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Medium-Size Project
National Soil Services Centre
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STUDY ON POVERTY-SUSTAINABLE LAND MANAGEMENT LINKAGES IN BHUTAN



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Acronyms, Abbreviations and Glossary

Acronyms

DNRM	Decentralized Natural Resources Management Project
EUSPS	Environmental and Urban Sector Support Programme
FGD	Focus Group Discussion
FYM	Farm Yard Manure
GEF	Global Environmental Facility
GNHC	Gross National Happiness Commission
HHs	Households
Masl	Meters above sea level
MoA	Ministry of Agriculture
MSP	Mainstreaming of Sustainable Land Management Project
NSSC	National Soil Services Centre
PPD	Policy and Planning Division
RNR	Renewable Natural Resources
SLM	Sustainable Land Management
SLMP	Sustainable Land Management Project
UNDP	United Nations Development Programme
WB	World Bank

Abbreviations

Nu.	Ngultrum (Bhutanese currency)
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Glossary

Chhuzhing	Wetland (mainly for paddy cultivation)
Chiog	Village or a cluster of villages
Chodrup	Capacity (wealth ranking)
Dzongkhag	District
Geog	A block in a District (consisting of several villages)
Gup	Elected Administrative Head of the Block
Kamzhing	Dryland
Tsamdo	Community Grazing Land
Tseri	Slash and Burn Cultivation
Tshogpa	An elected village representative

Cover page pictures

Picture on left hand side: Hedge Row Plantation undertaken at Kamjong *Chiog* with SLMP support

Picture on right hand side: *Chhuzhing* conversion undertaken at Tali *Chiog* with SLMP support

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Executive Summary

Introduction

The Medium Sized Project (MSP) on Building Capacity and Mainstreaming Sustainable Land Management Project funded by GEF through UNDP has the objective to strengthen institutional and community capacity for anticipating and managing land degradation in Bhutan while ensuring broad based political and participatory support for the process. The MSP was started since 2007, coordinated and managed by National Soil Services Centre (NSSC) under Ministry of Agriculture. Amongst other foreseen outputs of the project, one of the thematic studies for MSP is to better understand the causes and impacts of sustainable land management¹.

The MSP identified the need for a study to look at the linkage between Sustainable Land Management (SLM) and poverty including the relation between livelihoods of people and the sustainability of their land use. This study has the following objectives:

- 1) To analyze the relation between poverty - SLM vis-à-vis SLM - poverty and how this affects adoption of SLM practices by farmers;
- 2) To identify the main constraints for poor farmers to adopt SLM practices;
- 3) To assess to what extent the land use of poor households is sustainable in relation to households that are better off;
- 4) To develop recommendations how to overcome the main constraints for poor farmers in adopting SLM;
- 5) To define indicators of poverty –SLM linkages.

Approach and Methodology

The research involved data collection and analysis pertaining to possible linkages between poverty and land management with factors such as local village factors, rural household factors and constraints associated with SLM adoption and poverty, all of which influence income strategies and land management practices. Using the criteria to select *Geogs* from three regions in the country (west, central and east) and with *Chiogs* from areas within Decentralised Natural Resources Management Project (DNRM) *Geogs*, Sustainable Land Management Project (SLMP) pilot sites and MSP *Geogs*, 10 *Chiogs* were selected for survey. Design of survey tools using both qualitative as well as quantitative methods was undertaken to gather data from selected *Chiogs*. A total of 154 households were surveyed and an additional 100 farmers (10 in a group) were consulted through focus group discussion. Using the participatory method (Do-It-Yourself) with consultant as facilitator, a causal-effect analysis for the prioritized problems was undertaken to understand the causes and effects and to arrive at poverty-SLM linkages.

Findings

The typical livelihood system in Bhutan can be described as mixed mountain agriculture with subsistence farming in agriculture and livestock combined with off-farm activities for farmers to

¹ www.moa.gov.bt/nssc

generate additional cash income. Traditionally, SLM practices such as tethering, application of FYM, crop rotation, fallowing of land, mixed cropping, plantation of fodder trees have been most common. With government support, sustainable land management practices such as hedge row plantation, compost making, *Chhuzhing* conversion, irrigation maintenance, water source protection, community forestry plantation, development of pasture have been introduced and practiced in pilot sites.

Major cash income is obtained from vegetables, followed by other cash crops (citrus, areca nut, cardamom and ginger). The income from dairy products and remittances were the third major sources. More than half the households without self-sufficiency (61%) and slightly less than half from households with self-sufficiency (49%) have an average annual cash income of less than Nu.13,000 (non-food poverty line in Bhutan is Nu. 13,163.28 per person per year)² indicating that majority of farmers in general have very less cash income, though income is mainly agriculture dependent. Farmers spent most of their income on food items, which is particularly higher for poorer category.

Majority of the households in the villages had only 1 to 2 able farm-labours (between the ages of 16 to 60 years) for agricultural works, indicating the shortage of labourer for agriculture in rural areas. Drudgery and limited income opportunities within the *Chiogs* have led to migration of productive agricultural labour for off-farm activities to supplement income and household needs.

Family fragmentation compounded with constant soil erosion, landslides, flood and forest encroachment on steep slopes were main causes for decreasing land holdings. A substantial number of farmers from both the categories owned *Kamzhing* between 2.1 to 4 acres, while good percentages have land (*Chhuzhing* as well *Kamzhing*) less than 2 acres. The study revealed that small land holders face difficulty to adopt even short-term benefit SLM practices that demand compromising their land in addition to several other difficulties.

Amongst various physical assets, ownership of cattle has been a significant determinant of land management, as availability and increase in FYM could substitute the farmer's needs to purchase inorganic fertilizers. Majority of the households without self-sufficiency own 3 to 5 numbers of cattle (38%) which are comparatively lesser as compared to richer households.

There are few households that produced paddy which lasted for 12 months for their respective household (10% of richer and 12% of poorer). Maize is a top most important livelihood crop for remoter and inaccessible *Chiog* like Kheri and second important crop for *Chiogs* such as Tali, Kamjong and Zhobling. Majority of the farmers indicated Maize production that lasted for 12 months.

Given the poverty in terms of both food grain insufficiency and lack of cash income for the poor households, combined with less land holdings (especially *Chhuzhing*), SLM practices that require less inputs in terms of manpower, cash and land compromise are practiced and adopted by poor households. All practices adopted by better off households are not adopted by all poor households.

² Poverty Analysis Report, National Statistics Bureau, Royal Government of Bhutan, 2007

Small land holdings, shortage of farm labour, steep slope topography constantly prone to erosion and land slides and inadequate or lack of cash income have featured as the most prominent constraints in adoption of SLM practices. Similarly, lack of cash income, small land holdings, and subsistence food grain insufficiency for household, inadequate or lack of cattle, and need to work for others to generate cash income were the main constraints associated with poverty of the households.

Conclusions

- 1) The households' in rural Bhutan have highly variable assets endowment and livelihood strategies. Opportunities for income generation within the *Chiogs* are limited and livelihood strategies are combined efforts in on-farm works along with off-farm activities to generate income for rural livelihood.
- 2) The technical assistance programmes were focused to promote profitable technologies in the context of enhancing agricultural productivity (through improved seeds, seedlings, livestock breeds) and enhancing income.
- 3) Programmes aimed through SLMP have shown higher knowledge base of farmers and incidences of SLM practices adoption from piloted sites, without which the problems associated with land degradation, could possibly worsen in long-term.
- 4) Farmers with marginal land holdings were compelled to use the land intensively without alternative options such as crop rotation, fallowing or even proper application of FYM and other inputs.
- 5) Given the poverty in food grain insufficiency and lack of cash income for the poor households, combined with less land holdings (especially *Chhuzhing*) the practices that are less-labour intensive and requiring less inputs in terms of cash and land compromise were practiced and adopted by poor households.
- 6) The ownership of cattle has been a significant determinant of land management, as farming is dependent on use of draught power for ploughing, and availability and increase in FYM could substitute the farmers needs to purchase inorganic fertilizers in near-term.
- 7) Agricultural productivity, diary production, livestock enterprises and household income tend to be higher in the areas with higher agricultural potential and better market access, where farmers seem to intensify, diversify crop cultivation and increase production of high value crops.
- 8) With limited opportunities of other income within the *Chiogs*, income through non-farm activities outside the *Chiog* have led to migration of rural agricultural manpower leaving shortage of farm labour at the households.
- 9) Lack of irrigation and subsequently steep slope with less feasibility for *Chhuzhing* conversion has limited paddy cultivation for some *Chiogs* while diseases of citrus and uncertainty of production and market prices for ginger as cash crop has limited production potentials of these crops, where farmers have diversified towards vegetables cultivation.
- 10) Uncontrolled and open forest grazing of livestock as the traditional system of grazing has negative impacts on programmes for sustainable forest resources conservation and for programmes on agro-forestry, including for those on land slides and erosion control through plantation of trees.

Recommendations

- 1) The extension has to mix SLM programme with regular extension programme by providing information on subsequent benefits to farmers through investment in sustainable land management practices.
- 2) Programmes aimed at promotion and production of high-value cash crops (citrus, ginger, vegetables) that have high returns to the farmers have to be supported to overcome persistent poverty of the households.
- 3) The government investment towards long-term benefits of SLM practices need to be supported for poor farmers to enable them to adopt labour-intensive SLM practices (such as *Chhuzhing* conversion, dry-land terracing and contour bunding) by means of subsidies on labour inputs.
- 4) Teaching basics on sustainable land management in educational curriculum along with focus on profitability of agriculture farming could contribute to attract educated youths in farming to overcome the constrains in shortage of farm household labour in rural areas.
- 5) The government investment for intensification of land use change through *Chhuzhing* conversion and irrigation development need to be continued and strengthened to ensure both the production potentials as well as adoption of sustainable land use and soil conservation practices.
- 6) The existing livestock programme on development of livestock need to be emphasized on improving access to cattle for cattle-poor households. At the same, alternatives to promote agriculture without dependency on oxen would reduce cattle-poor household's dependency on oxen as draught power.
- 7) In areas of common property management (such as water source protection and grazing land management) it is essential to involve local community for collective management in order to collectively protect the common land or water resources against illegal deforestation, overgrazing and subsequent land degradation.

Poverty-SLM Indicators

Considering the findings from this study and identified constraints of SLM adoption and poverty, the indicators of poverty - SLM linkages for use in RNR planning and food security policy development are identified.

The indicators are the following:

- 1) 30% of poorest farmers from each *Chiog* with SLM adoption targeted for enhancing farm (crop and livestock) productivity increase their income from farm produce by 25% by the end 5 years as compared to the baseline.
- 2) Farmers with marginal landholdings owned (less than a total of 2 acres per household) in each *Chiog* with SLM adoption for preventing land loss and enhancing soil fertility, control land loss and enhance their agricultural production of main crops (Maize and Paddy) by 5% by the end 5 years as compared to the baseline.

Chapter 1: Introduction

1.1 Background

The Medium Sized Project (MSP) on Building Capacity and Mainstreaming Sustainable Land Management Project is funded by GEF through UNDP. The objective of MSP is to strengthen institutional and community capacity for anticipating and managing land degradation in Bhutan while ensuring broad based political and participatory support for the process. The global objective of the project is to contribute to more effective protection of trans-boundary watersheds in a manner that preserves the integrity of ecosystems in Bhutan³. The MSP was started since 2007, coordinated and managed by National Soil Services Centre (NSSC) under Ministry of Agriculture. Amongst other foreseen outputs of the project, one of the thematic studies for MSP is to better understand the causes and impacts of sustainable land management⁴.

Sustainable land management (SLM) in agriculture is a very complex and challenging concept. It encompasses biophysical, socioeconomic and environmental concerns that must be viewed in integrated manner. To address land degradation in Bhutan, the Sustainable Land Management Project (SLMP -February 2006 to June 2012) was introduced. The project was funded by the Global Environmental Facility (GEF) with the World Bank (WB) as the Implementing Agency and from DANIDA (Danish International Development Agency) as parallel funding through its EUSPS (Environmental and Urban Sector Programme Support).

The SLM project is implemented in three pilot areas - Phuentsholing *Geog* (Chukkha *Dzongkhag*), Nangkhor *Geog* (Zhemgang *Dzongkhag*) and Radhi *Geog* (Trashigang *Dzongkhag*)⁵. However, SLM practices are challenged with poor marginalized farmers with small land holdings to set aside for SLM practices and despite farmers being aware of SLM practices and benefits, they preferred to combine their resources for short-term benefits to enhance their livelihoods.

Through MSP, it is foreseen that the lessons learned from the pilot activities under the World Bank funded SLMP is directly fed into the preparation of the National Action Plan (NAP) to combat land degradation. Capacity building efforts under MSP mainly focus on *Dzongkhags* that are not covered under SLMP, in order to expand experiences and lessons from SLMP through cross visits, training and workshops and facilitate the replication of lessons throughout the country⁶.

Amongst various thematic studies, the MSP identified the need for a study to look at the linkage between SLM and poverty including the relation between livelihoods of people and the sustainability of their land use. Therefore this study seeks to improve the understanding of this linkage by examining how poverty (broadly defined to include limited access to capital, infrastructure, and services) influences land-management practices, land degradation, crop productivity, and household incomes. Linking poverty and SLM practices, through this study, is expected to identify the existing constraints for poor farmers to adopt SLM practices and generate recommendations how these constraints could be overcome. The study also entails defining few

³ Building capacity and mainstreaming sustainable land management in Bhutan, GEF, UNDP, 2006

⁴ www.moa.gov.bt/nssc

⁵ Annual Report 2007-08 SLMP Project Year 2 (PY2), NSSC, MoA

⁶ Building capacity and mainstreaming sustainable land management in Bhutan, GEF, UNDP, 2006

possible indicators of poverty-SLM linkages for use in RNR planning and food security policy development.

1.2 Objectives of the Study

The issue of land degradation is of crucial importance in terms of food insecurity challenges. Continuation of land degradation can have serious impact on livelihoods of the people and can be a hindrance to poverty alleviation as it results in land shortage in severely degraded conditions. Understanding the linkages between land degradation, land management, and poverty is essential for designing policies that simultaneously reduce poverty, reverse land degradation, and encourage the adoption of sustainable land management practices.

The study has the following objectives:

- 1) To analyze the relation between poverty - SLM vis-à-vis SLM - poverty and how this affects adoption of SLM practices by farmers;
- 2) To identify the main constraints for poor farmers to adopt SLM practices;
- 3) To assess to what extent the land use of poor households is sustainable in relation to households that are better off;
- 4) To develop recommendations how to overcome the main constraints for poor farmers in adopting SLM;
- 5) To define indicators of poverty –SLM linkages.

1.3 Literature Review

Land degradation recognised as global issue for environmental and sustainable development and been recognised as the need for collective international action to address the problems, the United Nations Convention to Combat Desertification was adopted in June 1994⁷. Bhutan acceded to it in August 2003. Located in the young and rugged Himalayan range, the population of Bhutan is making its living within fragile and inherently unstable ecosystems. Bhutan's usable land resource is limited owing to difficult and high mountain terrain, vast areas of snow and barren rocks, and large forests. This forest area, which includes scrub forest, is mandated to remain above 60 percent of the national territory in perpetuity. Arable land makes up less than 8 percent of Bhutan's territory, most of it located in the central valleys and southern foothills, and in these relatively flat areas, agriculture must contend with the other development activities of a population. Population growth has led to split inheritance among families, and consequently farmlands are becoming fragmented resulting in less investment in sustainable land management by farmers⁸. The predominant steep slopes further place the available small arable area under uncertain risk of various forms of land degradation.

In Bhutan land degradation is a man-made as well as natural phenomenon. Loss of vegetation due to deforestation, over cutting beyond silvi-culturally permissible limits, unsustainable fuel wood extraction, shifting cultivation, encroachment into forest land, forest fire, over grazing, extension of cultivation onto lands of low potential or high natural hazards, non-adoption of adequate soil

⁷ Cited on www.unccd.int

⁸ As cited from <http://www.worldbank.org> downloaded on 25 July 2009

conservation measures and improper crop rotation are some of the important factors contributing to land degradation in Bhutan⁹.

Land degradation in Bhutan can be broadly identified as the following¹⁰:

a) Physical Degradation (Topsoil Capping and Subsoil Compaction) which are the main types of physical *in-situ* degradation in Bhutan. Topsoil capping is light and mostly occurs in *Chhuzhing* (irrigated paddy fields). Subsoil compaction is moderate and quite extensive, both in *Chhuzhing* and *Kamzhing*. It is mainly caused by insufficient application of organic fertilizers and/or due to extensive application of chemical fertilizers, cattle trampling during fallow grazing and repeated ploughing by a traditional plough to same soil depth. As a result, the ease of workability and water holding capacity of the soil are decreased.

b) Chemical Degradation (Depletion of Soil Organic Matter and Soil Nutrient Mining) which are moderately severe and are quite extensive both in *Chhuzhing* and *Kamzhing*. In Bhutan, the depletion of soil organic matter is mainly attributed to inadequate application of organic fertilizers due to labour shortage and use of chemical fertilizers.

c) Splash and Sheet Erosion are light to moderate but extensive in *Kamzhing* especially when the soils are left bare. They remove the fertile topsoil and if not mitigated promptly, they slowly lead to rill and gully erosion. Heavy rainfall, low organic matter content in the soil, bare soil (poor ground cover) and steep slopes are some of the main causes of these erosion types in Bhutan

d) Gullies and Landslides are of moderate to strong severity and are quite extensive in areas where the underlying geology is unstable with a poor drainage system. Unchecked rills, steep slopes, high rainfall and anthropogenic causes such as deforestation, road development and overgrazing all contribute to causing gullies and landslides. Large areas of arable land are degraded, threatening national food security.

e) Ravines are an extreme of erosion but do occur in areas where the underlying geology is very unstable (phyllites). Unchecked gullies and landslides, steep slopes, improper drainage system, high rainfall and anthropogenic causes like deforestation, overgrazing and unsustainable land use practices contribute to ravine formation.

f) Flash floods are moderate and extensive in valleys (Bumdeling, Punakha and Wangdue valleys) where most of the arable land is located. High and intensive rainfall, glacial lake outburst and inadequate protection of upper catchment areas are some of the major causes of flash floods in Bhutan. During such events, arable land is either washed away or buried under the debris, making it unsuitable for cultivation.

The past experiences and studies indicate that the relationship between poverty and land management could be complex. Poverty reduces farmers' ability to pay for investments in land improvement and accentuates the short-term perspective of farmers, which may limit their interest in making long-term investments in soil and water conservation. Poor people may have few alternative investments available to them because the opportunity costs of their labour-intensive investments in land improvement may be lower than the labour costs of wealthier households. Thus the linkages between poverty and sustainable land management can be in both directions. Poverty which can reduce agricultural productivity can impact land management by limiting farmer's ability

⁹ As cited from http://www.rrcap.unep.org/pub/soe/bhutan_land.pdf downloaded on 25 July 2009

¹⁰ Land Degradation in Bhutan, Leaflet No. 14, RNR Extension Material, 2008, SSU, NSSC, MoA

to invest in land management. Similarly other local factors such as poor access to market and services or the programmes could limit farmer’s ability to manage land more sustainably. Studies indicate that if markets and support institutions are in place providing access to assets, services and goods, resources allocated for land management will be most profitable and the investment will have positive outcomes¹¹. Similarly, households with access to more labour relative to their land are likely to undertake more labour intensive and less land intensive farming practices such as less following, farming on steep slopes amongst others. Such intensification could have mixed impacts on land degradation by decreasing soil fertility and increasing erosion as a result of farming on steep slopes.

1.4 Approach and Methodology

A wide range of issues and their linkages to each other has to be assessed to arrive at the analysis on the relations between poverty and sustainable land management practices. The research involved data collection and analysis guided by the framework presented in figure 1. The framework pertains to possible linkages between poverty and land management with factors such as local village factors, rural household factors and constraints associated with SLM adoption and poverty, all of which influences income strategies and land management practices. The outcomes are linked to household income, agricultural production potentials and adoption or rejection of SLM practices.

