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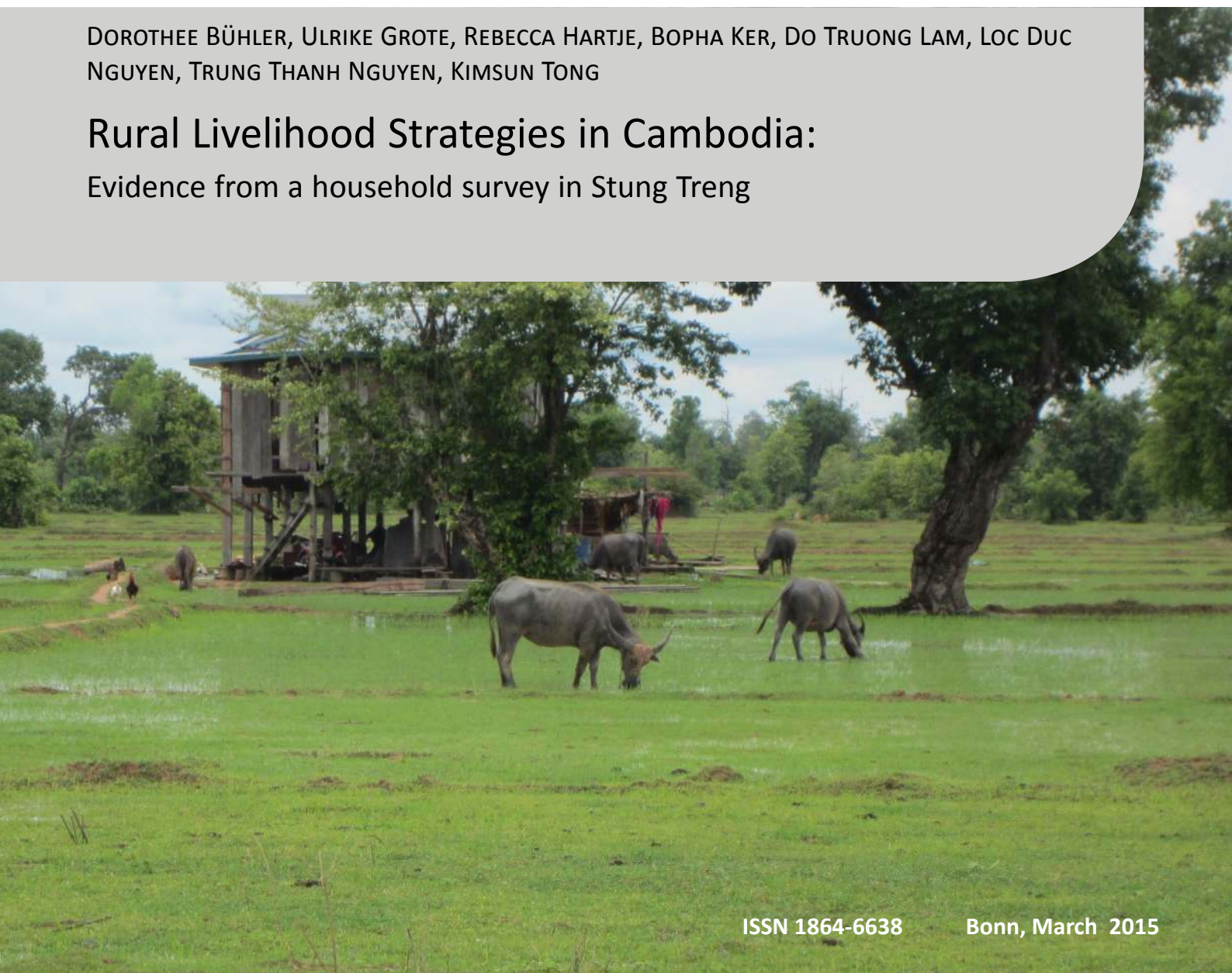
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Rural Livelihood Strategies in Cambodia: Evidence from a household survey in Stung Treng



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Abstract

The overall objective of this discussion paper is to advance the knowledge on rural livelihoods in Stung Treng, Cambodia. In a cluster analysis, five clusters with very different livelihood strategies are identified based on a sample of 600 rural households. Despite the fact that nearly all households are engaged in some form of subsistence farming, especially by growing rice, the richer clusters build on self-employment and higher-skilled wage employment. In contrast the middle income cluster mainly depends on natural resources (fish and firewood). The poorer two clusters are engaged in lower-skilled wage employment. The incidence of poverty is widespread but differences between the clusters are clearly visible. Even the better-off households have consumption poverty headcount ratios of between 37 to 50% at PPP \$1.25. For households from the poorest clusters the poverty headcount ratio amounts to even 70% for income and 80% for consumption. Especially the households largely depending on natural resource extraction are characterized by a high incidence of poverty and high vulnerability. In addition, there are a number of pressures which are expected to increase poverty problems in the future. Policies aimed at reducing poverty and improving rural livelihoods need to carefully consider the close linkages between rural livelihoods and natural resources. But also a diversification away from natural resource extraction into higher-skilled jobs is found to be a strategy opening up new opportunities to improve livelihood security and raise the living standards of the poor.

Keywords: Livelihoods, Rural Poverty, Cluster Analysis, Diversification, Cambodia

1 Introduction

1.1 Problem statement

Cambodia belongs to the group of least developed countries (LDCs) (World Bank, 2014a). Even though it has made progress in economic growth during the last decade, it is still characterized by a relatively low Gross Domestic Product (GDP) and a high incidence of poverty and food insecurity. In 2012, the national poverty rate, based on the national poverty line, decreased to 19%. Over 80% of the population, including 90% of the poor, still lives in rural areas. Despite the pro-poor growth that Cambodia witnessed in recent years, the majority of the former poor only marginally escaped poverty. Rural poverty remained high at 24% in 2011 compared to only 1.5% in Phnom Penh and 16% in other urban areas (World Bank, 2014b).

The agricultural sector's share of GDP decreased over time from 45% in 1995 to about 26% in 2011, mainly due to the strong growth in the garment, construction, and services sectors (World Bank, 2014a, b). However, the agricultural sector is still the key economic sector as it employs more than half of Cambodia's total labor force (Yu and Diao, 2011). A major source of vulnerability arises from the structure of Cambodia's agricultural production and trade portfolio, which is heavily skewed towards rice. Cambodia is a net exporter of rice, mainly paddy (Shicavone, 2010). According to the World Bank (2014a), paddy rice production grew from 4.3 million tons (2003) to 9.3 million tons (2013), and formal rice export in 2013 was about 30 times as large as in 2009; it grew from 12,000 tons to 378,800 tons and contained exclusively milled rice. In 2013 Cambodia exported about 63% of its formally traded rice in volume to the European Union market (World Bank, 2014a). Additionally, it is estimated that at least 1.7 million tons of paddy rice were informally exported to Vietnam in 2013. Thailand, followed by China and Vietnam, remain the largest trading partner for agricultural products in general (Hing and Thun, 2009). When comparing rice prices, Cambodia is less competitive than for example Vietnam because transport and milling costs within Cambodia are relatively high. In addition, it is worth noting that most rice producers are small farmers with less than 1 ha land holdings and no formal land titles (World Bank, 2014a).

In general, rural livelihoods in Cambodia are strongly linked to available natural resources and their seasonal changes. Cambodia is rich in natural resources with a national forest cover of about 60% (FAO, 2010) and considerable water resources. The principal water bodies are the Mekong River, the Tonle Sap (Great Lake) and the Tonle Bassac River which together form a network of river channels, levees, and river basins and offer fishing and aquaculture opportunities for the rural population to earn a certain portion of their income. However, fisheries and forest resources significantly declined over time. This is not only due to a growing rural population, but also because of illegal and unsustainable fish and timber harvests by commercial enterprises, military and local authorities (McKenney and Tola, 2002). As a result of these pressures, rural livelihood activities are increasingly impaired.

