

Jenny Turunen, Juha-Pekka Snäkin, Juha Panula-Ontto,  
Heikki Lindfors, Hanna Kaisti, Jyrki Luukkanen, Stefano  
Magistretti & Chinda Mang

# LIVELIHOOD RESILIENCE AND FOOD SECURITY IN CAMBODIA

- Results from a Household Survey



Jenny Turunen

Tulevaisuuden tutkimuskeskus, Turun yliopisto

[jenny.turunen@utu.fi](mailto:jenny.turunen@utu.fi)

Juha-Pekka Snäkin

Rovaniemen ammattikorkeakoulu

[juhapekkasnakin@luukku.com](mailto:juhapekkasnakin@luukku.com)

Juha Panula-Ontto

Tulevaisuuden tutkimuskeskus, Turun yliopisto

[juha.panula-ontto@utu.fi](mailto:juha.panula-ontto@utu.fi)

Heikki Lindfors

Tampereen ammattikorkeakoulu

[heikki.lindfors@env.tamk.fi](mailto:heikki.lindfors@env.tamk.fi)

Hanna Kaisti

Tulevaisuuden tutkimuskeskus, Turun yliopisto

[hanna.kaisti@utu.fi](mailto:hanna.kaisti@utu.fi)

Jyrki Luukkanen

Tulevaisuuden tutkimuskeskus, Turun yliopisto

[jyrki.luukkanen@utu.fi](mailto:jyrki.luukkanen@utu.fi)

Stefano Magistretti

[smagis@btopenworld.com](mailto:smagis@btopenworld.com)

Chinda Mang

[chindamm@yahoo.com](mailto:chindamm@yahoo.com)

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Finland Futures Research Centre  
University of Turku  
Rehtorinpellonkatu 3, FI-20014 University of Turku  
Korkeavuorenkatu 25 A 2, FI-00130 Helsinki  
Pinninkatu 47, FI-33100 Tampere  
Tel. +358 2 333 9530  
Fax +358 2 333 8686  
[ffrc.utu.fi](mailto:ffrc.utu.fi)  
[tutu-info@utu.fi](mailto:tutu-info@utu.fi), [firstname.lastname@utu.fi](mailto:firstname.lastname@utu.fi)





# CONTENTS

EXECUTIVE SUMMARY .....	8
TIIVISTELMÄ .....	10
1. INTRODUCTION .....	12
1.1. Sustainable Livelihoods Approach (SLA) and Resilience .....	14
1.2. Research Team .....	15
2. MATERIAL AND METHODOLOGY .....	18
2.1. Focus Group Discussions .....	18
2.2. Household and village leader survey .....	21
<i>Sampling</i> .....	22
3. RESULTS .....	25
3.1. Livelihoods in rural Cambodia .....	25
<i>Versatile livelihood strategies</i> .....	28
<i>Agriculture</i> .....	31
<i>Small business and wage labour</i> .....	33
<i>Cash income from work outside the village</i> .....	35
<i>Uncertain future</i> .....	36
<i>Summary</i> .....	36
3.2. Forest and land - the basic resources for rural living .....	37
<i>Reasons for deforestation</i> .....	38
<i>Economic Land Concessions</i> .....	39
<i>Summary</i> .....	41
3.3. Food security situation in Cambodian households .....	41
<i>Difficulties of farming caused by unpredictable weather</i> .....	46
<i>Rice farming</i> .....	46
<i>Fisheries</i> .....	48
<i>Livestock</i> .....	50
<i>Vegetable farming</i> .....	51
<i>Availability of clean water</i> .....	52
<i>Health concerns about chemicals in food</i> .....	53
<i>Summary</i> .....	54
3.4. Energy consumption .....	55
<i>Rural villages without electricity</i> .....	56

	<i>Electrified rural villages</i> .....	58
	<i>Urban areas</i> .....	59
	<i>Summary</i> .....	59
3.5.	Coping strategies .....	60
	<i>Borrowing money to cover basic costs</i> .....	60
	<i>Selling assets</i> .....	62
	<i>Migration as a coping strategy</i> .....	63
	<i>Summary</i> .....	65
4.	CONCLUSIONS .....	67
4.1.	Possibilities for further use of the data .....	68
4.2.	Lessons learnt.....	69
5.	POLICY RECOMMENDATIONS .....	71
	REFERENCES .....	75
	APPENDIX 1: DESCRIPTIONS OF THE FOCUS GROUP DISCUSSION VILLAGES .....	77

LIST OF FIGURES:

Figure 1: Map of Focus Group Discussion locations in ecozones ..... 20

Figure 2: Map of the provinces where survey data was collected ..... 24

Figure 3: Households in income classes..... 26

Figure 4: Household monthly income in village types ..... 26

Figure 5: Distribution of monthly income classes to village types..... 27

Figure 6 Primary sources of livelihood in village types..... 29

Figure 7: Primary sources of livelihood in income classes ..... 30

Figure 8: Number of different livelihood sources during wet season ..... 30

Figure 9: Number of different agricultural products during wet season ..... 32

Figure 10: Raising animals in different income classes..... 33

Figure 11: Food security situation of households in different income classes..... 43

Figure 12: Food security class shares within ecozones ..... 43

Figure 13: Changes in the affordability of food ..... 45

Figure 14: Affordability of food stuffs in urban areas ..... 45

Figure 15: Self-sufficiency of foods in food producing households in different ecozones ..... 47

Figure 16: Sources of drinking water ..... 53

Figure 17: Household energy costs ..... 56

Figure 18: Reasons for borrowing money ..... 60

Figure 19: Borrowing money to buy food ..... 61

Figure 20: Selling land and animals ..... 62

Figure 21: Selling assets in food security classes..... 63

LIST OF TABLES:

Table 1: Location criteria for the Focus Group Discussions ..... 19

Table 2: Ecozone description..... 20

Table 3: Provincial level sample and its distribution to urban and rural locations..... 24

Table 4: Description of food security classes ..... 42

Table 5: Policy recommendations ..... 72

# EXECUTIVE SUMMARY

This research report presents the results of the assessment of Cambodian rural and urban households. In the assessment, livelihoods and food security issues, coping strategies, agricultural and other rural resources use, and energy issues were examined with respect to climate change considerations. Policy recommendations are given accordingly.

The study applies Sustainable Livelihoods Approach (SLA) and resilience as integrating concepts. They bind together ecological and economical aspects of making a living. In Cambodia, households' ability to diversify their livelihoods and increase flexibility (resilience) is critical. The research aims at answering the following questions: what are the applied livelihood sources, what affects rural and urban food security, how environmental changes affect livelihoods, and what kind of coping strategies there are to overcome livelihood related difficulties. The research data was gathered using qualitative Focus Group Discussions and a quantitative household and village headman survey.

Results indicate that major changes in weather conditions have been observed (high temperatures, drought and excess rains in a peculiar time) causing difficulties to farming. Life in villages has become harder also due to depletion of natural resources and economic hardship. People felt that due to these changes their incomes have decreased and they have difficulties to cover necessary household costs.

During wet season more than half of all the studied households have four or more different livelihood sources and during dry season the diversity is slightly lower. The diversity is highest in rural non-electrified villages throughout the year. High diversity corresponds to low income level. People are dependent on agriculture and try to secure food and income by a versatile livelihood strategy. Small business or wage labour is most common in urban areas. In rural areas, own business or wage labour does not increase incomes remarkably. Income provided by family members who have migrated to cities is very important. Migration is often seasonal and migrants return to their home villages during agricultural peak seasons.

Cambodia's forests are important by providing energy and income complementing agriculture and fishing, and improving food security. Fish is an essential staple food along with rice but catches of fish have decreased significantly and prices have risen. The number of pigs and chicken has decreased due to sicknesses. Half of vegetable growers have had poor harvests due to hot weather, pests and land sales. Price of drinking water has not risen like the prices of food. A surprising finding is people's common concerns about health effects of chemical substances in food from markets.

There is a strong link between the availability of cooking fuel and food security. If firewood or other cooking fuel is scarce, households start preferring foods that can be cooked quickly. A wide diversity of energy sources is used. In villages with electricity grid, other energy sources have not been displaced by electricity. Household energy costs are clearly higher in urban areas and rural electrified areas than in rural non-electrified areas. Firewood is the most common energy source used for cooking. Only few people used electricity for business purposes.

Households have several coping strategies to overcome economic difficulties caused for example by poor harvest or sickness or death in the family. People try to work more, they borrow money, sell their

assets (land, livestock, house etc.) or migrate for work. Borrowing is the most usual way to obtain money quickly, but interest rates are often very high. The respondents want to avoid selling their assets, which form the basis of agricultural livelihood and selling them weakens the capability of a household to produce food. However, especially land sales (both small and large scale) are increasingly common in Cambodia and many respondents have mentioned them as a major change affecting the environment and livelihoods.

**Policy recommendations** (a more detailed list of policy recommendations can be found in table 5, page 66.)

- Negative effects of climate change pose a major threat to food security in Cambodia. Climate change prevention and mitigation must remain a high priority of the Finnish development policy.
- Strong emphasis must be put on curbing deforestation because forest cover loss is another major threat to food security.
- Land ownership issues should be raised in development agenda: more attention should be put on negative effects of large scale private land ownership partly due to land sales by poor. Improving the livelihood of rural poor reduces their need for obtaining cash income by selling land and other assets. More emphasis needs also be put on strengthening the legal and social position of community lands.
- Fisheries need to be protected by curbing illegal fishing and protecting important fish habitats, such as flooded jungle and mangrove forests. This is crucial as those most directly dependent upon fisheries and related aquatic resources are the poorest villagers. Also, it should be recognised that hydropower development in the region is a major threat to fishing.
- Continuous dependence on traditional firewood for energy should be addressed: even with access to the grid power, rural population continues using wood as a primary source of energy. It is important to integrate livelihood projects into the energy projects in order to develop income generating activities that use the available energy sources, especially in the case of electrification projects. There is need to consider the priorities of securing sustainable firewood availability and electrification schemes producing energy that poor people cannot always afford.
- Energy related aid and development resources should be increased for promoting renewable energy sources and technologies, which would allow local people to profit from energy projects increasing the livelihood resilience at household and village level. The potential for promoting small-scale and distributed biodiesel production could be considered.
- New approaches to aiming at holistic village and household level livelihoods development should be tested and introduced. These could include efforts of combining e.g. renewable energy production, climate change mitigation efforts, and soil fertility improvements in a single development package with access to easy financing.

# TIIVISTELMÄ

Tässä loppuraportissa esitetään tulokset Kambodzhan kotitalouskyselytutkimuksesta, jossa selvitettiin maaseudun ja kaupunkien kotitalouksien elinkeinoja, ruokaturvaa, selviytymisstrategioita, maatalous- ja muiden resurssien käyttöä ja energian kulutusta erityisesti ilmastonmuutosnäkökulmasta. Tuloksiin pohjautuvat politiikkasuositukset tuodaan esiin raportin lopussa.

Tutkimuksessa käytettiin tietojen hankinnassa ja analysoinnissa SLA -näkökulmaa (Sustainable Livelihoods Approach) ja palautuvuus -käsitettä (resilience). Nämä liittävät ekologiset tekijät kotitalouksien talousnäkökulmiin. Joustavuuden lisääntyminen ja parempi palautuvuus erilaisista negatiivisista tekijöistä on tärkeää köyhien kotitalouksien selviytymisessä muuttuvissa oloissa. Tutkimusaineisto hankittiin laadullisilla ryhmäkeskusteluilla (10 ryhmää) ja kvantitatiivisilla kotitalous- ja kyläpäällikköhaastatteluilla (1250 kotitaloutta, 153 kyläpäällikköä).

Tulosten mukaan sääolot ovat selvästi muuttumassa ja kuumuus, kuivuus ja rankkasateet ovat yleistyneet. Elämä kylissä on vaikeutunut luonnonresurssien vähenemisen ja talouskriisin vuoksi, tulot ovat pienentyneet ja toimeentulon ylläpitäminen on käynyt vaikeammaksi. Metsäkato ja kalansaaliiden merkittävä pieneneminen nousevat esiin keskeisinä elinkeinoinhin vaikuttavina ympäristömuutoksina. Maanomistussuhteiden nopea muuttuminen vaikuttaa maatalouden harjoittamiseen.

Kotitaloudet ovat toimeentulossaan voimakkaasti riippuvaisia maataloudesta ja esimerkiksi katovuosista johtuvien riskien vähentämiseksi maatalous on monipuolista ja sitä tuetaan monenlaisilla sivuelinkeinoilla. Sadekaudella yli puolella kotitalouksista on erilaisia elinkeinonlähteitä (viljelykasveja, eläimiä, pienyrittäjyyttä, satunnaisia palkkatöitä) neljä tai enemmän. Elinkeinojen runsaus on suurinta maaseudulla alueilla, joilla ei ole verkkosähköä. Pienyrittäjyys ja palkkatyö ovat hyvin yleisiä sekä maaseudulla että kaupungissa, mutta kaupungeissa kotitalouksilla on useampia erilaisia rahatulon lähteitä. Maaseudulla pienyrittäjyys ja palkkatyö eivät merkittävästi paranna kotitalouksien taloudellista tilannetta, mutta ne tarjoavat pitkälti omavaraistaloudessa eläville kotitalouksille edes pienen rahatulon lähteen.

65 % kotitalouksista pystyy hankkimaan kaikkia tarvittavia ruoka-aineita riittävästi ympäri vuoden. Kotitalouden tulotaso heijastuu selvästi ruokaturvatilanteeseen. Sikojen ja kanojen kasvattaminen on osassa kotitalouksista vaikeutunut eläinsairauksien ja rehun hintojen takia. Vihanneksien viljelijöistä noin puolella olivat sadot heikentyneet sääolojen, tuholaiten ja maanomistuksen muutosten vuoksi. Juomaveden saatavuus ja hinta ovat pysyneet muuttumattomina. Uutena huolena ihmisillä on pelko markkinoilta ostettavan ruoan mahdollisista myrkyllisistä kemikaaleista.