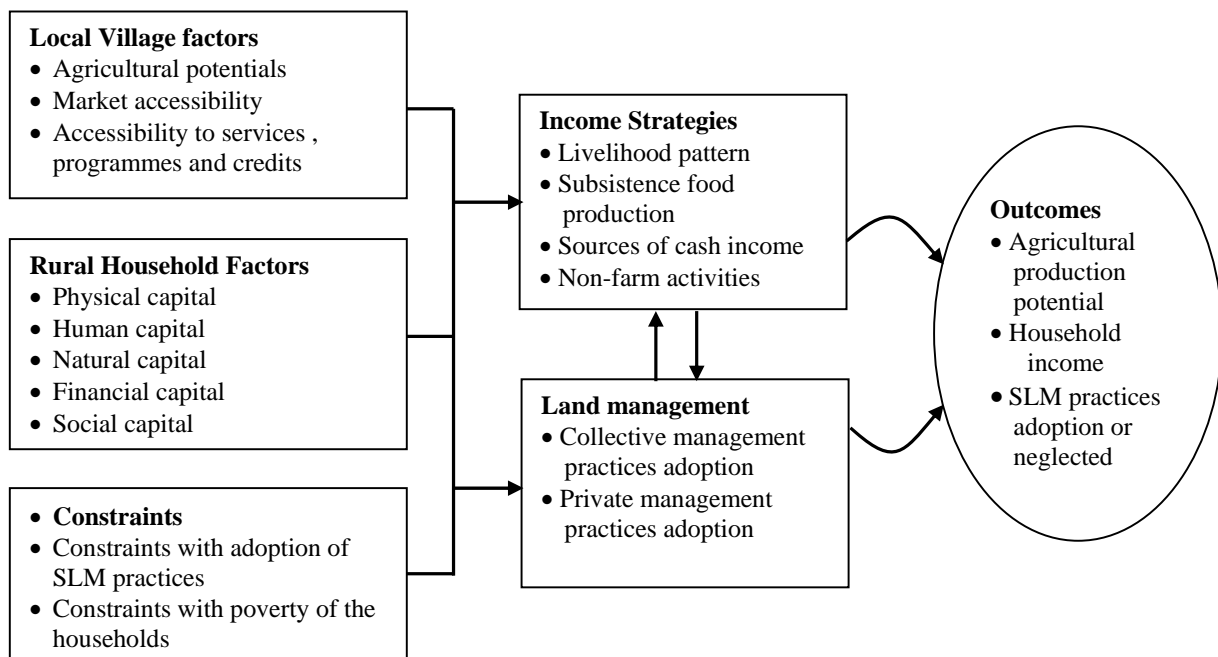


Figure 1: Conceptual framework for SLM-poverty linkages

Household-level factors as endowments of “physical assets” (for example livestock and houses owned), “human capital” (assets embodied in people’s knowledge and abilities such as education, experience, and training), “social capital” (assets embodied in social relationships, such as through participation in organizations or networks), “financial capital” (access to liquid assets, including

¹¹ Linkages between Land Management, Land Degradation, and Poverty in Sub-Saharan Africa, Washington D.C., International Food Policy Research Institute

credit and savings), and “natural capital” (assets embodied in natural resources, including the quantity of land and access to other resources) was examined in the study to assess if they determine strategies for income generation or otherwise the land management practices pursued by particular households. Local village factors pertaining to agricultural potentials (in terms of subsistence food grain production and marketable surplus), accessibility to markets, services and programme as important determinant of income strategies and influencing land management practices were also studied.

1.4.1 Sample Survey and Design

Using the criteria as discussed with PPD and NSSC to select *Geogs* from three regions in the country and with *Chiogs* from areas within Decentralised Natural Resources Management Project (DNRM) *Geogs*, Sustainable Land Management Project (SLMP) pilot sites and MSP *Geogs*, 10 *Chiogs* were selected for survey. The selection was done in consultation with officials from MSP (NSSC), PPD (MoA) and Field Coordinators of SLMP sites, and as feasible for survey. The survey sites along with total households in each *Chiogs* and sample sizes are presented below in table 1.

Table 1: Selected *Geogs* and *Chiogs* with sample sizes for field survey

Region	Geog	Chiogs	Total Households	40% Sampling	Remarks
Western	Phuentsholing	Chilauney A	31	12	SLMP site
		Ahalley	37	14	SLMP site
Central	Dekiling	Dekiling	57	21	DNRM site
	Nangkhor	Kamjong	26	10	SLMP site
		Zhobling	8	7**	SLMP site
		Tali	23	11	SLMP site
	Tashiding	Norbugang	30	12	MSP site
	Drujegang	Pangna	101	41	DNRM site
Eastern	Lumang	Kheri	35	14	Landslide area
		Tshogonpa	28	12	Landslide area
Total		10	376	154	

** Considering few total households, entire population was selected for interview (one HH could not report)

A mix of poor and comparatively richer *Chiogs* with prominent land management problems were selected for the survey and agreed upon. Though only 10 *Chiogs* were selected, apart from 10 farmers for FGD in each of the *Chiogs* visited, another 40% sampling of the total households was used for individual quantitative interview to make the survey representative. A PRA tool (wealth ranking exercise) was used with village *Tshogpa* and few *Chiog* elders to carry out a *Chodrup* category (wealth ranking) prior to the interviews in order to determine the socio-economic class of farmers so that the data could be gathered and analyzed by class of farmers to assess differences between the richer and poorer farmers in term of “households without self-sufficiency” and “comparatively better off households”. Criteria such as having good land holdings, having good houses, having sufficient subsistence food grain production, having good number of cattle, having some cash income and having good number of household farm labourers amongst others were used for *Chodrup* ranking. Accordingly but confidentially, *Tshogpa* and *Chiog* elders were asked to

randomly select 5 respondents from each *Chodrup* category for FGD. In total 154 farmers were interviewed individually and another 100 in a group of 10 each from each *Chiog* were interviewed using FGD method.

Design of survey tools using both qualitative as well as quantitative methods was undertaken to gather data from selected 10 *Chiogs*. The questionnaire designed was guided by the framework for linkages and analysis and the data gaps identified through secondary documents review. The quantitative questionnaire was used with individual farmers to gather data on socio-economic factors, local village factors, household factors, physical assets, income strategies and private land management practices. A pre-designed questionnaire and checklist was used to gather data through focus group discussion on collective land management practices, its relation to land, production, forest, irrigation and water conservation, sustainability of present land use, and identification with prioritization of constraints associated with poverty and adoption of SLM practices. Through participatory “Do-It-Yourself” exercise with consultant as facilitator, a causal-effect analysis (problem tree) of constraints of SLM and poverty was undertaken making linkages to its causes and effects. This was done for each of the *Chiogs* visited. Such a participatory tool enabled a wide range of data collection that provided analyses of its causes, effects, and direct and indirect benefits. The focus group discussion lasted for 3 – 4 hours, depending upon the SLM context and settings of the *Chiogs*.

1.4.2 Data Analysis

In terms of data assimilation and analysis, the quantitative data was processed using MS Excel and SPSS to generate tables with percentages and frequencies. The qualitative data was processed using content analysis method to derive summaries of the findings. Such analysis was made based on wealth ranking and its linkages to conditioning factors and income strategies including relationship with land holdings. Compounded findings from analysis of both quantitative and qualitative data contributed to the outcomes of this study.

1.5 Scope and Limitations of the Study

This study is, as result of the methodology used, not without limitations. The field survey and *Chiogs* sampling were adapted to make efficient use of the limited time available for the study. Though 40% sampling was considered to make the findings authentic and representative, some *Chiogs* already for e.g. Zhobling have only eight households and therefore entire population was considered for survey. With limited time available for survey, especially for FGD and causal-effect analysis that demanded more time, all sites in Bhutan facing land degradation could not be visited. Despite the choice made to focus on DNRM, MSP and SLMP sites, the survey areas were with problems of poverty as well as land degraded and the outcomes are expected to be representative for the country study.

Chapter 2: Findings on Situational Analysis

2.1 Profile of the Study Area

The study area consisting of 10 selected *Chiogs* are prominent areas with soil erosion and constant landslides, including flood in some of the *Chiogs*. Five of the *Chiogs* are from SLMP pilot sites (under Nangkhör and Phuentsholing *Geogs*). Two *Chiog* from Lumang *Geog* are SLM scaling up *Chiogs* while rests were sites with incidences of poverty and areas with challenges in land management. The topography ranged from gentle and moderate sloping land (e.g. Dekiling, Kamjong, Pangna and Ahalley) to very steep sloping land in *Chiogs* like Norbugang, Kheri and Tshogonpa. The profile of the *Chiogs* under study is elaborated below describing agricultural pattern including land use of the particular *Geogs*¹².

Phuentsholing *Geog* is situated in the southern part of the country. Amongst 19 *Chiogs* under Phuentsholing *Geog*, Chilauney A and Ahalley were the two visited during the survey. Paddy is grown in *Chhuzhing* while maize, millet, mustard and ginger are grown on *Kamzhing*. Orange, cardamom, areca nut and ginger are the main cash crops for many *Chiogs* under this *Geog*. With comparatively better accessibility to Phuentsholing town, the production potential is considered to be better in *Chiogs* under Phuentsholing.

Nangkhör *Geog* under Zhemgang *Dzongkhag* is located in central south part of the country and has 10 *Chiogs*, out of which three were visited for the survey (Tali, Zhobling and Kamjong). Farmers cultivate paddy, maize, buckwheat and also wheat in some areas. While Tali is accessible by road, other two *Chiogs* visited do not have road connectivity, limiting their potentials for marketing agricultural products.

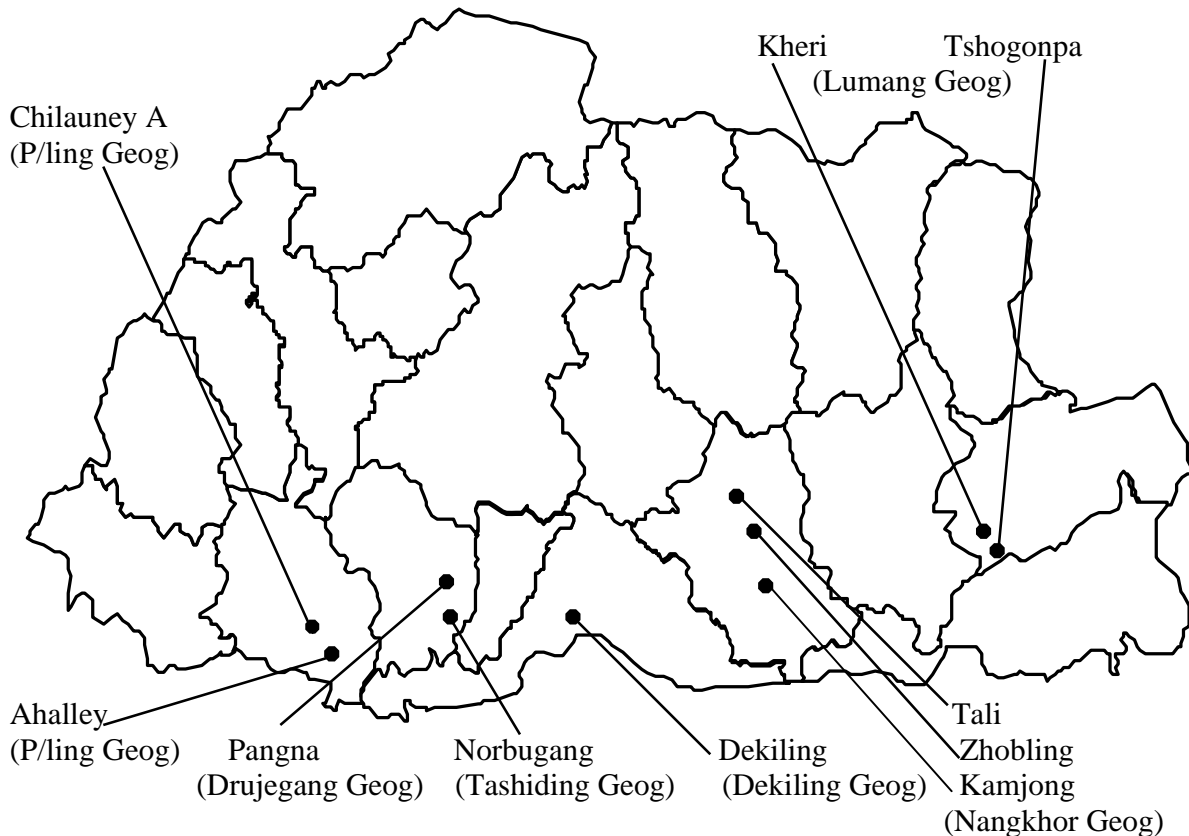
Dekiling *Geog* under Sarpang *Dzongkhag* is located in the southern part of the country and has 16 villages. Amongst these, Dekiling village which has been the Decentralized Natural Resources Management Site with prominent soil erosion, flood and land slide was visited during the survey. The main crops grown are paddy, maize, barley, millet, buckwheat and mustard. The *Chiog* being accessible by road and closer to commercial town at Gelephu, whatever surplus produced are easily marketed.

Drujegang *Geog* located under Dagana *Dzongkhag* is situated in central part of the country and has 3 *Chiogs*, out of which *Chiog* Pangna with 101 households was visited for the survey. The *Chiog* has road till Drujegang town but marketing of produce are limited owing to lack of consumers. The main crops cultivated are paddy, millet, mustard and buckwheat. Amongst the cash crops, citrus is the main followed by cardamom and green-gram.

Tashiding *Geog* under Dagana *Dzongkhag* has 6 *Chiogs* out of which Norbugang comprising of 30 households with prominent land slide and erosion area was visited. For Norbugang *Chiog* important crops grown are maize and millet and orange is also grown as main cash crop. Norbugang has no road connectivity.

¹² Ninth Five Year Plan, GNHC, Royal Government of Bhutan

Lumang *Geog* under Trashigang *Dzongkhag* is located in central eastern part of the country. Amongst 32 villages under this *Geog*, two *Chiogs* (Kheri and Tshogonpa) were visited. Potato and citrus are the main cash crops and other crops such as maize, beans and millet are also grown. While Kheri does not have road connectivity, Tshogonpa is connected by a farm road.



Map 1: Map of Bhutan with illustration of ten sites visited for survey

This map was designed only for illustrative purpose and is not to the scale. It may not show international and district boundary accurately. The ten *Chiog* visited with respective *Geogs* are shown in the map.

2.2 Demography of Respondents

The survey had two categories of respondents, one for individual interview and other for focus group discussion (FGD). In each of the *Chiogs* visited, a PRA tool (well-being / poverty ranking) was used to identify the economic / poverty status of the households for the respondents randomly selected for the interview. Using such ranking, equal number of respondents from each category were selected for both individual interview as well FGD as shown in table 1 under annexure 2.

An effort was made to balance gender of respondents so as to have gender balanced opinion and perspective in data gathering. Still, there were more males available as compared to females as shown in table 2 under annexure 2. More males were available in Chilauney A, Ahalley, Pangna,

Kamjong and Norbugang *Chiogs* while more females were available in Tali, Zhobling and Dekiling *Chiogs*.

With reference to table 3 under annexure 2, regarding the age of respondents for individual interview, highest numbers were from elderly age group of 46 to 60 years (31% of total), followed by second highest numbers from age group of 36 to 45 and 26 to 35 (20 % each). Therefore elderly people were interviewed for both individual as well as FDGs.

The table 4 under annexure 2 on occupational distribution for respondents revealed that as high as 78% of them were engaged in agriculture while some were engaged as skilled labour (about 10%). Few had occupations such as business and services in civil and private sectors. This indicates that majority of the population in Bhutan are dependent on agriculture.

The table 5 under annexure 2 shows that out of total of 154 respondents interviewed individually, as high as 65% were illiterate, followed by another 12% each with primary and non-formal level of education.

2.3 Local Village Factors

Gathered through individual interview and FGD with farmers, various local village factors influencing land management practices were discussed and analyzed. Local village factors such as livelihood and land use pattern, agricultural potentials, farmers' knowledge on SLM practices, important crops for livelihood, crops marketed by the farmers, availability of household farm labour and accessibility to markets, services and facilities were analyzed.

Livelihoods

The typical livelihood system can be described as mixed mountain agriculture with subsistence farming in agriculture and livestock combined with off-farm activities for the farmers to generate additional cash income. Agriculture is characterized by a low degree of mechanization and thus has rigorous drudgery involving high human and animal labour input. Ploughing is performed using draught animals (oxen) and farm yard manure is applied. Chemical fertilizers are rarely applied. Given steep slopes, terracing or conversion to *Chhuzhing* was not very common, though some farmers have *Chhuzhing* for paddy cultivation. Forest land is an important source of fuel wood and timber and a grazing ground for the grazing livestock.

Agriculture potential

Regarding the agricultural potentials, it revealed that despite difficult terrain and difficulty in proper land management practices the farmers combined a variety of crops for their livelihood. Crops such as paddy, citrus, maize, ginger, vegetables, millet, wheat, potato, buckwheat, arecanut, cardamom and mustard were main crops for the livelihood. Lack of irrigation and subsequently steep slope with less feasibility for *Chhuzhing* conversion has limited paddy cultivation for some *Chiogs* while diseases of citrus and uncertainty of production and market prices for ginger as cash crop has limited production potentials of these crops. With reference to table 6 under annexure 2 on comparison between the "self-sufficient household" with comparatively "poorer households" shows

that Maize as subsistence food and Vegetables as cash crop are important for higher number of poorer farmers as compared to richer ones. In separate analysis on important crops for livelihoods undertaken *Chiog*wise as shown in table 7 under annexure 2, majority of the farmers from all *Chiogs* indicated Vegetables as the most important crop for their livelihood. However, Maize is a top most important livelihood crop for remoter and inaccessible *Chiog* like Kheri and second important crop for *Chiogs* such as Tali, Kamjong and Zhobling. For *Chiogs* undertaking citrus cultivation such as Chilauney A, Ahalley and Dekiling, citrus is the second important crop for livelihood. Therefore, Maize is the subsistence staple food for the majority of the farmers from sampled *Chiogs*, though despite lack of *Chhuzhing* rice is imported from the market as food crop for household consumption.

Knowledge on SLM practices

Earlier studies in East African Highlands by International Food Policy Research Institute shows that education may promote changes in income strategies and technologies by increasing households' access to information about alternative market opportunities and technologies, and hence households' ability to adapt to new opportunities. On the other hand, more educated households may be less likely to invest in inputs or labour-intensive land investments and management practices because the opportunity costs of their labour and capital may be increased by education. Thus, the net impacts of education on land management, crop production, and land degradation are shown to be unclear but the impact on household income is expected to be positive. An experienced and a better-educated household head are likely to collect and interpret extension messages better, hence be more likely to adopt improved land management practices¹³.

Unlike the past studies on linkages between literacy and adoption of SLM practices as cited above, the survey revealed that farmers from all the *Chiogs* visited had a good knowledge on SLM practices. Strategies such as road development, participation of community for decentralized natural resources management, demand-side extension approach with introduction of improved and advanced agricultural technology, availability of scheme for rural credits for rural farmers through Bhutan Development Finance Corporation (BDFC) and awareness programmes through trainings and demonstration (especially towards sustainable land management practices in Sampled *Chiogs*) have enhanced rural income and increased farmer's knowledge of SLM practices. There were no differences amongst the richer and poorer farmers with regards to knowledge on SLM practices. This attribute to capacity building of the farmers for SLM practices through SLMP interventions and agriculture extension in SLM, DNRM and MSP sites.

Accessibility to services

Analysis from table 8 under annexure 2 on access to services influencing poverty and land management revealed that remoteness of the *Chiogs* and scattered settlement have had limited access to services and facilities. For example, despite having a *Gup*'s office and extension centres located in the *Geog*, considering the walking distance to reach and obtain services from such centres, majority of the respondents indicated their dissatisfaction in availing the services. Similar has been the findings for availing health and educational services. While people were comfortable

¹³ Strategies for Sustainable Land Management in the East African Highlands, Washington D.C., International Food Policy Research Institute

with access to drinking water and communication facilities (through cell phones), access to credits and farm inputs has been identified to be moderate indicating the need for further improvement. Such a distance factor limiting the accessibility to agricultural, livestock and other needy services could limit farmers from availing necessary inputs for improving their livelihoods as well for availing inputs (seeds, seedlings) for adoption of SLM practices.