One of the remote rural provinces in Cambodia which has been especially affected by the degradation of the natural resource base is Stung Treng. With its extensive forests (Virachey National Park) and intersecting rivers (Mekong, Sekong, Sesan, and Sreapok), Stung Treng is unique and rich in natural resources as compared to most other provinces (NIS, 2013). The Reforestation Office (2002) estimated the share of forest area to cover around 90%. However, logging and fishing – legally and illegally – put high pressures on the forest and fisheries reserves. At the same time, the province is characterized by a relatively high incidence of poverty with a majority of households (85%) engaged in small scale farming (National Committee for Sub-National Democratic Development, 2012). Business opportunities, apart from logging, are missing in the province. Furthermore, the infrastructure in the province is rather underdeveloped. Only a small portion of the roads is paved, many families lack access to basic water and sanitation facilities (ratio of people to latrines: 18.2), and electricity (only 14% of the households are connected to the electricity grid) (National

Committee for Sub-National Democratic Development, 2009). In addition, literacy rates range between 56 to 65% and are therefore lower than in the more developed provinces in the South and West of Cambodia (ODC, 2011).

To date only few and partly outdated studies have analyzed livelihood strategies in the context of food insecurity and poverty in rural Cambodia (McKenney and Tola, 2002; CDRI, CARD, IFPRI, 2011). Livelihood strategies consist of diverse activities undertaken by households in order to sustain their livelihoods. By clustering households based on their different livelihood activities, it is possible to identify households being most vulnerable to hunger and malnutrition. Ecker and Diao (2011) ask for more research to identify such groups in Cambodia in order to better understand the major drivers of hunger and malnutrition and to determine the role of agriculture in reducing vulnerability to poverty.

Ellis (1998, 2000) further points out that identifying the opportunities for diversification of livelihoods increases the capabilities of households to raise their living standards and secure their livelihoods. The analysis of livelihoods helps to understand the strategies and the factors behind these decisions made on strategies by households. Choosing strategies is a dynamic process since households combine different activities to meet their changing needs. Migration is one such activity of households. The choice of livelihood strategies also depends on access to assets and / or natural resources, as well as policies and institutions that influence their ability to use these assets.

1.2 Research question

The overall aim of this discussion paper is to advance the knowledge on livelihood decisions, their links to sustainable development, and the access to natural resources in Stung Treng, Cambodia. In more detail, the research has the following two objectives:

- (1) to identify and describe rural livelihood strategies for different household clusters in Stung Treng; and
- (2) to analyze selected livelihood activities and their determinants.

Analyzing rural livelihoods in its many facets helps exploring the width of the data of a comprehensive representative survey of 600 households in Stung Treng. Thus, this discussion paper can be also considered as a basis for further research which digs deeper into the many selected aspects of rural livelihoods.

The paper is structured as follows: In section two the study site Stung Treng and the data collection method are described. Section three describes the clustering process and gives baseline information about the different clusters. Section four analyzes selected livelihood activities in detail. Section five discusses future challenges. Section six summarizes and concludes.

2 Data

2.1 Study site and data collection

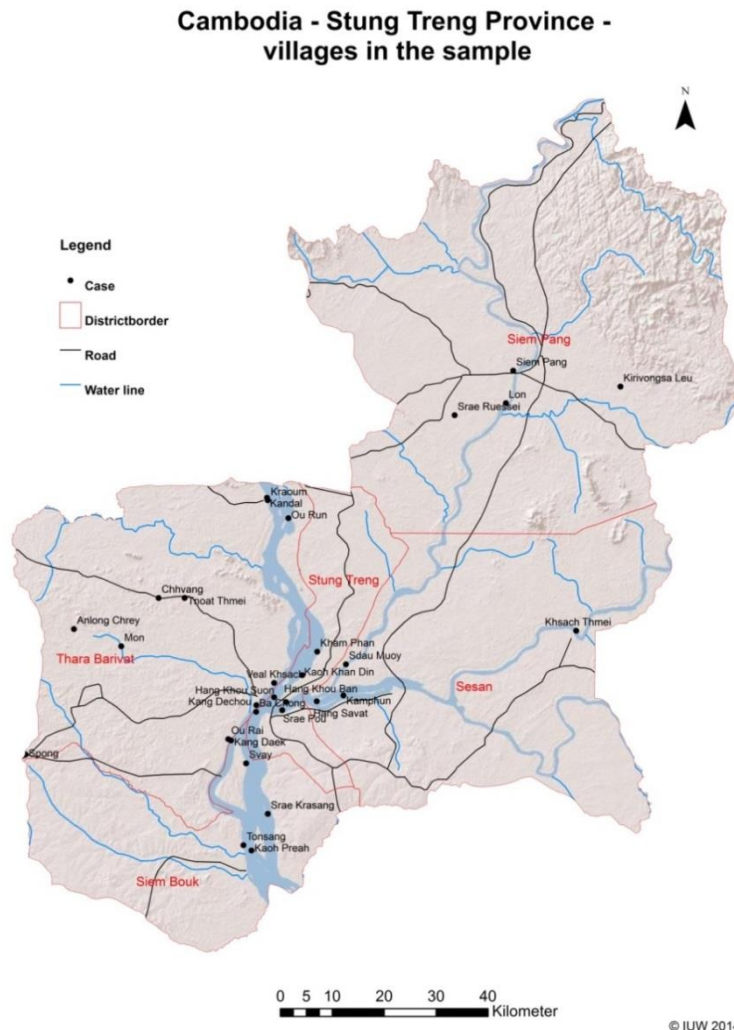
The province of Stung Treng is situated in the North-East of Cambodia (see Appendix, Figure 9-1). It shares a border with Lao PDR in the North and is close to Vietnam in the East. The province is remote and sparsely populated with a distance of close to 500 km from the nation's capital, Phnom Penh. The province covers around 12,000 km² and is divided into five districts with 34 communes and 129 villages. The rural population totals some 95,000 inhabitants which belong to 17,900 households.¹ Stung Treng was selected as study site because of its relatively high incidence of poverty and food insecurity and its relatively high dependency on natural resources. The National Committee for Sub-National Democratic Development estimated the poverty rate to be around 41% in 2009. However, there is huge heterogeneity among the different communes.

Data from Stung Treng was collected in a household survey aimed at measuring vulnerability to poverty and food insecurity of rural households in Cambodia. Hence, the target population of the survey were rural households which are poor/food insecure or at risk of falling into poverty and food insecurity.

The sampling procedure was designed in line with Hardeweg et al. (2013), as used in the DFG FOR 756 project. It is based on the guidelines of the UN Department of Economic and Social Affairs (UN, 2005). Data on population, number of households and classification as rural or urban were available at the village level. Agro-ecological conditions as well as socio-economic heterogeneity were assumed to be sufficiently homogenous to draw a self-weighted sample with clustering on village level. The total sample size was limited to 600 households.

¹ The majority of Cambodians belongs to the group of the ethnic Khmer. In Stung Treng they account for 91% of the population. However, some minorities can also be found such as the Cham (1.4%), Lao (1.5%), Kaaveat (2.6%) and Kuoy (1.5%) (National Committee for Sub-National Democratic Development, 2012).

Figure 2-1: Study site in Stung Treng, Cambodia



To generate the sample of 600 households, two steps were taken. In the first step, 30 villages were sampled as primary sampling units (PSUs) proportional to size (PPS) from a list containing all 129 rural villages in Stung Treng. The data used to define the listing frame in the first step comes from the National Census 2008 (NIS, 2008). In the second step, 20 households of each PSU were randomly drawn from the village-level listing frame – a list of all households in the village maintained by the village head or commune chief for administrative purposes. The probability of getting selected amounted to 3% for each household. As opposed to Hardeweg et al. (2013) the size of the village clusters was set at 20 because of the low number of villages in the province.

In order to ensure smooth operation during field work, additional replacement households were sampled from the frame in case households were found to be ineligible. This was the case for less than 5% of the originally sampled households. All households finally sampled answered to the questionnaire.

2.2 Questionnaire design

Two different questionnaires, one referring to the household and one to the village level, were used during the survey. Both questionnaires were designed to measure vulnerability to poverty as described by Hardeweg et al. (2013).

The questionnaire for interviewing the household heads contains 89 pages and 616 different variables. In addition to basic data on individual household members, the household questionnaire contains sections on all possible income components, such as agriculture, business, off-farm employment, hunting, collecting and fishing, transfers as well as lending. Moreover, it asks for information on assets, land, consumption, investment, borrowing, risk aversion, and observed climatic and environmental changes.

Additionally, a village head questionnaire with 5 pages and 180 variables captures village-level data on population, infrastructure, economics, the social structure of the village, natural disasters, and public transfers to the village.

