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Sustainability of Small Scale Farming in a Mountain Region: Case Study of the Khaling Rai Population of the Solukhumbu, Nepal

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Abstract

The Khaling Rai live in a remote area of the mountain region of Nepal. Subsistence farming is central to their livelihood strategy, the sustainability of which was examined in this study. The sustainable livelihood approach was identified as a suitable theoretical framework to analyse the assets of the Khaling Rai. A baseline study was conducted using indicators to assess the outcome of the livelihood strategies under the three pillars of sustainability – economic, social and environmental. Relationships between key factors were analysed. The outcome showed that farming fulfils their basic need of food security, with self-sufficiency in terms of seeds, organic fertilisers and tools. Agriculture is almost totally non-monitized: crops are grown mainly for household consumption. However, the crux faced by the Khaling Rai community is the need to develop high value cash crops in order to improve their livelihoods while at the same time maintaining food security. Institutional support in this regard was found to be lacking. At the same time there is declining soil fertility and an expanding population, which results in smaller land holdings. The capacity to absorb risk is inhibited by the small size of the resource base and access only to small local markets. A two-pronged approach is recommended. Firstly, the formation of agricultural cooperative associations in the area. Secondly, through them the selection of key personnel to be put forward for training in the adoption of improved low-cost technologies for staple crops and in the introduction of appropriate new cash crops.

Introduction

A study was undertaken to investigate the relationships between the human, natural, physical, financial and social assets of the Khaling Rai population of the Solukhumbu district of Nepal and their livelihood strategies. The Khaling Rai are a small tribal group with a unique culture and language who depend on subsistence farming and cope with the constraints of remoteness, marginality and fragility so characteristic of mountain communities in the global south. They practice cropping, animal husbandry, horticulture and forestry. This is the principal occupation and source of sustenance for the majority of such mountain dwellers (Jodha, 1997). Thus the characteristics of the Khaling Rai render them an appropriate subject for sustainable livelihood research with a mountain perspective.

The objective of the study was to determine the key factors that enhance household capabilities and assets towards livelihood sustainability. Small-scale

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farming, as their main livelihood strategy, was central. The study examined how livelihood sustainability is modified by the accelerating process of change manifested by population growth, deteriorating natural environment, migration and the development of external linkages. While temporary migration (transhumance and seasonal porter work) has always been a livelihood strategy for mountain people, permanent migration has become a growing phenomenon of mountain regions (Ives, 2004).

The significance of the study is highlighted by the following: no research was ever carried out to investigate the livelihoods of the Khaling Rai; the study contributes to the body of livelihood analysis and in particular to the body of research on mountain livelihoods dependant primarily on small-scale farming. Given the active involvement of members of the Khaling community, it represents a bottom-up as opposed to a top-down approach, and as such the issues and problems identified are those raised by the Khaling community themselves, which allows for more effective, targeted development interventions. While the overall study was wide-ranging, including considerations of culture, education, health and migration, the present paper focuses on a key central aspect – the small scale farming practices of the Khaling Rai. These are presented, analysed and discussed and conclusions are drawn – but first an outline is given of the theoretical framework and the methods used.

Theoretical Framework

The impact of development interventions in mountain areas, the complexity of rural and mountain poverty, the emergence of a multifaceted development response at macro and household level, and the use of the sustainable livelihood approach were all key considerations. For sustainable mountain development Rieder and Wyder (1997) elaborated on each of the three components – ecology, economy and social – in the Rio declaration of 1992. Links between poverty, environment and agricultural growth are governed by complex interactions involving politics, institutions and technologies. Innovative approaches are necessary from local and global sources to assist rural economies while at the same time protecting the environment (Ellis-Jones, 1999). However, mountains still remain marginalised in the development agenda despite being home to 12% of the world's population (Schild and Sharma, 2011). At the heart of the debate on environment and poverty is the issue of how rural households and communities utilise resources. They are the main stakeholders and it is their decisions in pursuit of survival, food and livelihood security that form a key determinant of the links between poverty, sustainability and growth (Reardon and Vosti, 1995). As Jodha (1992, 2000) points out, excessive dependence on external resources (fertilisers, pesticides, subsidies) can happen while at the same time traditional adaptation techniques are ignored. Agricultural measures that are short-term, product-centred as opposed to resource-centred, often focus on food self-sufficiency while ignoring the carrying capacity of the environment. Population pressure on existing land and the incorporation of more marginal land including steep slopes are major factors causing severe environmental pressure according to Upadhaya (2000). A different viewpoint is maintained by Ives (2004) who states that mass wasting is a natural consequence of a landscape that has been shaped by fluvial erosion and landslides over time and that the extensive terracing by farmers has slowed rather than augmented the rate of erosion and denudation.