Accessibility to market

Farmers in FGD mentioned several crops being marketed depending upon the accessibility and market availability. *Chiogs* under Phuentsholing *Geog* being closer to Phuentsholing town, marketed citrus, ginger, and vegetables. For some *Chiogs* under Nangkhor *Geog* (Tali and Zhobling) potato and citrus remain to be the main cash crop. In the eastern *Geogs* potato, citrus, beans (Rajma) are marketed. However, the production and marketing potentials were directly influenced by accessibility by road and availability of marketing sheds. For e.g. Dekiling *Chiog* with accessibility to market and road has an absolute advantage in producing perishable vegetables and advantage in income generation as opposed to Kamjong *Chiog* without such accessibility that do not sell any agricultural crops. Therefore better access to road and market would increase the capacity of the farmers to purchase inputs and intensify agriculture and thereby increase the chances of farmers' investment in land management.

Household farm labour

The assessment on availability of household farm labour for agricultural works by *Chodrup* classification is presented in table 2. It shows that majority of the households in the villages had only 1 to 2 able farm labour (between the age of 16 to 60 years) for agricultural works. This was more prominent in case of households without self-sufficiency (58%) as compared with self-sufficient households (49%).

Table 2: Frequency and percentage of respondents with able members available for agricultural works by *Chodrup* category

Number of able persons available for agriculture	Frequency and percent	Household with self-sufficiency	Households without self-sufficiency	Total
1-2 persons	Count	34	49	83
	% within category	49.3	58.3	54.2
3-5 persons	Count	30	31	61
	% within category	43.5	36.9	39.9
6-8 persons	Count	4	4	8
	% within category	5.8	4.8	5.2
> 8 persons	Count	1	0	1
	% within category	1.4	0.0	0.7
Total	Count	69	84	153
	% within category	100.0	100.0	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

A slightly larger percentage of self-sufficient households had 3 to 5 able members available for agriculture as compared to households without self-sufficiency. The findings substantiated from analysis derived from FGD with farmers indicated shortage of farm labour for agriculture in rural areas. Farmers indicated shortage of farm labour affect farmers' ability for land management and accordingly the decisions.

2.4 Physical Assets

Physical capital includes the value of farm equipment and buildings and other durable goods and number of livestock. Natural capital in this study is the land, which includes the amount of land owned and its impact on poverty and SLM adoption. The past studies show that as with natural capital, physical assets may have mixed impacts on land management. Ownership of physical assets in general increases the household's ability to finance investments and purchase inputs and likewise the ownership of livestock may increase the supply of manure available to the household. Farmers having greater land ownership may increase households' ability to hire labour or purchase inputs by increasing their access to credit. Some land investments such as bench terraces may compete for space with less land holders¹⁴.

Types of houses owned

Field analysis on types of houses owned (presented in table 9 under annexure 2) shows that majority of the richer households owned stone walled or mud walled houses with CGI roofing, while the majority of the poorer households had mud walled or bamboo walled with shingle roof determining their weaker socio-economic conditions in the villages. Looking at *Chiogwise* comparison (presented in table 10 under annexure 2), highest percentage of households in Tali (73%) have stone walled houses with CGI roofing. Similarly highest numbers of households from *Chiogs* with road accessibility (such as Dekiling, Ahalley) have wood-walled houses with CGI roofing. The concrete houses were found in Dekiling and Tali *Chiogs* indicating their higher socio-economic conditions. Remote located *Chiogs* such as Kamjong and Zhobling have majority with stone walled houses with single roof or mud walled houses with single roof. Bamboo walled houses with single roofing were prominent in these remoter *Chiogs* like Kamjong, Zhobling, Norbugang, and Chilauney A.

Land holdings

Analysis with *Chodrup* category presented in table 11 under annexure 2 revealed that majority of the people in both the classes did not own *Chhuzhing* (41% of the total respondents), particularly more households from poorer category. A substantial numbers from both the categories owned *Kamzhing* between 2.1 to 4 acres, while substantial percentages have land (*Chhuzhing* as well *Kamzhing*) less than 2 acres. As high as 14% of the households owned *Chhuzhing* and 8% owned *Kamzhing* less than 1 acre. A large majority does not own *Tseri* land, *Tsamdo*, private pasture and private forest land. A comparison between the richer and poor households shows that higher number of poor households do not own *Chhuzhing* as compared to the richer ones (38 poor household and 25 richer households do not own *Chhuzhing*). Though majority of the households own 2.1 to 4 acres

¹⁴ Strategies for Sustainable Land Management in the East African Highlands, Washington D.C., International Food Policy Research Institute

of *Kamzhing*, higher numbers were from poorer households as compared to the richer ones (37 poorer households : 27 richer households).

Livestock ownership

Owning sufficient numbers of cattle has been important for rural people for the need of having oxen for ploughing and having farm yard manure (FYM) to maintain and improve soil fertility. An analysis on *Chodrup* group classification with cattle population for the sampled *Chiogs* is presented in table 4 below. Percentage within *Chodrup* category shows that majority from self-sufficient households own higher numbers of cattle (43% own 3 to 5 numbers; about 28% own 6 to 10 numbers; and about 18% own more than 11 numbers). Likewise, majority of the households without self-sufficiency own 3 to 5 numbers of cattle (38%) which are comparatively lesser percentages as compared to richer households.

A lesser percentages of households without self-sufficiency own cattle more than 5 numbers (about 24% own 6 to 10 numbers and 8% own more than 11 numbers). It is also evident that there are still some households with self sufficiency but without any cattle (7%). But in comparison, higher numbers of households without self-sufficiency have no cattle (15%). Analysis gathered from FDGs revealed that in general poor households have less capacity to purchase cattle and maintain sufficient numbers of cattle required for regular farming that impacts households' capacity for cultivation of crops.

Table 4: Frequency and percentage of total cattle owned by the respondents by *Chodrup* category

Chodrup category	Frequency and percent	Total cattle owned by the households					Total
		1-2 nos	3-5 nos	6-10 nos	> 11 nos	Have none	
Household with self-sufficiency	Count	3	29	19	12	5	68
	% in Chodrup	4.4	42.6	27.9	17.6	7.4	100
Households without self-sufficiency	Count	12	32	20	7	13	84
	% in Chodrup	14.3	38.1	23.8	8.3	15.5	100
Total	Count	15	61	39	19	18	152
	% in Chodrup	9.9	40.1	25.7	12.5	11.8	100

Source: Field Survey, Poverty –SLM Linkages, July 2009

Similarly majority of the farmers own in total 1 to 5 numbers of other livestock that includes a total of goats, sheep, horses, poultry and pig, which is presented in table 12 under annexure 2. Ownership of other types of livestock is not significantly associated with land management practices.

2.5 Income Strategies

Income strategies are the set of activities that households pursue to produce or acquire income that collectively include various income sources, subsistence food production, livestock and cash crops production and income from non-farm activities. The past studies show that income strategies and land management decisions are affected by many different factors operating at different scales.

These factors may have generalized affects at the village or higher level on income strategies and land management, such as through their influence on local prices of commodities or inputs, or they may affect household-level factors such as average farm size¹⁵. Considering these, the survey looked at various income strategies including the impacts on abandoning *Tseri*, present food security in terms of subsistence food grain production, income sources and cash income per household.

Impacts of abandoning Tseri

In the past, people in Bhutan undertook *Tseri* cultivation (slash and burn). Most mentioned *Tseri* being abandoned due to the government policy to restrict such cultivation. Few farmers from *Chiogs* such as Tali and Zhobling mentioned having still practiced *Tseri* in order that their *Tseri* land would be registered as their private land and not occupied or registered under forest land.

The effects of *Tseri* abandoning as mentioned by farmers were many. *Tseri* land was fertile for cultivation and a rotational system of cultivation was maintained. A wide variety of crops was grown such as upland rice, maize, millet, chilli, mustard, buckwheat and cotton. For example a remote and inaccessible Kamjong *Chiog* mentioned having cultivated upland rice and cotton during *Tseri* cultivation which is not cultivated these days. The production (yield) was very high and households achieved grain sufficiency and did not rely on import of grains from markets. With clearing of bushes in the surrounding for *Tseri* cultivation, the incidence of crop destruction by wild animals was less and the net harvested volume was much higher. Farmers indicated that wild life population was much lesser in the past as compared to the present times.

Presently, with *Tseri* being abandoned, the forest have encroached *Tseri* abandoned areas. This has contributed to creation of habitat for wild animals in the surrounding and the crop destruction by wild animals is on increase every year compounded with increasing population of wild animals. A typical case of Norbugang *Chiog* was mentioned by farmers where maize being staple food, only 25% of the total product was harvested and about 75% was destroyed by wild animals even after guarding for 24 hours.

Subsistence food grains production

Analysis from field survey presented in table 13 under annexure 2 revealed that crops such as paddy, maize, millet, buckwheat, potato, mustard and wheat are main subsistence food grains cultivated by the farm households in present times. As majority of the respondents did not own *Chhuzhing*, more than 50% of the people from richer and poorer category do not cultivate paddy. There are few households where their farm produced paddy lasted for 12 months for their respective household (10 % of richer and 12% of poorer). Therefore Maize is the main subsistence food grain produced and majority of the households from each category (25% of richer and 30% of poorer) indicated having sufficient production of Maize to last for 12 months consumption. Despite this, a large section of the population does have subsistence Maize production to last for 12 months. For majority but below 30% of the farmers from each category have sufficient millet and mustard that lasted for 3 to 6 months consumption. Majority of the households do not cultivate other remaining

¹⁵ Strategies for Sustainable Land Management in the East African Highlands, Washington D.C., International Food Policy Research Institute, 2006

crops (buckwheat, potato and wheat) and for those that cultivated, it added to household consumption but did not last for more than 3 months. Therefore for the sampled *Chiogs*, Maize is the main food grain substituted by rice either cultivated by few of the *Chhuzhing* owners or imported from markets by income generated through off-farm activities.

Sources of cash income

Amongst the various sources of cash income as presented in table 5 below, major income was obtained from vegetables, followed by other cash crops (citrus, areca nut, cardamom and ginger). The income from dairy products and remittances were the third major sources.

Table 5: Frequency and percentage of respondents on sources of income based on number of responses

Main income sources	Responses	
	Count	Percent
Cash crops	72	22.9
Vegetables	80	25.4
Dairy products	45	14.3
Poultry products	23	7.3
Livestock (meat/live)	27	8.6
Non-farm activities	22	7.0
Remittance	46	14.6
Total	315	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

A separate analysis with *Chodrup* category based on the number of responses, presented in table 6, revealed that income from cash crops for the richer and income from vegetables for the poorer were the main sources for majority of the farmers. Income from dairy and remittances as mentioned stood significant for both categories of *Chodrups*. This reflects that agriculture and livestock farming are the main income sources for rural people in Bhutan. However, according to the road and market accessibility and agro-ecological conditions, the important crop for cash income varied as substantiated by findings with comparison between the *Chiogs* presented in table 14 under annexure 2. It revealed that cash crops were the main source of income for accessible *Chiogs* such as Ahalley and Pangna but with exception that it was also important source of income for remote and inaccessible *Chiogs* such as Norbugang and Chilauney. Cash crops in particular were important source of income for *Chiogs* under Phuentsholing *Geog* due to relatively good market access and potentials in Phuentsholing. No cash income from cash crops was indicated from remoter and inaccessible *Chiogs* Kamjong, Zhobling and Kheri. A highest numbers of households from Kamjong (100%) indicated cash income through sale of livestock (live / meat) followed by income from dairy and poultry products. Income through non-farm activities was important for Dekiling, Pangna, Norbugang, Tali, Ahalley and Chilauney A *Chiogs* but as evident from the analysis (table 5) farmer's highest income source is from agriculture.

Table 6: Frequency and percentage of respondents on sources of income by *Chodrup* category

Income sources	Frequency and percent	Household with self-sufficiency	Households without self-sufficiency
Cash crops	Count	33	39
	% in category	23.1	22.8
Vegetables	Count	32	48
	% in category	22.4	28.1
Dairy products	Count	26	19
	% in category	18.2	11.1
Poultry products	Count	11	12
	% in category	7.7	7.0
Livestock (meat/live)	Count	11	16
	% in category	7.7	9.4
Non-farm activities	Count	10	12
	% in category	7.0	7.0
Remittance	Count	20	25
	% in category	14.0	14.6
Total	Count	143	171
	% in category	100.0	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Average household cash income

In Bhutan, the poverty line is drawn by (a) setting the food poverty line, as the cost of bundle of goods attaining a pre-determined minimum food energy requirement, and (b) adjusting this food threshold by adding some non-food requirements to obtain the total poverty line. In Bhutan the non-food poverty line is estimated at Nu. 1,096.94¹⁶ per person per month (Nu.13,163.28 per person per year)¹⁷.

The table 7 shows that more than half of the households without self-sufficiency (61%) and slightly less than half from households with self-sufficiency (49%) had an average annual cash income of less than Nu.13,000 indicating that majority of farmers in general have very less cash income and are below the non-food poverty line. However, farmers produced a variety of crops and grains for household consumption. This was substantiated by cash income generated from various sources to meet the additional food and other basic requirements, imported from market.

With reference to table 15 under annexure 2, there are variations within the *Chiogs* on income levels. While majority have indicated an average annual income of less than 13,000 per year, a good numbers of households also had income above Nu.13,000 per year from *Chiogs* Dekiling, Pangna, Ahalley, Chilauney A and also from remoter *Chiog* like Kamjong. All households from Zhobling have indicated average annual income of less than Nu. 13,000 per year.

¹⁶ Exchange Rate: 1 USD = Nu. 48.1096

¹⁷ Poverty Analysis Report, National Statistics Bureau, Royal Government of Bhutan, 2007

Table 7: Frequency and percentage of respondents with income for last calendar year by *Chodrup* category

Total household income last year (Ngultrum)	Frequency and percent	Household with self-sufficiency	Households without self-sufficiency	Total
< Nu. 13,000	Count	34	51	85
	% in category	49.3	61.4	55.9
Nu. 13,001-20,000	Count	14	14	28
	% in category	20.3	16.9	18.4
Nu. 20,001-30,000	Count	10	12	22
	% in category	14.5	14.5	14.5
Nu.30,001-50,000	Count	7	5	12
	% in category	10.1	6.0	7.9
> Nu.50,001	Count	4	1	5
	% in category	5.8	1.2	3.3
Total	Count	69	83	152
	% in category	100.0	100.0	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Household expenditure

The expenditure pattern for richer and poor farmers as comparison is presented in table 8. It shows that amongst the households with self-sufficiency, majority of the farmers spent most on food, followed by spending on religious ceremonies, education of their children and on social occasions. Likewise, amongst the farmers from households without self-sufficiency majority also spent on food followed by religious ceremonies, social gatherings and for education of their children. In total of all respondents, highest number of farmers spent most on food owing to lesser farm produced food grains. However, there was no significant difference between the number of poor and rich farmers in terms of spending.

Table 8: Frequency and percentage of respondents with expenses heads classified by *Chodrup* category

Expenditure Heads	Count and percentage	Chodrup category		Total
		Household with self-sufficiency	Households without self-sufficiency	
Food	Count	66	82	148
	% within category	19.1%	19.6%	19.4%
Clothing	Count	44	47	91
	% within category	12.8%	11.2%	11.9%
House renovation	Count	4	16	20
	% within category	1.2%	3.8%	2.6%
Medical expenses	Count	7	4	11

	% within category	2.0%	1.0%	1.4%
Education	Count	48	58	106
	% within category	13.9%	13.8%	13.9%
Travels	Count	39	44	83
	% within category	11.3%	10.5%	10.9%
Farm tools and machineries	Count	9	5	14
	% within category	2.6%	1.2%	1.8%
Farm inputs	Count	22	18	40
	% within category	6.4%	4.3%	5.2%
Religious ceremonies	Count	59	73	132
	% within category	17.1%	17.4%	17.3%
Social occasions	Count	47	72	119
	% within category	13.6%	17.2%	15.6%
Total	Count	345	419	764
	% within category	100.0%	100.0%	100.0%

Source: Field Survey, Poverty –SLM Linkages, July 2009

Chapter 3: Findings on Poverty - SLM Linkages

With analyses triangulated from earlier chapters and subsequent analysis in the respective sub-sections, this chapter collectively analyses issues such as *existing land management practices*; *main constraints for poor farmers to adopt SLM practices*; *relationship between poverty and SLM practices* and how this effects the possibility for farmers to adopt SLM practices; and assessment *to what extent the land use of poor households are sustainable in relation to households that are better-off*.

3.1 Existing Land Management Practices

Agricultural production and land conditions are affected by land management practices, including both private decisions made by farm households and collective decisions made by groups of farmers and communities. For example, farm households make decisions about land use (cropland or grazing land), the types of crops to cultivate, the amount of labour to use, and the type and amount of inputs, investments, and practices to use to conserve soil and water, improve soil fertility, reduce pest losses, and so on. Communities also can influence land management through their collective decisions. They may make investments on communal land (e.g., erosion controls on degraded lands, tree planting) or private lands (e.g., drainage investments as part of watershed conservation and development efforts) or regulate use of communal land (e.g., restrictions on use of grazing areas) or private lands (e.g., bylaws limiting burning or cutting of trees). As argued above, these household and collective decisions affect current agricultural production and income and affect the condition of land resources, thus influencing potential future agricultural production and income¹⁸. This study looked at both private and collective land management practices including the factors effecting their adoption in the sampled *Chiogs*.

Collective land management practices

Data gathered through FGD with farmers from 10 *Chiogs* revealed that farmers adopted various collective land management practices amongst which the organic farming (limited use of chemical fertilizers), hedge row plantation and irrigation management were the most common as shown in table 9. With traditional practice of applying FYM, farming in all *Chiogs* is more of organic farming. Irrigation management has been the important group activity in *Chhuzhing* owned *Chiogs* such as Dekiling, Pangna, Tali and Kamjong where both people and the government have substantially contributed to the cause. In addition, *Chhuzhing* conversion, bamboo and trees plantation in land slide areas, water source protection, dry-land conversion were other commonly practiced collective land management. With traditional system of sharing labour for cultivation and resolving common causes in the *Chiogs*, farmers have contributed and shared labour for dry-land terracing and *Chhuzhing* conversion. Collective watershed protection with fencing and plantation of trees and land slides prevention with plantation of bamboo and trees were other main collective practices adopted.

¹⁸ Strategies for Sustainable Land Management in the East African Highlands, Washington D.C., International Food Policy Research Institute, 2006

Table 9: Collective land management practices adopted by the people from 10 *Chiogs*

Collective land management practices	Responses	
	Count	Percent
Irrigation management	6	11.1
Community forest plantation	4	7.4
Hedge row plantation	7	13.0
Terracing	4	7.4
Water source protection	5	9.3
Fallowing	2	3.7
Plantation of fodder trees	3	5.6
Contour bunding	1	1.9
Maintain <i>Tsamdo</i>	1	1.9
Bamboo plantation	5	9.3
Wet land conversion	5	9.3
Compost making	2	3.7
Organic farming	9	16.7
Total	54	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Private land management practices

With regard to private land management practices, the farmers have adopted many land management practices. Traditionally, tethering, application of FYM, crop rotation, fallowing of land, mixed cropping, plantation of fodder trees have been most common practices. With government support (either through SLMP or government extension services), proper land management has been introduced in pilot sites. The common practices adopted were hedge row plantation, compost making, *Chhuzhing* conversion, irrigation canal maintenance, watershed protection, community forestry plantation and development of pasture. An explicit comparison of various private land management practices between the poorer and richer households is presented in table 10.

Findings indicate that prior land investments undertaken with support measures from the government (such as watershed management, trees plantation to control land slide, *Chhuzhing* conversion amongst others) have contributed to current and better land management with higher crop productivity and income, and with lower soil erosion as indicated by farmers. Farmers mentioned that soil fertility has direct and strong positive impact on cultivation and therefore on farm produced household grain sufficiency and the income to households through diversification of marketable crops.