3 Livelihood clusters and their characteristics in Stung Treng

3.1 Identifying relevant livelihood clusters

In order to gain a better understanding of different livelihood strategies of the rural farm households in the study area, the analysis of livelihood strategies was undertaken in two steps. In the first step a Principal Component Analysis (PCA) was used to reduce the different input variables to major factors. In the second step a Cluster Analysis (CA) was performed to group households according to their livelihood inputs.

To map the different input factors for livelihood strategies, variables capturing different input factors are used. Therewith, our approach differs from recent literature that uses income shares to identify livelihood strategies (Babulo et al., 2008; Sherbinin et al., 2008). It is considered as more advantageous since it is capable of describing the input allocation within livelihood activities (Nielsen et al., 2012). Based on the data collected, 31 variables² are used, including labor, land, investment, and expenditure. Our data screening detects 18 outliers which have been excluded from the analysis, so that the sample size amounts to 582 observations. The PCA analysis results in eleven factors representing the main household livelihood activities. The Kaiser (K1) criterion which retains all factors with eigenvalues greater than one was used to determine the assignment of individual variables to the factors.

Table 3-1: Classification of livelihoods by cluster

Cluster	Absolute no. of households and (%)	Main livelihood activities
Cluster 1	122 (21)	Small farmers engaged in low skilled agricultural employment who receive transfers
Cluster 2	254 (44)	Natural resource extractors
Cluster 3	78 (13)	Self-employed and cash crop farmers
Cluster 4	78 (13)	High skilled wage workers with cropping and livestock
Cluster 5	50 (9)	Non-agricultural low skilled wage laborers
Total	582 (100)	

Source: Own calculation.

In the second step the factors are used to identify the livelihood clusters based on Ward Linkage (Garson, 2012). The Calinski-Harabasz criterium and the Duda/Hart index (Alinovi et al., 2009) are applied as the stopping rule to determine an appropriate number of livelihood clusters. Accordingly, five different livelihood clusters are generated (Table 3-1). For more information on PCA and CA see Costello and Osborne (2005).

The classification into livelihood clusters is based on main livelihood activities performed by the household. Cluster 1 is comprised of 21% of the households. It is the group of small farmers who also participate in low skilled employment in agriculture (ploughing, sowing, watering, or weeding). This group also receives monetary transfers, either from relatives or from the government. Households in cluster 2 are mainly natural resource extractors engaged in fishing or logging. The high proportion of the surveyed households of this cluster (44%) indicates the importance of natural resources for rural livelihoods. Cluster 3 includes 78 households who are mainly self-employed, for example as retail shop owners or petty traders. They also invest more in cash crops, most notably cassava. Cluster 4 includes 78 households with at least one member working in a high skilled or permanently paid job (e.g. teacher, police officer). Those households invest more in crop production and livestock rearing.

² See Table 9-1 in Appendix for list of variables used (excluding activity dummies).

The last cluster (cluster 5) includes households with members working mainly as low skilled workers in non-agricultural sectors such as in manufacturing jobs.

Despite the differences described above, the majority of households are involved in subsistence farming. However, magnitude and specialization in farming differ across clusters. The differences among the livelihood clusters in terms of education level, farm land size, labor allocation, annual expenditure, and investment are summarized in Table 9-1 (see Appendix).

3.2 Characteristics of the clusters

3.2.1 Income and consumption

Table 3-2 shows the income and consumption levels of the five different clusters. Overall, the income tends to exceed household consumption. However, income data are rather sensitive to the way they are calculated and they fluctuate more than consumption, making the latter generally a more reliable data source (Deaton and Zaidi, 2002).

Households from clusters 3 and 4 are better-off with the highest levels of both income and consumption. In line with the differences in livelihood activities performed by individual clusters, households in clusters 3 and 4 appear to be comparatively richer. The remaining three clusters have somewhat similar low income and consumption levels. This picture also holds for the daily per capita expenditures and income levels which take the family size into account. While the per capita income of the non-agricultural low-skilled wage laborers is slightly higher in comparison to mean per capita incomes in cluster 1 and 2, the per capita consumption of the natural resource extractors is the highest among the three poorer clusters. The higher consumption level of natural resource extractors is a very intuitive result since their livelihood activities are less dependent on monetary transfers and income from employment to buy their food. This hints at the fact that natural resource extraction can be used to buffer income fluctuations households face.

Table 3-2: Income and consumption by cluster (in PPP \$)

Indicators (means)	Cluster					All
	1	2	3	4	5	
Household size	4.88	5.08	4.85	5.21	5.62	
Income						
Annual household income	3,246 (2,558)	3,364 (3,171)	7,070 (5,760)	5,185 (8,010)	3,734 (3,895)	4,125 (4,657)
Daily per capita income	2.05 (1.87)	2.06 (2.48)	4.17 (3.35)	3.08 (5.20)	2.18 (3.49)	2.49 (3.17)
Consumption						
Annual household consumption	2,593 (1,347)	2,969 (1,292)	4,160 (2,019)	4,477 (2,247)	2,956 (1,195)	3,321 (1,791)
Daily per capita consumption	1.58 (0.80)	1.73 (0.84)	2.46 (1.06)	2.59 (1.57)	1.60 (0.85)	1.94 (1.29)

Note: The income and consumption figures refer to nucleus household members; these are individuals who stayed in the household for 180 days in the reference period or longer (Hardeweg et al., 2013). Standard deviations are given in parenthesis. A standard t-test reveals that the mean of each cluster (income and consumption) is significantly different from zero (1% significance level). For consumption the standard t-test also reveals that the mean values of each cluster are significantly different from the overall mean. Paired t-tests reveal that there is no significant difference between incomes in clusters 1, 2 and 5 as well as between 3 and 4.

Source: Own calculation.

3.2.2 Poverty

The headcount ratios for income and consumption show the expected differences between the clusters (see Table 3-4). Again, due to the relatively higher income levels, the percentage of income poor households is lower in comparison to consumption poverty. For example, in cluster 1 about 64% of the households are income-poor whereas 80% are consumption poor at PPP \$1.25. Furthermore, the ratio of consumption-poor households from cluster 1 rises to 95% for the \$2 poverty line. This indicates that the probability to fall below the absolute poverty line is high; for households from other clusters this difference is even higher.

Table 3-3: Poverty (headcount ratio) based on income/consumption by cluster

Cluster	Income poverty		Consumption poverty	
	Estimate (%)	Std. Dev. (%)	Estimate (%)	Std. Dev. (%)
US \$1.25 PPP				
C1	64	48	80	48
C2	62	49	70	4
C3	22	42	37	46
C4	56	5	50	49
C5	70	46	74	5
Average	57	5	65	48
US \$2 PPP				
C1	84	36	95	22
C2	89	32	94	24
C3	50	5	77	42
C4	77	42	77	42
C5	90	3	94	24
Average	81	39	90	31

Note: The absolute poverty lines released by the World Bank based on 2005 \$ PPP have been adjusted for inflation to be compared to 2013 PPP \$ values from the household data.

Source: Own calculation.

Households in cluster 3 (self-employed households) have the lowest poverty headcount ratio across all five different cases. This underlines that the households in cluster 3 (self-employed households) are better off compared to the other clusters (agricultural wage laborers, resource extractors, high-skilled employment and low-skilled off-farm employment). Furthermore, they are less likely to fall into poverty if income fluctuates. Thus, their livelihood strategy seems to make them less vulnerable to poverty.

4 Selected livelihood activities and their determinants

The agricultural sector plays a fundamental role in the livelihoods of rural Cambodians. For most, rice farming is the primary basis of food security and the main source of employment and income. But also other livelihood activities, especially natural resource extraction, are indispensable for many families in Stung Treng.

4.1 Farming

4.1.1 *Access to land, farm size and main crops*

Owning land for agriculture or gardening is quite common in Stung Treng. The majority of the selected households possesses agricultural land with an average of 2.8 hectare (ha) and 2.5 plots per household – there is only one household in the sample which does not own any agricultural land.³ It is worth noting that for 52% of the plots there are no land documents, followed by 37% with only papers from local authority, and 4% with certificates (title) from the government. This shows that land security is still an issue in Stung Treng which may threaten households' livelihood strategies in the future. In addition, irrigated land accounts for only 12% and the remaining plots depend solely on rainfall. Approximately 85% of the households with agricultural land holding grow rice, field crops, garden crops, or permanent crops between March 2012 and April 2013. Of these, rice is the most important crop – it was planted on 43% of the total plots.

