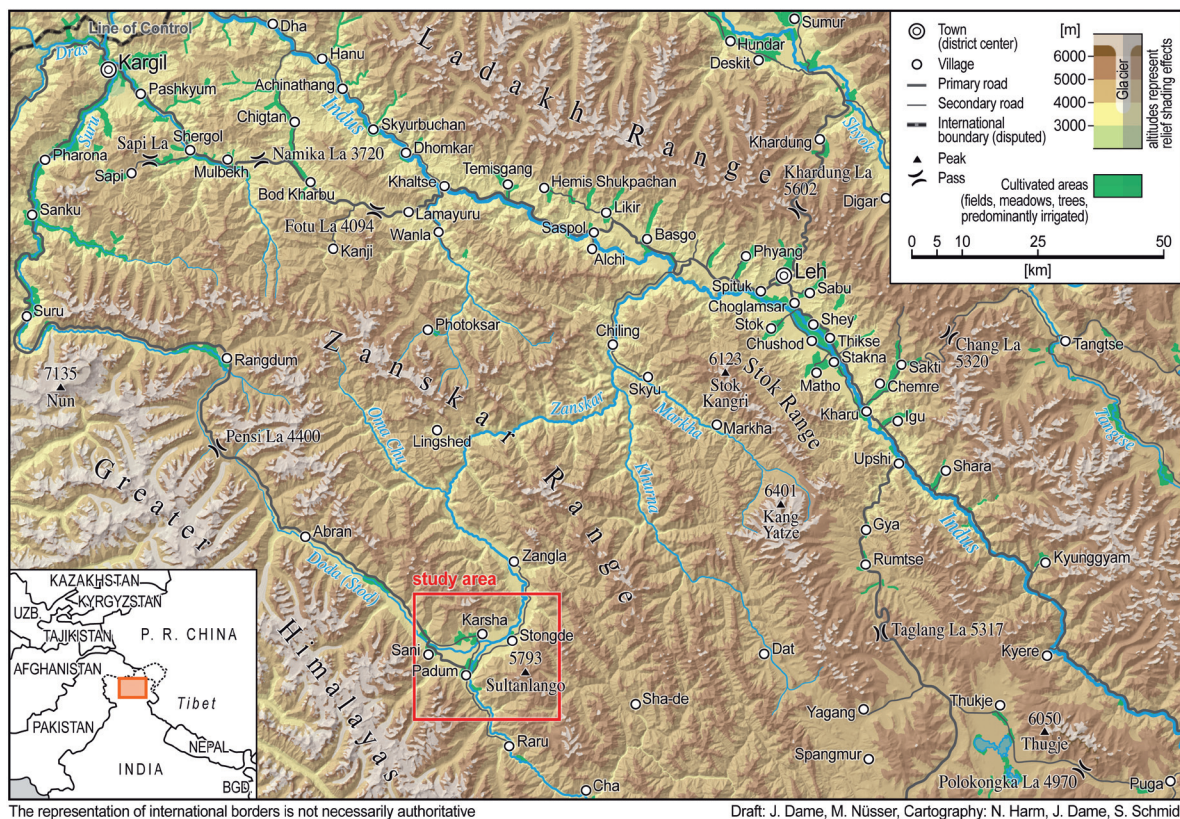


Fig. 1: Map of Central Ladakh and Zangskar

ments. The village consists of 6 hamlets (Peyu, Tetsa, Tang, Trodong, Laru and Tama) and together with irrigated land occupies an area of around 120 ha. Environmental constraints on cultivation are typical of those faced by villages across Central Zangskar, although Stongde's farmers regularly observe that their soil is slightly richer in clay and is therefore considered more prone to compaction. Benefiting from reliable irrigation water, extensive grazing rights and abundant sources of wood (*Salix* spp.), Stongde is one of Zangskar's wealthier settlements. The village also benefits from its relative proximity to the administrative and commercial centre of Padum.

Stongde is connected to Zangskar's growing network of roads including the 235 km seasonal road from Kargil to Padum and the new Padum-Nimu highway, a defence-funded strategic road link that is currently under construction⁴). Since 2004, the permanent presence of road building camps, and the associated influx of seasonal labourers from Bihar and Jharkhand, has greatly boosted Central Zangskar's cash economy. Fluctuating numbers of tourists who

⁴ See DEMENGE (2009) for an account of the Zangskar road construction and migrant labour livelihoods.

have visited Zangskar over the last 30 years have also contributed, especially in recent years with the growth of guaranteed employment from winter trekking groups. However, the absence of convenient road connectivity has stifled the tourist boom experienced in the Indus Valley. Until the new strategic roads are completed, Zangskar's connectivity is restricted to the arduous, seasonal and historically unreliable road link with Kargil. Due to heavy winter snowfall, this road remains closed for six months of the year. During that time, only sporadic, exceptional helicopters and the ice trek on the frozen Zangskar River (*chaddar*) in January link the region with the rest of Ladakh.

2.2 Combined mountain agriculture

Zangskar's population subsists to a great extent on a mountain agricultural system that was introduced by RHOADES and THOMPSON (1975) as *mixed mountain agriculture* and referred to as *combined mountain agriculture* by EHLERS and KREUTZMANN (2000). Given the environmental conditions in high mountains, this farming system combines various production strategies that utilize different ecologi-

cal zones. Crop farming and animal husbandry together with the collection of fuel, additional fodder and wild vegetables, comprise the central pillar of high mountain livelihoods (see, e.g., NÜSSER 1998; SCHMIDT 2004; KREUTZMANN 2006b; DAME and NÜSSER 2008). Agricultural and pastoral activities are interdependent elements with common nutrient and energy cycles. While crop farming is essential for fodder provision during the winter, animal husbandry fulfils the demand for manure, draught power and transportation.