Etenkin sähköistämättömissä kylissä kotitalouksilla on käytössä useita eri energiamuotoja. Polttopuu on yleisin energialähde ruoanlaitossa lähes kaikkialla. Myös sähköistetyissä kylissä käytetään edelleen perinteisiä energialähteitä, sähkö ei ole niitä syrjäyttänyt. Verkkosähköä ei juurikaan käytetä liike-toimintaan eikä se ole merkittävästi monipuolistanut elinkeinoja tai parantanut tulotasoja sähköistetyissä kylissä. Kotitalouksien energiakustannukset ovat korkeammat kaupungeissa ja verkkosähköistetyissä kylissä kuin maaseudulla.

Uusien tulonlähteiden etsiminen, rahan lainaaminen, omaisuuden myynti ja muuttoliike ovat keskeisiä keinoja, joilla kotitaloudet yrittävät selvitä taloudellisista vaikeuksista esimerkiksi kadon tai perheenjäsenen sairastumisen tai kuoleman aikana. Maan tai karjan myynti nähdään huonoina kainoina saada rahaa käyttöön, koska ne heikentävät entisestään kotitalouden mahdollisuuksia harjoittaa maataloutta ja tuottaa riittävästi ruokaa. Maanmyynti on kuitenkin Kambodzhassa hyvin yleistä ja monet vastaajat nostivat sen esiin yhtenä suurimmista elinkeinoihin ja ympäristöön vaikuttaneista muutoksista. Kaupunkiin töihin muuttaneet perheenjäsenet ovat taloudellisesti tärkeitä kyliin jääville perheenjäsenille. Muuttoliike on tyypillisesti kausiluonteista ja kaupungeissa työskentelevät perheenjäsenet palaavat kotikyläänsä maataloustöiden kiireisimpänä aikana.

### **Politiikkasuositukset:**

- Ilmastonmuutos vaikuttaa yhä selvemmin ruokaturvaan, tähän on reagoitava jatkossa voimakkaammin.
- Metsien häviämistä on kaikin keinoin pyrittävä vähentämään, koska se ilmiönä vaikuttaa suoraan ja epäsuorasti myös ruokaturvaan.
- Maanomistusolot on otettava kehitysapuagendalle, koska kehityksen ongelmina ovat maanomistuksen keskittyminen, ja pienviljelijöiden maanmyynnin lisääntyminen köyhyyden vuoksi. Jatkossa on korostettava yhteisöllisten maan- ja metsänomistusmuotojen turvaamista ja kehittämistä.
- Kalakantoja täytyy suojella estämällä laitton kalastus ja suojelemalla tärkeitä kalojen lisääntymisalueilta, kuten mangrovemetsiä ja tulvametsiä. Lisäksi on tiedostettava, että suurten vesivoimaloiden rakentaminen alueella vaikuttaa merkittävästi kalakantoihin. Tällä on erityisen suuri merkitys köyhimpien kotitalouksien ruokaturvalle.
- Maaseudun väestö on arkipäiväisissä kotitalouden askareissaan riippuvainen perinteisistä puupolttoaineista, vaikka verkkosähköä olisikin saatavilla. Verkkosähkön tulo kyliin ei vähennä polttopuun käyttöä ja metsäresursseihin kohdistuvia paineita. Verkkosähkön saatavuus tuo vain vähän kaivattuja uusia liiketoimintoja. Energiahuoltoa kehitettäessä on syytä pohtia eri energiamuotojen tärkeysjärjestystä maaseudun köyhien näkökulmasta; verkkosähkö on usein liian kallista ja sitä käytetään maaseudulla lähinnä valaistukseen ja viihteeseen. Sen sijaan puupolttoainesten saatavuuden turvaaminen kestäväällä tavalla vaikuttaa keskeisesti maaseudun kotitalouksien ruokaturvaan ja elinympäristöön.
- Kestävien elinkeinojen ja energiahuollon edistämistä on tärkeää käsitellä yhdessä erityisesti sähköistämishankkeiden osalta, jotta voidaan kehittää uusia elinkeinomahdollisuuksia, joissa hyödynnetään olemassa olevia paikallisia resursseja. Energiaan liittyvää kehitysyhteistyötä tulisi lisätä painottaen pienimuotoisen uusiutuvan energian kehittämistä. Paikalliset energialähteet ja teknologiat antavat paikallisille ihmisille mahdollisuuksia hyötyä taloudellisesti energian tuotannosta ja monipuolistaa elinkeinojaan. Pienimuotoisen ja hajautetun biodieselin tuotannon mahdollisuuksia olisi tutkittava.
- Uusia avauksia kokonaisvaltaisen paikallistason kehityksen edistämiseksi olisi tuettava, esimerkkinä energiantuotannon, ilmastonmuutoksen torjunnan ja viljelysmaan parantamisen yhdistäminen.

# 1. INTRODUCTION

In late 2008, the Ministry for Foreign Affairs of Finland (MFA) made a call for research proposals on development themes consisting of poverty and food security issues and their linkages with climate change and other major environmental issues. Since there exist numerous and often complex links between poverty, hunger, the environment and rural development issues in developing countries, MFA listed issues of particular research interests under three central themes A, B and C as follows:

## A) Agriculture and rural development

- The role of agricultural production/productivity in rural development (e.g. livelihoods, employment)
- Linkages of rural poverty, malnutrition and hunger with agricultural production/productivity
- The role of land tenure and property rights in agricultural production/productivity
- Linkages of gender issues with agricultural production/ productivity

## B) Food security

- Forces behind world market price fluctuations of major food crops
- The role of supply-side factors (trade policy, market mechanisms, storage and local speculation, biofuels, demand for land, rural infrastructure)
- The role of demand-side factors (population, diets and food consumption patterns)
- The potential of new crops and GMOs in food security
- The role of 'aid for trade' and regional cooperation in food security

## C) Climate change

- The potential effects of climate change related phenomena to agricultural production (varying climate conditions, drought, excessive rainfall and floods, soil fertility, soil pollution and salinity, water contamination and groundwater withdrawal)
- The potential influence of global initiatives, such as the IPCC, and international relations of major actors, such as China, India and Africa.

The Finland Futures Research Centre's (FFRC) team participated in the 2008 research call successfully with the study proposal "**Knowledge for Development: Creating Rural Resources Database for Sustainable Livelihoods in Cambodia (SURVEY)**". The research report at hand is the outcome of this project.

Central research themes chosen in this study include the assessment of Cambodian rural and urban households and their food security issues related to climate change effects and paying also attention to

the overall MFA goal of incorporating environmental viewpoint as a cross-cutting theme in all development cooperation interventions.

The target country of this study is the Kingdom of Cambodia, which is one of the World's poorest countries with about 40 % of the population below international poverty line of US\$1.25 per day. Large scale urbanisation has not yet started, and about 80 per cent of the population lives in the rural areas (UNICEF, 2010.) The poorest communities reside in remote rural areas, living in self-subsistence economies and without electricity. Rural households often lack adequate and sustainable food production systems that would ensure affordable and nutritious food at all times. Communities thus have little resources to adapt to social, environmental and economic changes such as environmental degradation and climate change, or increasing fuel and commodity prices.

Cambodian Government is committed to rural poverty reduction, and in this goal it is assisted by a variety of development cooperation organisations and bilateral assistance. One of the challenges facing the government and development organisations is the lack of knowledge with respect to rural natural resources and livelihood development. There is little basic nationwide data on rural natural resources, their present and potential use and the distribution of related benefits and constrains. The Cambodian Ministries have pointed out this knowledge gap and the fact that without nationwide baseline data the Government cannot e.g. predict natural resource consumption in the future, which impedes the policy planning.

The primary objective of the FFRC project is to **provide data on rural resources and livelihood strategies in Cambodia that would support climate sensitive and sustainable natural resource policies and improved development assistance for poverty reduction.** The collection of this type of data helps in policy planning and in identifying the potential resource conflicts and in anticipating future needs with priority to adaptation and mitigation to climate change and food security. This is in line with the Finnish Development Policy Programme 2007, which underlines the need for sustainable management of natural resources as the basis for national economy and local livelihood. (MFA, 2007) Data also directly supports MFA's Mekong Regional Plan.

The linkages between poverty and the environment are obvious in Cambodia and elsewhere. Among the first attempts to characterize these linkages is the work of Sedara et al. (2002). In their study "Land, Rural Livelihoods and Food Security in Cambodia: A Perspective from Field Reconnaissance" authors conclude e.g. that the Cambodian rural population and labour force have grown too much compared to available resources affecting adversely the food security. Furthermore, Cambodian natural resources are under a severe strain as a result of various survival strategies adopted by the rural people and due to excessive resources demands from outside the agrarian sector. Other problems include issues such as land inequality due to emerging land demands, emergence of too small farm plots resulting in low yields, uneven distribution of gains favouring large-scale farmers rather than the small, lack of irrigation, lack of parity between the prices of agricultural inputs and outputs, and markets that are less competitive hurting subsistence farmers.

Another attempt to describe important poverty-environment linkages is for example the analysis by the Food and Agriculture Organization of the United Nations. FAO conducted a wood energy and poverty mapping study in Cambodia as part of A WISDOM case study in Southeast Asia (FAO, 2007). Information from poverty and wood fuel availability was combined in this assessment. According to results, in the year 2000 Cambodia and Viet Nam were those Asian countries appearing more vulnerable,

with over 40 percent of the entire population facing malnutrition and wood fuel deficits, of which half faced critical conditions (concomitance of high to critical malnutrition and high to critical wood fuel deficit).

Furthermore, energy issues in poverty reduction and livelihoods are entering the research and development arenas. In Cambodia, the United Nations Development Programme UNDP has recently completed a residential energy demand survey in two rural provinces (UNDP, 2008). This project aimed at performing empirical and conceptual analyses of linkages between energy and poverty. A more general presentation on sustainable energy issues in development is presented e.g. by the United Nations Collaborative Framework called UN-Energy (United Nations, 2007a).

In general, the importance of poverty and environment linkages, or "nexus", has been raised in recent years by development organizations (Dasgupta et al., 2005). Nexus is a set of mutually reinforcing links between poverty and environmental damage, where poverty reduction and environmental protection are complementary goals. The existence of such nexus in Cambodia was tested by Dasgupta et al. (2005) using e.g. georeferenced indicator mapping, correlation, and regression analysis as tools.

In this study we aim at responding to the growing needs for research to incorporate poverty, energy, environment, livelihoods, food security and agriculture, and climate change issues in a single study set-up. While the literature of research and development projects about the issues mentioned above are increasingly available also in the Cambodian context, there exist no readily available information which would cover information needs of decision makers including both Cambodian and Finnish governments in the field of development cooperation and aiming at benefitting the Cambodian poor.

**The research aims at answering the following questions:**

- What are the sources of livelihood (both subsistence and cash income) for Cambodian households?
- What factors affect food security in rural and urban areas?
- How environmental changes affect livelihoods of households?
- What are the coping strategies of households to overcome economic hardship, environmental changes and other livelihood related difficulties?

## 1.1. Sustainable Livelihoods Approach (SLA) and Resilience

Due to the information needs described earlier our study concepts are based on applying Sustainable Livelihoods Approach (SLA) and the term called resilience. Sustainable livelihood is an integrating concept, which binds together different ecological and economical aspects of making a living. Widely used in both development literature and practical applications in development cooperation as well, the SLA as a concept has the following characteristics according to IFAD, The International Fund for Agricultural Development under the United Nations (IFAD, 2010):

- SLA is a way to improve understanding of the livelihoods of poor people;
- SLA draws on the factors affecting poor people's livelihoods and the relationships between these factors;
- SLA can be used in planning new development activities and in assessing existing activities;

- SLA has two components: a framework for understanding the complexities of poverty and principles to guide action to address and overcome poverty.

In the SLA framework rural poor in particular are seen in the middle of inter-related phenomena that affect people's livelihoods. Close to people are available resources and other livelihood assets that they have. These include human, social, physical and financial assets such as natural resources, technologies, people's skills, knowledge and capacity, health, access to education, sources of credit, and e.g. social support.

The extent of people's access to above assets is influenced by their vulnerability context. It takes into account various existing trends, shocks and seasonalities. Also prevailing social, institutional and political environment affect the use of assets to achieve people's goals. This is called as applied livelihood strategy.

According to IFAD's (2010) definition, there are seven principles describing the use of SLA approach, but which yet are flexible to diverse local conditions:

- People-centred (SLA begins by analysing people's livelihoods and how they change over time)
- Holistic (people adopt many strategies to secure their livelihoods)
- Dynamic (seeks to understand the dynamic nature of livelihoods and what influences them)
- Build on strengths (builds on people's strengths and opportunities rather than focusing on their problems and needs)
- Promote micro-macro links (examines the influence of policies and institutions on livelihoods)
- Broad partnerships (counts on broad partnerships drawing on both the public and private sectors)
- Sustainability (important if poverty reduction is to be lasting).

In addition to SLA approach described above, this study aims at using the concept of resilience as an additional analytical approach. Resilience supports the understanding of livelihoods development considering the dynamics of making a living and the characteristics of complex adaptive systems including in particular scale and uncertainty (Marschke and Berkes, 2006).

In their study on Cambodian livelihood issues, Marschke and Berkes (2006) state that in rural livelihood cases most critical is the households' ability to diversify their livelihoods and building the capacity of a household to be flexible, which then refers to a resilience-building measure. Resilient systems imply more flexibility and are able to maintain their integrity and reorganize while undergoing change (Holling 1973, Redman and Kinzig 2003, Walker et al. 2004; see Marschke and Berkes, 2006).

## 1.2. Research Team

Finland Futures Research Centre (FFRC) conducted the project in collaboration with Professor Stefano Magistretti and Indochina Research Ltd (IRL). Indochina Research is a local subcontractor, based in Phnom Penh, which conducted the data collection fieldwork. The research team consists of both senior and junior researchers and it has been constructed by taking into account the gender balance and local expertise.

The leader of the research team has been Dr. **Juha-Pekka Snäkin**. Prior to FFRC he worked in Laos for UNDP Lao PDR as the manager of the environment unit. Apart from research he has experience e.g. on forestry, bioenergy and carbon sink expert duties. He has worked in Laos, Indonesia and Zambia.

M.Sc.Adm. **Jenny Turunen** has been in charge of the analysis of the data collected in the project as well as project coordination and administration. She holds a Master's degree in Environmental Policy from University of Tampere, Finland. Turunen has studied developing countries studies and has field experience from Tanzania, where she has worked in an environmental NGO. Her research interests focus on rural development and sustainable natural resources management in developing countries.