Table 4-1 provides more detailed information on the rice sector. Cluster 4 seems to have the largest rice fields but the lowest rice productivity among the five clusters – their rice fields amount to 2.5 ha per household but rice productivity reaches only 1.87 tons per ha. On average, about 71% of total rice production has been used for own consumption while 6% has been used for seeds. About 25% of the households (or 110) sold rice directly after harvest, whereas 5% or 21 sold three months later. 10% of the households processed rice and another 10% gave it away as payment in kind for labor or machine rental.

³ In the survey, agricultural land holding is defined as any formal or informal land holding indicated by the household. Due to this definition, the average agricultural land per household in the sample exceeds the national average. According to the Cambodian Socio-Economic Survey 2004, 2007-2011, on average the agricultural landholding per household conditional on those who have land is only 1.58 ha – households with no agricultural land amount to 28%.

Table 4-1: Average agricultural characteristics by cluster for rice (mean)

	N	Cluster (mean)					Average
		1	2	3	4	5	
Land size (in ha)	428	1.4	1.44	1.52	2.5	1.37	1.55
Productivity per ha (in kg)	428	1875	2058	2289	1871	2196	2030
Total production (in kg)	428	2325	2645	2926	3093	2797	2660
Production loss after harvest per ha (in kg)	367	30	33	37	38	37	34
Consumption (in kg)	428	1693	1905	1882	2260	1973	1902
Give away (in kg)	64	335	255	196	336	143	271
Household processing (in kg)	43	50	46	604	147	30	117
Animal feed (in kg)	147	56	85	62	160	41	82
Payment in kind for labor, machine rental (in kg)	46	277	404	250	210	168	326
Seed (in kg)	411	152	154	185	225	141	162
Sale (directly after harvest) (in kg)	110	257	383	609	269	536	375
Sale (3 months later) (in kg)	21	87	42	79	139	45	65

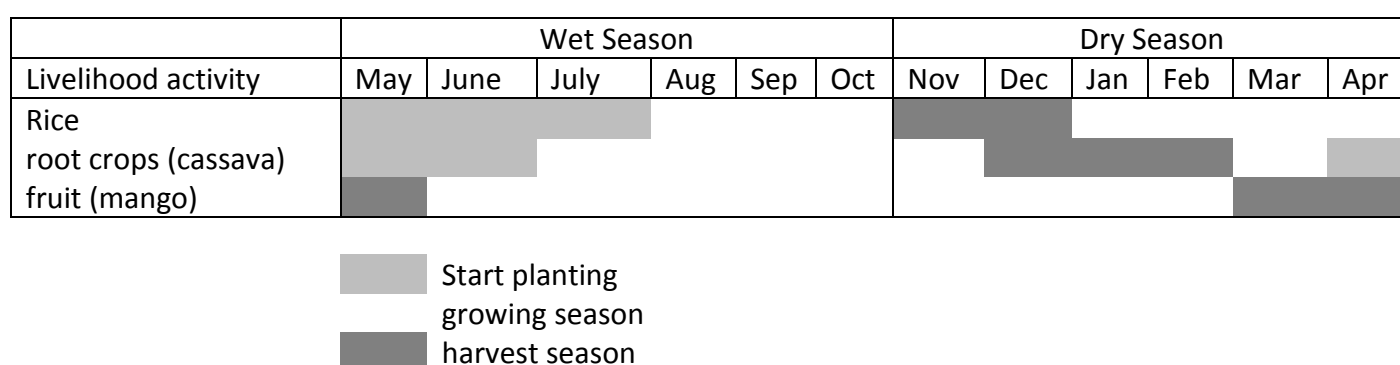
Source: Own calculation.

4.1.2 Cropping cycle

Farmers in Stung Treng are predominantly engaged in wet season rice production since irrigation is not available on a large scale. Accordingly, farmers have to adjust their cropping patterns to the weather situation. Depending on the rainfall levels, the planting season starts between May and July (Figure 4-1). The main harvesting season starts in November or December. Apart from rice a number of households is engaged in root crop production, mainly cassava. Again, the planting and growing season depends on rainfall levels in the wet season. For fruits and vegetables seasonality is not as clear. The climatic conditions allow cultivating vegetables around the year. Fruits are mainly perennial (e.g. mango) and have a distinct harvesting season. The harvesting season for mango is from March to May.

For the activities connected to natural resource extraction, seasonality is not visible from the survey. Most households go fishing or hunting all year around to complement their diets. Since we do not ask for the amount of fish caught per month we are not able to distinguish high and low fishing seasons. For firewood collection and also logging the picture is similar. Since the climatic conditions do not force people to build up stocks, they extract wood products from the forest on a daily or weekly basis.

Figure 4-1: Cropping calendar for Stung Treng



Source: Own compilation.

4.1.3 *The role of value adding*

Overall, Cambodia's rice production slightly improved in terms of quality between 2012 and 2013. The World Bank (2014b) notes that a production shift towards fragrant and high-quality white rice could strengthen Cambodia's international competitiveness. The major obstacles to growth in rice production - and in other agricultural sectors - are: limited access to quality seeds, little knowledge concerning yield enhancing production techniques, lack of high-quality farming equipment (e.g. fertilizer and tractors), and irrigation. Furthermore, despite the increasing milling capacity within Cambodia, only a small portion of the rice is processed within the country. Paddy rice is mostly exported to the neighboring countries, since transport and electricity costs are high and properly skilled labor is scarce (World Bank, 2014b).

Of the households engaged in agricultural production, 46% have extra expenditures⁴ regarding agricultural production. On average households spend about \$48 PPP for these activities or inputs. Turning to machinery used for production, about 20% of the households in cluster 2, 3 and 4 possess a two-wheel tractor – and only 2 households in the sample possess a four-wheel tractor.

Table 4-1 shows that the sales share for rice amounts to 30% of the total production for households in cluster 3. Households from other clusters, however, sell less of their production indicating that they are mainly subsistence rice farmers. It is also important to note that households in cluster 3 have allocated about 21% of their total rice production to processing – the largest amount among the 5 clusters. Of all rice producers, about 26% sell part of their rice as paddy rice directly after harvest and only 6% sell part of their dried rice three months later. This evidence highlights an urgent need for cash by farmers, or a lack of storage capacity among households in Stung Treng. Cluster 3 and 5 are more likely to sell their paddy rice directly after harvest as compared to the other clusters. Thus, households do not seem to have the opportunity to sell the rice at a later point in time when they could realize a higher income as local market prices for rice should be rather low directly after the harvest.

In addition, only a minority of households has unrestricted access to rice milling facilities. Roughly 20% of the households in cluster 3 and 4 own a rice mill, while the share of households in the other clusters is below 10%. Hence, value upgrading at a small scale rarely takes place (as the sales figures show).

4.1.4 *Livestock*

In Cambodia, the livestock sector contributes about 15% to the agricultural GDP (Burgos et al., 2008). Livestock rearing is also a major livelihood activity of rural households in Stung Treng in which 82% of them are engaged. Buffalos, cattle, pigs, chickens, and ducks are reared, with chicken being the most popular. About 57% of the households are involved in chicken breeding with an average number of 14 chickens per household. The popularity of chicken can be explained as chicken production is exclusively a private sector affair with minimal investment (Burgos et al., 2008). Between May 2012 and April 2013, each household spent about PPP \$3 to buy more chickens and PPP \$13 for expenditures related to food, breeding, medicine etc.

Raising buffalos is the second most popular activity in the livestock sector with about 46% of the surveyed households being engaged. Buffalos are important in the study site because (i) they are used to plough land, and (ii) they are considered as an important asset. In the former case they can be seen as an input to crop production. In Cambodia in general and in the study site in particular, buffaloes and oxen are kept for a variety of laborious fieldwork activities. In the latter case buffalos are part of households' savings.

⁴ These are expenditures related to seeds and seedlings, fertilizer, herbicides, insecticides and snail killers, and irrigation.

About 42% of the households are involved in pig rearing, either for meat or for piglet production. Cattle for beef are also kept by 20% of the households.