Due to the prevailing aridity, crop farming depends on glacier-fed and snow-fed irrigation. Water follows a hierarchy of gravity-fed channels before it is distributed to the terraced fields. As water is the most critical resource in the region, its utilization follows a rotational system which relies on community-based, institutionalised rules of irrigation management (GUTSCHOW 1998; LABBAL 2000; GUTSCHOW and GUTSCHOW 2003). Between early May and mid September, relatively fast growing varieties of barley (*Hordeum vulgare*) and wheat (*Triticum aestivum*), mostly rotated with peas (*Pisum sativum*), are cultivated in Central Zangskar. Further common crops include mustard seed (*Brassica campestris*) and potatoes (*Solanum tuberosum*). Limited quantities of vegetables such as cabbage, radish and spinach are grown in kitchen gardens. Some households additionally collect wild herbs. As opposed to Central Ladakh, almost no fruit trees (apples, apricots) are cultivated in Zangskar. Livestock comprises cattle (primarily yak, *dzo* and other hybrids), sheep and goats. During the summer months, cattle are driven to the high pastures. Sheep and goats are grazed on the surroundings of the villages on a daily basis, while individual dairy cattle are non-seasonally kept on designated pastures within the permanent settlements. Fodder grasses and alfalfa (*Medicago sativa*), grown on plots or fringes of fields, leaves and straw fulfil the need for winter fodder. For ploughing and threshing, the *dzo* is the commonly preferred animal. Horses and donkeys are kept for transportation purposes. Animal husbandry further provides manure, which is highly valued as fertilizer, sun-dried dung for cooking and heating, wool and foodstuff, especially dairy products (OSMASTON et al. 1994a).

Combined mountain farming is generally coupled with additional income sources to buffer the household economy against risks such as water shortages, crop infestations or climatic extremes (EHLERS and KREUTZMANN 2000). Albeit self-sufficient to a great extent, Zangskaris have traded for products that were not locally available or in case of

yield shortfalls (RIZVI 1999). After the construction of the road between Zangskar and Kargil, a rise of the cash economy has been witnessed. Due to external impacts such as national subsidies on staples, rural development programmes and non-agrarian income sources, **agricultural practices have undergone significant modifications** (MANKELOW 2008). Recent trends include the introduction of chemical fertilizer, mechanisation, increases in wage labour and adjustments of institutions of resource use (see TIWARI and GUPTA 2007 on Leh town). Government agricultural policies are based on the idea of “modernisation” through subsidies on inputs. By improving the local production of food and firewood, the government intends to ease the financial burden of importing food and kerosene into Zangskar.

3 Data and Methods

Recent field research in Stongde was carried out between 2006 and 2009. For our study, data from CROOK and OSMASTON (1994) provided a suitable data source for comparative interpretation of land-use dynamics over almost three decades. Moreover, the village offers the unique opportunity for bitemporal land-use analysis as OSMASTON (1994, 154–155) included a map of the cultivated fields based on a survey conducted in the summer of 1980 (Photo 1).

In August 2008, a repetition of the ground survey of the village of Stongde with its cultivated area was undertaken. A pansharpened and orthorectified Quickbird image (27 Sept 2003) with 0.61 m spatial resolution was used as a base map for this survey (Fig. 2). Spatial accuracy was enhanced by ground control points and a digital elevation model (DEM) from the Shuttle Radar Topography Mission (SRTM-3, version 4.1, downloaded from <http://srtm.csi.cgiar.org>). OSMASTON’s survey was originally backed up by Landsat RBV imagery with a resolution of 80 m. In order to improve the accuracy for field size calculation, this map was georeferenced and plotted on our Quickbird data. Visual interpretation was used for the complete and exact delineation of plots and cropping pattern. Fields were manually digitized on-screen using ArcGIS 9.3. with the advantage of direct and precise replication of small plots in contrast to automated classifications of field boundaries. Based on this bitemporal approach, changes in cropping area, plot sizes and cropping pattern between 1980 and 2008 could be identified. Calculations were operated in ArcGIS 9.3. Estimation of the total area under cultivation needs to be interpreted carefully,



Fig. 2: The village of Stongde, Zangskar (Quickbird Scene, 27 September 2003, band combination 4-3-2, pansharpened)

given a lack of accuracy in the 1980 dataset where very small kitchen gardens near the house might not be represented and a “fringe of abandoned and semi-abandoned fields on the north and south side” (OSMASTON 1994, 144) was not sketched and thus defined as “long-term fallow” in the 2008 map. These

plots as well as the outlier fields on the northern edge of the village were excluded from calculations.

Qualitative interview data was gathered from Stongde and neighbouring settlements across Central Zangskar with the assistance of an experienced Zangskari/English interpreter. Interviews



Photo 1: View of Stongde in 1980, taken from Stongde Monastery (Photo: H. Osmaston, 18. August 1980, reproduced with kind permission of A. Osmaston)

were informal in nature – often conducted in the fields – but were semi-structured to ensure coverage of core topics including: changes to agricultural practice over the last 50 years; fertilizer preference; mechanisation; cropping preferences, experimental cultivation and cash cropping; farm labour and reciprocal agreements; animal husbandry; perceptions of self-sufficiency; and the future of Zangskari agriculture. Whilst core subjects were covered with every interviewee, sufficient flexibility was also allowed to pursue other areas of interest arising from discussion. Efforts were made to interview a cross section of age groups and a representative sample of both male and female household members. Interviewees remained anonymous although some background information was taken to enable responses to be analysed in context. In addition, extensive background data on imports, rural development and current agricultural initiatives was collected from employees and official records from government departments in Padum.