A perspective embodied by the sustainable livelihood approach gained increased currency in recent years in organisations such as DFID, the World Bank, FAO, Oxfam and CARE (Hussein, 2002). The concepts of the sustainable livelihood approach are based on insights drawn by Chambers and Conway (1992) from previous research on rural livelihoods, household vulnerability, food insecurity and agro-ecological sustainability. They argued for the need to create livelihood strategies that maintained the natural resource base while being resistant to external shocks and stresses. According to Carney (2003), the underlying ethos of the approach is characterised as a set of principles for action: people-centred, participatory and responsive, multi-level, partnership-based, sustainable and dynamic. Scoones (1998) identifies four different types of 'capital' – natural, economic or financial, human and social. Ellis (2000) emphasises the importance of social relations

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and kinship networks (as well as the mediating role of institutions) in facilitating access to assets. Farrington (2001) notes considerable overlap and some differences between the sustainable livelihood approach and the rights based approach. According to Carney (2003), the sustainable livelihood approach is a more practical approach being concerned with what people themselves aspire to. Some perceived shortcomings in the sustainable livelihood approach and framework have led development professionals and agencies to adapt the framework to address these issues (Hussein, 2002). These shortcomings are issues of power, politics and empowerment, which are not directly addressed by the framework (Carney, 2003). This may reflect the non-ideological stance of the livelihood approach (De Haan and Zoomers, 2005).

Drawing on the work of Chambers and Conway (1992), Jodha (1992, 1997, 2000), Scoones (1998) and Ellis (2000), a modified framework for sustainable mountain livelihoods was developed for this study and used as a research tool to facilitate data collection and analysis. The framework is governed by Jodha's concept of mountain specificities because the mountain perspective influences all aspects of mountain livelihoods. The asset categories that form the basis of the households' livelihood strategies in the model are those identified by Scoones (1998) and further elaborated on by Ellis (2000). These are human capital, natural capital, physical assets, financial capital and social capital. Social capital incorporates Bebbington's (1999) concept of access: that is the ability of mountain people to access the spheres of market, government and civil society. The sustainable livelihood approach examines the assets and livelihood strategies of the community at household level – the world of lived experience – and overcomes the limitations of measurements such as scaler or multidimensional-indexed basic needs measurements (Lindenberg, 2002). In this study the variables used to analyse the households' endowment of assets are as follows:

- Human assets: household labour, literacy and education, child mortality, household health and nutrition.
- Physical assets: housing, tools, water and sanitation, and access to basic infrastructure.
- Financial assets: income flows and stocks including savings, borrowings and livestock.
- Natural assets: land, forest and water.
- Social assets: kinship and beliefs, claims and reciprocity, membership of organisations and perception of access to government, market and civil society.