Professor **Stefano Piergiulio Magistretti** is a senior research consultant based in Phnom Penh, Cambodia. He has been the regional director of social research in Indochina Research Ltd, and has conducted many multi-phased field studies in Cambodia and Laos for e.g. UNDP, GTZ, and USAID. He has a long experience in socio-economic, demographic and cultural studies. Prof. Magistretti has contributed to this project as an advisor and commentator and he has designed the sampling of the survey.

Dr. **Jyrki Luukkanen** is a research professor of futures studies specializing in energy, environment and development research. He has been a director of numerous national and international research and development projects funded by European Commission, Finnish government, European Parliament, UNDP, the Academy of Finland, companies and industrial organization, NGOs, technology agencies, etc. Dr. Luukkanen has contributed to the Survey project as an advisor and commentator.

M.Soc.Sc. **Hanna Kaisti** has her educational background in international relations, environmental policy, Asian studies and information sciences. She has worked in various research projects relating to environmental policy and politics, sustainable energy and equity issues in the developing countries. In the Survey project Kaisti has contributed her help as an advisor and commentator.

M. Sc. Adm. **Juha Panula-Ontto** is working as a researcher in FFRC focusing on development of sustainable development indicators. In the Cambodian household survey project Panula-Ontto has contributed to the treatment and analysis of the statistical data.

**Heikki Lindfors** is a student of Environmental Engineering in Tampere University of Applied Sciences. Lindfors has worked in the project as a trainee, contributing to the treatment and analysis of the statistical data.

BA **Chinda Mang**, junior researcher based in Phnom Penh, has a Bachelor's degree in Management. She has worked for several years in international firms. In this research project she is a junior researcher, and the project serves as a capacity-building opportunity for future M.Sc. studies abroad. She has extensive networks and understanding of Cambodian rural areas. In this research project Ms. Mang participated in the preparations and field work of data collection as a local member of the FFRC team.

B.Sc.Adm, B.Tech in Environmental Engineering **Toni Paju**, has worked in the project as university trainee. Paju's role has been to investigate the possibilities of using Geographical Information Systems (GIS) methodologies as part of the research design and to produce thematic maps of the study area.

**Indochina Research Ltd. (IRL)** Indochina Research is an experienced regional research company working in the Mekong region. Since 1995 IRL has conducted a broad range of quantitative and qualitative studies. Company has a staff of more than 1000 people with offices in Cambodia, Laos and Vietnam. The field staff consists of trained university students. The clients of IRL include e.g. the WB, the ADB, UNDP, and Nokia. In this research project IRL has been planning and implementing the data

collection in cooperation with FFRC and Stefano Magistretti. IRL has conducted all the data collection field work and provided the organized and coded data to FFRC research team.

## 2. MATERIAL AND METHODOLOGY

The functional unit of the study is a household, from which the resources data are primarily collected. The research data has been gathered by both qualitative and quantitative methods. The core of this research is a qualitative household survey. 1250 households have been interviewed about livelihood strategies, food security and energy consumption of the household. As the studied topic is very complex, also qualitative data is useful and needed for analyses. Such material obtained from households provides more versatile data for analyses compared to a plain quantitative survey, and it provides the villagers a voice and a possibility to define the topics that they consider relevant. The qualitative data was collected by Focus Group Discussions (FGD), i.e. group discussions lead by a facilitator. The facilitator presented all the discussion groups a given set of questions. However, the overall procedure of a FGD is more open than that of a survey interview, and the participants had the possibility to take up discussion topics outside the presented questions. The dynamics of the group also offers the possibility of presenting differing views and arguments and their justifications.

All the qualitative and quantitative data collection field work has been done by Indochina Research.

### 2.1. Focus Group Discussions



*Photo: Chinda Mang*

The data collection began in Cambodia with 10 Focus Group Discussions (FGD), which were organized in 10 locations. Each group had 8 participants. In order to guarantee maximal representativeness of the Cambodian society, the Focus Group Discussions were organized in both urban and rural areas in different village types. The locations represent 7 different provinces (Kampong Cham-East, Phnom

Penh, Kandal, Prey Veng, Battambang, Kampong Chhnang and Kampot), six different village types (rural village in upland location, urban area, rural village along a national highway, rice farming village, fishing village and a village where rice farming and fishing are practiced) and 4 different ecozones (plateau, plains, Tonle Sap region and coastal area). This division of chosen study areas was based on the expertise and long-lasting experiences of the Cambodian research partners and then approved by FFRC research team.

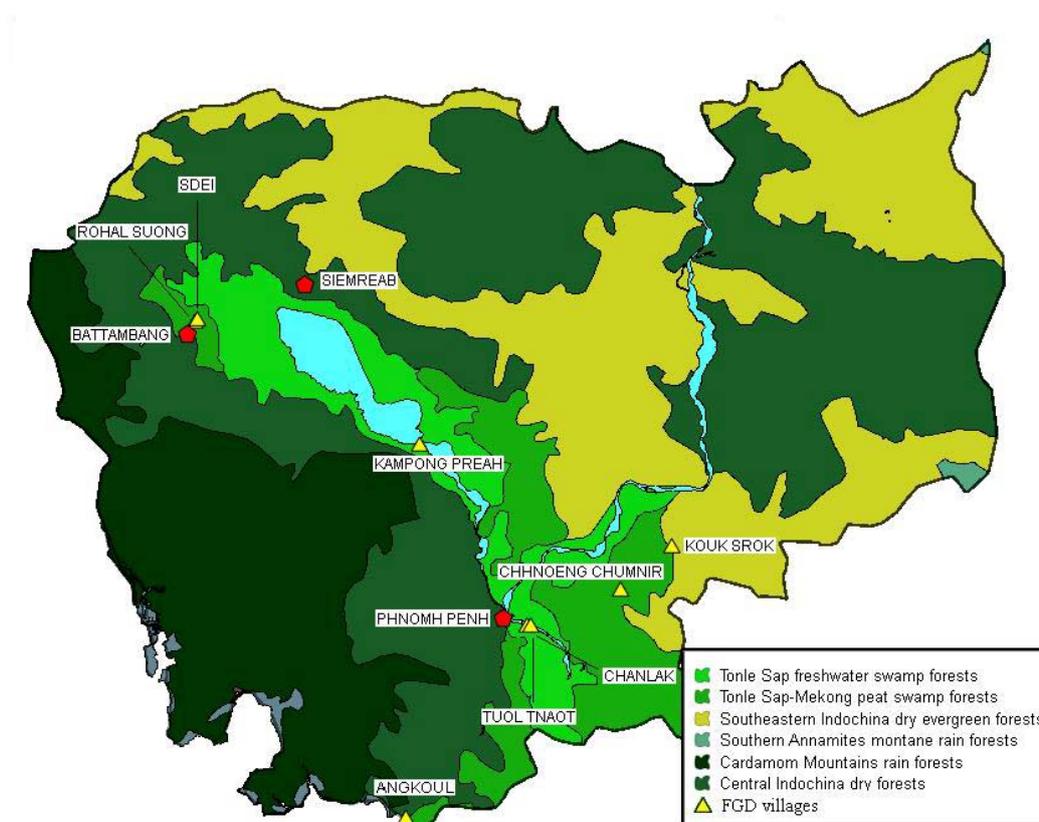
As road connection and access to electricity also have indirect impacts on people's livelihood, the Focus Group locations cover both areas that have connection to main road and also those which are far away from highways. The same logic is applied also to availability of grid power; FGD villages were identified both from areas with access to electricity grid and those that rely on other forms of energy (See Tables 1 and 2). The rural FGD villages are described in Appendix 1.

*Table 1: Location criteria for the Focus Group Discussions*

<b>Eco-zone</b>	<b>Village type</b>	<b>Province</b>	<b>District</b>	<b>Commune</b>	<b>Village</b>	<b>Livelihoods</b>	<b>Energy</b>	<b>Groups</b>
Plateau	Upland	Kampong-Cham-East	Dambae	Kouk Srok	<i>Kouk Srok</i>	Rice and cassava farming	Battery/Fuel-wood	1 Female group
Plains	Urban	Phnom Penh	Ruessei Kaev	Toul Sanke	-	Women: garment factories; Men: mototaxi drivers, other casual work, seasonal migration to village	Electricity grid	1 Female group and 1 Male group
	Rural village along national highway	Kandal	Kien Svay	Kokir	<i>Chanlak and Tuol Tnaot</i>	Dry season: Bean, corn, vegetables; Wet season: casual employment and migration to work in the factories of Phnom Penh	Electricity grid	1 Female group and 1 Male group
	Rice farming village	Prey Veng	Kanhchriech	Kanhchriech	<i>Chhnoeng Chumnir</i>	Wet season: rice farming; Dry season: vegetables	Battery/Fuel-wood	1 Female group
Tonle Sap	Rice farming village	Battambang	Aek Phnum	Preaek Norint	<i>Sdei and Rohal Suong</i>	Wet season: rice farming; Dry season: vegetables	Battery/Fuel-wood	2 Female groups
	Fishing village	Kampong Chhnang	Baribour	Chhnok Trou	<i>Kampong Preah</i>	Wet season: fishing; Dry season: vegetables	Battery/Fuel-wood	1 Female group
Costal	Rice/Fishing village	Kampot/Kep	Damnak Chang'aeur	Angkaol	<i>Angkoul</i>	Wet season: rice farming; dry season: fishing	Battery/Fuel-wood	1 Female group

*Table 2: Ecozone description*

Plateau	Remote upland areas. Low population density; upland agriculture; some upland minorities.
Plains	Lowland plains. Most urban centers are located in the plains; in rural areas lowland rice farming and mixed farming are typical livelihoods. Most of the Cambodian population lives in this zone.
Tonle Sap	Areas surrounding the Tonle Sap lake. Mixed farming of rice and other crops; lake fisheries.
Coastal	Two southern provinces with seaboard. Coastal area with mosaic of lowland plains and uplands in the interior.



*Figure 1: Map of Focus Group Discussion locations in ecozones*

The members in the rural discussion groups were people who are in charge of making daily decisions on food and energy in their household. In the Cambodian context this generally means women. In the original FGD sampling plan there were two rural male groups and six rural female groups, but as the fieldwork started, it proved to be very difficult to find enough rural men who are responsible for food and energy consumption in their household. Therefore, in order to guarantee the representativeness of the groups, it was decided that only one rural male group will be conducted and the number of female groups increased to seven.

In the urban discussion groups the respondents were people who have moved from a rural village during the past 3 years. The female group consisted of women who work in the garment factories of Phnom Penh and the male group of men who work as motorbike taxi drivers in Phnom Penh. Migration is an increasingly important part of the livelihood strategies of rural families and the income provided by the migrated family members is an important addition to the village economy. Thus understanding the dynamics of migration is important in the context of studying the rural resources base.

The participants in the FGDs were between 18 and 35 of age. It is important that the respondents have first-hand experience in dealing with energy procurement and food resources management in their household. Such experience is not frequently available to people less than 18 years old. On the other hand, as this research project is future oriented, it is important to put more emphasis on young people who have a bigger stake in the development of the country in the future. That is why respondents were younger than 35 years.

Another important reason for restricting the age of the participants is the strong age hierarchy prevailing in the Cambodian society and culture. In situations like open group discussions, Cambodians will almost always defer to the opinion of the older participants, thereby making FGDs nearly worthless. This justifies the narrow age composition required by any FGD session.

The Focus Group Discussions were lead by experienced facilitators from IRL. The discussions were recorded and filmed. The discussions began with a few general warm-up questions, which guided the respondents' thinking towards livelihood and energy-related issues and made the atmosphere more relaxed.

The actual discussions focused on two major themes: changes in the livelihood and environment and coping strategies during economic difficulties. The aim of the FGDs was to find out 1) what kinds of changes have happened in the living environment and livelihoods of the respondents during the past one year<sup>1</sup> ; 2) how these changes are affecting the lives of the respondents and their families, and 3) what kind of coping strategies the respondents have when they face negative changes and difficult situations, such as crop failure or unexpected expenses from funerals, illness or accident.

The facilitators used a set of questions to conduct the discussions but the participants were also encouraged to take up topics outside the questions presented to them. The discussions were conducted in Khmer language, and each discussion lasted for approximately one hour. The FGD data was analyzed using methods of qualitative thematic analysis.

## 2.2. Household and village leader survey

The core of this research is the survey, which consists of 1250 household interviews and 153 village leader interviews. Two different survey questionnaires were used in the data collection: one in the

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<sup>1</sup> The original plan was to use a time span of three to five years in the questions considering changes, but the research and fieldwork directors of Indochina Research recommended looking back only one year. According to their experiences, the answers get very unreliable especially in the rural areas, if the respondents are asked to remember e.g. their levels of income or the size of their rice crop after long periods of time.

household interviews and another in interviewing the village headmen. The survey questionnaires were designed in cooperation by FFRC team and Cambodian research partners (IRL Ltd, Prof. Stefano Magistretti). About one month was spent in commenting and modifying the questionnaires before starting the field activities. Organising and quality-checking the statistical data was done by IRL. The survey data was analysed by the FFRC research team using basic correlations and cross-tabulations.

## Sampling

The survey sampling has been designed together with Professor Stefano Magistretti, who has long research and teaching experience from Cambodia.

The household sample has been constructed to be representative of the Cambodian population and reproducible in future surveys. A multistage stratified proportional cluster sample was constructed for the survey, ensuring that the sample composition matches known distributions within the Cambodian population.

The source of national population data for proportional province random selection was the National Institute of Statistics (NIS) Population Forecasts to the Year 2020. The source of data for proportional random selection and proportional household quotas for districts, communes and villages within provinces was the Cambodian 1998 Census.

All samples were equally distributed across selected provinces, and chosen at random. The sample was large enough to allow disaggregation into sub-samples that would remain statistically significant, for example, by urban or rural location.