Table 4-2: Livestock rearing in Stung Treng (mean)

Livestock	Rearing households (no. of HH)	Average /rearing HH (mean)	Purchase/ HH (mean, in PPP \$)	Expenditure/ HH (mean, PPP \$)	Average/HH (mean, whole sample)
Buffalo	279	3.6	22.89	12.03	1.68
Beef cattle	120	6	26.53	21.21	1.20
Pig (fattening)	202	2.07	65.2	55.33	0.70
Pig (piglet production)	53	2.08	30.26	48.81	0.18
Chicken	340	14.04	3.12	12.78	7.96
Duck	58	10.06	5.08	23.27	0.97
TLU ⁵		3.23			2.64

Source: Own calculation.

Despite the high popularity of chicken and buffalo, households tend to spend most for raising pigs, followed by ducks and beef cattle. Indeed, households typically spend very little to rear buffalos. Mostly buffalos (and also other animals) can walk around freely and forage for food. Thus, they do not need extra feeding.

Table 4-3: Average value (mean) of livestock for rearing households by cluster

Cluster	Stock at the beginning (PPP USD)	Stock at the end (PPP USD)	Value of animals sold (PPP USD)
1	1821	1684	365
2	2182	1961	391
3	2256	1923	661
4	3628	4109	911
5	1842	1680	556
Average	2284	2166	502

Source: Own calculation.

Turning to the value of livestock, displayed in Table 4-3, it is evident that households in cluster 4 hold by far the highest livestock value. Moreover, they also realize the highest average sales value of all animals sold in the reference period.

Notably, households diversify rather than specialize in terms of livestock keeping. Of those households that have livestock only 8% specialize in buffalo, 13% in chicken and 2.5% in cattle rearing. The majority rears more than one type of livestock, mainly for household consumption. Yet, despite the nutritional aspect, livestock also yields supplementary income (Sisovanna, 2012).

⁵ TLU – Tropical Livestock Unit: Measure to convert different types of livestock into one standardized unit based on cattle equivalent with a body weight of 250kg (FAO, 2014).

4.2 Fishing, hunting and logging

4.2.1 Access to extracting grounds

The majority of rural residents in Cambodia still lives in traditional ways, primarily cultivating rice and collecting natural resources from water bodies and forests (Ra et al., 2011). Stung Treng province is richly endowed with water and forest resources. Thus, the extraction of these resources is one of the main livelihood activities of rural households. It provides various types of products that are used for both home consumption and sales. Table 4-4 summarizes the status of property right enforcement of the extracting grounds which are classified into (i) open-access, (ii) community, and (iii) other-property regimes (e.g. governmental or private property).

Table 4-4: Property rights enforcement status of the extracting grounds

Product	No. of HH	Open access (%)	Community (%)	Others (%)
Fish	369	88	7	5
Small animals	48	98	2	0
Game	18	94	6	0
Vegetables and fruits	256	95	2	3
Wood	242	94	2	4

Source: Own calculation.

Natural resource extraction is undertaken by 77% of the surveyed households. Of these 79% and 73% participate in the extraction of water and forest resources, respectively. A large number of these households participate in both water and forest resource extraction. As can be seen from Table 4-4, most of the extraction activities are conducted in open access areas where regulations might exist but their enforcement is generally ineffective or absent. This might indicate a high potential for resource degradation.

4.2.2 Extracted products

The products extracted include various types of fish, bee honey, red ant's eggs, lizards, frogs, toads, mollusks, snakes, birds, deer, wild pigs, mushrooms, herbs, bamboo shoots, lotus, and other vegetables and fruits, resin as well as wood which can be grouped into (i) fish, (ii) small animal, (iii) game, (iv) vegetables and fruits (including resin), and (v) wood. The following Table 4-5 summarizes the number of the surveyed households participating in the extraction, their mean distance to the extracting grounds, and the mean economic values which include values for sales and for home consumption.

Table 4-5: Extraction of natural resources

Product	No. of HH	Distance (km) (mean)	Output value (USD PPP) (mean)	For sales (USD PPP) (mean)	For consumption (USD PPP) (mean)
Fish	369	2.8	1401	861	540
Small animals	48	4.3	330	183	147
Game	18	6.9	852	611	241
Vegetables and fruits	256	3.5	491	415	76
Wood	242	4.0	406	286	120

Source: Own calculation.

The most popular products are fish, bamboo shoots, vegetables, and firewood, which are extracted throughout the year. Fishing grounds are on average rather close to the household (2.8 km) whereas households travel a longer distance to hunt game (6.9 km). However, some households have to go 71 km for wood exploitation and 50 km for fishing. On average, the output value of fishing is highest with a maximum value of USD 32,100 PPP. The proportion for home consumption is on average higher than that for sales, indicating the importance of natural resources as an integral part of home consumption but also as a source of cash income for rural households.

4.2.3 Income contribution

Table 4-6 shows that on average the extraction of natural resources contributes a high proportion of 27% to the annual household income. This comprises of 19% from water resources, namely fish, and 8% from forest resources. The highest contribution to the annual household income (about 42%) from natural resource extraction is in cluster 2. In general, income from water resources contributes more to annual household income than income from forest resources.

Table 4-6: Contribution of natural resources to annual household income

Cluster	Household income (USD PPP) (mean)	Contribution of environmental income (%)		
		Total	Water resources	Forest resources
1	3,246	16	12	3
2	3,364	42	25	17
3	7,012	11	9	3
4	5,185	26	2	1
5	3,737	25	22	4
Total	4,104	27	19	8

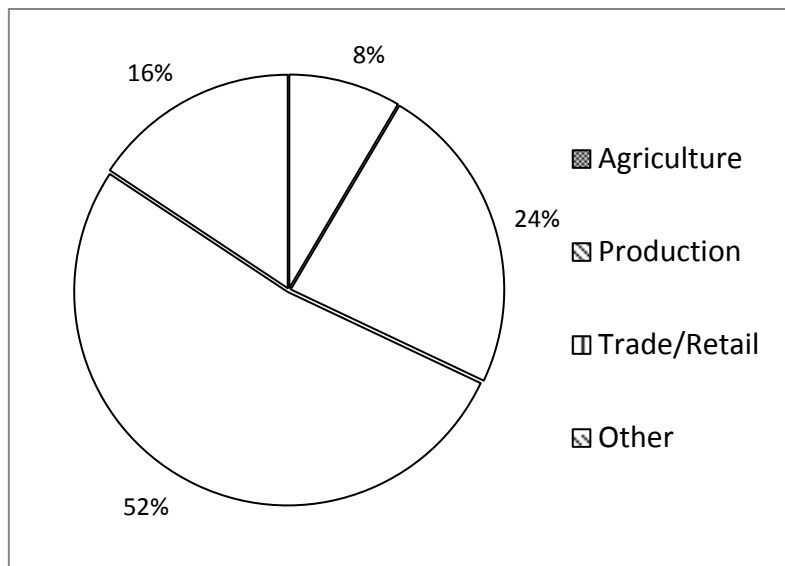
Source: Own calculation.

4.3 Business and wage employment

4.3.1 Self-employment

In total, 129 households of the sample are engaged in self-employment (22%). This includes the following sectors (see Appendix Table 9-2): (i) agriculture – including different kinds of agricultural service and livestock trading, (ii) production – comprised of value upgrading of agricultural products and industrial production, (iii) food – containing small scale food processing and sales, (iv) trade – consisting of retail and petty trading, and (v) others – subsuming health and service related activities. More than half of the individuals engaged in self-employment are working in the trade sector. Indeed, 50% of the self-employed work as retail-shop operator or as petty trader. The other important sector is the production sector. However, it only account for 24% of the individuals who are self-employed.

Figure 4-2: Self-employment by sector



Source: Own calculations.

Turning to the breakdown per cluster, it can be found that in the poorer three clusters (cluster 1, 2, and 5), less than 10% of the households are engaged in self-employment. According to the factors used for clustering the share of households with a self-employed member in cluster 3 is about 96%. Further, about 39% of the households in cluster 4 are engaged in self-employment activities.

In addition to the frequencies the differentiation in high- and low-skilled self-employment per cluster is relevant. Those households in cluster 1, 2, and 5 who are engaged in self-employment are mainly involved in low-skilled activities. These are particularly in the production, food, or trade, transport and communication sector, e.g. as rice mill operators, small food store operators, or taxi drivers. In contrast, households in cluster 3 and 4 primarily work in medium-skilled jobs. The majority of individuals work in the trade, transport and communication sector, for example as retail shop owners or petty traders. Further, some are engaged in high-skilled jobs including craftsmen, nurses, and doctors.