Materials and Methods

A survey was used as the main method to gather the above mentioned quantitative data about the assets that govern the livelihoods of the Khaling Rai. Using local enumerators, primary data was collected from a simple random cluster sample of 201 households from ten villages in the Khali valley in the Solukhumbu district of Nepal. Face to face interviews were conducted with all respondents and the response rate was 100%. The format of the questionnaire was designed using the above indicators based on the sustainable livelihood framework, and in order to have comparisons with a wider population, some questions followed the format of the Nepal Living Standards Survey, the methodology of which was developed by the World Bank. The structured questionnaire also allowed for analysis using SPSS and Excel. Prior to the interviews, which took place between December 2003 and January 2004, pilot testing was undertaken and the enumerators were trained. The qualitative aspect of the research was undertaken through discussions with key informants in Kathmandu and in the survey area and submissions from members of the Kirant Khaling Rai Upliftment Association in Kathmandu. Interviews were also held with government agencies, multilateral institutions and NGOs. Interviews included the Head of Mountain Farming Systems Division at ICIMOD and relevant officials at World Bank, UNDP, Ministry of Agriculture and Cooperatives, National Planning Commission, Centre for Environment and Agricultural Policy Research and Asia Network for Sustainable Agriculture and Bio-resources as shown in **Table 1**.

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Table 1. Interview partners between 2003 and 2004.

Type of actor	Interviewees (interviewed once or several times)
National level	1 representative from the Ministry of Agriculture and Cooperatives, 1 from the National Planning Commission,
Regional intergovernmental level	2 representatives from the International Centre for Integrated Mountain Development (ICIMOD).
NGOs	1 representative from the Centre for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED), 1 from the World Wildlife Fund (WWF), 1 from the Asia Network for Sustainable Agriculture and Bio resources (ANSAB). 1 from Swabalamban (Rural self-reliance development centre), 3 from United Missions Nepal.
Association	8 representatives from the Kirant Khaling Rai Upliftment Association
Survey area	2 Representatives from the District Development Committee (DDC), 2 from the Village Development Committee (VDC), 11 community leaders, 201 household heads.
Foreign cooperation Agencies	2 representatives from the World Bank, 1 representative from the United Nations Development Programme.

As the objectives of the study included investigating the relationships between the human, natural, physical, financial and social assets of the Khaling Rai, these relationships were tested using bivariate and multivariate analysis to ascertain the key factors that determine household security or vulnerability. Cross tabulations were performed to examine relationships between binary variables and Chi-square was used to test how significant were differences in education, gender and landholding in terms of household assets and livelihood outcomes. Finally, multiple linear regression was conducted to test conceptual models that predict household total income, household cash income and crop output.

The ten villages surveyed in the Khali valley (86º 40'E, 27º 35' N) lie along the west side of the Dudh Koshi Nadi, i.e., in the heartland of Khaling Rai culture and habitation, and concentrated on the districts of Kaku, Basa and Takasindu. The area is a day's walk from the nearest airfield at Paphlu and a similar distance from the recently completed road head at Salleri – capital of the district of Solukhumbu in the eastern mountain region of Nepal. The area lies 52 km SSW approximately from the Summit of Mount Everest.

Elevation and orientation are important factors in determining local climate; the range in altitude is from 1000 m to 3000 m. Altitudes from 1000 m to 2000 m are classified as warm temperate and humid with mean annual air temperatures of 15º C – 20º C. The higher slopes are classified as cool temperate and perhumid (climate with humidity index of +100 and above). Annual rainfall is estimated at 2300 mm based on measures for the nearest district weather station at Jiri with 78% of precipitation falling during the monsoon – June to September (Government of Nepal: Central Bureau