The survey's stratified random sampling stages included:

- 12 provinces were randomly chosen by Probability Proportional to Size (PPS), covering 75% of Cambodian population. This random selection stage was completed by Professor Stefano Magistretti. All random sampling below province level was completed by Social Research Director of Indochina Research, Mr. Kent Helmers. Sample quotas were calculated for each province based on the percentage of the total population of all 12 selected provinces located in each province, multiplied by the total sample of 1250. Thus the province quotas match the distribution of the population in those provinces.
- The 12 provinces were stratified by urban, rural and remote districts. "Urban" districts are defined as the districts of Phnom Penh and the district containing the provincial centre in each province. "Remote" districts are defined as  $\leq 10$  inhabitants per sq km and "rural" districts are all other districts aside from urban and remote districts. A total of 61 districts were chosen at random, again by PPS. The number of districts selected in each province was calculated by dividing each province total sample quota by 20 sampling units per district (rounded up). In the case of Phnom Penh, all the urban districts were included in the sample. In the case of provincial urban districts all 12 urban districts (one in each province) were included. All rural and remote districts were randomly selected. See Table 3 below for the provincial level sample distributed to urban and rural locations.
- Within each district one commune was randomly chosen by PPS and then three villages were randomly chosen within the commune by PPS. Quotas for interview were set at the dis-

trict/commune level proportional to population. Field teams were instructed to conduct interviews in at least two selected villages to fulfil the quotas and could use the third village if required as a supplement.

- The total population sample quotas were sub-divided for the purpose of the study according to access to the electricity grid. As there is no national sample frame by access to electricity grid, IRL with FFRC and Stefano Magistretti agreed on breakdown that should be representative for Cambodia and which provided sub-sample sizes large enough for comparative analysis. The sub-quotas were as follows (see Table 3):
  - Urban location with access to electricity grid (n=340/ 27% of total sample)
  - Rural location along a highway with access to electricity grid (n=160/ 13% of total sample)
  - Rural location without access to electricity grid (n=750/ 60% of total sample)
- Representative sub-quotas by access to electricity grid were derived for each province, district and commune, based on the total province sample quota and the urban/rural population structure at each level. Quotas for “Rural locations along a highway with access to electricity grid” were filled first within randomly selected communes if any villages had electricity and, if not, from a village located on a highway and with electricity in the nearest neighbouring commune in the district.
- The complete random sample of provinces, districts, communes and villages and the sample quotas were referred to Stefano Magistretti and FFRC for approval prior to field work. During field work, field work progress reports were provided to FFRC.
- Within villages households were selected using a skip interval proportional to village population from a random start point. This sampling process was implemented by IRL Field Work Supervisors.
- Individual interviewees were screened and chosen within each randomly selected household according to the response to the question: “Are you the person who is mainly in charge of making decisions on food and energy in your household?” This means that the respondent was not always the household head. In a household of two parents, husband is usually the household head, but wife is often responsible for daily decisions such as food and energy use.

In addition to household interviews a village headman interview was conducted in a total of 153 sampled villages to get village level information on livelihoods, food security situation, energy use, resource availability, and prevailing land use and land tenure patterns.

For analytical purposes the survey locations were further classified to represent six different ecological zones (see detailed zone description in Table 2):

- 1) Lowland agricultural villages without electricity grid;
- 2) Lowland agricultural villages which are influenced by the seasonal flooding of the Mekong river of Lake Tonle Sap and where fishing is practised seasonally - no electricity grid;
- 3) Fishing villages along the Mekong river or Lake Tonle Sap - no electricity grid;
- 4) Upland agricultural villages – no electricity grid;
- 5) Rural lowland agricultural villages along a national highway, connected to electricity grid; and
- 6) Phnom Penh or provincial urban centres connected to electricity grid.

Table 3: Provincial level sample and its distribution to urban and rural locations.

Ecozone	Province	Total quota	Urban - with Electricity grid	Rural - High-way with Electricity	Rural - No Electricity Grid
Plains	Kampong Cham	215	10	36	169
	Kandal	149	12	24	113
	Phnom Penh	180	180	0	0
	Prey Veng	123	20	18	85
	Svay Rieng	65	7	10	48
Tonle Sap	Beanteay Meanchey	92	20	13	59
	Battambang	116	21	17	78
	Kampong Thom	95	15	14	66
	Pursat	49	16	6	27
Coastal	Kampot	70	16	10	44
Plateau	Kampong Speu	84	11	12	61
	Stung Treng	12	12	0	0
<b>Total</b>		<b>1250</b> <b>100 %</b>	<b>340</b> <b>27 %</b>	<b>160</b> <b>13 %</b>	<b>750</b> <b>60 %</b>

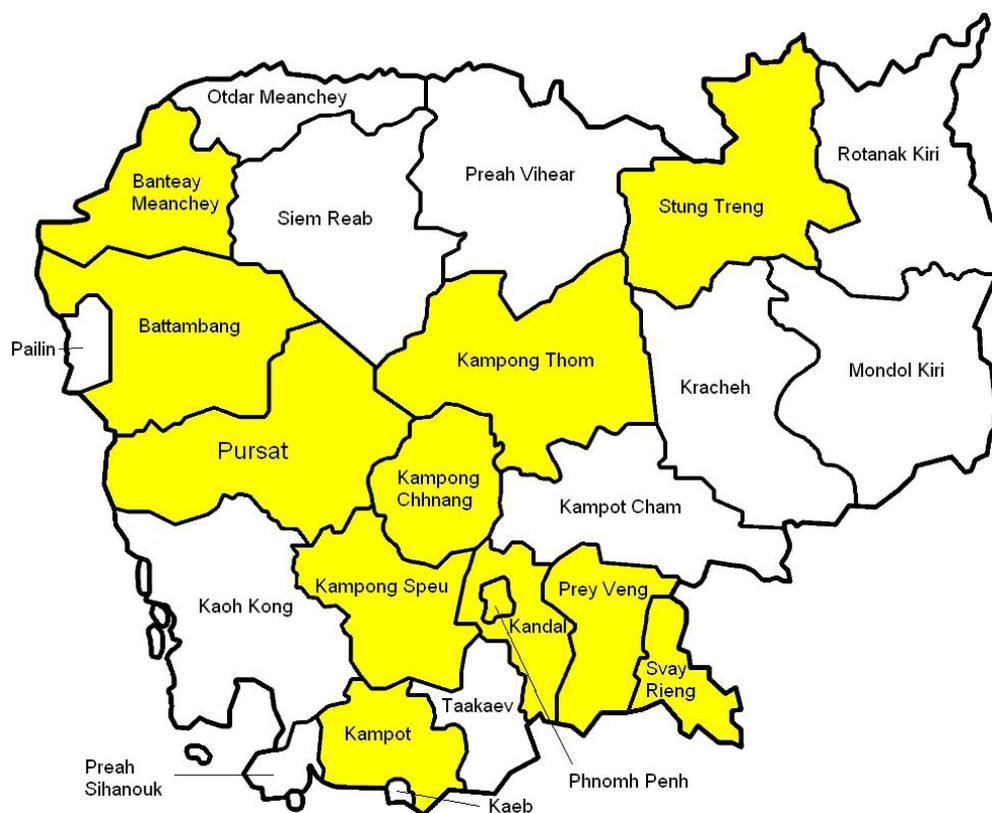


Figure 2: Map of the provinces where survey data was collected

## 3. RESULTS

The central findings of the research are presented in this section. We start by describing the versatility of rural livelihoods in Cambodia. The second chapter describes environmental changes observed by rural Cambodians and linkages between those changes and livelihoods. A major change observed by most of the interviewed farmers is the unpredictability of the weather conditions. High temperatures, drought and excess rains at the wrong time of the year have become more common and cause serious difficulties to farming. These phenomena are likely to become stronger along with climate change. The third chapter discusses food security, the most essential theme of this study. We describe the results that the FGD and survey data give about the present food security situation in Cambodia. Chapter four deals with energy consumption, and energy costs. Energy is a fundamental resource closely linked with the sustainability of natural resource use, rural livelihoods and food security and energy use is a source of climate change. In the fifth chapter we describe coping strategies that families use to survive difficult times e.g. during crop failure or sickness.

### 3.1. Livelihoods in rural Cambodia

An overall finding from the group discussions (FGD) conducted in Cambodian villages is that life has become harder due to depletion of natural resources, economic hardship and changes in the weather conditions. When the discussion groups were asked, what have been the major changes in their village during the last year, two themes emerged in most of the villages: degradation of forest resources causing difficulties in getting firewood and other forest products, and decreasing incomes from agricultural production. Many respondents in the rural FGD villages told that because of these changes their incomes have decreased and they have difficulties to cover necessary household costs, such as food, health care and education.

Figure 3 below shows the percentages of respondent households in nine income classes. A great majority of the households has a cash income of 50 to 150 USD per month. About 7% of the studied households belong to the poorest income class of under 50 USD per month, i.e. less than two dollars per day. About the same amount of households are in the highest income class of more than 400 USD per month. It must be pointed out, however, that asking people about their cash income levels can be difficult in Cambodia because many people either do not want to tell how much money they earn or they are not able to estimate their monthly incomes. Rural population seldom has any regular sources of cash income and they usually receive larger sums of money a few times in a year, mainly after harvests. During other months they may have almost no cash income at all. Because of these uncertainties the income figures may not be entirely accurate and reliable. The respondents have been asked to estimate the income of their household, meaning all the people who are living in their house, but it is also possible that some respondents have answered only for themselves. That would explain why the income levels seem lower than those given for example by the National Institute of Statistics of Cambodia (NIS). According to NIS,

in 2008 the GDP per capita was 739 USD (NIS, 2010). The average households size in Cambodia was 5,1 in 2004 (WFP, 2010a).

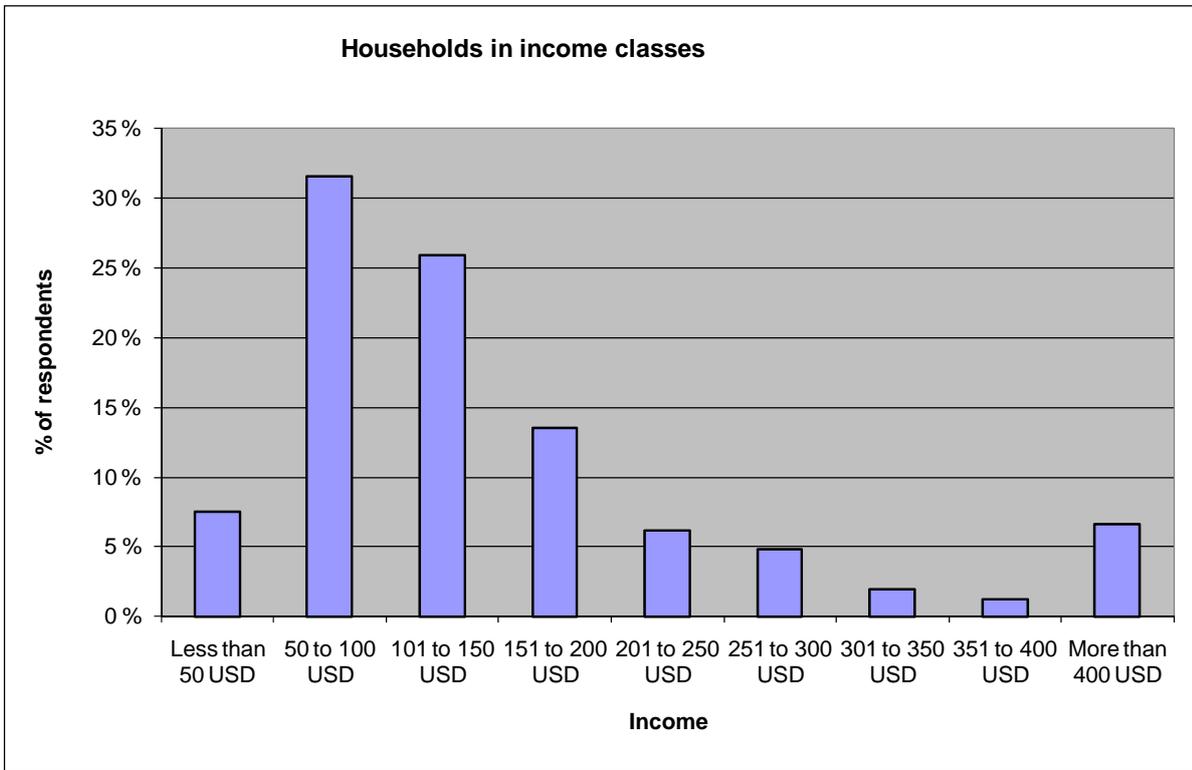


Figure 3: Households in income classes

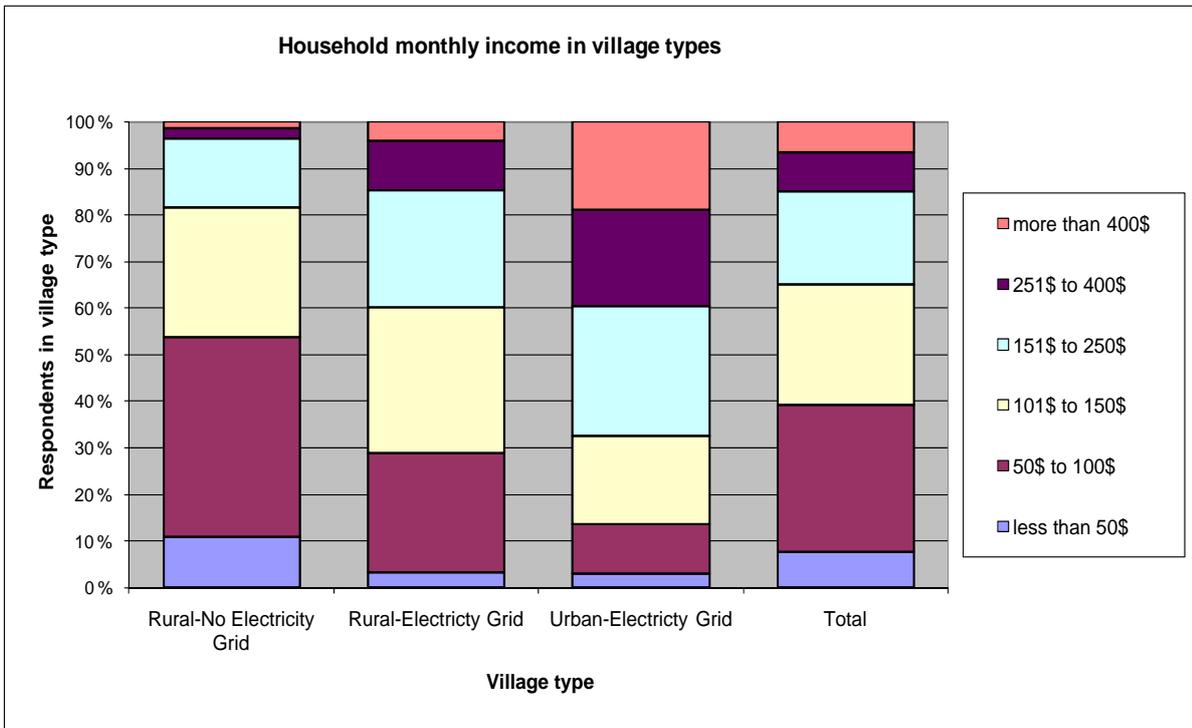


Figure 4: Household monthly income in village types

Figure 4 above shows how the monthly income classes are represented in different village types. Rural households are divided into those that have electricity and those that don't. Villages that have grid electricity are usually located along better roads than villages that do not have access to electricity grid. Better roads mean better access to markets and services, which leads to more diverse livelihood possibilities and higher income levels.