The breakdown of income per livelihood cluster shows the same distribution (see Table 3-3 p. 15). Self-employment activities play a major role for the richer two clusters. For cluster 3 the income share from self-employment accounts for 65% of the total household income. Although the share is much lower for cluster 4 (highly-skilled wage laborers), it still accounts for 31%. For the remaining three clusters income from self-employment plays only a minor role since it accounts for less than ten percent of the total household income.

Interestingly, the socio-demographic indicators, displayed in Table 4-7, show that the average years of schooling of individuals engaged in self-employment is just marginally higher compared to the remaining sample population. However, the share of men who completed secondary school or higher levels exceeds both, the share of female self-employed and of individuals who are not engaged in self-employment. Thus, education appears to be one determinant of self-employment.

Table 4-7: Selected socio-demographic characteristics for self-employed (in percent)

	self-employed			non self-employed		
	Male	female	Total	male	female	total
Education Level						
N	49	74	123	1,287	992	2279
less than primary (in %)	45	62	55	47	49	48
primary/pagoda school (in %)	29	24	26	28	29	28
secondary school (in %)	18	14	15	21	19	20
complete University (%)	4	0	2	2	1	1
Other (in %)	4	0	2	3	2	3
Total (in %)	100	100	100	100	100	100
Marital Status						
N	57	100	157	2,147	2,180	4,327
Unmarried (in %)	7.0	7.0	7.0	39.2	31.5	35.3
Married (in %)	89.5	78.0	82.2	59.2	61.7	60.4
Widow / Divorced /Separated (in %)	3.5	15.0	10.8	1.7	6.8	4.3
Total (in %)	100	100	100	100	100	100

Note: this Table is based on frequencies for individuals between 13 and 73 years (age range during which people in our sample are engaged in self-employment)

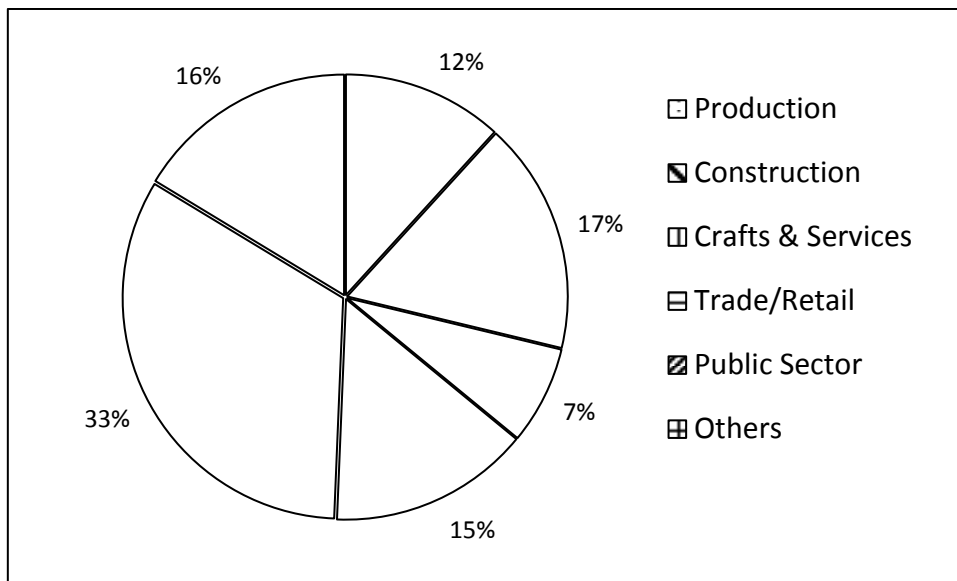
Source: Own calculations.

4.3.2 Off-farm employment

In the off-farm employment sector which includes all wage employment (formal and informal) that is not related to agriculture, the picture differs. Overall, 320 individuals of 224 households (39%) are involved in off-farm wage employment. Of these 224 households 54% belong to the richer clusters (3 and 4) and only 46% to the poorer clusters (1, 2 and 5). While the richer clusters account for 25% of the households engaged in off-farm employment the shares of the respective poorer clusters vary between 8 - 24%. The sectors displayed in Figure 4-3 are defined as follows (see also Appendix Table 9-2): (i) production – comprised of manufacturing jobs that are not related to construction, (ii) construction – includes jobs related to construction and mining, (iii) crafts & services – contains crafts activities and various services not related to retail, (iv) retail – contains sales and retail activities, (v) public – involves all types of public sector worker, (vi) others – subsumes health sector jobs, logging and others. Note, due to the questionnaire design and the coding of activities the sectors for off-farm employment differ from the sectors in self-employment.

As the characteristics of the livelihood clusters already show there are a number of individuals engaged in high-skilled wage employment. These people work mainly in the public sector, and in retail. In the public sector the majority works as teachers, followed by police officers, government administrators and soldiers. In the retail sector most individuals work as salespersons.

Figure 4-3: Off-farm employment by sector



Source: Own calculations.

Turning to the distribution of off-farm employment jobs per cluster the expected differences can be found. Households in the poorer clusters are mainly engaged in the production and the construction sector. Only a minor share is engaged in high-skilled employment such as police officer, government official and teacher. In contrast, households in the richer clusters predominantly work in high-skilled jobs in the retail and the public sector.

4.3.3 Salary structure and labor shortage

The salary structure indicates that wages differ considerably across sectors. Notably, since only 244 of the 320 individuals reported their monthly wage, wages of some sectors (esp. the retail sector) cannot be used for interpretation. Thus, excluding the retail sector it is evident that higher-skilled jobs in the public sector are associated with higher wages. On the other end of the scale employment in the production and the crafts and services sector are associated with 10% lower monthly wages on average.

Yet it has to be noted that the monthly salary does not account for the real number of working hours per month. Especially employment contracts in the crafts and services, construction, and the retail sector might not be permanent. Hence, monthly wages could be misleading since some individuals only work if their labor is demanded for e.g. constructing a house or fixing shoes.

Table 4-8: Monthly salary by sector

Sector	N*	Monthly salary in PPP USD (mean)
Production	27	120.97
Construction	49	127.84
Crafts & Services	20	126.99
Retail	5	105.38
Public Sector	99	140.90
Others	44	132.73

Note: * some observations had to be dropped because the salary was not reported.

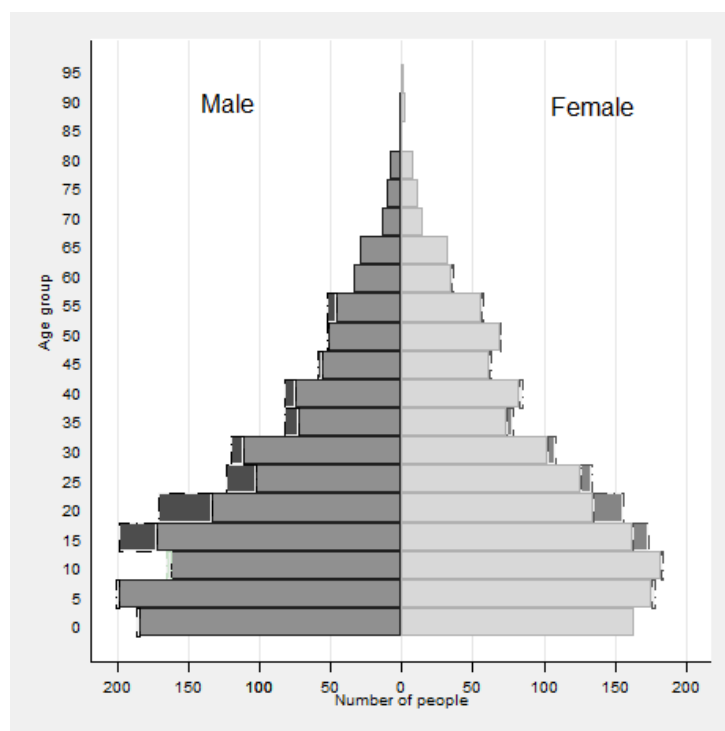
Source: Own calculation.

4.4 Migration

4.4.1 *Socio economic indicators*

Rural households sometimes decide to send one or several of their members to other rural or urban centers to look for a job and contribute to the household income. Thus, migration can be a livelihood activity for rural households allowing them to benefit from remittances. However, while international migration in Stung Treng does not seem to play a role, internal, seasonal migration occurs frequently in rural settings. In such a case, migrants are defined as household members, who moved out of their own village for at least 1 month in the reference period. According to this definition, about 190 household members (of 3,133 household members in total) migrated. Put differently, 105 households sent at least one of their members to migrate. Thus, migration accounts for only 6% of the total sample population. Figure 4-4 confirms that the population pyramids with and without migration hardly differ. Evidently, young male individuals between 15 to 35 years of age account for 70% of all migrants.