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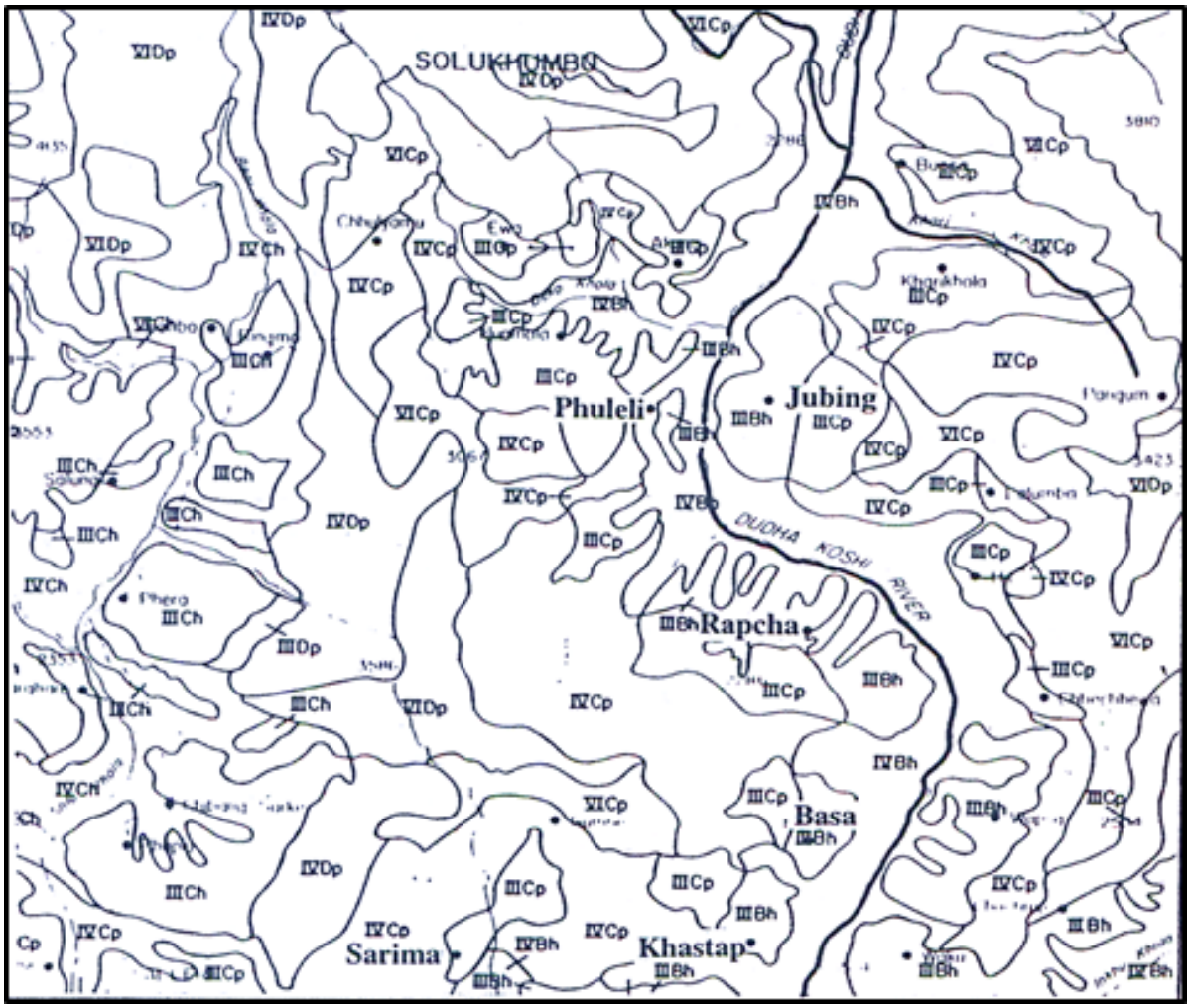
Figure 1. Land classification of the survey area



Note: Class III Bh=Slopes 5º-30º, warm temperature, humid.
Class III Cp=Slopes 5º-30º, cool temperate, perhumid.
Class IV Cp=Steep slopes, cool temperate, perhumid.
Class IV Dp=Steep slopes alpine, perhumid.

Source: Land Resource Mapping Project (1986). *Land Utilisation Report*. Kathmandu: HMG/Nepal, Topographical Survey Department.

of Statistics, 2012). The climate in the region is suitable for growing winter and summer crops. Land is left fallow during the colder months of December and January.

Under most conventional classifications, the land farmed by the respondent households would not be classified as arable but because of the management input in the form of terracing, the Land Resource Mapping Project (1986) defined this land type as arable. The respondent households farm on small scattered terraced plots the height and depth of which are governed by the steepness of the slope. Depth of terraces ranged between 3 and 20m and their height fluctuated from 1 to 3m. Landslides in the area are small and local but frequent.