Figure 5: Distribution of monthly income classes to village types

Figure 5 shows how the households belonging to different monthly income classes are distributed to rural non-electrified, rural electrified and urban areas. It can be very clearly seen that poverty is a rural phenomenon as a great majority of the households that belong to poorest income classes live in rural non-electrified areas.

In the urban areas households are generally more evenly distributed to all income classes (Figure 4) than in rural areas. However, it is important to remember that the amount of cash income alone does not give a clear picture of the wealth of a household. In rural small farmer households most of the agricultural production is consumed by the family and not much is left for sale.

Majority of the households tell that their overall income and expenditure level in 2009 was lower than in 2008. In rural non-electrified villages 55% of the households were earning and spending less in 2009 than in 2008. In rural electrified villages the incomes and expenditure has decreased in 61% of the households and in urban areas in 54% of the households. In urban areas 14% of the households were

able to increase their incomes and expenditure, in rural areas this has been the case in approximately 8% of the households.

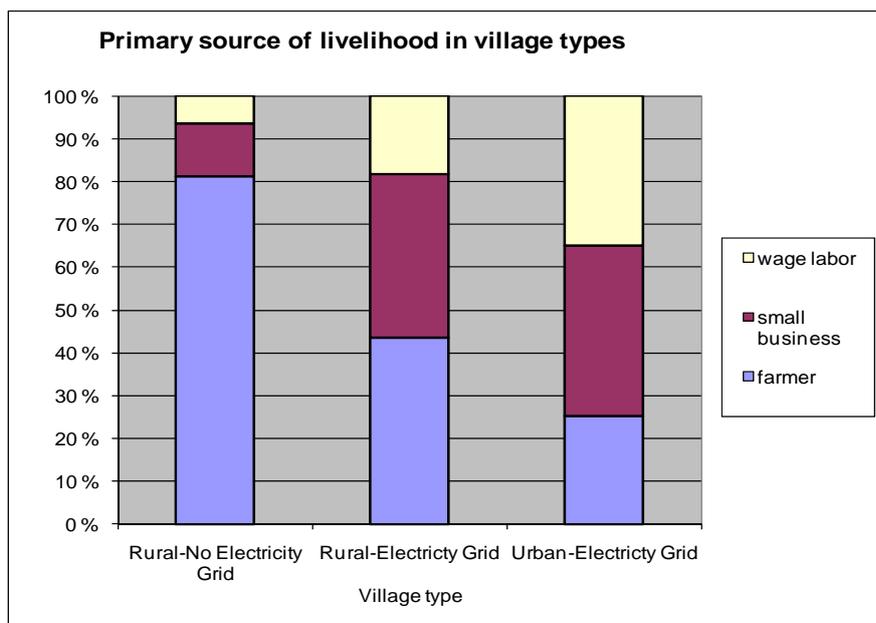
### Versatile livelihood strategies



*Photo: Mira Käkönen*

Cambodian families are composing their livelihood from many different sources that change according to the seasons of the year. They supplement the subsistence production or cash income received from the main source of livelihood with other kinds of work. For instance livelihood gained from own agricultural production is supported by selling home grown vegetables or doing casual paid work, such as construction work or agricultural work in someone else's farm. Apart from having different kinds of work, one household typically has plenty of variety inside these spheres of work. Agriculture is diverse especially in the subsistence farmer households and one family can have many small businesses, such as selling food products and driving a mototaxi.

According to the survey data, on the average 61 % of the population have agriculture as their primary source of livelihood. 23 % make a living primarily from some kind of small business and 16 % are primarily engaged in wage labour.



*Figure 6 Primary sources of livelihood in village types*

As was expected, agriculture is the most important source of livelihood in the lowest income groups. Figure 7 shows the primary sources of livelihood in different income classes. In 74% of the households that earn less than 150 USD per month agriculture is the most important source of livelihood. These households are farming land mainly for their own use. In the income classes upwards from 150 dollars the importance of farming as the main source of livelihood declines rapidly, from 52% of the households in the income class 151-200 USD to only 10% of the households in the highest income class of over 400 USD. However, it is remarkable that the highest income classes of the society also practice agriculture. These high rank households typically earn most their income from family businesses. Wage labour is not the most important source of livelihood in any income class. The most important source of livelihood for a household remains the same throughout the year, regardless of the natural seasons.

According to the survey data, during wet season more than half of all the studied households have 4 or more different livelihood sources, e.g. plant and livestock species, paid job or own businesses (Figure 8). During dry season the diversity is slightly lower. The diversity is highest in rural non-electrified vil-lages throughout the year. There seems to be a connection between the diversity of livelihood sources and income class. The higher is the diversity of livelihood sources the lower is the level of income. This indicates that most diverse livelihood strategies are applied in households that are dependent of subsis-tence farming.

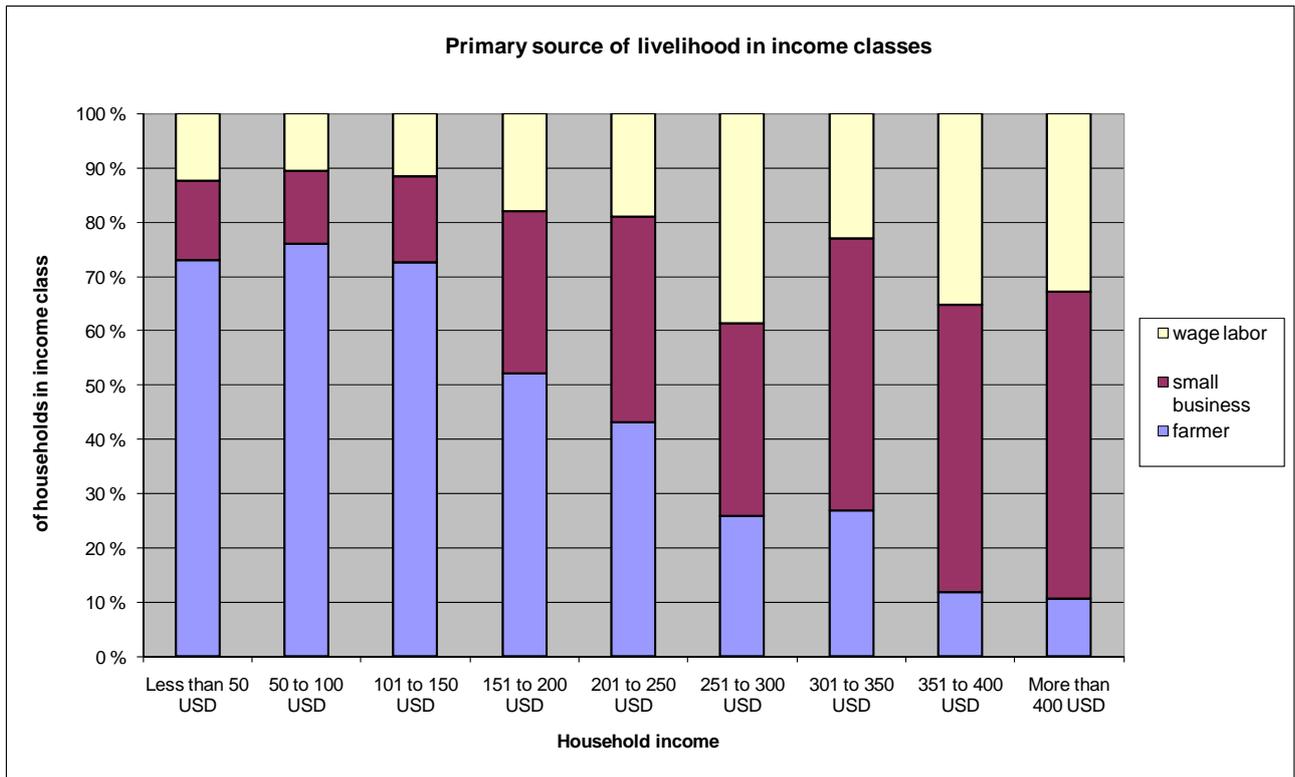


Figure 7: Primary sources of livelihood in income classes

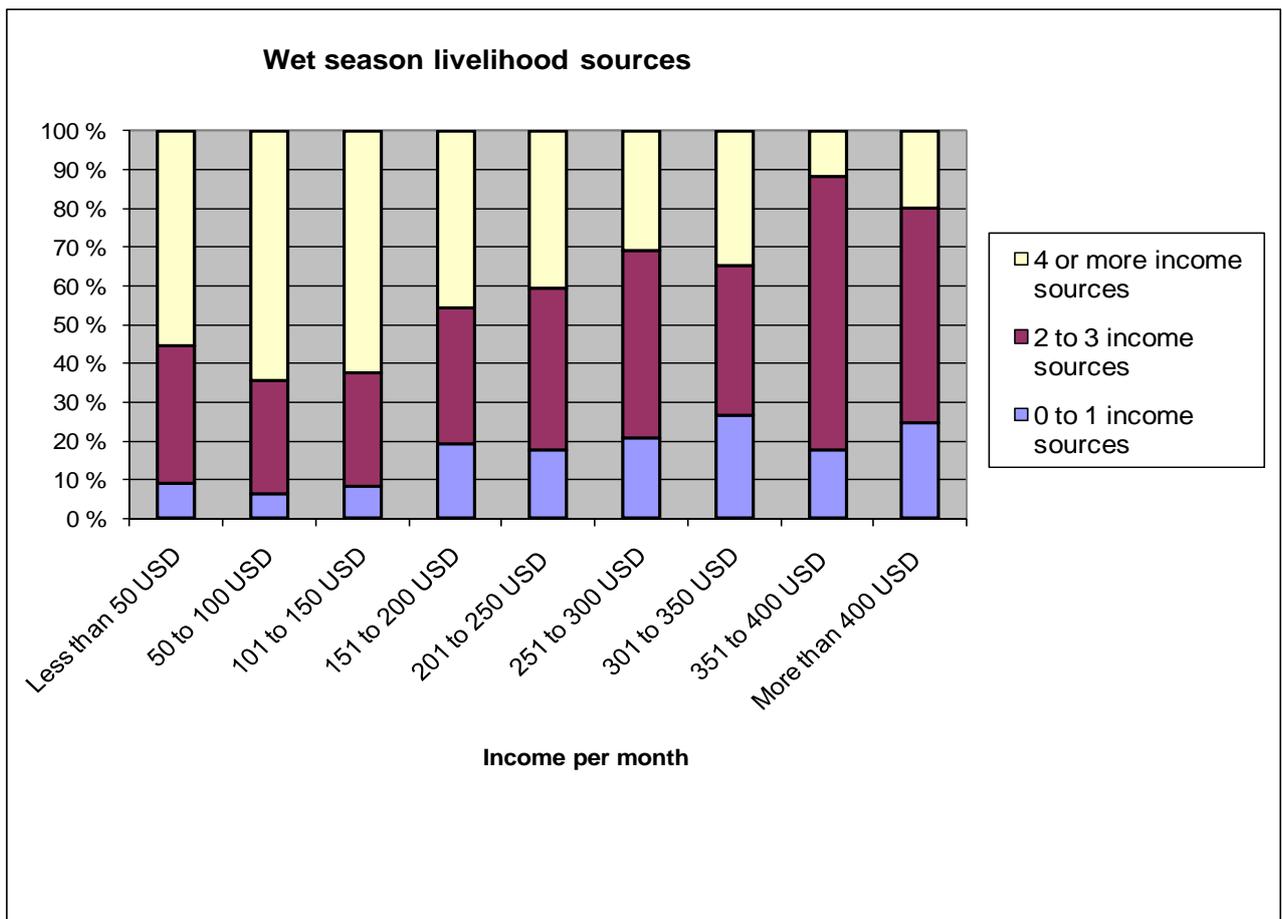


Figure 8: Number of different livelihood sources during wet season

## Agriculture

Livelihood strategies of the rural villages are based on seasonality and composing the livelihood from many different sources. About 80% of the Cambodian population is living in the rural areas and cultivating land (UNICEF, 2010). Throughout the year the economy of the rural villages is based on natural resource exploitation, which is supplemented with services and small scale industry, such as construction work.

According to the survey data, 72% of all the studied households produce or gather food themselves. In rural villages without electricity grid 90-100% of the households produce food depending on the eco-zone. Highest percentages of own food production are found in upland agricultural villages (100%) and lowland agricultural villages (95%) that are not located near a lake or river. Even in the capital city of Phnom Penh and in provincial capitals 33% of the households produce food. In the rice farming villages people typically grow rice in the rainy season and vegetables in the dry season. In the fishing villages the main sources of livelihood are fishing in the rainy season and growing vegetables in the dry season. In villages where rice farming and fishing are combined people typically grow rice in the rainy season and work as fishermen in the dry season.