4 Land-use change in Stongde, Zangskar

4.1 Persistence in field structures

Within the context of recent changes in the high mountains of Ladakh, the effects of socio-economic transformation on the agricultural sector have been discussed (e.g. DEEN DAROKHAN 1999). To this day land-use remains the backbone of Zangskar's local economy. The village of Stongde with its houses and cultivated fields is located on a large alluvial fan below Stongde monastery, which resides on top of volcanic rocks on the eastern side of the fan (Fig. 2 and Photo 2). Water for irrigation derives from a tributary

valley towards Stongde La pass (5090 m), where most of the village's summer pastures and a seasonal settlement (*doksa*) are located.

Despite the enlargement of the village, comparing mapped plots of Stongde between 1980 and 2008 through visual analysis as well as automated calculations illustrates a remarkable persistence in the total cultivated area as well as the field structures (Fig. 3a and Fig. 3b). The change in total cropping area is due to a few plots on the fringes of the settlement which have (again) been put under cultivation and an increased density of plots within the village boundary. Within the cultivated land, fields have been terraced where necessary due to gradation of the terrain, while near the hamlet of Tetsa an almost plain level is reached. The shape of the plots is rounded, which is characteristic for Zangskar but rather untypical opposite to the rectangular shapes dominant in Central Ladakh. Consequently, the margins between fields are comparatively larger and planted lucernes or natural grass vegetation on them provide a valuable source for hay-making (Photo 2). Such winter provisions for the entire flock are essential for households as fodder from outside the region is not available. These grass margins benefit from excess water once neighbouring fields are irrigated. During the summer months, milk-giving animals are tethered along the irrigation channels.

In Stongde, the noticeable stability of the arable lands results from limitations of the amount of water available for irrigation. The settlement's water supply is derived from permanent and temporary snowfields in its tributary valley only, as the Zangskar River, which passes on the eastern edge of the village, is incised deeply into the valley floor. The limited quantity of water available to farmers under the given climatic conditions has led to regulations of its usage. The cul-



Photo 2: View of Stongde in 2008, taken from Stongde Monastery (Photo: J. Dame, 20. August 2008)

tivated area is fed by a hierarchy of channels which deviate water from the stream (*tokpo*) to the main (*mayur*) and intermediate (*yura*) channels. Several reservoirs (*zing*; three in 1980 and four in 2008) are used for overnight water storage. If their capacity is insufficient during peak times of water flow, households irrigate their fields during the night in order to avoid water loss. The scarcity of water has led to adapted institutions for its allocation within the village community. Households have been divided into user groups to which access to water is granted on 24-hour turns. The community generally adheres to these regulations, especially in July and August, when less water is available and crops demand a higher portion of this scarce resource. The particular conditions of Stongde village thus give little scope to significantly increase the land under cultivation. Moreover, the scope to develop land is restricted by dominant households and the complications of renegotiating established water sharing agreements (cf. GUTSCHOW and GUTSCHOW 2003). Consequently, the construction of new irrigation channels is a very rare phenomenon⁵⁾.

⁵⁾ In addition to Stongde's environmental constraints, it would appear that a percentage of farmers in Stongde are not interested in expanding their cultivation. Approximately 25 % of land in Stongde is owned by Stongde Monastery and, to a

Scarcity of irrigation water often leads to the abandonment of peripheral fields. In Stongde, OSMASTON et al. (1994b, 63) documented a former spring that was fed by snow melt and irrigated additional plots at the southern margin of today's settlement. The field boundaries are still detectable in the satellite image (Fig. 2), yet for several decades the cultivation of these plots has not been possible⁶⁾. By contrast, the northern margin of the settlement is susceptible to deterioration in the event of exceptional floods. Fields often have to be restored after the drainage of melt water in the spring, and regular deposits of alluvial gravel and sand have decreased the fertility of these plots.

The persistence of field structures has been fostered by the prevailing inheritance arrangement. In the subsistence economy, land (together with its

lesser degree, Karsha Monastery. Although interview data on this subject was difficult to collect, there was an indication that tenant farmers are less inclined to develop fields that they do not own. Further research may suggest that this also plays a role in the persistence of Stongde's field structures.

⁶⁾ There is still a reservoir in operation below the neighbouring settlement of Kumi that technically feeds the southern end of Stongde on the rare occasion that Kumi has sufficient water for irrigation.

water share) was not divided, seldom sold or traded but inherited by the eldest son (or daughter in the absence of sons) of a household together with the household's main house (*khang pa* or *khang chen*), which thus functions as a stable and continuous institution within the village⁷⁾ (DOLLFUS 1989; KAPLANIAN 2008). **Subsidiary and sometimes temporary minor houses** (*khang chung*) are associated to the main house. In the current context of socio-economic changes, many new houses have been constructed – most of them *khang chung* households that are in a way representative of the changing life of Zangskaris. Due to shifting marriage patterns (to monogamous matrimonies), off-farm income and less necessity of agricultural production as well as changing lifestyle preferences, new houses split and form separate, mainly *khang chung*, households. Legally both male and female siblings are entitled to a share of the farming estate, yet few women claim their entitlement, and even brothers continue to notice the residue of primogeniture as the eldest can usually expect to inherit the main ancestral house (*khang pa*) along with the most productive land and irrigation share⁸⁾.

Estate division does not necessarily impact on the field structures as fields are not physically partitioned. Whilst the ownership of a field may be divided between several households, the original field shape is left unchanged to preserve existing irrigation channels and ensure that the maximum area is cropped. The repeated division of farm estates and water shares over generations does however raise questions of long-term viability. Stongde has yet to achieve the acute situation experienced in Padum where a majority Muslim population – who traditionally have always divided their land between siblings – has promoted the creation of ever-decreasing agricultural plot sizes. Farmers in Stongde are well aware of the problems associated with estate division, especially as their ability to compensate through agricultural expansion is extremely limited.