Results and Discussion

Land Holdings

All of the 201 respondent households own their land. This is the norm for the mountain ecological region of Nepal where 98% of agricultural households own land. The average number of plots per

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Photo credit: Valerie Burris

Picture 1. Village of Phuleli in survey area.

household is 12 but the range varies from four to 26 plots per household. However, only 41% of respondents were ableto give details of their land holdings in ropani (system of land measurement in Nepal – one ha = 19.7 ropani). For these, the average holding per respondent was 50.5 ropani or 2.6 ha, twice that for the mountain ecological region of Nepal, and the average number of plots per ha was five, which is more typical of the region. An estimated Gini coefficient of 0.33 for respondent households, compared with that for Nepal overall of 0.54, reflects a relatively more equal distribution of land. However the plots are fragmented and discontinuous. The location of the furthest plots is often quite far from the dwelling house, an average of up to two hours walk away.

The majority of respondent households, when asked about soil loss, soil fertility and productivity, reported negative changes compared to five years ago. The overwhelming majority of respondent households –93%- used organic fertilizer only: dung collected from their animals. Chemical fertilizers as well as dung were used by the remaining 7%. With one exception, all the terraced plots of the respondent households are rain-fed. Irrigation is regarded as not appropriate because of the vulnerability of the land to landslips during the monsoon season. The tools of the respondent households are simple and fashioned locally by Kami (blacksmiths) who are Dalits. Ploughs are wooden with a steel tip and usually drawn by two oxen. While tool technology is simple, tools are easily and locally replaceable.

Livestock

All respondent households possessed some livestock, the average value of which was US$521 – compared with an estimated average of US$756 for households in the mountain ecological zone of Nepal as shown in **Table 2**. The value of livestock was based on local prices in the research area and an equal unit price was applied to stock numbers in the mountain ecological zone. These lower values reflect lower livestock numbers. Excepting cattle, livestock holdings are lower than those of the overall mountain ecological zone. The pressure on the physical environment means that increasing livestock numbers above what is necessary for subsistence farming is not an option. The numbers of larger livestock (cattle, buffalo) per household in the mountain ecological zone were checked against those listed in the first survey by the Nepal Living Standards Survey conducted in 1996. Average numbers per household remained generally stable for the mountain ecological zone.

Large ruminants (cattle, buffalo) play a vital role in the agricultural system of Nepal. They are the main sources of organic fertilizers, draught power and

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Table 2. Average number and value of livestock per respondent household compared with the mountain ecological zone of Nepal.

Livestock	Respondent Households N=169		Mountain Ecological Zone	
	Livestock Numbers	Livestock Value in US$	Livestock Numbers	Est. livestock Value in US$
Buffalo	0.9	115	2.1	266
Cattle	4.5	239	3.9	205
Goats	2.5	44	5.6	98
Pigs	0.9	102	1.4	157
Poultry	5.5	21	7.7	30
Total Value of Livestock in US$		521		756

Source: HMG/Nepal (2004), *Nepal Living Standards Survey 2003/04: volume 2*, Central Bureau of Statistics, HMG

Table 3. Per capita output levels for milk and meat for respondent households compared with per capita consumption levels in Nepal and targets for basic needs.

	Respondent households N=136	Nepal Consumption Level 1990	Basic Needs Level
Milk (kg per head)	49.0	46.4	57.8
Meat (kg per head)	4.1	9.4	14.4

Source: DFAMS (1990) cited by Joshi, 1992, 'The Role of Large Ruminants in 'Sustainable livestock production in the mountain agro-system of Nepal' *FAO Animal Production and Health Paper 105*. Rome, FAO

animal proteins. Beef is not consumed because of religious taboos: Nepal is a Hindu state, and the sale and consumption of beef is forbidden. Maintaining large ruminants is labour intensive: two thirds of respondent households spent three hours or more each day collecting fodder for livestock.