Table 10: Frequency and percentage of respondents with private land management practices by *Chodrup* category

Private land management practices		Household with self-sufficiency	Households without sufficiency	Total
Forest trees plantation	Count	22	31	53
	% in category	6.0	7.5	
Hedge row plantation	Count	19	21	40
	% in category	5.1	5.1	
Dryland terracing	Count	34	43	77
	% in category	9.2	10.4	
Tethering	Count	55	60	115
	% in category	14.9	14.5	
Keeping land fallow	Count	5	4	9
	% in category	1.4	1.0	
Applying FYM	Count	15	12	27
	% in category	4.1	2.9	
Plantation of fodder	Count	41	56	97
	% in category	11.1	13.5	
Making own pasture	Count	5	5	10
	% in category	1.4	1.2	
Water protection	Count	35	33	68
	% in category	9.5	8.0	
Bamboo plantation	Count	34	46	80
	% in category	9.2	11.1	
<i>Chhuzhing</i> conversion	Count	8	8	16
	% in category	2.2	1.9	
Compost making	Count	50	60	110
	% in category	13.6	14.5	
Contour bunding	Count	4	4	8
	% in category	1.1	1.0	
Organic farming	Count	17	8	25
	% in category	4.6	1.9	
Mixed cropping	Count	14	7	21
	% in category	3.8	1.7	
Crop rotation	Count	11	14	25
	% in category	3.0	3.4	
Others	Count	0	1	1
	% in category	0.0	0.2	
None	Count	0	1	1
	% in category	0.0	0.2	
Total	Count	369	414	783
	% in category	100.0	100.0	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

3.2 Constraints with Poverty and Adoption of SLM Practices

Through FGDs, the constraints that emerged were those that were associated with adoption of SLM practices and those associated with poverty of the households which has been listed separately. Based on the frequency of responses for each of the constraints mentioned, percentages of responses are presented in tables 11 and 12.

Table 11: Constraints with adoption of SLM practices by frequency of responses from FGDs

Constraints	Responses	
	Count	Percent
Small land holdings (acreage)	7	12.7
Shortage of farm labour	6	10.9
Lack of cash income	7	12.7
Lack of interest in agriculture	1	1.8
Uncontrolled local cattle grazing	1	1.8
Inadequate numbers / lack of cattle (improved as well as local)	4	7.3
Unsuitable marketing options	3	5.5
Uncertainty of production and prices	1	1.8
Forest encroachment of private land	1	1.8
Decreasing water volume at source	1	1.8
Steep slope prone to erosion and land slides	7	12.7
Insufficient farm yard manure	1	1.8
Lack of knowledge and idea on SLM practices	2	3.6
Unavailability of quality seeds and seed	2	3.6
Crops destruction by wild animals	2	3.6
Decreasing soil fertility	3	5.5
Lack of irrigation facilities	3	5.5
Agricultural land far away from settlement area	3	5.5

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 12: Constraints associated with poverty of households for adoption of SLM practices by frequency of responses from FGDs

Constraints	Responses	
	Count	Percent
Small land holdings	7	13.5
Shortage of farm labour	2	3.8
Lack of cash income	9	17.3
Subsistence food grain insufficiency	7	13.5
Inadequate / lack of cattle	7	13.5
Need to work as labourers for others	7	13.5
Insufficient farm yard manure	2	3.8
Lack of knowledge and idea on SLM practices	2	3.8
Need to do share-cropping	2	3.8
Lack confidence owing to persistent poverty	4	7.7
Owned land left fallow	3	5.8

Source: Field Survey, Poverty –SLM Linkages, July 2009

With regard to constraints in adoption of SLM practices, small land holdings, shortage of farm labour, steep slope topography constantly prone to erosion and land slides and inadequate or lack of cash income featured most prominently (table 11). With regard to constraints associated with poverty of the households in relation to sustainable land management, lack of cash income, small land holdings, subsistence food grain insufficiency for household consumption, inadequate or lack of cattle, and need to work for others to generate cash income were the prominent ones (table 12).

3.3 Poverty – SLM vis-à-vis SLM – Poverty Linkages

For each of the *Chiogs* visited, the farmers in FGD were asked to prioritize the listed constraints as mentioned under chapter 3.2. Using a participatory method (Do-It-Yourself) with consultant facilitating and assisting the farmers in recording, a causal-effect analysis for the prioritized problems was undertaken. Each of these causal-effect analyses for sampled *Chiogs* is presented under annexure 3. Considering the higher percentages of responses elaborating major problems (under table 11 and 12) and selecting the main problems prioritized through FGD for respective causal-effect analysis, five major problems were identified being associated with inability of the farmers to adopt SLM practices with its linkages to poverty of the households vis-à-vis poverty of the households with its linkages to adoption of SLM practices, as following.

1. Inadequate cash income,
2. Small size of land holding (acreage),
3. Shortage of household farm labour for agricultural works,
4. Subsistence household food grain insufficiency and
5. Constant erosion and land slides with steep landscape.

Causes and effects of inadequate cash income

Lack of cash income owing to lack of income opportunities in the villages and limitation on intensification of crops production for market were linked to accessibility to markets. For instance, the remote location of the villages without road accessibility and lack of consumers at road heads limited diversification of crops cultivation, as evident from *Chiogs* Kamjong and Zhobling. Citrus and ginger as main cash crop in some of the *Chiogs* (Chilauney B, Ahalley, Dekiling) were challenged with increasing disease infestation of citrus trees and fluctuating production and market prices for ginger. For many of the remoter *Chiogs* with subsistence agriculture as their main occupation, intensification of cash income from agriculture was challenged, mainly due to distant market sheds and high transaction costs for inputs and products.

Poorer households with lack of cash income in general had less number or lack cattle. The price of cattle is quite high and purchase of cattle by such households is beyond their capabilities. With lack of oxen to plough, these farmers had to depend on hiring oxen from neighbours, which was usually available after the completion of right season (as oxen is engaged for cultivation by the owner). With off season cultivation, the production decreased that further affected the subsistence food grain sufficiency for poor households. Lack of cattle also affected the availability of FYM to maintain and improve fertility of soil.

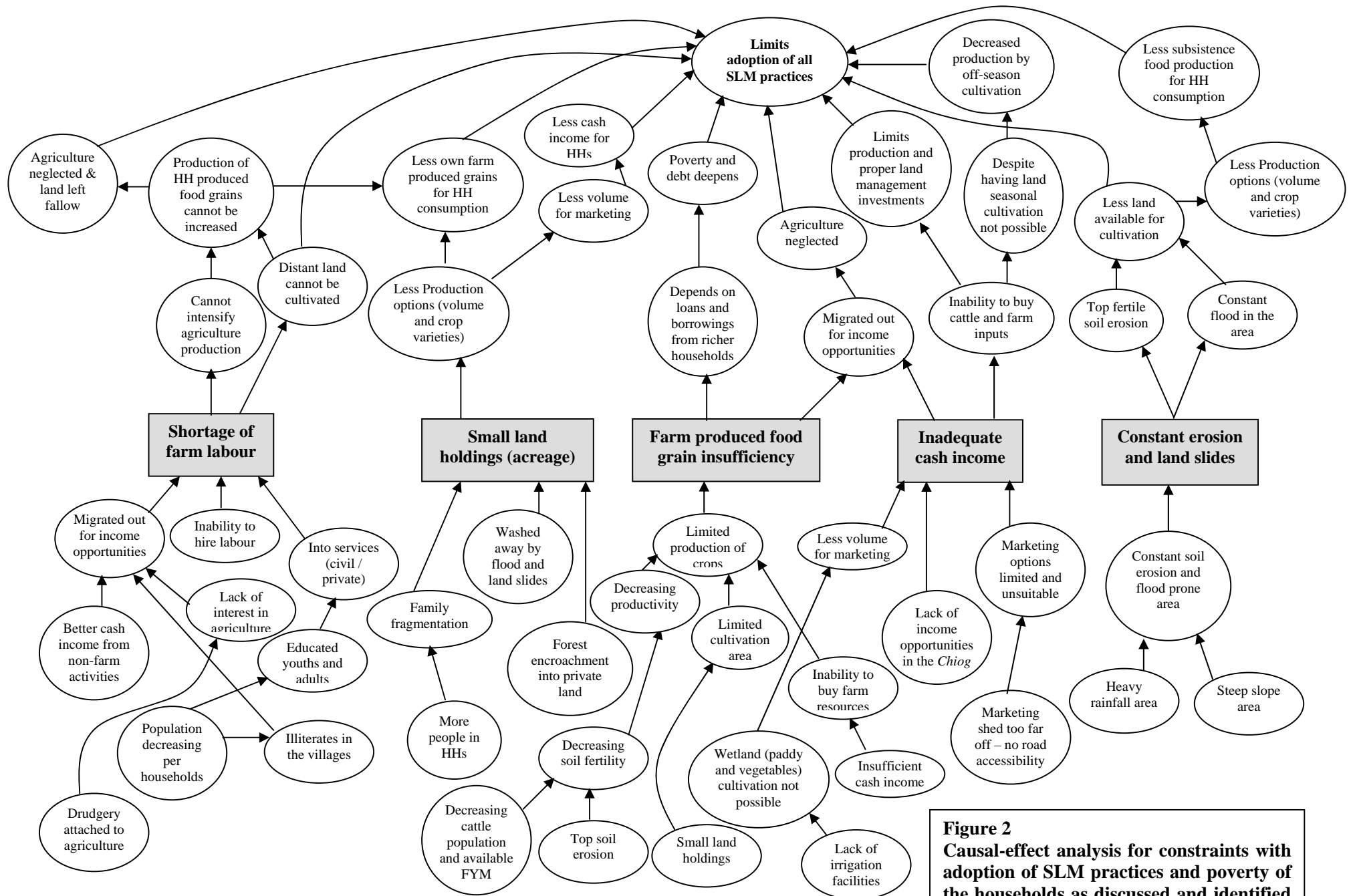


Figure 2
Causal-effect analysis for constraints with adoption of SLM practices and poverty of the households as discussed and identified by farmers

Constant erosion on steep slopes for e.g. rocky infertile soil being exposed owing to erosion in Norbugang *Chiog* compounded with increasing incidence of crops destruction by increasing population of wild animals (only 25% of the Maize was indicated to have been harvested by the farmers), the farmers were challenged with decreasing soil fertility as well as the requirement to guard against wild animals. While Maize as subsistence food grain was indicated to last for 12 months for one third of the households in sampled *Chiogs*, people as an alternative migrated during off-seasons to work on off-farm activities (mainly as road side or construction labourers working on daily wage system). This off-farm income has been particularly significant for households with inadequate income to purchase food items (rice, oil, sugar, salt, dal etc), meet educational expenses for children (uniform, shoe and travels), clothing, purchase farm tools and inputs including seeds, meet expenses for religious and social occasions amongst others. In the process, for some farmers with small land holdings, off-farm incomes have replaced agriculture as main occupation and agriculture has been neglected. While for some, the off-farm income has supplemented strengthening agriculture in terms of increasing farmers' capacity to purchase necessary inputs.

Causes and effects of small land holding (acreage)

Fragmentation of land holdings for distribution among family members has been the main cause for decreased or small land holdings per household. *Tseri* land that was earlier cultivated has been abandoned so forest trees have encroached these plots. These have remained out of household's registered land holding. Added to it, in some instances registered land was being washed away by floods and landslides, leaving behind small land holdings per households. An earlier analysis on land holding shows that majority of the people do not own *Chhuzhing* (41% of the total respondents), particularly more households from poorer category. A substantial numbers owned *Kamzhing* between 2.1 to 4 acres, while good percentages have land (*Chhuzhing* as well *Kamzhing*) less than 2 acres, confirming small land holdings per household.

The effects of small land holdings were many. The immediate effect was on subsistence food grain for household consumption. For poorer farmers, share cropping and income through off-farm activities were alternatives to meet the shortage for household consumption. Though farmers have knowledge on SLM practices, adoption of SLM practices demand compromising cultivable land for long-term as well for short-term benefits. However, small land holders faced the difficulty to adopt even short-term benefit practices that demanded compromising their marginal land.

Causes and effects of shortage of household farm labour

Field visits revealed that agriculture in Bhutanese mountainous terrain with steep slope topography is represented by drudgery especially where mechanized practices are not possible. With educated youth migrated out of village for job in urban towns and cities, the old and young children usually remain in village households. Even illiterate farmers migrated for off-farm activities. Thus the farm households in such *Chiogs* were challenged with shortage of farm labour, added with inability to hire required labour for agriculture.

Farmers indicated that shortage of farm labour affected farmers' ability for land management and accordingly the decisions. For e.g. despite availability of land and having good knowledge on SLM practices, farmers' decision on adopting SLM practices or improving economic conditions for

poorer households could be severely limited with lack of adequate numbers of farm labourers required for implementing SLM practices or for intensifying agriculture to enhance income.

Causes and effects of subsistence household food grain insufficiency

Shortage of labour means inability of the household to depute time for additional activities for SLM practices. This was more significant for poorer households with marginal land holdings. In many instances, people have cultivable land far away from settlement area. With *Tseri* being abandoned, forest have encroached the surrounding creating habitat for wild animals. The labour is intensive for agriculture in terms of drudgery and the incidence of crop destruction by wild animals is reported to have increased over the years despite guarding for 24 hours. All of these factors therefore limited intensification of agriculture that affected overall subsistence food grain production. Added to it small land holdings, declining soil fertility and land degradation impacted farm household grain production negatively.

Causes and effects of constant erosion and land slides with steep landscape

The steep sloping settlements with cultivable land in mountainous terrain of Bhutan face constant soil erosion with heavy monsoon rain. Cultivable land washed by swollen streams and those situated near the rivers were constantly eroded by flood and landslides. Farmers from *Chiog* Norbugang indicated difficulty in preventing landslide and erosion in their *Chiog*. With arable land being on too steep slopes with loose gravel type soil, farmers experienced difficulty in plantation of trees to prevent landslide due to shallow rooting depths. The FYM applied were washed away and top fertile soil was eroded exposing the rocky infertile soil that led to decreased production of crops. Such phenomenon on soil erosion has been reported from all the *Chiogs* visited and accordingly the sustainability of present land use has been discussed and analyzed as elaborated in next section.

3.4 Sustainability of Current Land Use Practices

Triangulated from earlier analyses, this section elaborates sustainability of present land use and relates it to whether land use of poor farmers are less sustainable as compared to land use of farmers that are better off. The effects of SLM adoption towards poverty alleviation and enhancement of livelihoods as gathered through FGD with farmers is also explicated in this section.

Effects of SLM on livelihoods

Most farmers mentioned that the effects of all SLM adoption towards enhancing income and poverty alleviation cannot be measured immediately as the project was implemented recently. However, farmers mentioned increased production of crops and increased income / savings through SLM interventions. For example, the supplies of seeds have increased crop production as per farmers' opinion from SLMP sites. Likewise, renovations of irrigation channel to enhance paddy production (for example in Kamjong *Chiog*) and *Chhuzhing* conversion in Tali, Zhobling and Kamjong have enhanced paddy production for household consumption, decreasing the dependency to import grains from market. Tali farmers mentioned increased in potato and mustard production and Zhobling mentioned increased in potato and paddy cultivation. Likewise, Norbugang mentioned diversified income based agriculture towards cultivation of mango, passion fruit and vegetables,

generating better cash income. However these improvements were based on the improvement in production which could have been contributed by many other factors such as use of improved seeds, increasing the area of cultivation for potato and paddy and diversification of crops cultivation. Farmers were not able to assess immediate impacts of some of the practices such as dry land terracing and hedge row plantation in relation to poverty alleviation. The quotes from farmers on effects of SLM adoption are provided in the box below which is explicit in itself.

Box 1: Quote from FGD with farmers on effects of SLM adoption

Farmers from Tali Chiog

“We feel that potato cultivation has been increasing over the years and with present FYM application and terracing through SLMP interventions, the soil fertility is expected to improve enhancing production of potato which is the main cash crop. With *Chhuzhing* conversion supported by SLMP, we are able to increase paddy for household consumption, decreasing our dependency to import grains from market. With all SLM practices adoption in future our production will increase enhancing our income and at the same land use can be sustainable.”

Farmers from Zhobling Chiog

“Applying manure, dry land terracing has helped us to control erosion and increase soil fertility thereby increasing potato productions. However for citrus and potatoes, maintaining or increasing production could also be a challenge with decreasing cattle population and decreasing availability of manure.”

Farmers from Ahalley Chiog

“With SLM practices of using farm yard manure and crop rotation, the land is sustainable for vegetable and ginger production. Many have increased ginger and vegetable production generating better cash income as compared to the past. However, people having less land cannot undertake fallowing and crop rotation, mainly for ginger production limiting their production potentials.”

Farmers from Kamjong Chiog

“Our Chiog being most inaccessible, our livelihood was dependent mainly on livestock. Our main crop is Maize and we have no other sources of income. Land slides and erosion are very common in our Chiog. With SLMP support we have benefitted a lot. For example, we have planted citrus seedling that will fruit in few years time. This will bring substantial income to farmers from Kamjong in addition to control and prevention of land slides. Soon we will also have road accessibility. We therefore foresee a better socio-economics for us in few years time.”

As per farmer’s perception, decreasing the incidences of soil erosion and preventing land slides by forest trees or fruit trees plantation and hedge row plantation were seen to have long-term benefits while adoption of dry land terracing, maintaining crop rotation and mixed farming, wet land conversion, and developing pasture were viewed as short-term benefits. Such benefits categorization by the project management unit (short-term and long-term) for the practices introduced by SLMP could differ from farmer’s perception on categorization.

Land use for the richer households

The findings showed that SLM practices that required adequate land holding such as crop rotation and fallowing were practiced by higher percentage of households with self-sufficiency (richer farmers). More households with self-sufficiency have also practiced SLM practices related to water source protection, application of FYM, organic and mixed cropping. This was evident from earlier analysis (table 11 under annexure 2) where more households with self-sufficiency owned higher acreage of *Chhuzhing* as compared to the poor households. Accordingly involvements of self-sufficient households in SLM practices for water source protection were higher. Likewise more number of better-off households had capability to purchase inputs including seeds to undertake mixed farming as compared to poor households as analysis on income strategies showed that higher cash income were generated by self-sufficient households.

Land use for the poor households

Farmers through FGDs have confirmed that fallowing and crop rotation were usually not practiced by poor farmers that have small land holding. Proper investment in land requires hiring of farm labour (with households facing shortage), purchase of farm inputs (seeds, seedlings and tools) and investment in cattle development (in terms of FYM and oxen needed for farmers). The poor households owning less number of cattle had limited capabilities in applying FYM and adopting organic farming in contrast to better off households owning higher number of cattle. Poor households also lacked capability in terms of cash or ability to hire manpower, and provide necessary inputs and time required to contribute towards water source protection (drinking as well the irrigation). This was further challenged with uncertainty and risk associated with investment (for example fluctuating production and market prices for ginger as cash crop). Therefore inadequate / less cash income for poor farmers was one of the major factors impacting investments in land for sustainable use.

Despite the constraints identified for poor households in adopting SLM practices, the findings from FGDs showed that many other practices such as plantation of private trees, hedge row plantation, dry-land terracing, tethering, fodder trees plantation, bamboo plantation and compost making were adopted by higher percentage of farmers without self-sufficiency. This confirms that practices that required fewer inputs in terms of manpower, cash and land compromise were practiced and adopted by poor households. On the other hand, this indicated that land use of poor households is also limited to some extent by their incapability (lack of cash income, small land holdings, insufficient food grain production and lack or adequate numbers of cattle). Therefore, all practices adopted by better off households were not adopted by all poor households.

Sustainability of land use

From farmers' opinion, few cultivation practices were identified as sustainable. For example ginger cultivation with mulching and crop rotation system is considered sustainable for farmers from Phuentsholing Geog having good acreage of land holding to enable crop rotation. However, farmers with small land holdings have experienced decreased production of ginger as compared to their neighbours as marginal land holders were unable to undertaking crop rotation and fallowing.