⁷⁾ Like most Zangskari villages, Stongde is entirely Buddhist. In Muslim settlements, the rules of inheritance apply an equal division of farming estates between siblings (such as practiced by Padum's Muslim majority).

⁸⁾ State Legislation outlawing primogeniture was passed in the early 1940s and although slow to be enforced, the change in practice has been applied to the last two generations of Zangskaris.

4.2 Agricultural trends

While field structures show a high level of persistence, a comparison of the cropping pattern between 1980 and 2008 discloses relevant changes (Fig. 3a and Fig. 3b). Above all, a trend towards diversification is significant. The most commonly cultivated crops in Stongde are the staples barley and wheat, which are grown in different local, adopted varieties (see OSMASTON 1994, 152–160). These food grains are the base for most Ladakhi dishes and barley especially has both a cultural and religious significance, not to mention its fundamental role in the brewing of *chang*⁹⁾ (RIPLEY 1995). As wheat requires a longer ripening period, and is thus more risk-prone to harvest failure than barley, the latter is increasingly favoured for successful yields during the short growing period between early May and mid September. In addition, the ready availability of fine wheat flour (*atta*) from both the bazaar and the subsidised government stores (see 3.4), has facilitated this preference for barley production. Barley and, to a lesser extent, wheat continue to be rotated with peas, which are appreciated for their positive effect on soil nitrogen as well as for their taste and food protein content when added to parched barley flour (*tsampa*). The share of peas cropped in Stongde has been relatively constant over the past decades (approximately 20%), while the total share of grain has reduced from 76.4% to 53.0% (Tab. 1). Besides grain and (local) peas, mustard, lentils and new varieties of (“green”) peas are increasingly cultivated.

Mustard in Zangskar was traditionally used for oil lamps, women's hair care and as cooking oil. Yet with the availability of imported edible oils and kerosene in the local market, Stongde farmers had stopped its cultivation by 1980. Due to the introduction of oil pressing machines that reduce the burden of labour intensive oil extraction, farmers have since returned to mustard cultivation. Despite having to make a two-day road journey, households in Stongde now pool their resources and transport their crop to Leh for pressing, a strong indication that farmers appreciate the quality of home-grown oil as opposed to that purchased from the market. With many Zangskaris introducing pulses into their diet, the Agricultural Department has also distributed subsidised lentil seed. However, unlike the suc-

⁹⁾ Interview data suggests that between 8 and 10 percent of the barley crop in Stongde is brewed into *chang*, an alcoholic beverage that tradition necessitates at every social occasion from weddings to the recitation of religious texts by the Buddhist laity.

cess of many kitchen garden species, lentils planted in Stongde seldom ripen in the short growing season and are frequently harvested as a fodder crop.

In 1980, vegetables for household consumption were grown in very small quantities. OSMASTON sketched few designated horticulture plots. Although first attempts to introduce a wider variety of vegetables to Zangskar were made at the time of his study, only radish, potato and cabbage were cultivated in the region. Today, horticulture has become much more relevant to Zangskaris. Most households have a kitchen garden and sometimes assign fields or plot shares to the cultivation of potatoes and other vegetables. Besides the area used for horticulture, the variety of vegetables grown in Stongde has increased to include carrots, spinach, turnip, lettuce and cauliflower.

A further change depicted by the bitemporal mapping is a trend towards tree plantations. Willow (*Salix* spp.) and poplar (*Populus* spp.) are important sources of wood and fodder. Besides willow, which is harvested as required from the far side of the Stongde La, there are also established private plantations of poplar and newly planted government plantations of willow situated on less productive, marginal ground to the north and east of the village. These plots are simultaneously used as grassland for fodder production, especially before the trees have matured. Such plot utilization is typical before putting the area under cultivation of more demanding crops.

In terms of agriculture, the Zangskar region has generally been considered backward and unproductive (SINGH 1992; KAUL 1998; KAUL and KAUL 2004), an inaccurate view that until recently was shared by the responsible government authority in Padum. However, since 2005 the Agriculture Department has been staffed by Zangskari graduates who have an appreciation for and understanding of local agricultural expertise. With an estimated one million Indian Rupees spent annually on importing vegetables and meat from Kashmir, a concerted effort is now being made to “modernise” the agricultural sector and increase productivity levels in Zangskar¹⁰. This longer-term move to a greater self-sufficiency relies in the short-term on subsidised seeds, chemical fertilizers, pesticides and agricultural machinery such as threshers, tractors and water pumps¹¹. Some households have extended

their cultivation by using greenhouses, which are likewise promoted through government subsidies as the Agriculture Department is keen to promote cash cropping. Although the market is still in its infancy and most of the vegetables offered in the marketplace of Padum are still imported by road, there are increasing opportunities to sell vegetables, e.g., to meet the demands of tourists and workers during the summer season. The selling of local production surplus is a welcome additional income for Zangskari households (Fig. 4). In addition to specific agricultural and horticultural initiatives, watershed development is being encouraged with a view to improving and rekindling the ownership and maintenance of community assets. Under the latest *Hariyali* (“Greening”) Watershed Development Programme guidelines, Zangskaris have largely chosen to focus on improving their water security by maintaining and “modernising” existing irrigation channels and harvesting new, reliable sources of irrigation water¹².

The diversification of agricultural production witnessed in Stongde, which is fostered by government initiatives, represents a typical trend for the entire region of Zangskar, with the possible exception of Padum where social and religious factors combined with the proximity of imported produce in the bazaar have created a unique set of agricultural and horticultural priorities.