Transhumance is practiced and large ruminants go to higher pastures during the monsoon season supervised by a herd. Two-thirds of respondent households stated that they had access to common grazing lands; 18% stated that the grazing lands were too distant and access was limited, and 14% indicated no access. Access to grazing lands was reported by over 80% of respondents to be in decline. This is due to traditional Rai grazing lands increasingly being utilised by another ethnic group and the traditional practice of dividing land holdings equally between male inheritors thus increasing pressure on land usage. Milk and meat were produced at a level that falls short of basic needs level (**Table 3**). The production of meat per capita was less than half of that of 1990 consumption levels for Nepal. There was very little trade in livestock with just 6% of respondent households regularly selling livestock and poultry.

Crops

Because of the diversity of agro-ecological conditions, the respondent households grew a wide variety of crops. All grew the most important summer crops: millet, maize and potatoes, on dry outward sloping bari terraces. Winter crops were wheat and barley. Because of altitude most of the land was not suitable for the cultivation of rice, and just 40% of households cultivated rice at

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lower altitudes on inward sloping khet terraces designed to retain water. Buckwheat was regarded as an inferior crop. Vegetables were grown in the gardens of the dwelling houses and generally were for household consumption only. A minority of households cultivated pulses: soybeans and lentils.

To maximise output from the sparse agricultural holdings, a wide variety of cropping practices was followed. One strategy involved double cropping. An example is maize followed by winter wheat or barley. Another involved intricate intercropping: the growing of two or more crops on a single plot: potatoes with maize with secondary crops such as runner beans inter-planted amongst the maize and soybeans planted around the perimeters of the plots. Crop output per household varied significantly given the variation in holding size, orientation and location. **Table 4** gives the output of crops for 196 respondent households and the range of output between different households. The variation in household output is illustrated by the range of output in rice, which varies from 11 kg for the lowest household output to 537 kg for the highest.

Given that the staple diet of the respondents consists of cereals and potatoes, it appears that on average enough of these crops is produced to fulfil the dietary needs of the average respondent household (5.5 persons). The average household production of cereals and potatoes amounted to 1078 kg or 196 kg per person, which is in excess of the absolute minimum requirement of 180 kg of grain per person per year. This parameter was used in a study by Bohle and Adhikari (1998) cited by Ives (2004). This is the WHO-Standard, corresponding to 1650 calories per day. But clearly there were significant variations in output: for the lowest-producing 20% of households, output was less than half the average; for the highest-producing 14% of households output was more than 150% of the average.

The most valuable cereal crop was rice, commanding more than twice the price of millet and maize. The least valuable cereal crop was barley. Lentils are a valuable crop, but they cannot grow at high altitudes and are subject to depredations by monkeys and as such are grown by a limited number of households. Soybeans also command a relatively

Table 4. Total and average output of crops grown by respondent households in kg and pathi (n=196).

Crops	Total output Pathi	Conversion rate to kg	Total output in kg	Average household output in kg	Household output range in kg
Rice	2449	2.44	5977	30	11 - 537
Maize	15164	3.14	47615	243	17 - 942
Millet	15462	3.29	50868	260	18 - 1053
Winter wheat	7620	3.40	25908	132	14 - 816
Barley	3565	2.62	9339	48	13 - 157
Total grain	44260		139707	712	85 – 3099
Potatoes	21076	3.40(est.)	71658	366	27 – 2176
Vegetables	12852 (dharni)	2.40	30845	157	5 – 1440
Lentils	885	3.63	3213	16	1 – 1815
Soybeans	413	3.18	1313	7	6 - 191

Source: based on the research study

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high price. Prices vary according to season, rising in the spring. Potatoes are a cheap and plentiful crop.

It is recognised that the diversity of altitude, temperature and soil in hill and mountain regions may be conducive to the development of niche products (Jodha, 1992). Potential high-value crops for the mountains are apples, vegetables and potato seeds but require the expansion of agricultural infrastructure (roads, electricity and irrigation) and the development and dissemination of appropriate technical support and research. However capacity for change is conditioned by policies that grant farmers a certain degree of flexibility as opposed to fixed prescriptions (Aase et al., 2013).