Raising poultry and water buffaloes or cows are the most common animal husbandry activities in the households that practice agriculture. Water buffaloes or cows are raised in 64% of all the agricultural households and in 72% of the households in two lowest income classes (under 100 USD per month). Water buffaloes are needed as draught animals in fields as tractors cannot be afforded. A great majority of the households (85-90% depending on income class) have less than 5 water buffaloes or cows. Almost 90% of the agricultural households keep chicken and majority has 5 to 20 of them. Raising pigs is less frequent, a third of the agricultural households have them and typically less than five animals.

The diversity of agricultural activities is higher in the rural non-electrified villages than in electrified villages and urban areas. Non-electrified villages are generally poorer and further away from markets and services than electrified villages. People are highly dependent on the successfulness of their agricultural production and try to secure sufficient availability of food and income by having a versatile livelihood strategy.

During wet season the diversity of agricultural activities is highest. In rural non-electrified villages almost 54% of the agricultural households raise 4 or more different plants and livestock during wet season. During dry season 53% of them raise 2-3 different plants or livestock. The plant and livestock diversity of the urban farmers is clearly smaller and during dry season 59% of the urban farmers have only one species and less than 5% have more than 4. During wet season 46% of the urban farmers have one species and 14% more than 4 (Figure 9).

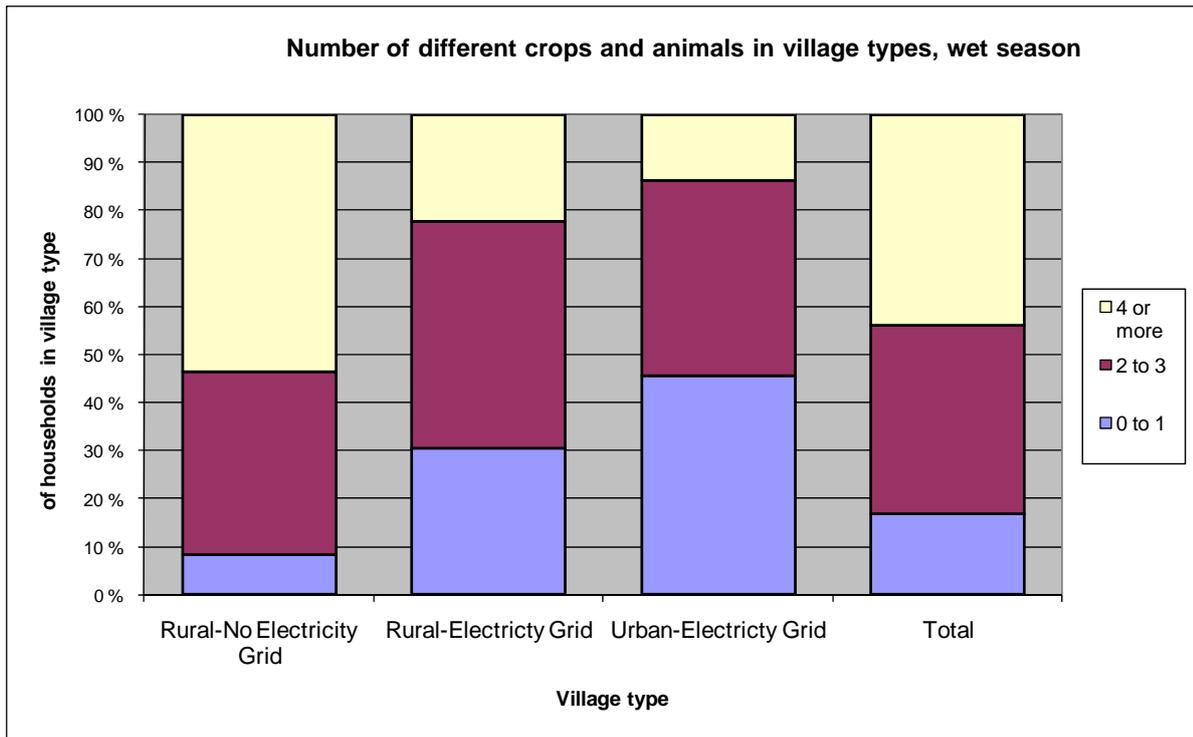
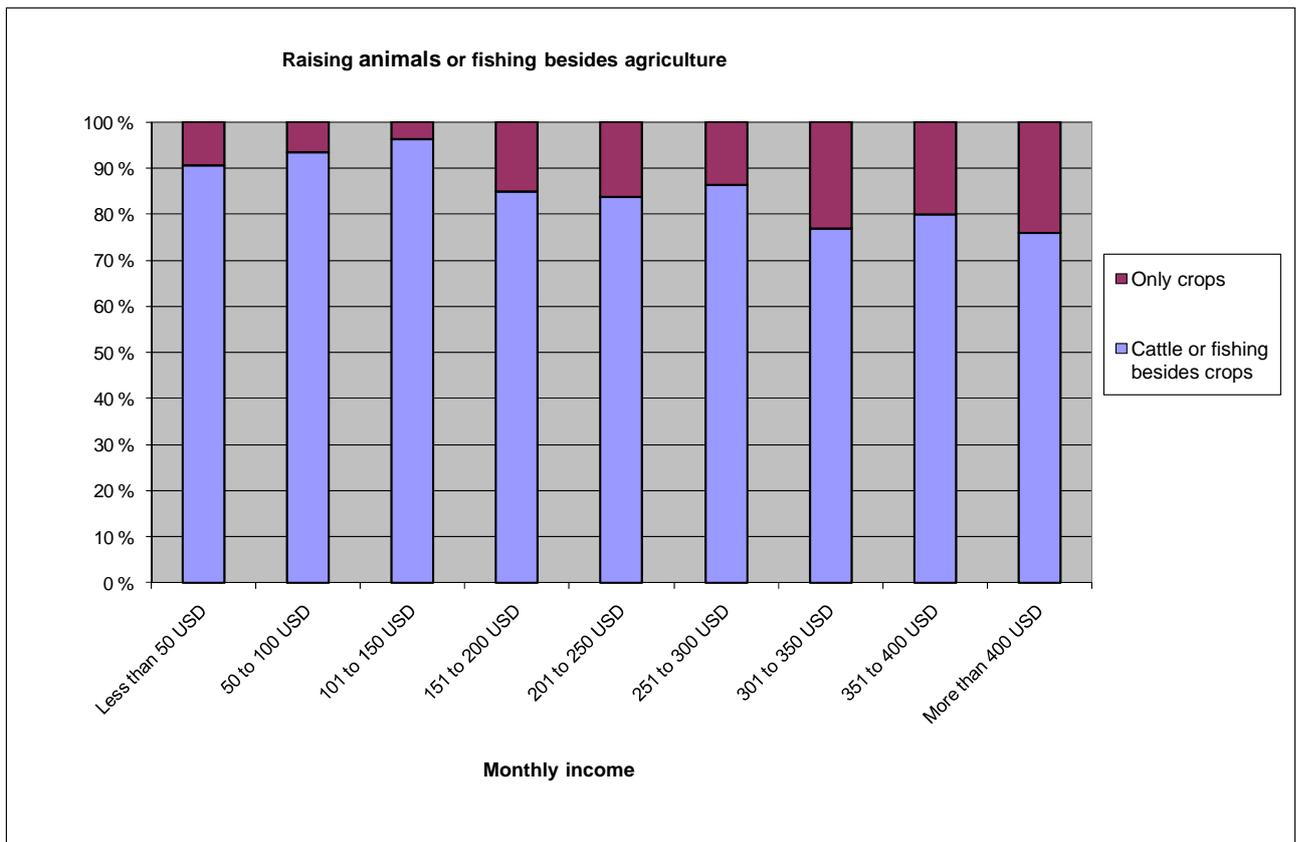


Figure 9: Number of different agricultural products during wet season

The diversity of agricultural production in Phnom Penh province is clearly lower than in rural areas, although practicing agriculture is common among households in the capital area. The farms of the Phnom Penh based farmers can be located outside Phnom Penh province, in the country side. In Phnom Penh province 11,5% of the respondents have agriculture as their primary source of income but 65% of agricultural households are cultivating only one species during wet season and 55% during dry season. In the capital area live probably more large scale land owners and farmers, who do not farm for their own consumption but cultivate one or two species for cash income.

More than 90% of all the agricultural households are raising livestock or fishing besides cultivation (Figure 10). Households that are only farming, are rare in the lowest income classes; 93,3% of the households earning 0-150 USD per month have also livestock. In the highest income class (more than 400 USD per month) 24% of the households do not raise livestock. These households are likely larger scale land owners practicing cash cropping.



*Figure 10: Raising animals in different income classes*

### Small business and wage labour

Small businesses include for example selling home made food products, selling ice for cooling food and drinks, hairdressing and beauty salon services, tailoring karaoke and bar services, sewing clothes as a subcontractor for a garment factory, running repair workshops, charging batteries or driving a moto-taxi. Paid work can be for example casual labour in a construction site or agricultural work in someone else's farm.



*Photo: Jyrki Luukkanen*

Doing small business or wage labour is most common in urban areas, where 96% of the households are engaged in this kind of work. In rural electrified villages 89% and in rural non-electrified villages 70% of households do some kind of business or paid work. These high figures for rural areas tell about the frequency of supplementing agricultural subsistence livelihoods with cash economy activities. Households that are engaged in small business or wage labour have only one type of business or paid job in half of the cases.



*Photo: Jyrki Luukkanen*

The diversity of income sources is high in urban areas, where it is more common to do 2 or 3 different businesses or jobs than in rural areas. Highest diversity of small business and paid work activities

can be found in Phnom Penh area, where having two different business or wage labour income sources is the most common strategy for those households who are engaged in these kinds of work. In Phnom Penh province 47% of the households get their livelihood mainly from running an own business and 42% from wage labour.

In the rural areas doing own business or wage labour does not increase the level of income remarkably. Wage labour and own businesses are done to secure at least some level of cash income, but it does not help to accumulate wealth. In rural non-electrified villages 74% and in rural electrified villages 51% of the households who are doing own business belong to the income classes of under 150 USD per month. Incomes from wage labour show similar kind of pattern. In the rural areas two thirds of the households doing wage labour earn less than 150 USD per month. These jobs include casual work e.g. in other people's farms or construction sites. In urban areas 55% of the small business entrepreneurs earn 200 to more than 400 USD per month, majority of them (23,3%) being in the highest income class of over 400 USD per month. 18% of the urban households doing wage labour earn more than 400 USD per month.

According to the data losing a paid job has been most common in rural non-electrified villages (29% of the respondents engaged in wage labour lost their job during 2008-2009). In urban areas 13% of the respondents in paid jobs have lost their job during 2008-2009. However, in the Cambodian context wage labour is highly unstable and flexible; especially in urban areas people do what ever kind of work is available at the moment and find a new job quickly when the old one ends. This means that it is possible that a bigger share of people has lost one job but they do not necessarily consider it as becoming unemployed because rapid changes are a norm in the Cambodian wage labour sector (Derks, 2008).

## Cash income from work outside the village

A very important addition to the village economy is the income provided by family members who have migrated to work in other provinces and cities, especially Phnom Penh. The income provided by migrated family members helps to reduce the seasonal changes in the income level of the rural families. Young adults move to work in towns and cities to support their parents and siblings in the home village. There are many reasons for migration. Sickness in the family, elderly parents, too small farming plots and poor rice yields are typical reasons, which cause young adults to move to cities. The migrants provide important income to cover costs of food, education and health care.

Before marriage young women often move to Phnom Penh to work in the garment factories. According to the FGD respondents about half of them work in the factories throughout the year, regardless of the seasons. Others return to their home village during peak seasons of agricultural work to help their families with e.g. rice planting and then return to work in the city. During 2008 many garment factories in Phnom Penh have shut their doors because of the global economic crisis. This has direct effects also at the village level, because many of the migrated adults have lost their job that has provided income to support the family in the village.

Men are more often seasonal migrants, who move between their home village and other provinces or cities according to the agricultural seasons of the year. In Phnom Penh many men work as mototaxi drivers or construction workers, and in rural areas they do paid agricultural work or fishing.

The FGD villages in Kandal province are located along a highway and close to the capital city of Phnom Penh. In these villages the respondents told that most of the adult women from their village are working in the garment factories of Phnom Penh around the year. Proximity to a big urban hub can also be seen as a generally more versatile livelihood structure in these rural villages compared to the sample villages in more remote locations.

## Uncertain future

The rural FGD respondents were asked to imagine their life in the village after one or three years, but almost all of them found it difficult to forecast the future. Only in one village in Battambang the villagers believed that their life would be better in the future, because there were plans to build new roads and connect electricity grid to their village. Rest of the FGD respondents felt that future is too unpredictable to forecast and told that it depends on things like how the prices of agricultural products will develop or what the village chiefs will decide. Some of the respondents were very pessimistic about their future. They were afraid that their economic situation would get worse. One respondent was afraid that mice would destroy their crop again. He also believed that because they did not have money to rent farming land and irrigation machine, the situation in the village would worsen.

## Summary

According to the data, life in the Cambodian rural villages has become harder due to depletion of natural resources, economic hardship and changes in the weather conditions. Degradation of forest resources causing difficulties in getting firewood and other forest products, and decreasing incomes from agricultural production emerge as the most important changes that have happened in the living environment during past year. Many households have difficulties to cover necessary household costs. Majority of the households told their overall income and expenditure level in 2009 was lower than in 2008.

Cambodian families are composing their livelihood from many different sources and supplementing the subsistence production or cash income received from the main source of livelihood with other kinds of work (agriculture, own business and paid jobs). During wet season more than half of all the studied households have 4 or more different livelihood sources. The diversity of livelihood strategies is highest in rural non-electrified villages throughout the year. Food is produced or gathered in 72% of all the studied households and 90-100% of the households in rural villages without electricity grid. More than 90% of all the agricultural households are raising livestock or fishing besides cultivating plants. The diversity of agricultural activities is highest in the rural non-electrified villages and in households that are dependent of subsistence farming. People try to secure sufficient availability of food and income by having a versatile livelihood strategy.

In Phnom Penh province 11,5% of the respondents have agriculture as their primary source of income but majority of them are cultivating only one species. In the capital area live probably more large scale land owners and farmers, who do not farm for their own consumption but cultivate one or two species for cash income.