4.3 Reconfiguration of work and livelihoods

Economic and social developments in Zangskar now provide a number of alternatives to working the ancestral farm estate. It is however the pursuit of alternative livelihoods that has impacted heav-

ing seeds to Zangskari farmers: carrot, radish, lettuce, cabbage, cauliflower, tomato, onion, kale, kohlrabi. Hybrid vegetables are supplied at 100% subsidy, open pollinated vegetables at 50% subsidy. Seedlings propagated in Kargil and Zangskar are also distributed at 50% subsidy. Fertilizer subsidy was phased out in 1998 although the government continues to cover transportation costs. Most agricultural machinery is available at 50% subsidy.

¹² As a result of the growing cash economy, and the availability of paid labour through various Rural Development initiatives, a number of settlements in Central Zangskar have observed a decline in willingness to participate in communal tasks without sufficient remuneration. Despite being fundamental to agricultural success, the maintenance of irrigation channels has been neglected in many villages and the Watershed Development Programme has now been implemented to reverse this trend (see MANKELOW 2003).

¹⁰ The estimated cost of importing fresh foodstuffs was obtained from Department of Agriculture.

¹¹ The Department of Agriculture distributes the follow-

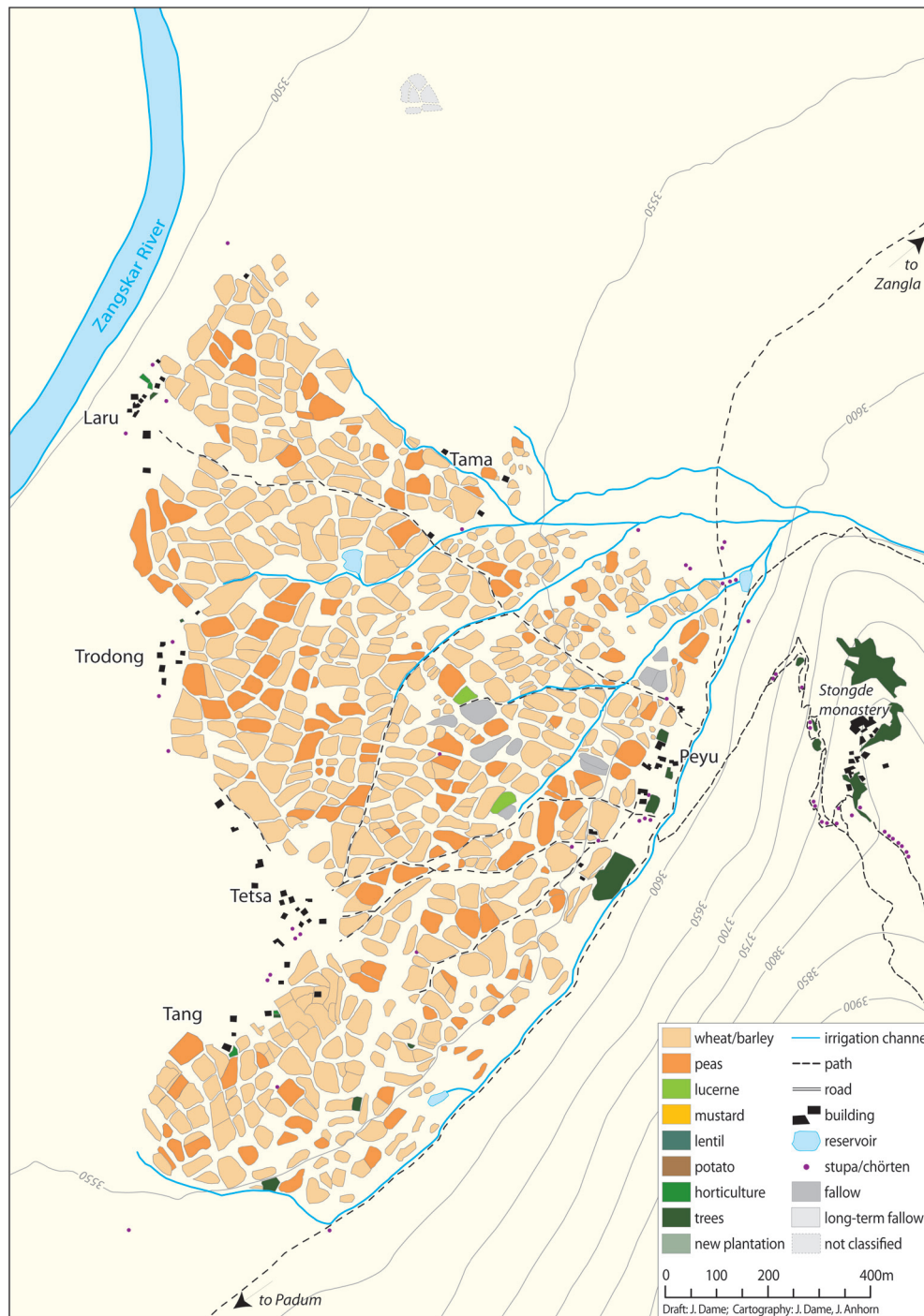


Fig. 3a: Stongde: Settlement and land-use in 1980 (Sources: OSMASTON 1994, Quickbird 27/09/2003, SRTM-3)

ily on the region's agricultural workforce. Interview data confirmed that many households are plagued by labour shortages as a result of schooling, migration to urban centres and employment opportunities that centre on the tourist industry, government ad-

ministration, teaching and the Indian Army. Labour shortages are also complicated by the preference for monogamous marriage, a practice that leads to smaller households and thus further fragments the agricultural workforce.