One eighth of respondent households were engaged in what are niche activities for this area: principally small scale bee-keeping. Just three households undertook the related activity of fruit growing, three undertook to grow cardamom, one started growing ginger as a cash crop and one was considering growing tea. In discussions, the respondents recognised the need to introduce new cash crops but emphasised also the importance of enhancing output from existing staple crops: millet and maize. Policies prescribing changes in agricultural practices need to allow farmers some flexibility. 94% of respondent households used their own saved seeds for their main crops. Seed potatoes are bartered for. The area is considered too humid for the cultivation of seed potatoes. A very small minority used new improved seeds and pesticides.

Forest Resources

The availability of forest resources for fuel and fodder is a critical element of the respondent households' natural resource base. Perceived declines in this resource were reported in terms of forest resources, forest cover, and more time spent gathering firewood by 94 – 95% of households. Two thirds of households were involved in the management of forests through forest user groups.

Labour, Trade and Supports

Both husbands and wives worked ten hours per day in summer, seven in winter, with some work also undertaken by children in a majority of households. 89% of households also utilised outside labour. This came in two forms: the exchange of reciprocal labour between neighbouring households known as parma, and labour hired by the day with payment in kind: half a pathi (1.6 kg) of grain for five hours' work.

The respondent households traded locally at the haat bazaar (local market) in Sombare, the dorphu bazaar (weekly market) at Salleri or with neighbours. Some – just 20 households - made the long journey to sell produce at the weekly market in Namche Bazaar in Khumbu, where prices are higher. Bartering was the preferred option. Almost all of the barter trade was for seed potatoes. It is estimated that respondents sold less than 10% of their total grain crops for cash. There was no indication that there were sales in a high value crop such as lentils. The main marketing difficulties faced by the farmers were the distance from markets and low prices.

The negative mountain specificities of isolation and inaccessibility had hindered the spread of information about new farming technologies and lack of income prevented the farmers from availing of these new technologies. Yet technological improvements - adapted to mountain constraints and targeted to the needs of small scale farmers with limited financial means - can help to improve yields and contribute to poverty reduction (Wymann von Dach et al., 2006). Also rural institutions such as farmers' cooperatives have the capacity to improve mountain livelihoods through income generating activities despite infrastructural constraints (Burli et al., 2008). However, while such institutions are key actors in identifying income generating and niche opportunities, their sustainability is dependent on capacity strengthening by service providers such as extension workers. Capacity strengthening must address the multiple needs of such institutions ranging from collective decision making to finance management and market negotiations (Kotru et al., 2014), The lack of farm extension services in the research area contributed to the lack of knowledge of new technologies by the respondents. While Nepal's history of extension services goes back more than forty years, less than 4% of respondents ever had a visit from a junior technical assistant (JTA).

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Relationships Determining Livelihood Outcomes

When households were divided into three income categories, in a similar approach to Ellis (2000), those in the lowest income category had the lowest land holdings, their crop output was approximately half of the middle income category and one third of the upper income category.

There was strong positive correlation (p<01) between total household income and the output of staple crops, underlining the importance of subsistence agriculture to total income. Bivariate analysis showed that the relationship between farm size and variables such as crop output and value of livestock holdings was significant at the 1% level. Chi square analysis of relationships between a number of variables showed inter alia that household educational level is strongly related to agricultural assets such as output of staple crops (p<01) and livestock holdings (p<001) and to a lesser extent to land holdings in plots (p<05). Multiple linear regression analysis confirmed the dependence on subsistence agricultural output, but also the importance of external remittances from migrants to the respondent households.

Because of the importance of agriculture as a livelihood strategy, the relationships between output of staple crops and key independent variables were examined using regression analysis (**Table 5**). The key independent variables were found to be as follows: farm size; value of livestock; highest level of education in the household. Other variables representing physical and human capital were tested and not found to be significant in determining output of staple crops.

Bivariate analysis showed that that total income is strongly correlated not only with crop output but also with household education levels and livelihood strategies that result in households being in receipt of income from migration both past (army pensions) and present (emigrants' remittances). Linear regression indicated non-farm occupations as a further factor, but to a lesser degree.