Despite small land holdings, farmers expect immense benefit of *Chhuzhing* conversion. However, lack of irrigation facilities was another limitation. For e.g. the irrigation channel supported and constructed by the Government for people in Dekiling *Chiog* but washed away by land slide have left *Chhuzhing* cultivation fallow and limited their income opportunities from vegetables cultivation. Another similar incidence of irrigation channel washed away by land slide in Pangna *Chiog* have left 75% of the households with *Chhuzhing* fed by that particular channel without *Chhuzhing* cultivation. Similarly, with decreasing volume at the source, water source being at lower altitude and *Chhuzhing* area at higher altitude, *Chhuzhing* cultivation was not possible for many farmers from Kamjong *Chiog*. Some farmers have *Chhuzhing* at distant location (for example Tali farmers) without power-tiller or road accessibility that limited their production potentials owing to transportation difficulties. Farmers from Zhobling, Tali and Kamjong that expect increased acreage of *Chhuzhing* with more *Chhuzhing* conversion expressed the need to strengthen the existing irrigation channels.

The shortage of farm labour limit farmers ability to adopt many of SLM activities despite awareness and their interest in proper land management practices. Farmers mentioned their inability to make dry-land terracing or *Chhuzhing* conversion, where the requirement of labour is more intensive on steep slopes. Concerned about the decreasing numbers of cattle population and decreasing forest fodder resources, the current pasture and fodder development in private land could be still far behind the requirement for the household, as mentioned by the farmers.

Box 2: Quote from FGD with farmers' from Dekiling *Chiog* on sustainability of land use

“We have sloping land and owing to constant soil erosion, fertility has decreased over the years. Even the cattle population has decreased and available FYM is decreasing. Despite having *Chhuzhing*, our irrigation channel was swept away by landslides. Leaving aside paddy cultivation, we have not been able to cultivate vegetables for our cash income. Production of Citrus as main cash crop is decreasing owing to citrus disease and about 75% of the trees are already dead. Despite present cultivation practice (rotation) the production of Ginger remains uncertain. There is always regular erosion with heavy rainfall and we experience regular stream floods and landslides. We feel our land use is not sustainable.”

Chapter 4: Conclusions and Recommendations

4.1 Conclusions

The conclusions provide description of the outcomes derived from linkages between conditioning factors (physical assets, land holdings), household factors, income strategies, land management practices and the constraints that are interlinked to each other. The impacts of each of the significant factors influencing land degradation, land management and poverty are also explicated.

The Royal Government of Bhutan's strategies toward poverty reduction are being implemented through programmes aimed at increasing productivity and reducing land degradation. Examples of such strategies include promoting investments in soil and water conservation and agro-forestry including focus on livestock development. However, the investment alone in poverty reduction and enhancing agricultural productivity may not be sufficient to address the problems of land management unless programmes are linked with measures to curb land degradation. Collectively derived from this study, the conclusions in terms of poverty-SLM linkages are the following:

- 1) The households in rural Bhutan have highly variable assets endowment and livelihood strategies. Households often located in remote and isolated areas rely on basic grain farming as their areas are relatively poor agro-ecologically and socio-economically. Opportunities for income generation within the *Chiogs* are limited and livelihood strategies are combined efforts in on-farm works along with off-farm activities to generate income for rural livelihood.
- 2) With drudgery attached to agriculture and lack of other income opportunities in remote rural areas, technical assistance programmes are focused to promote profitable technologies in the context of enhance agricultural productivity (through improved seeds, seedlings, livestock breeds) and enhancing income.
- 3) Programmes aimed through SLMP have shown higher knowledge base of farmers and incidences of SLM practices adoption from piloted sites, without which the problems associated with land degradation, could possibly worsen in long-term. The combinations of existing programmes of SLMP with agriculture extension are viewed highly beneficial in terms of increasing household income as well as adopting SLM practices.
- 4) The land holdings being marginal for majority of the farmers the study revealed that farmers with sizable land holdings and higher income through other sources use the land less intensively. Farmers with marginal land holdings are compelled to use the land intensively without alternative options such as crop rotation, fallowing or even proper application of FYM and other inputs.
- 5) SLM practices that require adequate land holding (such as crop rotation and fallowing) are practiced by higher percentages of households with self-sufficiency. Given the poverty in food grain insufficiency and lack of cash income for the poor households, combined with less land holdings (especially *Chhuzhing*) the practices that are less-labour intensive and requiring less inputs in terms of cash and land compromise are practiced and adopted by poor households.

- 6) Amongst the various physical assets, ownership of cattle has been a significant determinant of land management, as availability and increase in FYM could substitute the farmers needs to purchase inorganic fertilizers in near-term. Likewise, farming being dependent on use of draught power for ploughing, ownership of comfortable numbers of cattle would enable a household to undertake seasonal and productive cultivation.
- 7) Agricultural productivity and household income tend to be higher in the areas with higher agricultural potential and better market access, where farmers seem to intensify, diversify crop cultivation and increase production of high value crops (cash crops). Likewise, the dairy production and livestock enterprises (poultry and piggery) were found close to urban areas because of accessibility to markets. Access to markets and roads therefore influences farmer's decision to invest in land management as it favors the access to inputs and adoption of technologies by increasing their availability and favors commercialization of agriculture and livestock enterprises and enhances off-farm income opportunities.
- 8) With limited opportunities of other income with the *Chiogs*, income through non-farm activities outside the *Chiog* have lead to migration of rural agricultural manpower leaving shortage of farm labour at the households. The shortages of farm labour compounded with small land holdings have led to subsistence food grain insufficiency in term of farm produced food security.
- 9) Lack of irrigation and subsequently steep slope with less feasibility for *Chhuzhing* conversion has limited paddy cultivation for some *Chiogs* while diseases of citrus and uncertainty of production and market prices for ginger as cash crop has limited production potentials of these crops, where farmers have diversified towards vegetables cultivation.
- 10) Uncontrolled and open forest grazing of livestock as the traditional system of grazing has negative impacts on programmes for sustainable forest resources conservation and for programmes on agro-forestry, including for those on land slides and erosion control through plantation of trees.

4.2 Recommendations

4.2.1 Adopting SLM Practices and alleviating poverty

Past studies revealed that SLM practices are likely to be adopted where agriculture is important in rural livelihoods and where SLM has the potential to increase yields of high-value crops. SLM practices are more likely to be successful if they provide tangible benefits to the individual household or community by emphasizing enhanced agricultural productivity, food security, and income, rather than by controlling land degradation¹⁹. Therefore, in line with constraints associated with poverty of the households and adoption of SLM practices, the recommendations are measures to overcome constraints to enable poor farmers' adoption of SLM practices as well as to provide tangible benefits to the households.

- 1) Agricultural extension has to include SLM programme into the regular extension programme. Such programmes have to be delivered by providing information on subsequent

¹⁹ Sustainable Land Management (Challenges, Opportunities and Trade-offs), The World Bank, 2006

benefits to farmers through investment in sustainable land management practices and enhancement on productivity, farm produced subsistence food grain sufficiency and income to the households.

- 2) Programmes aimed at promotion and production of high-value cash crops (citrus, ginger, vegetables) that have high returns to the farmers have to be supported to overcome persistent poverty of the households. A mix of SLM programmes to support crop diversification (growing a range of staple and cash crops), providing access to necessary tools and implements, and mix of crops for enhancing soil fertility through inter-cropping and crop rotation are some measures identified to enhance subsistence food grain production, income and prevent land degradation.
- 3) The government's investment towards long-term benefits of SLM practices needs to be supported for poor farmers to enable them to adopt labour-intensive SLM practices (such as *Chhuzhing* conversion, dry-land terracing and contour bunding) by means of subsidies on labour inputs.
- 4) As majority of the farmers are illiterates that migrate out for off-farm activities, the awareness programmes through agriculture extension need to focus on principles of sustainable land management in addition to principles of increasing yield and profitability. Similarly teaching basics on sustainable land management in educational curriculum along with focus on profitability of agriculture farming could contribute to attract educated youths in farming to overcome the constraints in shortage of farm household labour in rural areas.
- 5) The labour saving technologies through improved farming technologies and supplies of farm tools and machinery will help to reduce labour pressure on rural households to enable farmers to assign labour for investment in sustainable land management practices.
- 6) The government investment for intensification of land use change through *Chhuzhing* conversion and irrigation development need to be continued and strengthened to ensure both production potentials as well as adoption of sustainable land use and soil conservation practices.
- 7) The existing livestock programme on development of livestock through improved breeds, health, housing, management, in addition to pasture and fodder development to reduce degradation through grazing needs to be emphasized on improving access to cattle for cattle-poor households. At the same time, alternatives to promote agriculture without dependency on oxen (supply of subsidized farm machineries and tools) would benefit commercialization of livestock enterprises with improved breeds and reduce cattle-poor household's dependency on oxen as draught power.
- 8) In areas with common property management (such as water source protection and grazing land management) it is essential to involve local community for collective management in order to collectively protect common land or water resources against illegal deforestation, overgrazing and subsequent land degradation.

4.2.2 Poverty-SLM Indicators

Based on the significant outcomes of poverty-SLM linkages identified through this study (i.e. the key challenges of SLM-Poverty vis-à-vis Poverty-SLM linkages with identified possible

interventions), the indicators of poverty and SLM linkages for use in RNR planning and food security policy development are identified. The indicators proposed are based on the constraints identified for adoption of SLM practices and expected benefits to the farmers to overcome the constraints. At the same the indicators are linked to alleviation of poverty in the rural households.

Indicator 1:

30% of poorest farmers from each *Chiog* with SLM adoption targeted for enhancing farm (crop and livestock) productivity increase their income from farm produce by 25% by the end 5 years as compared to the baseline.

Indicator No. 1 is based on the major problem of inadequate or lack of cash income for rural households, the effects of which were more pronounced for poor farmers, limiting their capabilities to invest in land management. Amongst others, limitation on intensification of agriculture to generate market surplus and enhance income has been identified as a constraint for farmers to raise their income. Though such limitation was also effected by other factors apart from land management such as inaccessibility and lack of marketing avenues, farmers from SLMP sites have enhanced income through SLMP interventions. Such interventions enhancing income were evident from crop diversification towards vegetable cultivation (seeds supplied by SLMP and adopting SLM practices) and increased production of potato as main cash crops. With citrus fruiting in about 5 years many farmers expect a very high income after fruiting. This indicator therefore measures enhancement of income through increase in farm productivity with SLM adoption by the poor farmers.

Indicator 2:

Farmers with marginal landholdings owned (less than a total of 2 acres per household) in each *Chiog* adopting SLM for preventing land loss and enhancing soil fertility, control land loss and enhance their agricultural production of main crops (Maize and Paddy) by 5% by the end 5 years as compared to the baseline.

Indicator No. 2 is based on two major problems associated with SLM adoption and poverty of the households - marginal land holdings and insufficient food grain production. Apart from family fragmentation, the cause for decreasing land size for cultivation has been land degradation (erosion, landslides, flood and forest encroachment). Constant soil erosion could lead to decreased fertility. The challenge for marginal landholders, usually poor farmers, is to adopt land management practices that could demand compromising their cultivable land, at the same without decreasing their productivity and production. The challenge is also to enhance production of grains for households, decreasing the dependency on imports from markets. In piloted SLMP sites, farmers have increased paddy cultivation through *Chhuzhing* conversion. Despite constant erosion and decreasing fertility reported by farmers some have indicated increased production of Maize while for some it has remained constant for some years. Measures such as improving availability of FYM, terracing to control soil erosion, hedge row plantation were implemented and adopted by some farmers in piloted sites and farmers indicated these practices being beneficial in improving soil fertility to enhance crop production²⁰. The indicator will measure outcomes of SLM as follows: 1)

²⁰ Rural Livelihoods and Peri-Urban Analysis, NSSC, Ministry of Agriculture, 2008

setting a baseline to measure control of land loss (through *Chuzhing* conversion, dry-land terracing), 2) setting a baseline to measure increased soil fertility (through compost making, improving availability of FYM and crop residue) 3) setting a baseline to measure increased production of main crops (Maize and Paddy)

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Annexure

Annex 1: Terms of Reference

Background

The Medium Size Project on Capacity Building and Mainstreaming of Sustainable Land Management (MSP) is funded by GEF through UNDP and hosted at the National Soil Services centre (NSSC) of the Ministry of Agriculture. The project started in 2007 and lasts until the end of 2009. One of the foreseen outputs of the projects is a number of thematic studies related to SLM to get a better understanding of the causes and impacts of SLM. In this context the project is interested to facilitate a study that will look into more depth at the linkage between SLM and poverty. This includes the relation between livelihoods of people and the sustainability of their land use. Poor household have in general smaller land holding and of lesser productivity. They are often forced out of necessity to continue with *Tseri* practices and have difficulty to adopt SLM practices that have a longer-term horizon, such as orchard development or terracing. In general it is expected that this study should help to identify the existing constraints for poor farmers to adopt SLM practices. The study should also generate recommendations how these constraints could be overcome so that farmers would be more inclined to adopt SLM practices.

Objective

- To analyze the relation between poverty and SLM and how this affects the possibility for farmers to adopt SLM practices.
- To identify the main constraints for poor farmers to adopt SLM practices.
- To assess to what extent the land use of poor households is sustainable in relation to households that are better off.
- To develop recommendations how to overcome the main constraints for poor farmers in adopting SLM
- To define indicators of poverty –SLM linkages

Output

- Report outlining the relation between poverty and SLM.
- Quantitative data documenting the SLM – poverty linkage
- Recommendation how to tackle the main constraints for poor famers in adopting SLM
- Definition of possible indicator of poverty and SLM linkage for use in RNR planning and food security policy development

Study Questions

- Is the land use of poor farmers less sustainable than the land use of farmers that are better off?
- What are the direct and indirect effects on land use if a farmer is poor?

- Why is it more difficult to adopt SLM practices for a poor farmer?
- What are the main constraints for a poor household to take up SLM?
- How can these constraints be overcome?

Tasks

- Carry out field survey in at least 10 Gewogs comprising of pilot Gewogs of DNRM, PPD and SLM Gewogs of SLMP project sites to assess as accepted by PPD and NSCC to identify the poorest chiwog in these Gewogs and identify causes of poverty, particularly from a sustainable land management perspective.
- Identify SLM practices, both traditional and improved, in these Gewogs with strong link to poverty alleviation. The SLM practices identified so should be related to, depending on their natural resource endowments, NRM issues such as management of agriculture land, grazing and pasture resources, irrigation and water management and access to forest resources as well as access to inputs and technical support for such management requirements.
- Based on the findings of the SLM linkages try to define at least three at national and local levels for each category of practices, for use in rural development and RNR planning for food security and poverty alleviation.
- Conduct a poverty-SLMP workshop including participation from the concerned local stakeholders, MSP, SLMP staff and PPD during which all findings of the study shall be presented for discussion.
- Submit and comprehensive report on SLM practices, their linkage to poverty and indicators including survey data and, community consultation reports and analytical work to MSP

Study Duration

2 months

Starting date

June

Provisional schedule

Week 1	Meeting with MSP-SLM-PPD team to detail work plan and prepare field visit scheme and questionnaire format
Week 2	Finalize questionnaire format and field approach
Week 3-5	Fieldwork in SLM <i>Geogs</i>
Week 5-6	Analysis of data and drafting of report
Week 6	Submission Draft report
Week 7	Workshop with SLM stakeholders
Week 8	Completion of final study document

Qualification

The consultant should have the following qualifications:

- Academic qualification of at M.Sc. level in natural resources management or rural development of related field
- At least 5 years work experience in natural resources management or rural development or related field.
- Must have references of having successfully completed at least three consultancy assignments related natural resources or environment areas.
- Must have valid consultancy license issued by the Ministry of Economic Affairs

Requirements

- A technical and financial proposal along with the bid
- Copies of valid license for consultancy in Bhutan
- References of earlier consultancy work from concerned clients

Duty Station

Once selected the consultant shall work from his or her office with frequent reporting on progress to the Program Director of NSSC (Project Management of MSP) and Planning Officer, PPD, MoA. Coordination with PPD on technical matters related to the work is desirable.

Annex 2: Tables of Analysis

Table 1: Frequency and percentage of respondents for individual interview and FGD by *Chodrup* ranking and by *Chiogs*

<i>Chiogs</i>	Frequency & percent	Respondents for individual interview			Respondents for Focus Group Discussion		
		Household with self-sufficiency	Households without self-sufficiency	Total	Household with self-sufficiency	Households without self-sufficiency	Total
Chilauney A	Count	7	6	13	5	5	10
	% of Total	4.6	3.9	8.5	5.2	5.2	10.3
Ahalley	Count	7	7	14	5	5	10
	% of Total	4.6	4.6	9.2	5.2	5.2	10.3
Kamjong	Count	5	5	10	5	5	10
	% of Total	3.3	3.3	6.5	5.2	5.2	10.3
Tali	Count	9	1	10	9	1	10
	% of Total	5.9	0.7	6.5	9.3	1.0	10.3
Zhobling	Count	0	7	7	0	8	8
	% of Total	0.0	4.6	4.6	0.0	8.2	8.2
Dekiling	Count	6	14	20	5	5	10
	% of Total	3.9	9.2	13.1	5.2	5.2	10.3
Kheri	Count	6	8	14	5	5	10
	% of Total	3.9	5.2	9.2	5.2	5.2	10.3
Tshogonpa	Count	7	5	12	5	5	10
	% of Total	4.6	3.3	7.8	5.2	5.2	10.3
Pangna	Count	22	19	41	5	5	10
	% of Total	14.4	12.4	26.8	5.2	5.2	10.3
Norbugang	Count	0	12	12	0	9	9
	% of Total	0.0	7.8	7.8	0.0	9.3	9.3
Total	Count	69	84	154	44	53	97
	% of Total	45.1	54.9	100.0	45.4	54.6	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 2: Frequency and percentage of respondents for quantitative interview and FGD by gender and by *Chiogs*

<i>Chiogs</i>	Frequency & percent	Respondents for individual interview		Total	Respondents for Focus Group Discussion		Total
		Male	Female		Male	Female	
Chilauney A	Count	9	4	13	8	2	10
	% of Total	5.8	2.6	8.4	8.2	2.1	10.3
Ahalley	Count	13	1	14	10	0	10
	% of Total	8.4	0.6	9.1	10.3	0.0	10.3
Kamjong	Count	7	3	10	6	4	10
	% of Total	4.5	1.9	6.5	6.2	4.1	10.3
Tali	Count	4	7	11	3	7	10
	% of Total	2.6	4.5	7.1	3.1	7.2	10.3
Zhobling	Count	3	4	7	4	4	8
	% of Total	1.9	2.6	4.5	4.1	4.1	8.2
Dekiling	Count	5	15	20	6	4	10
	% of Total	3.2	9.7	13.0	6.2	4.1	10.3
Kheri	Count	1	13	14	8	2	10
	% of Total	0.6	8.4	9.1	8.2	2.1	10.3
Tshogonpa	Count	6	6	12	5	5	10
	% of Total	3.9	3.9	7.8	5.2	5.2	10.3
Pangna	Count	28	13	41	5	5	10
	% of Total	18.2	8.4	26.6	5.2	5.2	10.3
Norbugang	Count	10	2	12	4	5	9
	% of Total	6.5	1.3	7.8	4.1	5.2	9.3
Total	Count	86	68	154	59	38	97
	% of Total	55.8	44.2	100.0	60.8	39.2	100.0
	% of Total	55.8	44.2	100.0	60.8	39.2	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 3: Frequency and percentage of respondents for individual interview by age and by *Chiogs*