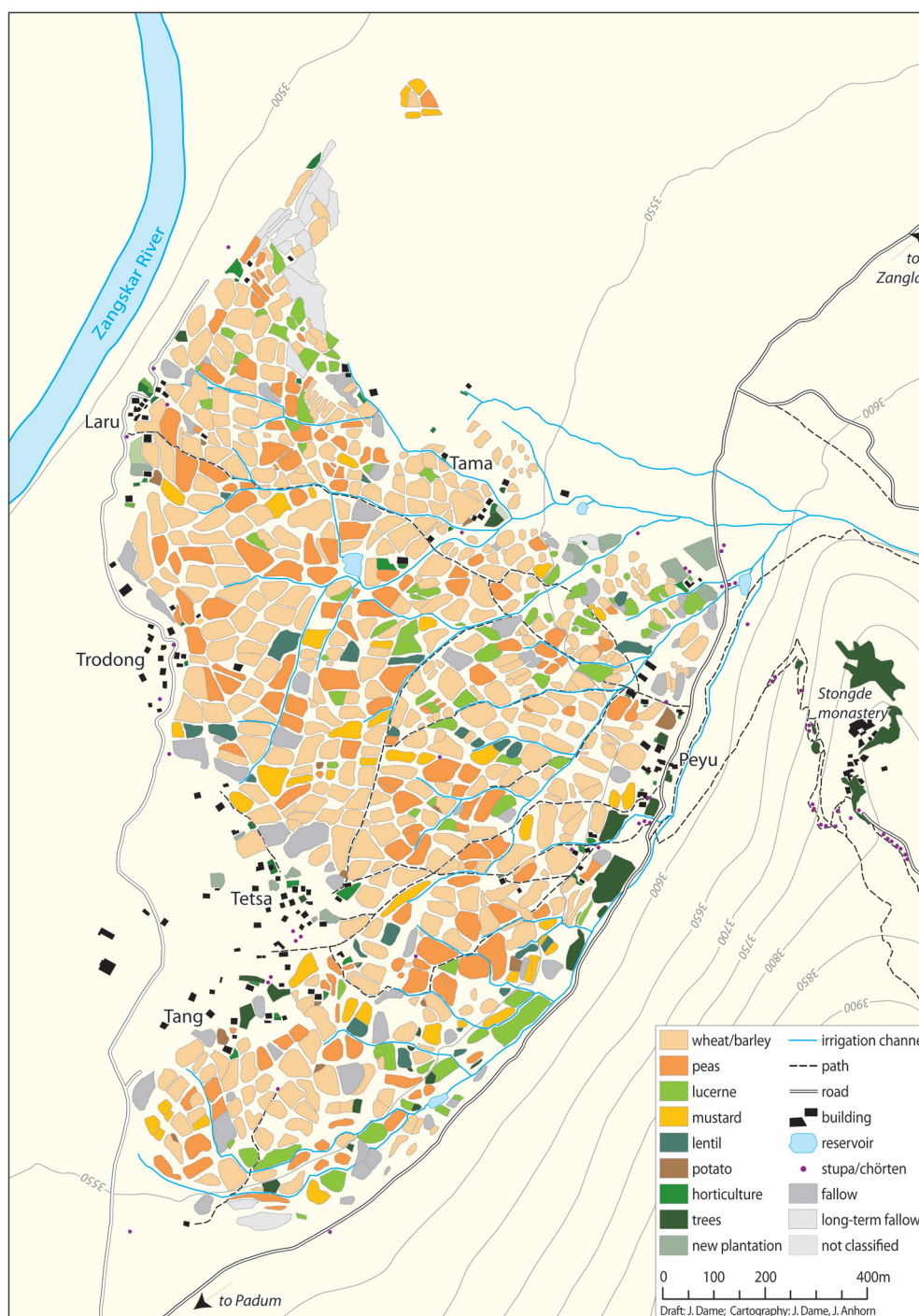


Fig. 3b: Stongde: Settlement and land-use in 2008 (Sources: own fieldwork 2008, Quickbird 27/09/2003, SRTM-3)

Traditionally, a number of labour-intensive agricultural tasks, such as transporting night soil and stable manure to the fields, maintaining irrigation channels, ploughing, harvesting and threshing have been carried out on a cooperative basis, sharing the work-

force and animals of several households. Known as *pay* in Zangskar, or *bes* in the Indus Valley (ASHTON 2001), these reciprocal work agreements are generally in decline across Ladakh. Admittedly, in Stongde, *khang chung* households from the same family still

Tab. 1: Area under cultivation in 1980 and 2008

	1980	2008*	1980	2008*
	area (ha)		crop share (%)	
barley/wheat	49.87	39.65	76.39	53.00
peas	13.35	14.75	20.44	19.72
lucerne	0.22	5.59	0.33	7.47
lentil	--	1.62	--	2.16
mustard	--	3.64	--	4.86
horticulture	0.06	0.50	0.09	0.67
potatoes	--	0.40	--	0.54
fallow	1.05	5.77	1.61	7.71
trees/plantations	0.74	2.90	1.14	3.88

* Outlier fields and long-term fallow plots have not been included in the calculations (Source: own calculations)

pool their resources for the crucial periods of ploughing and harvest, but in many cases even this is no longer sufficient to provide the required workforce. Moreover, a number of farmers in Stongde identified a growing reluctance to work for other households without financial remuneration. Traditional labour exchange in Stongde is now being re-evaluated in the context of wage labour and the cash-economy.

Addressing this deficit in the agricultural workforce, many farmers across Central Zangskar have resorted to employing Nepali, Bihari or even Zangskari labourers to make up the shortfall. Although additional workers are usually only required for the harvest of peas and cereal crops, it is now common for a household to budget upwards of 10,000 Indian Rupees a year for agricultural labour. Stongde is on the cusp of this labour force reorganisation; a number of interviewees stated that old labour exchange agreements had only recently been replaced with a reliance on employed labour. There is also still a nucleus of households with limited sources of cash income that continue to share the burden of agriculturally intensive periods with traditional reciprocal labour agreements.