There is a complementary relationship between crops and livestock holdings in the farming systems in hills and mountains (Yadov, 1992). Crops provide feed and bedding to the livestock and in return receive draught power and manure from livestock. Households strong in subsistence assets may be better able to educate household members thus enhancing household capabilities, which may feed back into agricultural practices. According to the World Bank (2001) there are powerful complementarities across assets and documented studies show linkages between household education levels and improved agricultural practices. The Chi-square analysis also indicated that household education levels had a more significant relationship with livelihood outcomes than either gender of household head or farm size. The research shows that respondent households strong in hu-

Table 5. Multiple linear regression: variables determining output of crops (n=195)

Variable	R2 cumulative	R2 Change	Coefficient B	Standardised coefficients Beta	Significance
Value of livestock	.227	.227	.008	.305	<.01
Farm size in ropani	.277	.050	6.19	.245	<.05
Highest education level in household	.321	0.44	43.97	.224	<.05

Source: based on the research study

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man capital – literacy and education – are positively and significantly correlated with endowment of other assets such as livestock holdings and farm output (**Table 5**). This indicates that access to one type of capital usually gives access to others - what Scoones (1998) describes as 'clustering' of assets.

Conclusion

Supplemented with qualitative information from interviews and discussion groups, the sustainable livelihood approach, examining the assets and livelihood strategies at household level, proved effective as the main method for gathering quantitative data about the livelihoods of an isolated population, providing inter alia a valuable baseline.

Small-scale farming fulfils a basic need of most of the respondent households, which is food security: three-quarters of them had enough food – essential given lack of food from outside owing to inaccessibility and lack of purchasing power. They are self-sufficient in terms of seeds, organic fertilizers and tools. They are caught, however, within a tightening vice grip of a growing population, smaller holdings and declining soil fertility and productivity. Their capacity to absorb risk is inhibited by the small size of their resource base and inaccessibility to markets. To meet the needs of a growing population, cultivation is extended onto ever-steeper slopes and forested lands resulting in environmental problems – reductions in forest cover and soil fertility.

There is a need to harness the niche opportunities afforded by the mountain environment. Some of the respondents recognise the need for farming innovation. In an increasingly monetized world, they need some more cash income from agriculture, their main activity. This cannot happen without institutional support from government and/or NGOs, the building of local capabilities, formal credit facilities, focused research, development and dissemination of appropriate technological packages – on post-harvest handling, processing, packaging and marketing – and the provision of infrastructure including roads, electricity and irrigation where appropriate as recommended by the 20 year Agricultural Perspective Plan (1995). The completion of the road to Salleri in recent years has opened access to the area and will allow enhanced market opportunities. Since the survey was conducted, a number of households in the Kaku area have successfully cultivated organic vegetables for sale at the market in Salleri.

Extension workers are the crucial links that facilitate the adoption of new technologies, whether based on existing production systems and/or new introduced crops. These should be compatible with the specificities of the mountain environment and the limited resources of the respondents and not lead to over-dependence on outside inputs (seeds, fertilizers, pesticides). Policies need to grant farmers a certain degree of flexibility to enhance their capacity to change.

A two-pronged approach is recommended. Firstly, the formation of agricultural cooperative associations in the area. Secondly, through them the selection of key personnel to be put forward for training in the adoption of improved low-cost technologies for staple crops and new cash crops (which could include extending the existing small-scale cultivation of cardamom and ginger as appropriate). A template for the formation of an agricultural co-operative for the respondent households is the Small Farmer Cooperative Ltd (SFCL). SFCLs are civil society organisations, which pool their joint resources to meet basic needs and defend their members' interests. They are member owned and controlled with an open membership towards poor farmers, for whom they are suitable because of the low transaction costs. The benefits would be considerable: access to seed capital, loan and savings products; also cooperation in the provision of veterinary and other services.

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Conflict of Interests

The author hereby declares that there is no conflict of interests.

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