<i>Chiogs</i>	Frequency & percent	Age of the respondent					Total
		5-25 yrs	26-35 yrs	36-45 yrs	46-60 yrs	> 60 yrs	
Chilauney A	Count	2	1	4	6	0	13
	% of Total	1.3	0.6	2.6	3.9	0.0	8.4
Ahalley	Count	5	3	3	3	0	14
	% of Total	3.2	1.9	1.9	1.9	0.0	9.1
Kamjong	Count	2	2	1	5	0	10
	% of Total	1.3	1.3	0.6	3.2	0.0	6.5
Tali	Count	0	2	1	7	1	11
	% of Total	0.0	1.3	0.6	4.5	0.6	7.1
Zhobling	Count	2	3	1	1	0	7
	% of Total	1.3	1.9	0.6	0.6	0.0	4.5
Dekiling	Count	3	4	3	7	3	20
	% of Total	1.9	2.6	1.9	4.5	1.9	13.0
Kheri	Count	4	0	2	6	2	14
	% of Total	2.6	0.0	1.3	3.9	1.3	9.1
Tshogonpa	Count	0	5	5	2	0	12
	% of Total	0.0	3.2	3.2	1.3	0.0	7.8
Pangna	Count	4	9	8	10	10	41
	% of Total	2.6	5.8	5.2	6.5	6.5	26.6
Norbugang	Count	6	2	3	0	1	12
	% of Total	3.9	1.3	1.9	0.0	0.6	7.8
Total	Count	28	31	31	47	17	154
	% of Total	18.2	20.1	20.1	30.5	11.0	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 4: Frequency and percentage of respondents for individual interview by occupation and by *Geogs*

<i>Geogs</i>	Frequency & percent	Main occupation of the respondent					Total
		Agriculture	Skilled labour	Business	Services	Others	
Phuentsholing	Count	23	2	0	0	1	26
	% of Total	14.9	1.3	0.0	0.0	0.6	16.9
Nangkhor	Count	19	5	2	1	1	28
	% of Total	12.3	3.2	1.3	0.6	0.6	18.2
Dekiling	Count	16	0	1	1	2	20
	% of Total	10.4	0.0	0.6	0.6	1.3	13.0
Lumang	Count	25	0	0	0	1	26
	% of Total	16.2	0.0	0.0	0.0	0.6	16.9

Drujegang	Count	34	0	6	0	1	41
	% of Total	22.1	0.0	3.9	0.0	0.6	26.6
Tashiding	Count	4	9	0	0	0	13
	% of Total	2.6	5.8	0.0	0.0	0.0	8.4
Total	Count	121	16	9	2	6	154
	% of Total	78.6	10.4	5.8	1.3	3.9	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 5: Frequency and percentage of respondents for individual interview by qualification and by *Chiogs*

<i>Chiogs</i>	Frequency & percent	Qualification of the respondent								Total
		Primary	LSS	MSS	HSS	Degree	Non-formal	Religious	Illiterate	
Chilauney A	Count	2	1	0	0	1	0	0	9	13
	% of Total	1.3	0.6	0.0	0.0	0.6	0.0	0.0	5.8	8.4
Ahalley	Count	1	0	0	0	0	5	0	8	14
	% of Total	0.6	0.0	0.0	0.0	0.0	3.2	0.0	5.2	9.1
Kamjong	Count	2	0	2	0	0	0	1	5	10
	% of Total	1.3	0.0	1.3	0.0	0.0	0.0	0.6	3.2	6.5
Tali	Count	1	0	0	0	0	0	1	9	11
	% of Total	0.6	0.0	0.0	0.0	0.0	0.0	0.6	5.8	7.1
Zhobling	Count	0	0	0	0	0	2	0	5	7
	% of Total	0.0	0.0	0.0	0.0	0.0	1.3	0.0	3.2	4.5
Dekiling	Count	3	2	1	0	0	1	0	13	20
	% of Total	1.9	1.3	0.6	0.0	0.0	0.6	0.0	8.4	13.0
Kheri	Count	0	0	0	0	0	2	0	12	14
	% of Total	0.0	0.0	0.0	0.0	0.0	1.3	0.0	7.8	9.1
Tshogonpa	Count	1	0	0	0	0	1	0	10	12
	% of Total	0.6	0.0	0.0	0.0	0.0	0.6	0.0	6.5	7.8
Pangna	Count	7	4	1	1	0	1	3	24	41
	% of Total	4.5	2.6	0.6	0.6	0.0	0.6	1.9	15.6	26.6
Norbugang	Count	1	0	0	0	0	6	0	5	12
	% of Total	0.6	0.0	0.0	0.0	0.0	3.9	0.0	3.2	7.8
Total	Count	18	7	4	1	1	18	5	100	154
	% of Total	11.7	4.5	2.6	0.6	0.6	11.7	3.2	64.9	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

LSS: Lower Secondary
MSS: Middle Secondary
HSS: Higher Secondary

Table 6: Frequency and percentage of respondents with important crops for livelihood by *Chodrup* group

Crops	Frequency & percent	<i>Chodrup</i> category		Total
		Household with self-sufficiency	Households without sufficiency	
Citrus	Count	29	36	65
	% of Total	19.1	23.7	42.8
Paddy	Count	13	10	23
	% of Total	8.6	6.6	15.1
Maize	Count	33	36	69
	% of Total	21.7	23.7	45.4
Ginger	Count	10	9	19
	% of Total	6.6	5.9	12.5
Vegetables	Count	37	55	92
	% of Total	24.3	36.2	60.5
Millet	Count	8	8	16
	% of Total	5.3	5.3	10.5
Wheat	Count	1	2	3
	% of Total	0.7	1.3	2.0
Potato	Count	12	5	17
	% of Total	7.9	3.3	11.2
Buckwheat	Count	2	2	4
	% of Total	1.3	1.3	2.6
Mustard	Count	8	1	9
	% of Total	5.3	0.7	5.9
	Count	68	84	154
	% of Total	44.7	55.3	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 7: Frequency and percentage of respondents with important crops for livelihood by *Chiogs*

Crops	Frequency & percent	<i>Chiog</i>							Total
		Chilauney A	Ahalley	Kamjong	Tali	Zhobling	Dekiling	Kheri	
Citrus	Count	7	12	0	0	0	6	1	26
	% within <i>Chiog</i>	58.3%	85.7%	.0%	.0%	.0%	28.6%	7.1%	
Paddy	Count	0	3	0	1	0	0	0	4
	% within <i>Chiog</i>	.0%	21.4%	.0%	9.1%	.0%	.0%	.0%	
Maize	Count	5	6	2	2	4	4	14	37
	% within <i>Chiog</i>	41.7%	42.9%	20.0%	18.2%	57.1%	19.0%	100.0%	
Ginger	Count	7	7	0	0	0	3	0	17
	% within <i>Chiog</i>	58.3%	50.0%	.0%	.0%	.0%	14.3%	.0%	
Vegetables	Count	7	10	9	10	7	13	2	58
	% within <i>Chiog</i>	58.3%	71.4%	90.0%	90.9%	100.0%	61.9%	14.3%	
Millet	Count	3	6	0	1	0	2	0	12
	% within <i>Chiog</i>	25.0%	42.9%	.0%	9.1%	.0%	9.5%	.0%	
Wheat	Count	2	0	0	0	0	0	0	2
	% within <i>Chiog</i>	16.7%	.0%	.0%	.0%	.0%	.0%	.0%	
Potato	Count	0	0	0	7	0	0	1	8
	% within <i>Chiog</i>	.0%	.0%	.0%	63.6%	.0%	.0%	7.1%	
Buckwheat	Count	1	0	0	0	0	0	2	3
	% within <i>Chiog</i>	8.3%	.0%	.0%	.0%	.0%	.0%	14.3%	
Mustard	Count	1	2	0	3	0	0	1	7
	% within <i>Chiog</i>	8.3%	14.3%	.0%	27.3%	.0%	.0%	7.1%	
Arecanut	Count	0	0	0	0	0	1	0	1
	% within <i>Chiog</i>	.0%	.0%	.0%	.0%	.0%	4.8%	.0%	
Total	Count	12	14	10	11	7	21	14	89

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 8: Frequency and percentage of respondents indicating accessibility to services and facilities

Accessibility to services and facilities	Frequency & percent	Satisfactory	Moderate	Unsatisfactory	Don't know	Total
Gup's office	Count	54	29	71		154
	%	35.1	18.8	46.1		100.0
Agriculture extension	Count	52	32	70		154
	%	33.8	20.8	45.5		100.0
Livestock extension	Count	52	32	70		154
	%	33.8	20.8	45.5		100.0
Forest extension	Count	51	33	70		154
	%	33.1	21.4	45.5		100.0
Basic health unit	Count	56	22	72	4	154
	%	36.4	14.3	46.8	2.6	100.0
Hospital	Count	34	23	97		154
	%	22.1	14.9	63.0		100.0
Primary school	Count	59	23	68	4	154
	%	38.3	14.9	44.2	2.6	100.0
Lower secondary school	Count	47	19	81	7	154
	%	30.5	12.3	52.6	4.5	100.0
Middle secondary school	Count	43	22	82	7	154
	%	27.9	14.3	53.2	4.5	100.0
Drinking water	Count	82	36	36		154
	%	53.2	23.4	23.4		100.0
Latrine	Count	100	35	17	1	153
	%	65.4	22.9	11.1	0.7	100.0
Irrigation	Count	28	39	75	12	154
	%	18.2	25.3	48.7	7.8	100.0
Farm inputs	Count	57	68	28	1	154
	%	37.0	44.2	18.2	0.6	100.0
Electricity	Count	52	3	96	3	154
	%	33.8	1.9	62.3	1.9	100.0
Telephones / cell phones	Count	126	7	21		154
	%	81.8	4.5	13.6		100.0
Credits	Count	23	17	23	91	154
	%	14.9	11.0	14.9	59.1	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 9: Frequency and percentage of respondents with types of houses owned by *Chodrup* class

Types of houses owned	Frequency and percent	Household with self-sufficiency	Households without self-sufficiency	Total
Stone wall with CGI roof	Count	25	8	33
	% in category	36.2	9.5	21.6
Mud wall with CGI roof	Count	11	5	16
	% in category	15.9	6.0	10.5
Stone wall with shingle roof	Count	9	4	13
	% in category	13.0	4.8	8.5
Mud wall with shingle roof	Count	5	23	28
	% in category	7.2	27.4	18.3
Bamboo wall with CGI roof	Count	0	8	8
	% in category	0.0	9.5	5.2
Bamboo wall with shingle roof	Count	2	14	16
	% in category	2.9	16.7	10.5
Concrete	Count	3	4	7
	% in category	4.3	4.8	4.6
Others	Count	14	18	32
	% in category	20.3	21.4	20.9
Total	Count	69	84	153
	% in category	100.0	100.0	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 10: Frequency and percentage of respondents with types of houses owned by *Chiogs*

<i>Chiogs</i>	Frequency & percent	Type of house owned								Total
		Stone wall with CGI roof	Mud wall with CGI roof	Stone wall with shingle roof	Mud wall with shingle roof	Bamboo wall with CGI roof	Bamboo wall with shingle roof	Concrete	Others	
Chilauney A	Count	3	0	3	0	1	2	0	3	12
	% in <i>Chiog</i>	25.0%	.0%	25.0%	.0%	8.3%	16.7%	.0%	25.0%	100.0
Ahalley	Count	0	0	0	2	3	1	0	8	14
	% in <i>Chiog</i>	.0%	.0%	.0%	14.3%	21.4%	7.1%	.0%	57.1%	100.0
Kamjong	Count	2	0	4	1	1	2	0	0	10
	% in <i>Chiog</i>	20.0%	.0%	40.0%	10.0%	10.0%	20.0%	.0%	.0%	100.0
Tali	Count	8	0	0	1	0	0	1	1	11
	% in <i>Chiog</i>	72.7%	.0%	.0%	9.1%	.0%	.0%	9.1%	9.1%	100.0
Zhobling	Count	0	0	0	5	0	2	0	0	7
	% in <i>Chiog</i>	.0%	.0%	.0%	71.4%	.0%	28.6%	.0%	.0%	100.0
Dekiling	Count	4	0	1	1	2	1	6	6	21
	% in <i>Chiog</i>	19.0%	.0%	4.8%	4.8%	9.5%	4.8%	28.6%	28.6%	100.0
Kheri	Count	3	2	1	2	0	1	0	5	14
	% in <i>Chiog</i>	21.4%	14.3%	7.1%	14.3%	.0%	7.1%	.0%	35.7%	100.0
Tshogonpa	Count	0	3	0	4	0	0	0	5	12
	% in <i>Chiog</i>	.0%	25.0%	.0%	33.3%	.0%	.0%	.0%	41.7%	100.0
Pangna	Count	11	8	3	13	1	1	0	4	41
	% in <i>Chiog</i>	26.8%	19.5%	7.3%	31.7%	2.4%	2.4%	.0%	9.8%	100.0
Norbugang	Count	2	3	1	0	0	6	0	0	12
	% in <i>Chiog</i>	16.7%	25.0%	8.3%	.0%	.0%	50.0%	.0%	.0%	100.0
Total	Count	33	16	13	29	8	16	7	32	154
	% in <i>Chiog</i>	21.4%	10.4%	8.4%	18.8%	5.2%	10.4%	4.5%	20.8%	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 11: Land owned and cultivated by the respondents based on the frequency of count and by *Chodrup* category

Land type		Household with self-sufficiency	Households without self-sufficiency	Total
<i>Chhuzhing</i> owned (acre)	<0.5 acre	2	6	8
	0.6 - 1 acre	10	11	21
	1.1 - 2 acres	14	15	29
	2.1 - 4 acres	16	12	28
	4.1 - 6 acres	1	2	3
	6.1 - 10 acres	1		1
	Have none	25	38	63
<i>Kamzhing</i> owned (acre)	<0.5 acre	1	1	2
	0.6 - 1 acre	5	7	12
	1.1 - 2 acres	11	12	23
	2.1 - 4 acres	27	37	64
	4.1 - 6 acres	16	18	34
	6.1 - 10 acres	4	3	7
	> 10 acres	3	4	7
	Have none	2	2	4
<i>Tseri</i> cultivated (acre)	0.6 - 1 acre	4	4	8
	1.1 - 2 acres	9	5	14
	2.1 - 4 acres	5	1	6
	4.1 - 6 acres	2	3	5
	6.1 - 10 acres	2	1	3
	> 10 acres	1		1
	Have none	46	68	114
<i>Tsamdo</i> owned (acre)	0.6 - 1 acre		4	4
	1.1 - 2 acres	3	3	6
	2.1 - 4 acres	1		1
	6.1 - 10 acres	2	3	5
	> 10 acres	2		2
	Have none	61	74	135
Private pasture owned (acre)	<0.5 acre	7	6	13
	0.6 - 1 acre		1	1
	1.1 - 2 acres		1	1
	6.1 - 10 acres	1	1	2
	Have none	61	75	136
Private forest owned (acre)	<0.5 acre	3	1	4
	0.6 - 1 acre	1	1	2
	1.1 - 2 acres	1	1	2
	6.1 - 10 acres		1	1
	> 10 acres	1		1
	Have none	63	80	143

Table 12: Frequency and percentage of other livestock owned by the respondents by *Chodrup* category

<i>Chodrup</i> category	Frequency & percent	Total other livestock owned (goats, sheep, horses, poultry and pig)				Total
		1-5 nos	6-10 nos	> 10 nos	Have none	
Household with self-sufficiency	Count	19	14	14	9	56
	% within <i>Chodrup</i>	33.9	25.0	25.0	16.1	100.0
Households without self-sufficiency	Count	30	15	20	8	73
	% within <i>Chodrup</i>	41.1	20.5	27.4	11.0	100.0
Total	Count	49	29	34	17	129
	% within <i>Chodrup</i>	38.0	22.5	26.4	13.2	100.0

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 13: Subsistence food production and farm produced grains sufficiency for the household consumption

Subsistence food production	Farm produced grain lasts	Household with self-sufficiency	Households without self-sufficiency
		Column %	Column %
Farm produced paddy sufficiency	1 to 3 months	5.8	8.3
	4 to 6 months	20.3	16.7
	7 to 9 months	10.1	3.6
	10 to 12 months	10.1	11.9
	> 12 months		1.2
	Don't cultivate	53.6	58.3
Farm produced maize sufficiency	1 to 3 months	17.4	4.8
	4 to 6 months	20.3	22.6
	7 to 9 months	11.6	22.6
	10 to 12 months	24.6	29.8
	> 12 months	21.7	17.9
	Don't cultivate	4.3	2.4
Farm produced millet sufficiency	1 to 3 months	17.4	20.2
	4 to 6 months	21.7	23.8
	7 to 9 months	4.3	6.0
	10 to 12 months	5.8	11.9
	> 12 months	1.4	2.4
	Don't cultivate	49.3	35.7
Farm produced buckwheat sufficiency	1 to 3 months	13.0	17.9
	4 to 6 months	11.6	10.7
	7 to 9 months	1.4	2.4
	10 to 12 months		1.2
	> 12 months		1.2
	Don't cultivate	73.9	66.7
Farm produced potato sufficiency	1 to 3 months	15.9	11.9
	4 to 6 months	13.0	7.1
	7 to 9 months		1.2

	10 to 12 months	7.2	
	> 12 months	1.4	
	Don't cultivate	62.3	79.8
Farm produced mustard sufficiency	1 to 3 months	13.0	16.7
	4 to 6 months	18.8	28.6
	7 to 9 months	1.4	2.4
	10 to 12 months	8.7	1.2
	> 12 months	4.3	2.4
	Don't cultivate	53.6	48.8
	Farm produced wheat sufficiency	1 to 3 months	13.2
4 to 6 months		11.8	3.6
7 to 9 months		7.4	2.4
10 to 12 months		1.5	1.2
Don't cultivate		66.2	79.8

Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 14: Frequency and percentage of respondents on sources of income based on number of responses by *Chiogs*

<i>Chiogs</i>	Frequency & percent	Income sources by percentages within the <i>Chiogs</i>							Total
		Cash crops	Vegetables	Dairy products	Poultry products	Livestock (meat/live)	Non-farm activities	Remittance	
Chilauney A	Count	9	11	5	1	2	1	0	12
	% in <i>Chiog</i>	75.0	91.7	41.7	8.3	16.7	8.3	.0	
Ahalley	Count	12	10	2	2	2	2	1	14
	% in <i>Chiog</i>	85.7	71.4	14.3	14.3	14.3	14.3	7.1	
Kamjong	Count	0	2	8	7	10	0	0	10
	% in <i>Chiog</i>	.0	20.0	80.0	70.0	100.0	.0	.0	
Tali	Count	3	8	4	1	1	2	2	11
	% in <i>Chiog</i>	27.3	72.7	36.4	9.1	9.1	18.2	18.2	
Zhobling	Count	0	6	0	1	3	0	1	7
	% in <i>Chiog</i>	.0	85.7	.0%	14.3%	42.9%	.0%	14.3%	
Dekiling	Count	6	5	7	3	0	9	6	21
	% in <i>Chiog</i>	28.6	23.8	33.3%	14.3%	.0%	42.9%	28.6%	
Kheri	Count	0	1	1	0	0	0	14	14
	% in <i>Chiog</i>	.0%	7.1%	7.1%	.0%	.0%	.0%	100.0%	
Tshogonpa	Count	4	8	0	0	0	0	12	12
	% in <i>Chiog</i>	33.3	66.7	.0%	.0%	.0%	.0%	100.0%	
Pangna	Count	27	20	15	7	8	6	10	41
	% in <i>Chiog</i>	65.9	48.8	36.6%	17.1%	19.5%	14.6%	24.4%	
Norbugang	Count	11	9	3	1	1	2	0	12
	% in <i>Chiog</i>	91.7	75.0	25.0%	8.3%	8.3%	16.7%	.0%	
Total	Count	72	80	45	23	27	22	46	154