Yet, the workforce deficit is only part of a much more complex issue, as Zangskaris are increasingly faced with a growing number of demands on their time. As the labour-intensive agricultural organisation clashes with 21st Century India, farmers in Stongde are searching for ways to balance their agricultural productivity with the opportunities and requirements of regional social and economic development. To achieve this balance, many farmers have turned to mechanisation and manufactured fer-

tilizers; practices that are normally employed to increase productivity. With little prospect of overcoming environmental constraints limiting agricultural production, Stongde's households, like many across Central Zangskar, are instead employing the time-saving advantages of agricultural modernisation to maintain productivity whilst pursuing government employment, schooling and lucrative entrepreneurial activities. A day's ploughing using *dzjo* or yak, can now be achieved with a tractor in one hour, whilst a mechanical thresher can reduce two weeks of work at the threshing circle to a single afternoon. Likewise, applying granular fertilizer from bags is quicker than digging out, transporting and spreading night soil and stable manure. The savings on time and effort are significant and interviewees in Stongde overwhelmingly indicated their preference for easier and quicker farming practices. Yet access to agricultural innovation is limited to households with sufficient income to afford such activities. Off-farm employment is rarely pursued to specifically invest in agricultural improvement. Indeed, for a growing number of households, the cost of covering peak periods of agricultural activity with hired machinery and labour now makes up a comparatively low percentage of their income. At the same time, households with lower off-farm incomes are excluded from these possibilities and thus forced to cope with a higher burden by undertaking a greater proportion of work themselves.

By juggling differing labour and time requirements with desired levels of agricultural production, Stongde's households exhibit a synthesis of established and new farming practices. In addition, a recurring theme in interview data suggests a com-

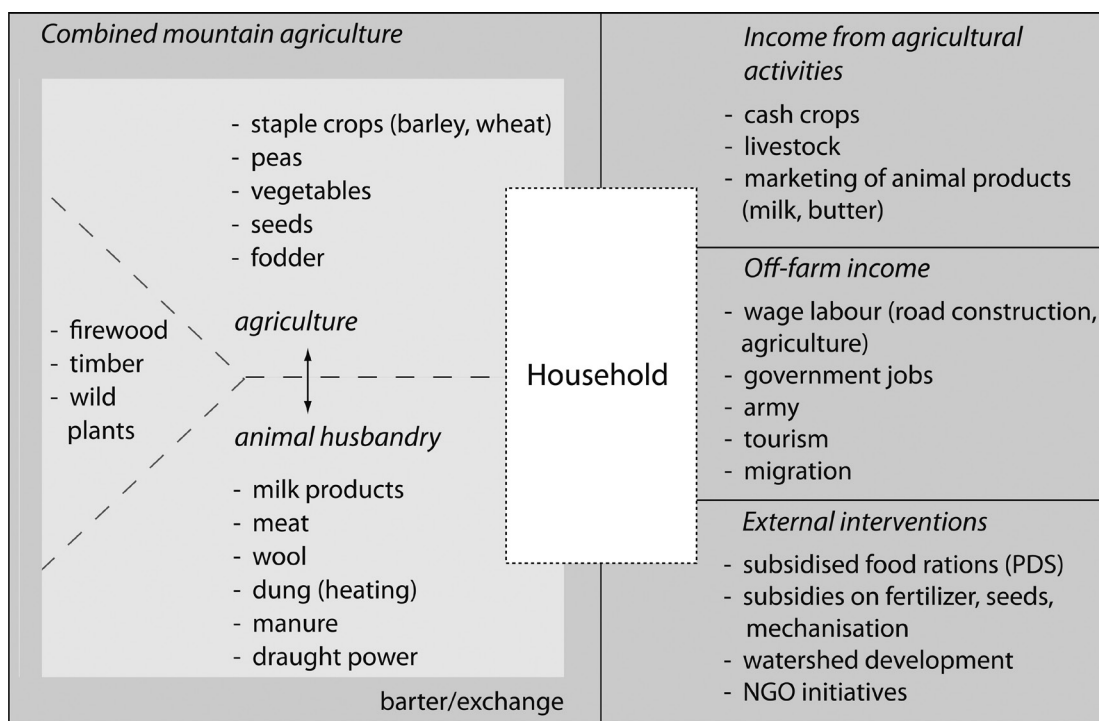


Fig. 4: Economy of a Zangskari household

petitiveness between households that is also motivating agricultural change. Whilst the Agriculture Department is promoting uptake with incentives such as subsidised machinery, manufactured fertilizer application and cash cropping, at the village level, a proportion of change is being encouraged simply through peer pressure. This was pointedly illustrated by farmers ploughing with animals adjacent to fields being worked by a hired tractor and plough¹³⁾. Those using the traditional draught alternative felt an enormous pressure to “modernise” and shed the associated social stigma.

¹³⁾ Few Zangskarits can afford to purchase tractors, even at 50% subsidy. Instead about a dozen wealthy entrepreneurial individuals operate Zangskar’s small tractor ‘fleet’. Tractors with a driver are hired out by the hour and are usually employed for autumn ploughing; a practice that breaks up a field’s surface after it has been hardened by repeated irrigation and evaporation. Many of Stongde’s farmers continue to use draught animals for the spring plough as careful use of the plough is required to prepare the fields for flood irrigation. Even those that use tractor-drawn ploughs have to use traditional ploughing techniques to go over the fields again and create the necessary channels. It is also important to recognize that the use of tractors is severely limited in Zangskar. Fields are often too small to make using a tractor financially viable and a combination of topography and irrigation channels renders the majority of Zangskar’s fields completely inaccessible to modern farm machinery.