Doing small business (e.g. selling food products) or wage labour (e.g. casual work at other people's farms or construction sites) is most common in urban areas, where 96% of the households are engaged in these kinds of work. The percentage is 89% for rural electrified villages and 70% for rural non-electrified villages. These high figures for rural areas tell about the frequency of supplementing agricultural subsistence livelihoods with cash economy activities. In the rural areas doing own business or wage labour does not increase the level of income remarkably. Wage labour and own businesses are done to secure at least some level of cash income, but it does not help to accumulate wealth.

A very important addition to the village economy is the income provided by family members who have migrated to work in other provinces and cities, especially Phnom Penh. The income provided by migrated family members helps to reduce the seasonal changes in the income level of the rural families and in the difficult times it is important in covering costs of food, education and health care.

### 3.2. Forest and land - the basic resources for rural living



*Photo: Mira Käkönen*

Cambodia's forests play an important role in rural livelihoods. Forests resources support subsistence and income-generating activities, but they also provide fuelwood for cooking. Income-generating activities related to forests include small-scale timber harvesting, fuelwood collection, resin tapping, collection of wild fruits, vegetables and medicines. These activities typically complement agriculture and fishing, thereby providing households a means for diversifying their livelihood activities. Forests can also provide food security against the risks of agricultural failures and poor fishing catches. Even people with no land, little money for capital investments and few alternative livelihood opportunities can collect forest resources for subsistence. In this manner the forest resource base can serve as an essential safety-net for the rural poor. (McKenney and Tola, 2002)

Cambodia's deforestation rate is high which has an impact on rural food security as well as fuelwood collection. Both urban and rural households still rely on wood and charcoal for cooking, and therefore

increasing deforestation has become a severe energy problem in many areas. Already for more than a decade there has been mounting pressure on households, which struggle to cope with the depletion of fuel wood and increasing costs for charcoal, kerosene and diesel. Also large concessions (see more below) have impact on the availability of fuel wood. They can also have severe impacts on availability of food in the near future.

Forest degradation was a common concern among the FGD respondents. Community forests around the villages have in many cases been cleared for agricultural land or transformed to tree or cash crop plantations. In seven of the eight rural FGD villages the respondents told that availability of firewood had decreased during the past year. In one village the situation had remained the same, but only because the firewood availability was very bad already before. Because firewood is the most important energy source in rural households, diminishing firewood supply causes serious difficulties to the daily lives of the families. As forest cover diminishes around villages, more time and energy needs to be spent for collecting firewood. In some of the FGD villages people had to go 10 km away from the village to find wood. Because good firewood is scarce, households were using secondary sources of energy for cooking purposes. For example coconut shells and cassava culms were used.

## Reasons for deforestation

There are many reasons for rapid deforestation. The forest face many pressures including small and large scale logging, the encroachment of agriculture and an increasing population. There is a contradictory relationship between food security and forest degradation, because forests are important for securing food security, but on the other hand forests are cleared to increase the size of agricultural land to produce food.

Illegal logging remains to be an important driver of deforestation. The stage for illegal logging was set during the time of political instability from the 1970s to the mid-1990s. During the civil war each warring faction financed fighting through timber sales. According to the Trade and Environment Database (TED), the Cambodian government exported tropical timber mostly to Japan and Vietnam, while the three guerrilla groups (including the Khmer Rouge) sent logs to Thailand. Thai timber companies—often with the involvement of military officials—were found to be actively engaged in logging of forests along the Cambodian border

After the ending of nearly three decades of political instability, the economic growth and the strengthening of social and economic infrastructure were a priority for the Government and the donors. Timber exploitation was seen as an answer and large scale commercial logging concessions were established in 1990s. During 1990s approximately 60% of the country's forests were leased to private concessions. (Poffenberger, 2009). Industrial forestry proved to be a failed strategy for the country, with unsustainable exploitation leading to widespread forest degradation, while generating limited income for the national government. Since 2001 the forest authorities of Cambodia have cancelled 6 million hectares of logging concessions (Poffenberger, 2009). Many commentators have identified the dangers of management vacuum before changes in forest management approach become more established. Cancelled forest concessions fall into the grey zone with no clear definition of management. (Miller, 2004)

During the 1990s, illegal logging was so widespread in Cambodia that the International Monetary Fund (IMF) canceled a \$120 million loan and the World Bank suspended direct aid to the government

until the corruption in the forestry sector was resolved. In response, the government moved to crack down on logging operations while issuing bans on unprocessed log exports and imports of logging equipment. The actions appear to have had little effect: between 2000 and 2005, Cambodia lost nearly 30 percent of its primary forest cover, and deforestation rates continued to climb. Illegal logging continues today despite further bans and restrictions (Le Billon, 2000).

## Economic Land Concessions

Besides illegal logging, in recent years also economic land concessions have been one of the major drivers of deforestation. The concessions seek long-term leases to convert forest land to plantation crops such as sugarcane, rubber, cassava and palm oil. Since the early 1990s, the Cambodian Government has conceded large tracts of land to private companies for investment in plantations and large-scale agriculture. These concessions have adversely affected the human rights and livelihoods of rural communities. By 2007 already almost a million hectares of land in rural Cambodia had been granted to private companies as economic land concessions, for the development of agro-industrial plantations. Most of these concessions had been granted in favor of foreign business interests or prominent political and business figures. (United Nations, 2007b). Foreign investors come for example from China, Thailand and Vietnam. Also countries like Kuwait and Qatar, which have funds but not much fertile land, have been interested in investing in Cambodia. Besides foreign investors, also local companies get large concessions.

The concessions boom began in 2001, when the Land Law was promulgated. According to the law, concessions should not exceed 10,000 hectares, but this restriction has not been properly enforced. Individuals have used different companies to acquire multiple concessions in order to obtain adjacent concessions for the same purposes, circumventing the 10,000 hectare size limit. Also public consultations and environmental and social impact assessments have not been done (United Nations, 2007b). Concessions have also been granted over forested areas and former forest concessions, contrary to the Forestry Law and forestry regulations.



*Photo: Jyrki Luukkanen*

As a result, the concession boom has created numerous negative environmental and social impacts. These include displacement of smallholder agriculture into national protected areas; deforestation and fragmentation of remaining blocks of forest and a significant increase in land-related conflicts between concessionaires and communities (United Nations, 2007b). In addition, government policies and donor programs that favor these types of agriculture may undercut alternatives for sustainable rural development. Given the negative impacts of plantations on existing resource-dependent rural livelihoods, large concessions may worsen rural poverty further.



*Photo: Jyrki Luukkanen*

In the focus group discussions three groups took up the issue of land sales in their village. In the village from Kandal province, near Phnom Penh, both female and male groups mentioned land sales as one of the major changes that have happened in their village during the past one year. The respondents told that people have come from outside their village to buy land and many of the villagers have sold their land to cope with economic difficulties. The male group told that the land sales have affected the food production in their village, since there was less land used in growing garden products. One participant also told that he had sold his land earlier and could not afford to rent any agricultural land. As he was not able to practice farming again, he started working as a mototaxi driver. Land sales are discussed more in Chapter 3.5.

## Summary

The forest resource base can serve as an essential safety-net for the rural poor. Forests resources support subsistence and income-generating activities, and provide households a means for diversifying their livelihood activities. Income-generating activities related to forests include small-scale timber harvesting, fuelwood collection, resin tapping, collection of wild fruits, vegetables and medicines. Even people with no land, little money for capital investments and few alternative livelihood opportunities can collect forest resources for subsistence. Cambodia's deforestation rate is high which has an impact on rural food security as well as fuelwood collection. Increasing deforestation has created a severe energy problem in many areas.

There are many reasons for rapid deforestation. The forest face many pressures including small and large scale logging, the encroachment of agriculture and an increasing population. There is a contradictory relationship between food security and forest degradation, because forests are important for securing food security, but on the other hand forests are cleared to increase the size of agricultural land to produce food.

### 3.3. Food security situation in Cambodian households



*Photo: Mira Käkönen*

Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (WFS, 1996). Food security is built on four pillars: food must be available, people must have the possibility to acquire food for their consumption, food must be safe to eat and the food production and distribution system has to be able to recover from unexpected stresses, such as natural catastrophes (WSFS, 2009).

Rice is the main staple food in Cambodia and food security is mainly, though not exclusively, understood as the availability of rice in the village and the capacity of a household to get sufficient rice for its needs. A household can ensure entitlement to rice through producing its own rice or through purchase or exchange. A household will have to purchase part or all of its requirements if it does not own farming land or the size of the land is insufficient to produce required food or household is unable to retain its produce. If the household cannot purchase food for lack of sufficient income from other sources or it has to undertake uncertain and hazardous jobs for indefinite periods at low subsistence wages, it is considered food insecure. In such cases either the household has to eat less, survive on the generosity of others, or adopt unsafe survival strategies (Sedara et al., 2002.) According to the FGD and survey data, the food security situation seems to have worsened during 2008-2009. The reasons can be found from decreasing rice yields, dramatically declining catches of fish, high food prices and decreasing levels of income.

To analyse the food security situation of the surveyed households we classified them to six different classes that describe their food security situation (Table 4). Class number 1 means a situation when the household has shortage of all kinds of food products (rice, vegetables, fruit and protein sources) throughout the year, whereas class number six includes households that never have shortage of any kind of food. Food profiles in the classes 4, 5 and 6 include a source of animal protein (fish or meat), whereas in the classes 1 to 3 people may be suffering from lack of protein.

*Table 4: Description of food security classes*

**Description of the food security classes**

**Class 1:** Shortage of all four food items (rice, fish, meat and vegetables/fruit).

**Class 2:** One of the four food items is always available.

**Class 3:** Both rice and vegetables/fruit but no fish or meat always available.

**Class 4:** Fish or meat and rice or vegetables/fruit always available

**Class 5:** Rice, vegetables/fruit and fish or meat always available

**Class 6:** All four food items are always available.

There is a clear connection between the income level of a household and its ranking in the food security classes (Figure 11). Half of the households in the lowest income classes are not able to include all food stuffs (rice, fish/meat, vegetables and fruits) in their diet at all times.

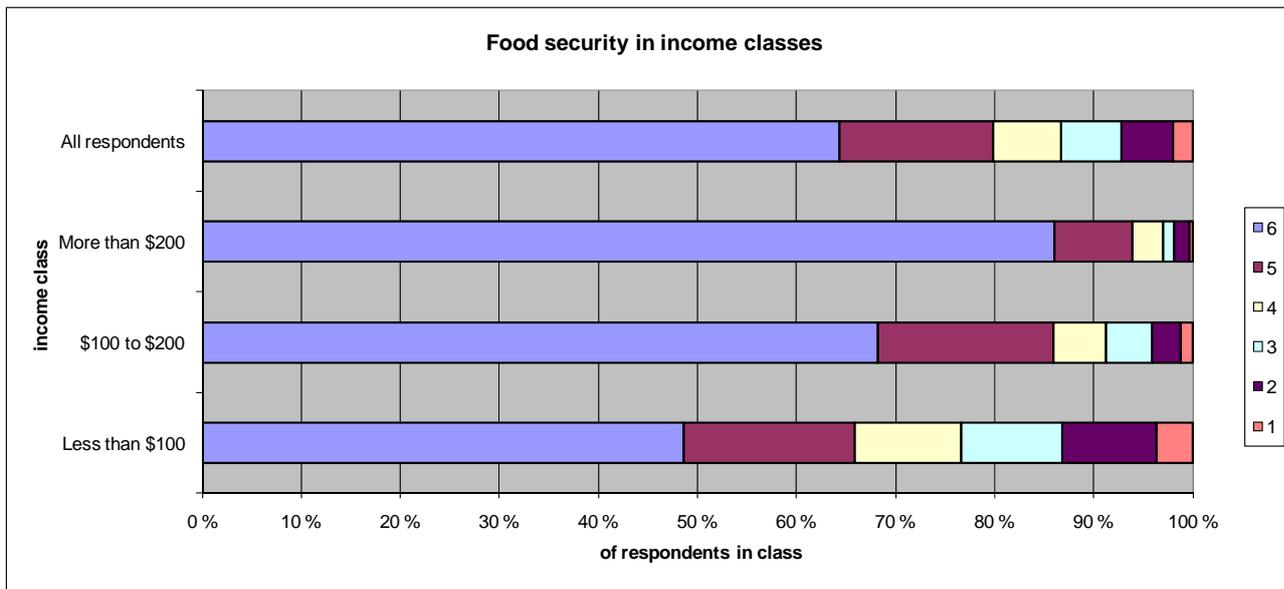


Figure 11: Food security situation of households in different income classes

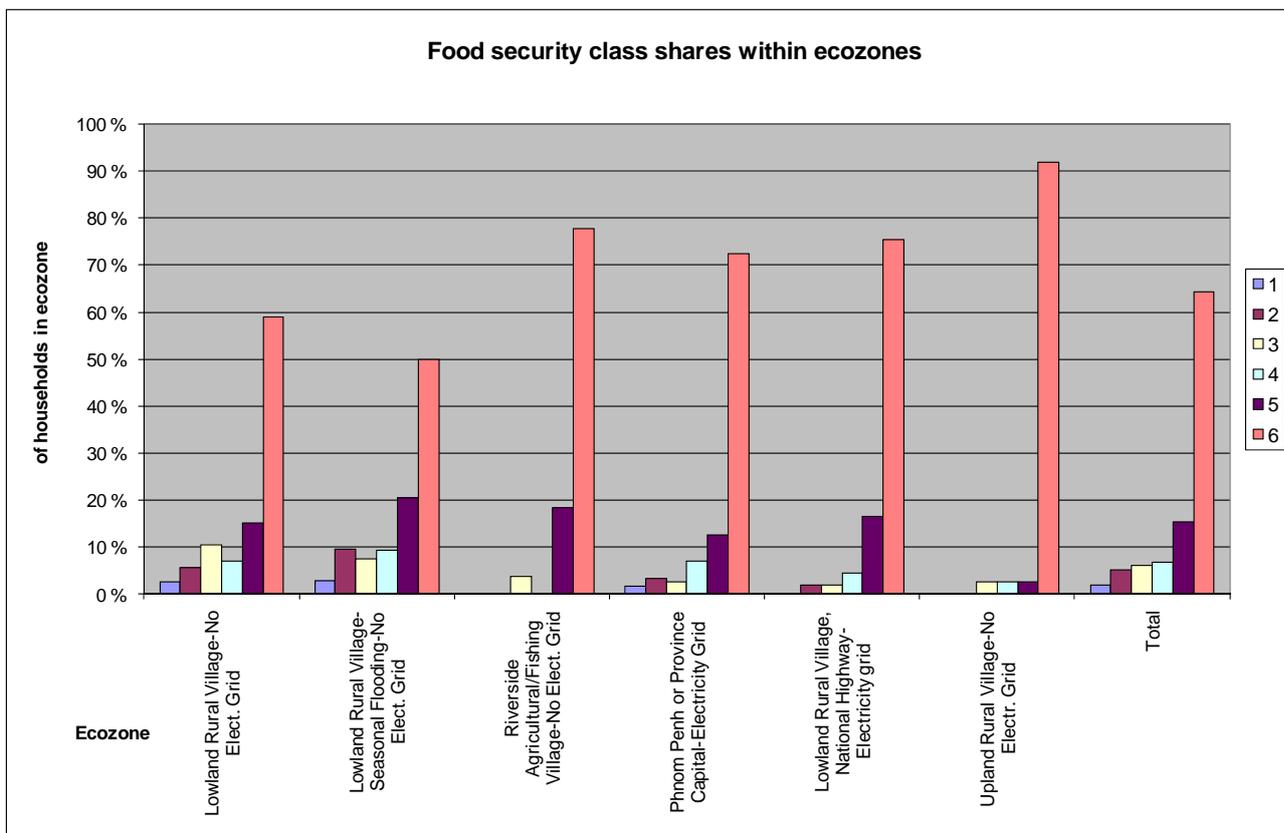


Figure 12: Food security class shares within ecozones

Figure 12 tells about the food security situation in different ecozones. In all ecozones majority of the households have a good food security situation (classes 5 and 6). The food security situation is weakest in lowland agricultural villages that are dependent on the seasonal flood pulses of Mekong River and Lake Tonle Sap.