Figure 4-4: Population distribution by age and gender



Source: Own presentation.

Table 4-9 shows some selected socio-demographic indicators comparing migrants and non-migrants. For both, migrants and non-migrants, the majority of individuals have little or no education. Yet, the share of migrants who hold a secondary or higher education degree is two times higher compared to non-migrants. Moreover, statistics also show that female migrants have a higher level of education than male migrants. Thus, in general, the selectivity of migration may be found by the success of higher education of female migrants. In addition, migrants are by far more likely to be single in comparison to non-migrants. Similar to the findings by the Cambodian Ministry of Planning (MoP, 2012), females that migrate are less likely married than male migrants.

Table 4-9: Selected socio-demographic characteristics for migrants (in percent)

	Non-migrants			Migrants		
	Male	Female	Total	Male	Female	Total
Education level						
No school	35	44	40	30	17	26
Pagoda/primary school	55	48	52	48	57	51
Secondary school	10	7	8	19	22	20
Higher education	1	1	1	4	3	4
Total	100	100	100	100	100	100
Marital status						
Single	58	50	54	54	59	55
Married	41	42	42	45	33	41
Other (Divorced/separated)	1	8	5	2	9	5
Total	100	100	100	100	100	100

Source: Own calculation.

4.4.2 Destination of migrants from Stung Treng

In their report on Cambodian Rural Urban Migration (CRUMP) the MoP (2012) indicated that half of all rural migrants in Cambodia move to Phnom Penh. However, for the province of Stung Treng, which is quite far away from the capital, we find a different picture (Table 4-10): migrants are less likely to move far away from their original households; close to 70% of all migrants move to other rural areas; most stay in the same district or at least the same province. Only 14% of the migrants move to another province. About 22% of all migrants move to urban areas, of which only 6% migrated to Phnom Penh. International migration only accounts for about 8%.

Table 4-10: Migrant distribution by destination (in percent)

		Male	Female	Total
Rural	In province	62	36	54
	Another province	17	7	14
Urban	In province	9	22	13
	Another province	4	3	4
Phnom Penh		2	16	6
Abroad		5	16	8
Total		100	100	100

Source: Own calculation.

In line with the results from the MoP (2012), Table 4-10 also shows that females are much more likely to migrate to an urban area, including Phnom Penh, or even to a foreign country than their male counterparts. This observation can be partly explained by the higher education of female migrants, which increases their probability of getting a job.

4.4.3 Types of jobs in destination areas

Table 4-11: Reasons for migration (in percent)

	Male	Female	Total
Job opportunity	83	83	83
Schooling or studying	7	10	8
Others (marriage, became a monk, joined the army)	10	7	9
Total	100	100	100

Source: Own calculation.

Table 4-11 clearly highlights that people migrate to find a job (83%). Migration for education accounts only for about 8% of all migrants. It is difficult to detect any differences by gender: female migrants are slightly more likely to migrate for education (10%). Since the higher education facilities are centralized in the provincial capital Stung Treng and its neighboring villages, migration for education could be driven by a lack of education infrastructure in villages. Further, temporary migration for teaching could be driven by the same fact. On the contrary, males migrate more often due to other social reasons (6%) such as marriage, becoming a monk, or joining the army.

Table 4-12: Types of occupation in destination areas

Types of occupation	Percentage
Agricultural wage laborer, logger	40
Public sector (teacher, police officer, admin., soldier)	17
Services (watchman, sales/bar tender...)	16
Other industry workers (food processing, wood industry, textile...)	11
Construction worker	9
Private traders (street vendors...)	5
Other own business	2
Total	100

Source: Own calculation.

Since a majority of migrants go to rural regions, agricultural wage labor and logging are the most popular jobs (about 40%). Around 33% of all migrants work as teachers, police officers, or soldiers for the public sector, or as watchmen or tender in the services sector. Another 9% of all migrants work as construction workers. The remaining migrants (7%) have their own private business, or work as private trader (Table 4-12).

Migration remittances transfers contribute about 288 PPP \$US per year to the income of rural households in Stung Treng. This equals about 5% of total yearly household income and 9% of total yearly household consumption. However, the results of t-tests show that there is no statistical difference between the welfare indicators of migrant and non-migrant households (see Appendix, Table 9-4).

Migrant households are likely to be observed in cluster 1 and 2 (see Appendix, Table 9-5), where most migrants mainly work as agricultural wage laborers, loggers, or depend on fishing. Especially, cluster 2 “natural resource extractors” includes 35 migrant households, which may be partly explained by the logging or fishing activities occurring far from the village of origin.

5 Future challenges

To be able to assess any future pressures on specific livelihood activities, the surveyed households from Stung Treng have been asked to comment on a number of environmental and climatic issues. With respect to climate change, almost all households (99%) perceive that there has been a change in climatic conditions in Stung Treng in the past 20 years. The majority of households states that they experience less rainfall accompanied by higher temperatures and higher wind speed.

The results indicated a decreasing trend during the last 20 years, with regard to the temporal availability of extracted products. For example, less than 1% of the respondents said that there had been no change in forest resources; meanwhile 38% indicated that the forest cover decreased, and 22% of the respondents said that there were no big trees any more. Further, 90% of the respondents think that the existence of wild animals was reduced while only 2% of the respondents declared that there were more wild animals of all kind. This is similar with respect to fish. 86% of the respondents said that there was less fish of all kind. Given the importance of natural resources in household income (27%), this might indicate a source of income vulnerability in the future due to the high level of income dependence on a decreasing stock of natural resources. This issue is most critical for households in cluster 2 where the contribution of natural resources accounts for 42% of the total income. Therefore, promotion of other income generating opportunities would be necessary.

In addition, future challenges derive from the management of the Mekong River. So far eleven dam projects have been planned along the Mekong River; China has realized already four dams (Spiegel online, 2012). Laos has announced to establish six hydropower plants along the Mekong River. The Xayaburi dam in Laos is already under construction and is expected to be finished in 2019 with 90% of the energy going to Thailand. As a consequence it is expected that the dams will impact on the around 700 fish species travelling downstream. Moreover, the level of sediment in the river is expected to change affecting the ecosystem as a whole (Fähnders, 2012).

The Mekong River is also affected by the increased export of its sands⁶. Booming developed cities such as Singapore traditionally depend on importing sands from other countries (mainly Malaysia, Indonesia, Cambodia, and Vietnam). It has been found that extracting sand leads to huge social and environmental costs for the ecosystem in the Mekong River. While the export of sand was banned in 2009 in Cambodia, it was found to still account for 25% of total sand imports in Singapore in 2010 (Gray, 2011). The export bans resulted in higher prices which has even promoted the illegal sand extraction. As a result, not only the fisheries resources, corals, mangroves and other plants decline, but also the velocity of the water changes resulting in more erosion and higher flood risks. In addition, the water quality is impaired and the water levels decreased which negatively affected the irrigation opportunities for rice cultivation in coastal areas (Franke, 2014).

Overall, the households in Stung Treng will most likely witness a continued change of their natural resource base. Many households rely on natural resources and already report that they experience a change regarding climate, natural resources, and environmental conditions. Not only natural resource extraction but also farming will be affected if the conditions change, especially if the water of the Mekong River is regulated upstream.

⁶ Special thanks go to Michael Hübler for pointing to this aspect.

6 Summary and conclusion

The overall objective of this discussion paper is to advance the knowledge on rural livelihoods in Stung Treng – a province in Cambodia which is characterized by a relatively high incidence of poverty and food insecurity. Since diversification of livelihoods has been found to improve living standards and raise livelihood security, it is important to identify constraints and opportunities for households to diversify (Ellis 1998, 2000). Ecker and Diao (2011) asked for more research to identify livelihood groups in Cambodia in order to better understand the major drivers of hunger and malnutrition and to determine the role of agriculture in reducing vulnerability to poverty.

Since no up-to-date studies are available from Cambodia in general, and from Stung Treng in specific, we take up this task. We consider such a livelihood analysis also as a first step helping to explore the width of our comprehensive data set from a representative survey of 600 households in Stung Treng. Based on the results, further research which digs deeper into the many selected aspects of rural livelihoods is being suggested.