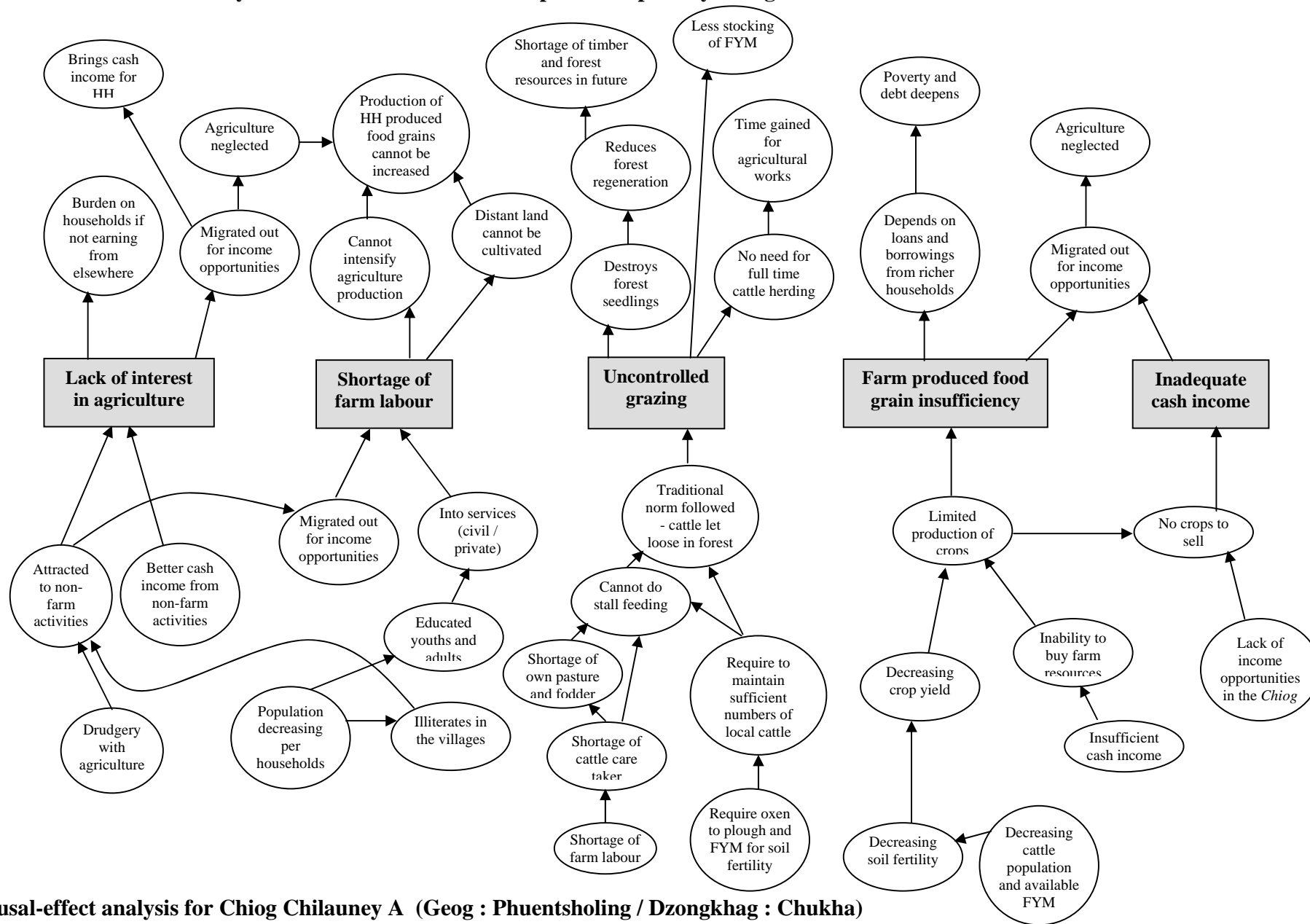
Source: Field Survey, Poverty –SLM Linkages, July 2009

Table 15: Frequency and percentage of respondents on average cash income based on percentage within *Chiogs*

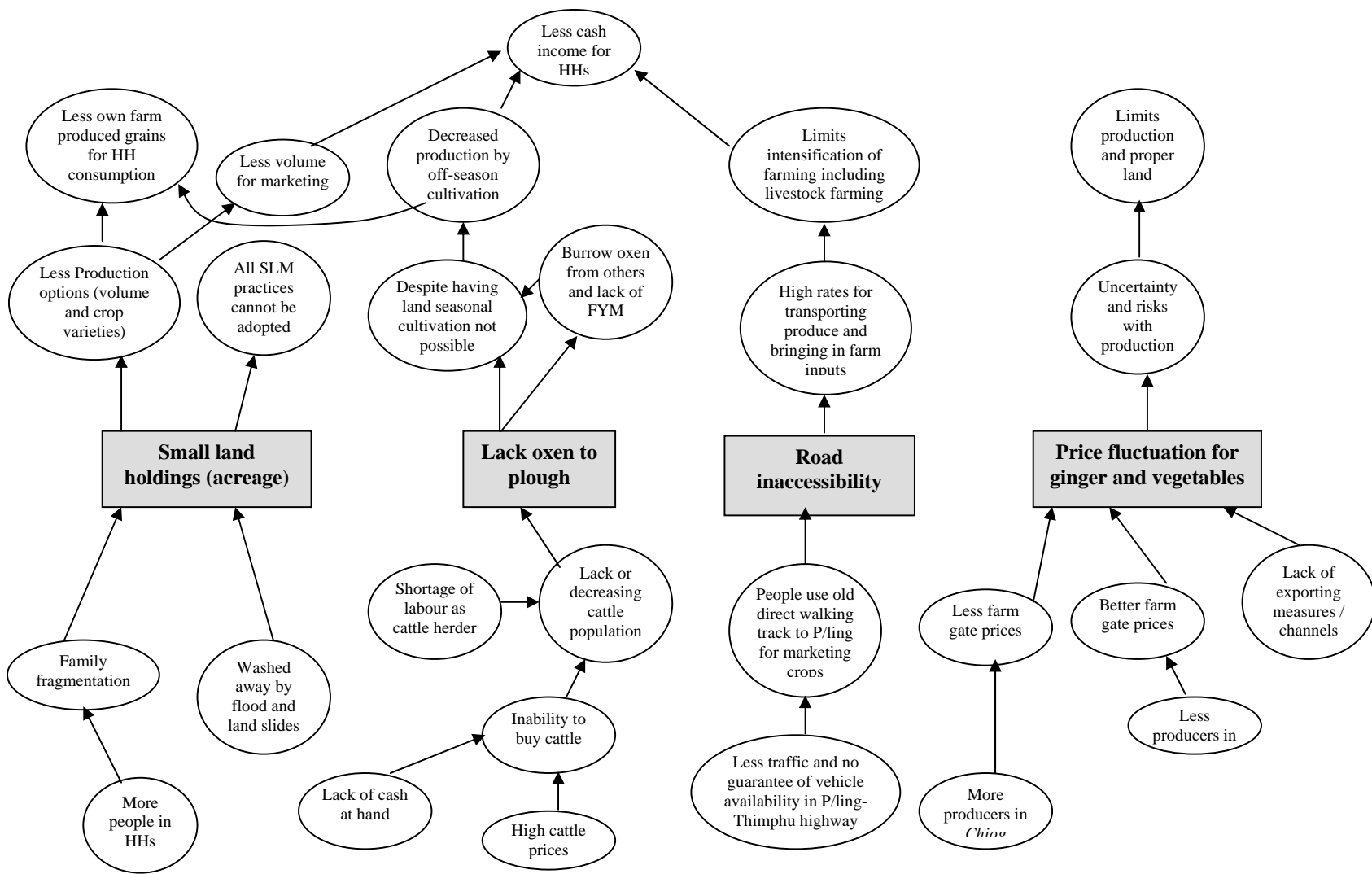
<i>Chiogs</i>	Frequency & percent	Total household income last year (Ngultrum)					Total
		< 13,000	13,001-20,000	20,001-30,000	30,001-50,000	> 50,001	
Chilauney A	Count	6	1	2	2	1	12
	% within <i>Chiog</i>	50.0%	8.3%	16.7%	16.7%	8.3%	100.0%
Ahalley	Count	4	3	5	2	0	14
	% within <i>Chiog</i>	28.6%	21.4%	35.7%	14.3%	.0%	100.0%
Kamjong	Count	6	2	1	0	0	9
	% within <i>Chiog</i>	66.7%	22.2%	11.1%	.0%	.0%	100.0%
Tali	Count	10	0	1	0	0	11
	% within <i>Chiog</i>	90.9%	.0%	9.1%	.0%	.0%	100.0%
Zhobling	Count	7	0	0	0	0	7
	% within <i>Chiog</i>	100.0%	.0%	.0%	.0%	.0%	100.0%
Dekiling	Count	4	8	5	2	2	21
	% within <i>Chiog</i>	19.0%	38.1%	23.8%	9.5%	9.5%	100.0%
Kheri	Count	13	0	1	0	0	14
	% within <i>Chiog</i>	92.9%	.0%	7.1%	.0%	.0%	100.0%
Tshogonpa	Count	10	2	0	0	0	12
	% within <i>Chiog</i>	83.3%	16.7%	.0%	.0%	.0%	100.0%
Pangna	Count	16	11	6	6	2	41
	% within <i>Chiog</i>	39.0%	26.8%	14.6%	14.6%	4.9%	100.0%
Norbugang	Count	10	1	1	0	0	12
	% within <i>Chiog</i>	83.3%	8.3%	8.3%	.0%	.0%	100.0%
Total	Count	86	28	22	12	5	153
	% within <i>Chiog</i>	56.2%	18.3%	14.4%	7.8%	3.3%	100.0%

Source: Field Survey, Poverty –SLM Linkages, July 2009

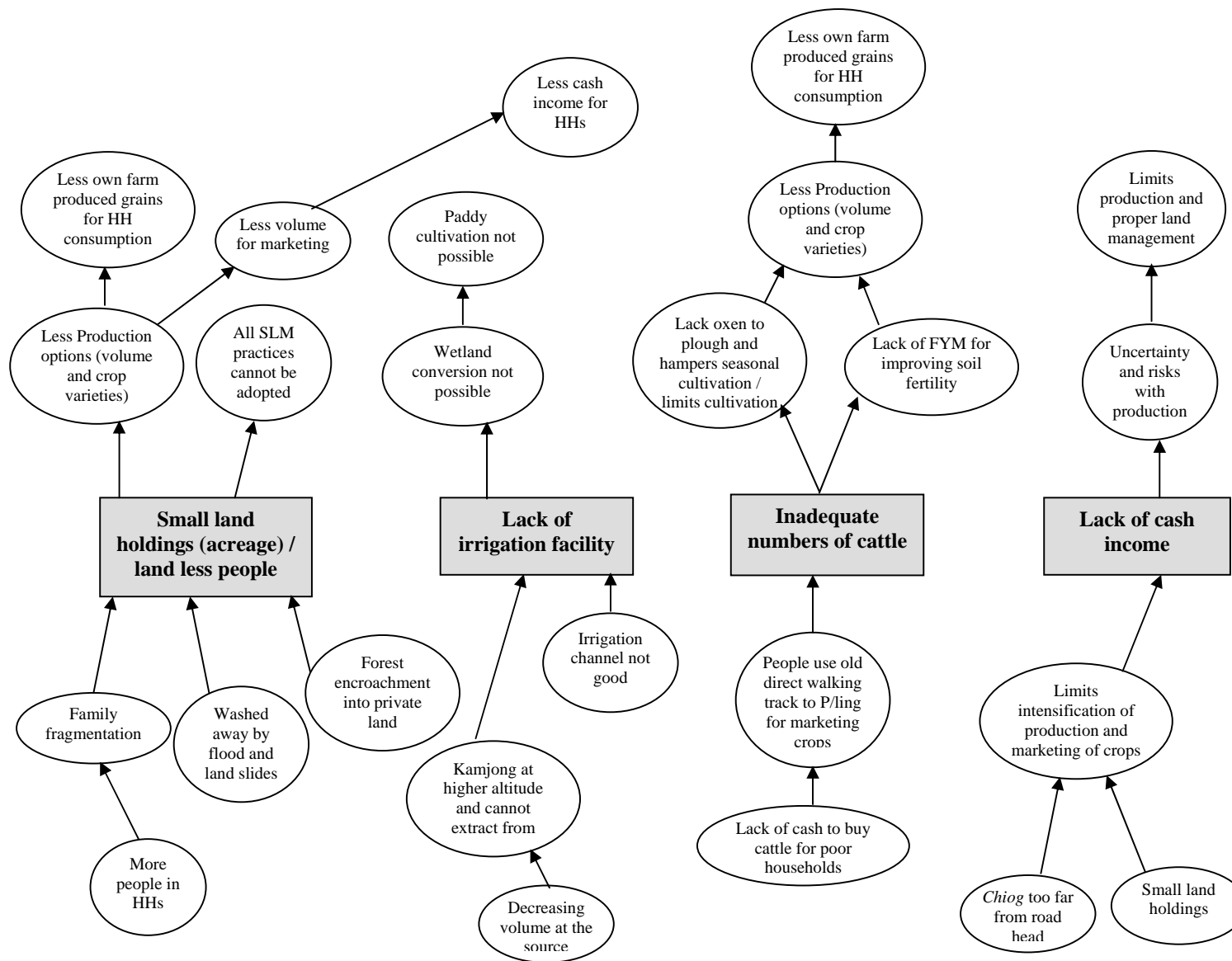
Annex 3: Causal-effect analysis for constraints of SLM adoption and poverty Chiogwise



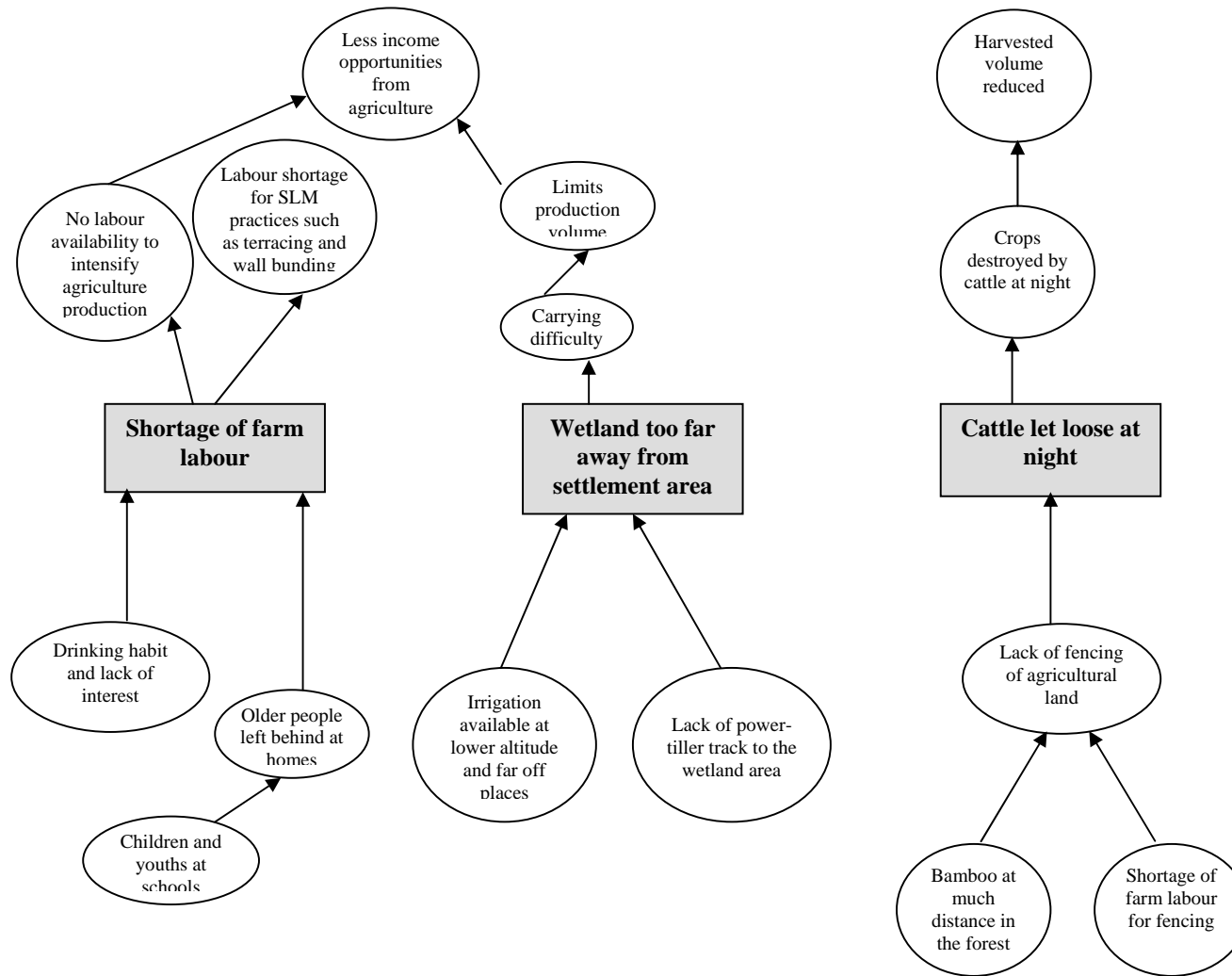
Causal-effect analysis for Chiog Chilauney A (Geog : Phuentsholing / Dzongkhag : Chukha)



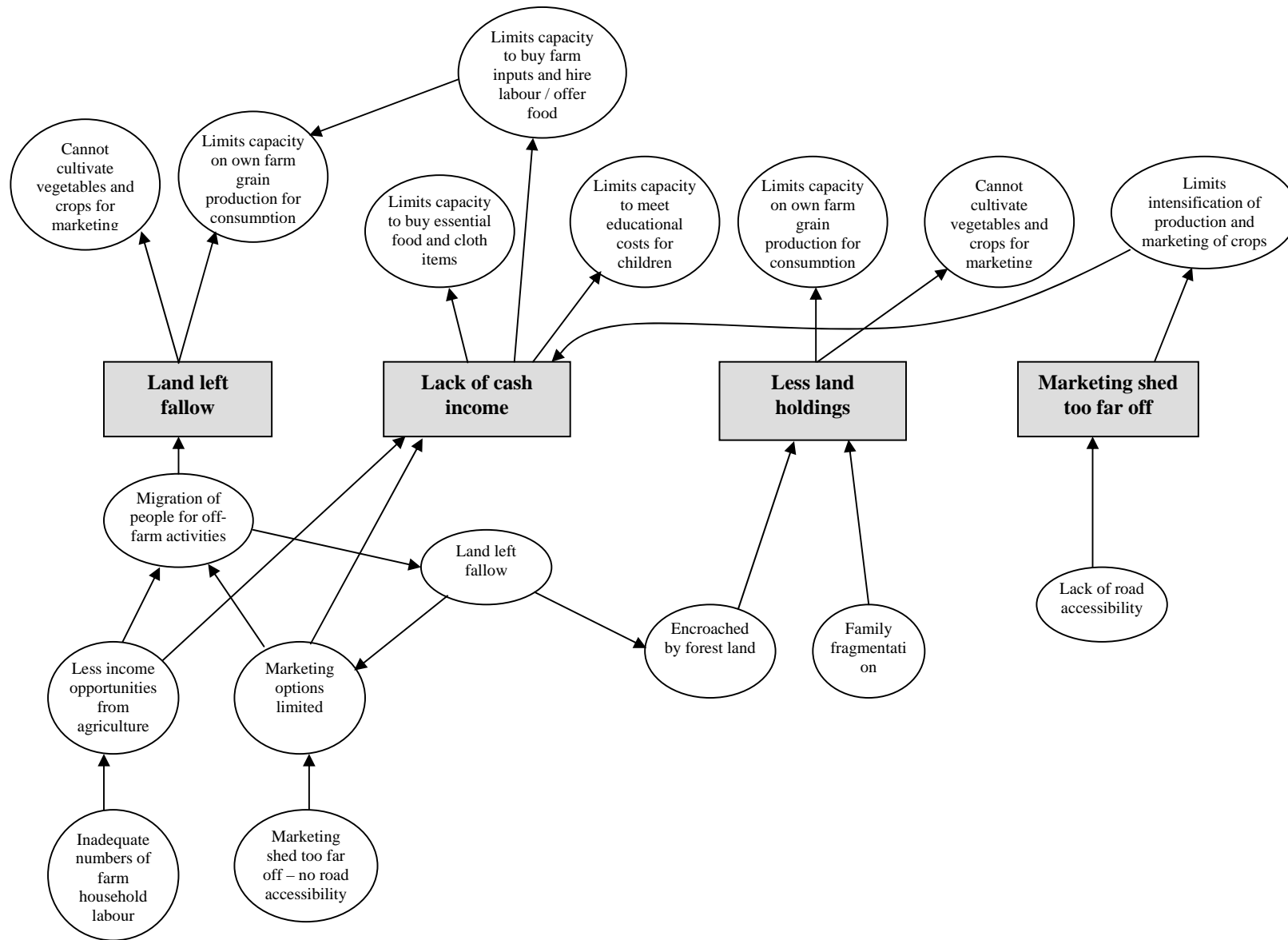
Causal-effect analysis for Chiog Ahalley (Geog : Phuentsholing / Dzongkhag : Chukha)