Stongde’s farmers continue to rely heavily upon their agricultural production. Yet, in terms of basic survival, the dependency on this production has largely been removed along with the risk and uncertainty inherent to subsistence agriculture. Any shortfall in agricultural production, whether intentional or as a result of environmental variables, is now offset through a combination of subsidised imports, Zangskar’s cash economy and, when required, government relief rations¹⁴⁾. Subsidised rations of staple foods and kerosene are distributed through the Indian Public Distribution System, which is considered a major instrument of the national government’s economic policy (MOOIJ 1999; LANDY 2009). Ladakh benefits from a nationwide (re)distribution network that ensures the import of foodstuff from the Indian lowland and the distribution of subsidized commodities to accredited recipients. Import figures from the Consumer Affairs and Public Distribution Office, which manages Zangskar’s network of 21 so-called ration stores, demonstrate the government’s continued support for the region; wheat flour, rice, sugar and kerosene imports have all increased since 2000 (Tab. 2). An estimate from Zangskar’s subdivi-

¹⁴⁾ Recent natural events include drought and the destruction of crops by locusts. In 2006, the government distributed 70,000 kg of rice in response to the locust devastation.

sional magistrate suggests that households in Central Zangskar cultivate 60% of their own food and make up the remaining 40% with purchases from ration stores, private vendors in Padum's bazaar and, to a lesser extent, from other Zangskari households.

Historically, agricultural shortfall forced those affected to borrow from wealthier households or monasteries, often at exorbitant interest rates. The relatively recent arrival of subsidised foods and the cash economy has been welcomed as an alternative to the recourse of borrowing. However, echoes of a time when food security was not assured still remain. Farmers in Stongde continue to value independence, self-sufficiency and the ability to productively work the ancestral estate; a failed harvest is still considered to be a very serious issue. Many of Stongde's elders are cautious of being overly dependent on imported foods. Even with careful stockpiling for Zangskar's long winter, there is often a shortage of goods in the spring before the road to Kargil is cleared of snow. Many Zangskaris also recall the shortage of fruit and vegetables resulting from the disruption to the regional road infrastructure during the 1999 Kargil War.

Tab. 2: PDS import figures for Zangskar, 2000 and 2006

	2000	2006
rice (in quintals*)	4,331	4,800
wheat flour (in quintals)	4,915	7,150
sugar (in quintals)	1,099	1,330
kerosene (in liters)	246,000	335,360

* 1 quintal = 100 kg (Source: Consumer Affairs and Public Distribution Office, Padum)

5 Conclusion

Field structures in the Zangskari village of Stongde show a high continuity over the past three decades. A set of environmental, political and social factors has fostered the persistence of field plots, such as the limited availability of irrigation water, existing rules of inheritance, the power of *khang pa* households and a lack of desire or necessity to expand the cultivated areas. However, the repeat survey between 1980 and 2008 depicted a diversification of the cropping pattern and recent agricultural trends. Households have increased vegetable production, not only for personal use, but also as a cash crop. Yet the local context and demand for vegetables is not comparable with the success of cash cropping in the Indus valley. In Zangskar, vegetable production is still largely limited

to kitchen gardens and has not reached a scale where-by hired labour is required.

Rural livelihoods in Stongde, like those across much of Central Zangskar, are being modified by a number of internal and external drivers. Interventions such as the Public Distribution System or agricultural subsidies have a strong impact on household strategies. Since the introduction of subsidised food ration distribution in Zangskar, the share of cultivated food grains has diminished with the exception of the culturally significant barley crop. Households are supported in "modernizing" their agricultural practices. At the same time, increased off-farm employment opportunities and labour shortages lead to the adoption of mechanisation and labour reorganisation by those who can afford such investments.

Households are now a nexus of traditional agricultural values, rural development initiatives, government policies, new agricultural practices and ideas and aspirations nurtured by a flourishing cash economy. A growing inequality between Stongde's agrarian estates is promoting individual practice and experimentation as households integrate their desired levels of productivity with the pursuit of wider social and economic concerns. As in other rural areas of the global South, non-agricultural income opportunities in Zangskar are becoming increasingly important. Once the foundation of the regional economy and the primary concern of every household, agriculture in villages like Stongde is no longer fundamental to survival and livelihoods are being reconfigured accordingly. Until now, Zangskari households have not yet fully dissolved their ties to farming. However, future challenges might arise from new intervention schemes, market connectivity, cultural re-evaluations of food and improved access to Leh once the new link road – currently under construction – is completed.

Despite variability of the characteristics and dynamics of change, the current agrarian trends depicted in Zangskar are – in general – similar to rural settlements in Central Ladakh. Trends such as livelihood diversification, an increasing level of market integration and external development interventions, are also exhibited in adjacent mountain regions. However, on a local scale, significant variations exist and these in turn are shaped by the specific historical and political context. Our research findings from Zangskar have illustrated the importance of national policies in a borderland of geopolitical interest. Moreover, development interventions have been shown to manifest in unique configurations in response to particular local settings. Place-based actors modify their strategies not only based on external processes but also on internal

choices, including preferences and cultural evaluations. It is this interplay that drives socio-economic change in the communities concerned and therefore needs to form an integral part of an in-depth analysis of mountain livelihoods.

Acknowledgements

The field survey of 2008 was generously supported by the German Research Foundation (Deutsche Forschungsgemeinschaft, DFG). We are indebted and very grateful to Anna and Amiel Osmaston for the provision of Henry Osmaston's original photographs. Special thanks go to Prof. Dr. M. Nüsser (Heidelberg) for valuable comments. We would like to express our gratitude to the people of Stongde. We especially appreciate the help of Dorje Gyalpo (Padum). We also thank Johannes Anhorn, André Borchers and Nils Harm (Heidelberg) for their contributions to the study.

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