The first more detailed research objective was to identify and describe rural livelihood strategies for different household clusters in Stung Treng. A cluster analysis was used to group the surveyed households into five clusters which differ according to their major livelihood strategies. Despite the fact that nearly all households are engaged in some form of subsistence farming the richer clusters build on self-employment and higher-skilled wage employment. In contrast the middle income cluster mainly depends on natural resources (fish and firewood) while the poorer two clusters are engaged in lower-skilled wage employment.

The incidence of poverty is widespread but differences between the clusters are clearly visible. Even the better-off households have consumption poverty headcount ratios of between 37 to 50% at the PPP \$1.25 line. At the PPP \$2 line, these ratios rise to considerable 77%, respectively. This shows the high vulnerability of even relatively rich households to fall into poverty. For households from the poorest clusters the poverty headcount ratio amounts to even 70% for income poverty and 80% for consumption poverty at the PPP \$1.25 line. Overall, these figures underline the severity of poverty across the clusters in Stung Treng. Especially the households depending to a large extent on natural resource extraction are characterized by a high incidence of poverty and high vulnerability. The more diversified and higher-skilled households are found to have higher living standards and therefore a higher livelihood security compared to the other clusters.

The second objective of this paper was to analyze selected livelihood activities and their determinants in more detail. It was found that the livelihoods of most rural Cambodians in Stung Treng remains largely depend on agriculture, fisheries, and other kinds of natural resources. Rice production is generally still the most important staple crop, but only households from the richer cluster invest into value addition, namely rice processing. Furthermore, they tend to grow cash crops such as cassava. Moreover, livestock rearing is widespread in Stung Treng with the richer households tending to have the highest value of livestock. Natural resource extraction (fishing, logging) is undertaken by almost 80% of the surveyed households. For almost half of all households, natural resource extraction accounts for around 40% of their annual household income.

Migration as a livelihood activity plays a minor role due to the distance to the capital Phnom Penh and the remoteness of the area. The few migrants tend to stay within the province, and they are found in the poorer clusters where most households mainly work as agricultural wage laborers, loggers, or depend on fishing.

Households who diversified into self-employment, for example as retail shop owners or petty traders tend to be the richest households, followed by households with at least one member working in a high skilled or permanently paid job (e.g. teacher, police officer). These households are also

characterized by up to 6.4 years of schooling of the household head, while most household members in Stung Treng have low levels of education with only around three years of schooling.

Overall, the households in Stung Treng largely base their livelihood strategies on natural resources. There are a number of factors which are likely to increase the pressure on the natural resource base in the future. These relate to the management of the Mekong River which determines the availability of fisheries resources but also to climate change, population growth, and illegal use of forest and fish resources. These kinds of pressures are expected to increase poverty problems in the rural areas of Stung Treng in the future. Further, the difference between the headcount ratio at the \$1 poverty line and the \$2 poverty line shows that many people are vulnerable to fall into poverty if their income (and consumption) levels drop marginally. Therefore, despite currently promising poverty reduction in Cambodia, the picture will change if natural resources are continuously exploited unsustainably. But not only natural resource extraction, also farming will be affected if the conditions change, especially if the water of the Mekong River will be regulated upstream.

To what extent any future efforts will reduce rural poverty largely depends on the sustainable management of natural resources. Policies aimed at reducing poverty and improving rural livelihoods need to carefully consider the close linkages between rural livelihoods and natural resources. The latter often function as the “safety net” for the poorest of the poor. Poverty alleviation policies are more likely to be effective if they focus on integrated development approaches that aim at enhancing rural livelihood strategies. But also a diversification away from natural resource extraction into higher-skilled jobs has been found to be characteristic for the better-off households. Such a strategy opens up new opportunities to improve livelihood security and raise the living standards of the poor. Education, therefore, is most crucial for giving individuals the capability to improve their livelihoods.

Food security of households depends not only on the availability, access to, and use of food, but also on stability of supply⁷ (FAO, 1996). Further research should therefore focus on improving the understanding of the seasonality of livelihood activities. Little is known about the dependence of rural livelihoods on fishing, logging or hunting over the period of a year and the role of livestock and value addition in improving food security. To what extent institutional changes in terms of developing cooperatives, or extension services, and training contribute to an improvement of livelihoods also needs to be explored.

⁷ The availability of food depends on domestic production and/or imports, while the access to food refers to individuals who need to have adequate resources or entitlements for obtaining food. The use of food depends on adequate diets, nutritious values of food and clean water, and stability ensures that food can be accessed at all times (see also Grote, 2014).

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8 Appendix

Figure 9-1: Cambodia – study area Stung Treng



Table 9-1: Variable list and summary statistics for clusters

Variable	Cluster				
	1	2	3	4	5
No. of members in agriculture	2.31	2.70	1.58	1.92	2.60
No. of members in natural resource extraction	0.30	0.68	0.19	0.30	0.29
No. of members in non-farm owned business	0.08	0.03	0.99	0.29	0.04
No. of members in low skill agri. employment	1.03	0.11	0.10	0.10	0.04
No. of members in non-agri. employment	0.02	0.00	0.17	0.00	2.20
No. of members in skill off-farm employment	0.05	0.01	0.09	1.04	0.14
Received transfers (PPP USD)	37.89	4.51	2.83	2.62	1.39
Days worked for forest resource extraction	46.87	98.67	39.21	27.22	32.98
Days worked for fishing	83.73	96.32	55.79	62.26	71.60
Costs for forest resource extraction (PPP USD)	12.58	82.39	22.15	19.41	9.18
Cost for fishing (PPP USD)	30.44	76.93	64.79	82.56	70.59
Cash expenditure for livestock (no buffalo) (PPP USD)	26.87	18.64	30.90	110.37	5.28
Cash expenditure for buffalo (PPP USD)	7.53	2.51	3.29	17.25	2.85
TLU for livestock (no buffalo)	0.57	0.70	1.39	2.86	0.52
TLU for buffalo	1.11	1.15	0.97	1.33	0.84
Received remittance (PPP USD)	100	20	75	54	68
Investment in crops (PPP USD)	600	985	1465	1000	668
Investment in livestock (PPP USD)	16.63	10.37	17.86	64.54	10.74
Investment in fishing (PPP USD)	45.92	107.24	121.61	69.69	129.80
Investment if self-employment (PPP USD)	37.48	28.46	684.16	255.49	18.07
Land area for food crops (ha)	1.06	1.44	0.72	1.59	1.04
Land area for cash crops (ha)	1.00	0.83	0.92	1.08	0.63
Years of education household head	2.98	2.46	4.37	6.41	3.68

Source: Own calculation.

Table 9-2: List of occupations by sector

Sector	Type of occupation
Production	Food processor/Rice miller Involved in Textile, Apparel Logger - Wood industry Involved in Metal Products and Machinery
Agriculture	Agricultural services provider Livestock trader Foodstall operator Butcher Other small scale food processor
Construction	Miner, Quarryperson Construction worker Brickyard worker Other worker in construction, industry
Crafts & Services	Watchperson Housemaid (Taxi) Driver Work in Bar/Restaurant Work in hair salon/barber Work in handcrafts/carver Craftsperson (Shoemaker, Tailor, Barber) Maintenance person (e.g. electrician, plumber) Tourism/hotel Work in funeral and wedding service
Trade/Retail	Worker in Retail Shop (sales store) Petty trader (sales on street) Wholesaler
Public Sector	Police Officer Teacher Soldier Government administrator NGO staff Village head Civil servant
Others	Nurse (private / public clinic) Doctor, etc.

Source: Own compilation.

Table 9-3: Migrant remittances and household welfare

	Non-migrant households		Migrant households	
	Mean	SD	Mean	SD
Migration remittances transfer (PPP \$)			288	823
Total household income (PPP \$)	4,023	4,888	4,577	3,449
Total household consumption (PPP \$)	3252	1,727	3,244	1,566
Number of households	477		105	

Note: The t-test shows insignificant differences between migrant households and non-migrant households for all welfare indicators.

Source: Own calculation.

Table 9-4: Migration and household livelihood cluster

Cluster	Non-migrant	Migrant	Total
1	95	27	122
2	219	35	254
3	66	12	78
4	65	13	78
5	32	18	50
Total	477	105	582

Source: Own calculation.

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