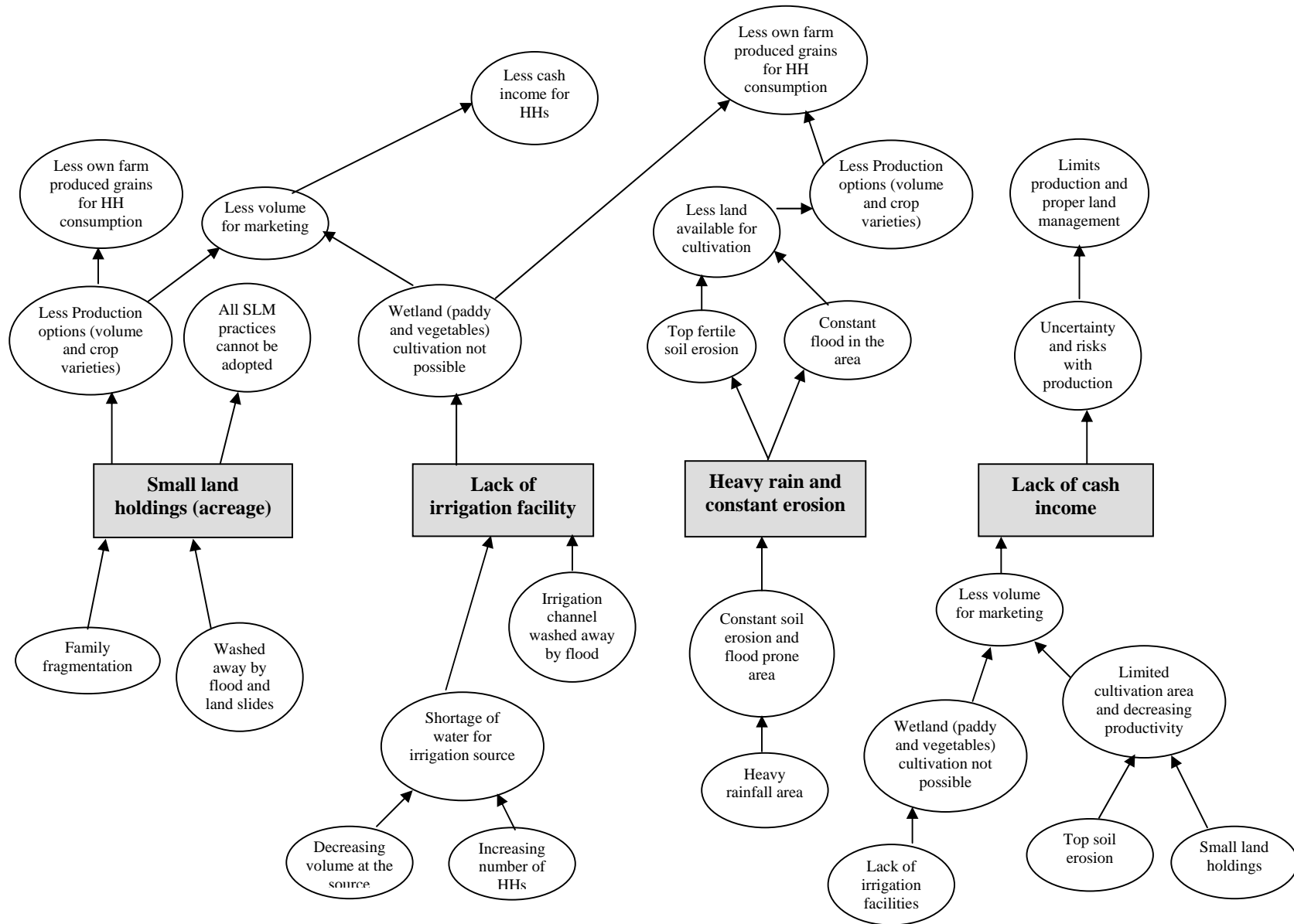
Causal-effect analysis for Chiog Kamjong (Geog : Nangkhor / Dzongkhag : Zhemgang)



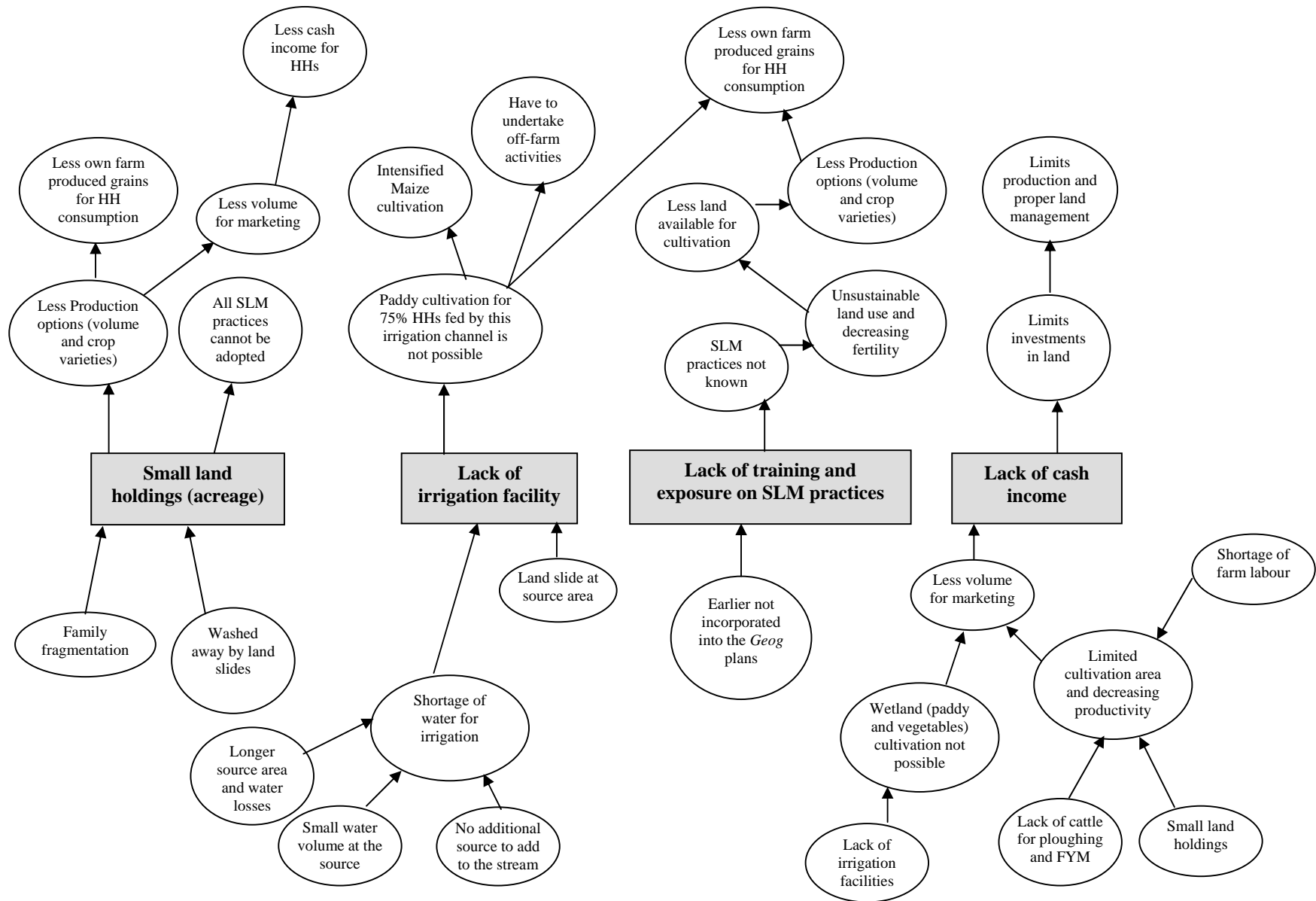
Causal-effect analysis for Chiog Tali (Geog : Nangkhoh / Dzongkhag : Zhemgang)



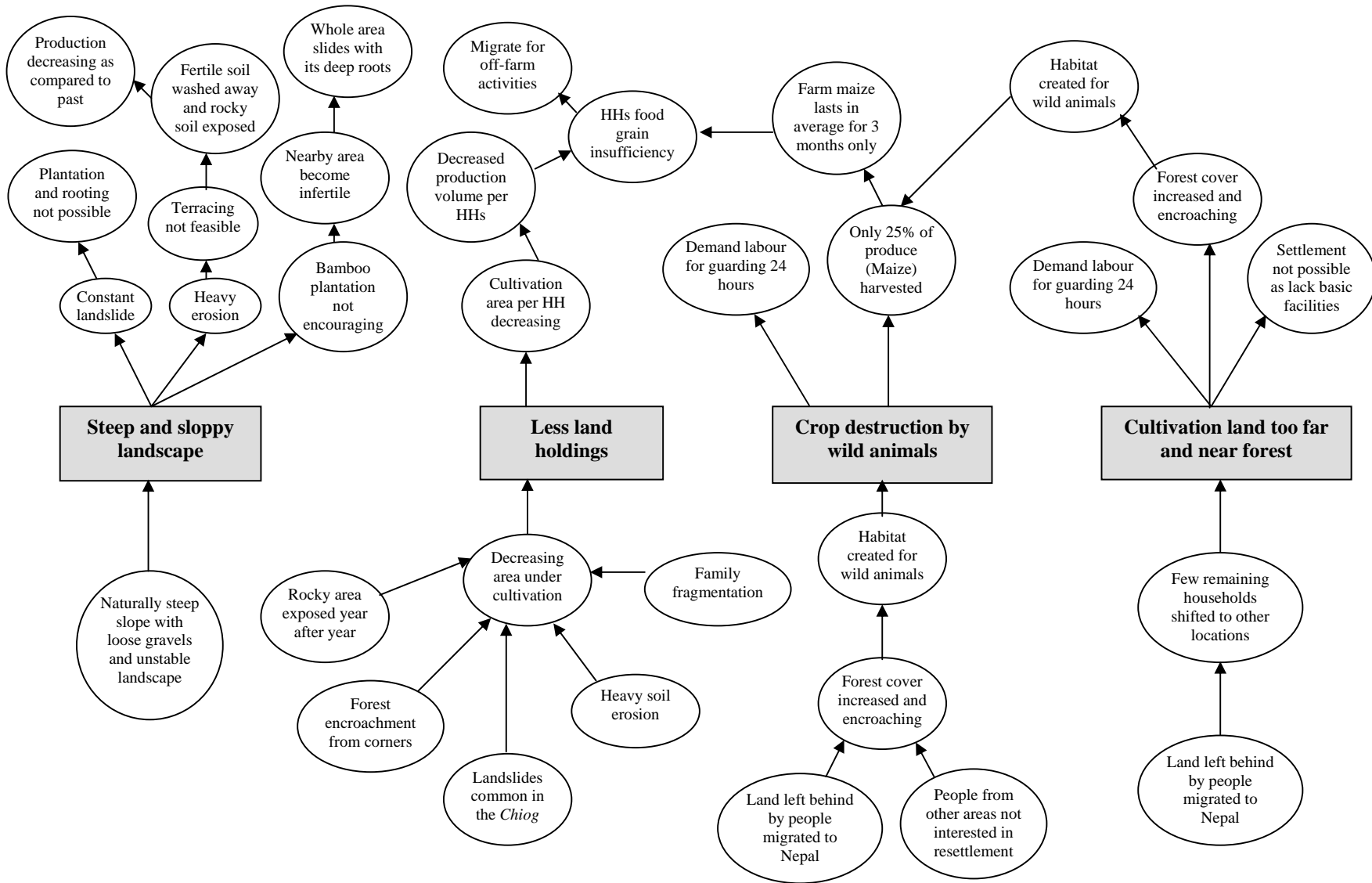
Causal-effect analysis for Chiog Zhobling (Geog : Nangkhor / Dzongkhag : Zhemgang)



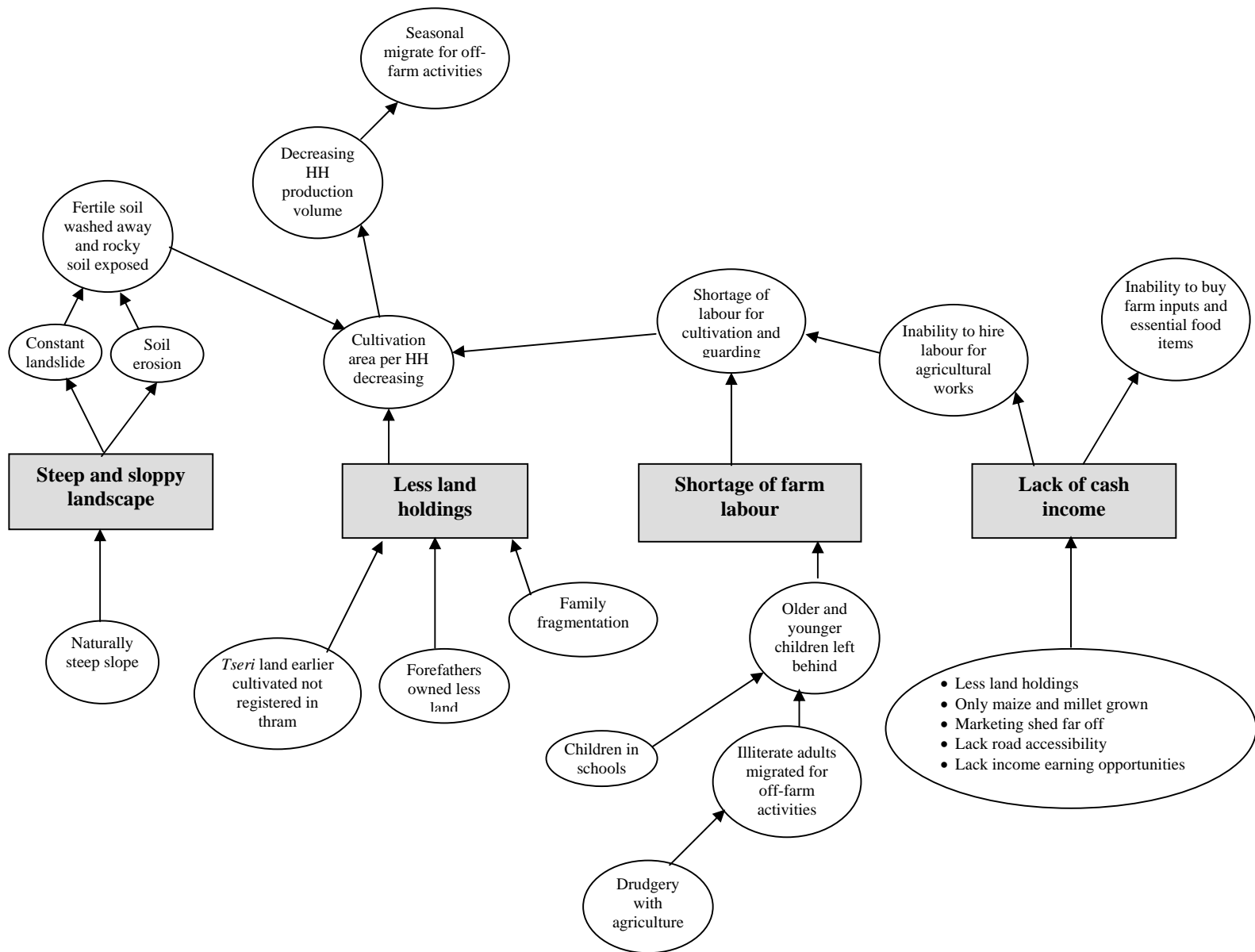
Causal-effect analysis for Chiog Dekiling (Geog : Dekiling / Dzongkhag : Sarpang)



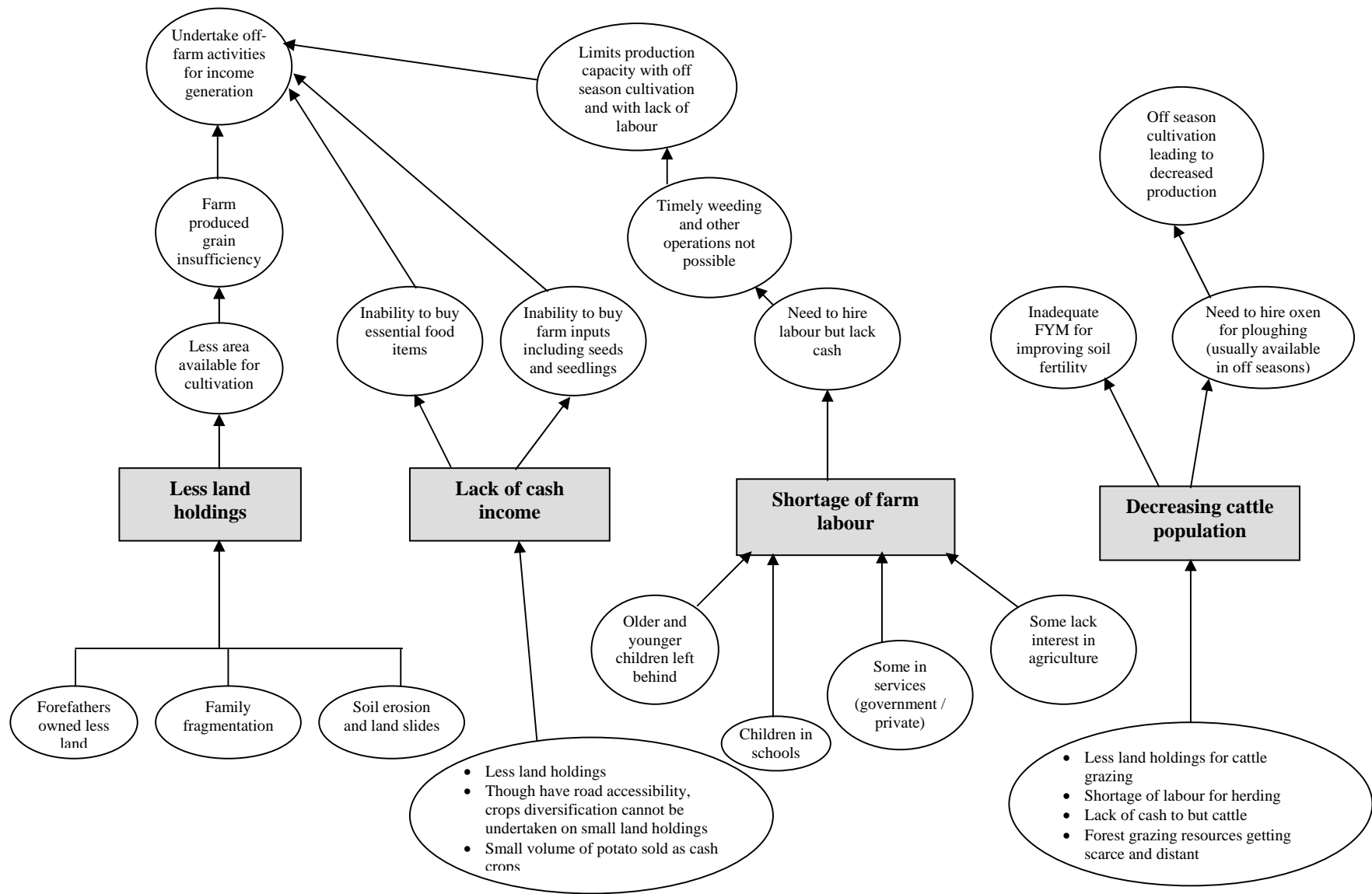
Causal-effect analysis for Chiog Pangna (Geog : Drujegang / Dzongkha)



Causal-effect analysis for Chiog Norbugang (Loduma) (Geog : Tashiding / Dzongkhag : Dagana)



Causal-effect analysis for Chiog Kheri (Geog : Lumang / Dzongkhag : Trashigang)



Causal-effect analysis for Chiog Tshogonpa (Geog : Lumang / Dzongkhag : Trashigang)