*Photo: Jyrki Luukkanen*

According to the statistics of the UN Food and Agriculture Organisation (FAO), at the end of year 2008 the Cambodian population used on the average 71% of its total monetary expenditure on buying food products (FAO, 2008). According to the survey data there have been clear changes in the affordability of food during 2008-2009 (Figure 13). 21% of the households can afford buying less rice than year before. For 57% of the households the affordability of rice has remained the same as before and the rest are able to buy more rice. The shares for vegetables and fruit are similar to those of rice. The clearest changes have happened in the prices of fish and meat, which have become less affordable for approximately a third of the population. These foods have become more affordable for about 15% of the population and for the rest there has been no change.

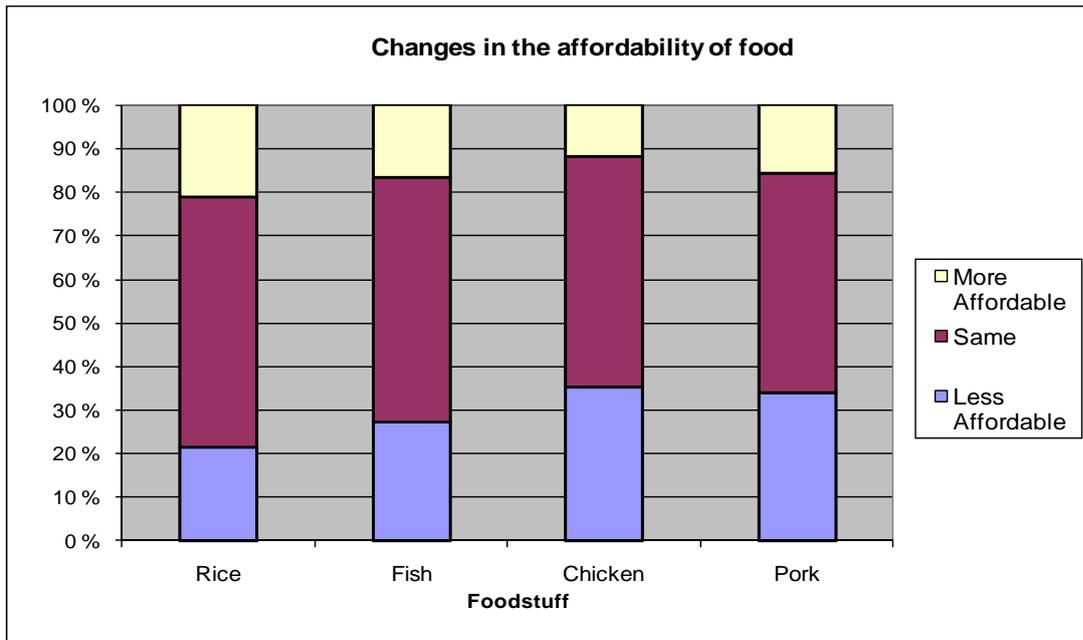


Figure 13: Changes in the affordability of food

According to the survey data, there are no big differences in the affordability of food between rural and urban areas (Figure 14). Availability of rice was quite good for the urban respondents – only 7% were not able to buy enough rice for their households during 2008-2009. The situation was a little more difficult with fish and meat. 10% were not able to buy enough fish and 17% were not able to buy enough meat.

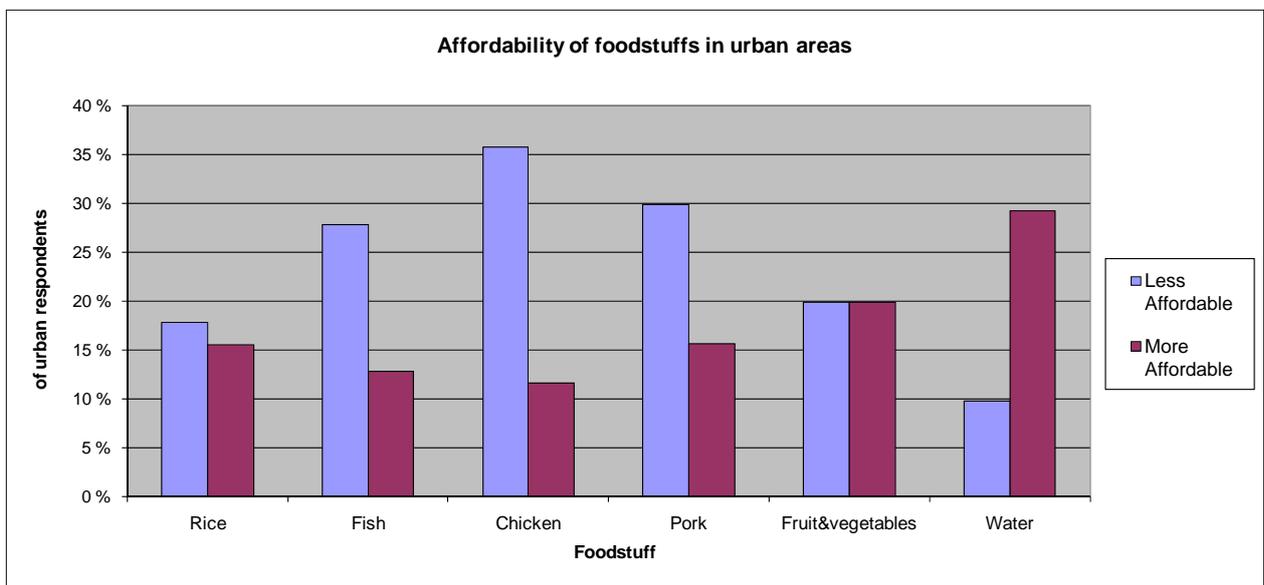


Figure 14: Affordability of food stuffs in urban areas

## Difficulties of farming caused by unpredictable weather

Unpredictable weather is one of the main concerns of the FGD respondents regarding agriculture. In six of the eight rural FGD villages the respondents tell that unpredictable weather conditions have negatively affected the yield of agricultural products. The respondents tell that rains are coming at the wrong time or it is raining too much or too little. Many respondents mention that last year the weather has been very hot, causing sicknesses to people and losses of crops and livestock. These kinds of changes in the climate patterns are likely to become more common as climate change becomes stronger, causing serious threat to the food security of small farmer households in the developing countries as well as in the global level. Also hydropower dams in the Mekong River and its tributaries are likely to cause flooding and droughts in many areas.

According to the survey data droughts and flooding are posing serious problems to rice farming. 75% of the respondents tell their rice farms have experienced both flooding and drought during 2008-2009. There is variance in the occurrence of these natural phenomena between provinces, but in all areas more than half of the farmers have experienced these difficulties. The impacts of drought have been most severe in Battambang province, where 46% of the farmers tell that drought has caused major damage to their rice production and 11% have experienced total loss of rice crop. Overall a third of the farmers have had major damage to their rice crop because of drought.

The impacts of flooding have been generally less severe and it caused only minor damage to the rice crop of 46% of the farmers. Flooding has caused most difficulties in Prey Veng, where 40% of the farmers have experienced major damage to their rice crop and 6% a total loss.

## Rice farming

Rice is the most important staple food in the Cambodian diet, and according to the FGD data rice yields have decreased and rice prices increased. Participants in all villages told that rice price increased during 2008-2009. According to Cambodia Development Research Institute, during the international food crisis of 2007-2008 the price of all variables of rice rose by 100 %. A major reason for the rising prices and a general concern for the farmers are the rising prices of fertilizers and fuels needed in cultivation (CDRI, 2008). Although majority of the small scale farmers are not using tractors (in the whole survey data 101 households of 1261 own a two-wheel tractor and 3 own a four-wheel tractor), chemical fertilizers are used. Four of the five rice farming villages where FGD was organized have experienced decrease in the rice crops during last year. The respondents explain it with unstable rain patterns and damage done by insects, rats and crabs. Some of the FGD respondents also mention soil degradation as a factor that makes agriculture more difficult and less profitable than before. Respondents say that earlier the land gave a good yield without any chemical inputs but nowadays they need to use fertilizers because the soil is poorer.



Photo: Jyrki Luukkanen

According to the survey data approximately 70% of the food-producing households are self-sufficient in rice throughout the year (Figure 15). There are less rice self-sufficient households in the lowest income class (less than 100 USD per month) than in the better-off households.

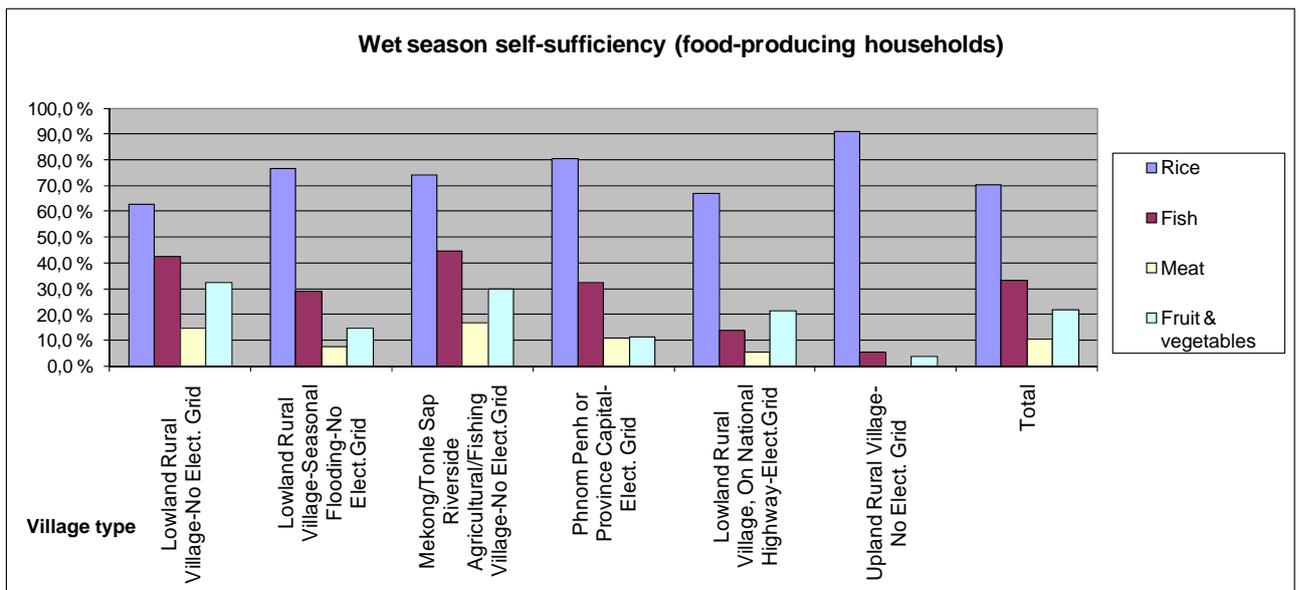


Figure 15: Self-sufficiency of foods in food producing households in different ecozones

In half of the FGD villages people are experiencing “hungry months”, i.e. months during which people are facing shortage of food, mainly rice. Rice shortage is occurring during rainy season, 1-2 months before rice harvesting. During hungry months the respondents borrow rice from their better-off neighbours. Sometimes they can borrow without interest, but one of the rural FGD respondents told that if she borrows 10 kg of rice she has to pay back 20 kg. During hungry months rice consumption is cut down by eating cheaper but less nutritious rice porridge instead of normally cooked rice.

The female and male groups had different opinions about the amount of rice available. According to the male group the amount of rice was abundant, because they had heard in TV that a lot of rice is exported to Vietnam. According to the female groups the rice crop had not been good the year before, because in the market rice was more expensive than before. These differing answers clearly reflect a different approach of thinking of the issue – national level and household level – but it also tells about the power of the international markets over the needs of the local populations.

## Fisheries



*Photo: Mira Käkönen*

Fish is an essential staple food for Cambodians along with rice. Fish is consumed in both fresh and processed forms throughout Cambodia and it counts for a significant proportion of the total animal protein consumed by Cambodians with estimates ranging from 40 per cent to 90% in fishing-dependent communities (McKenney and Tola, 2002). Availability of fish varies according to the wet and dry seasons. According to the survey data, during dry season only 10% of the households who practice fishing can catch enough fish for its own consumption, but during wet season a third of the fishing population is self sufficient with this crucial source of protein. Aquaculture is not very common in the studied communities. According to all the FGD participants in all villages, catches of fish from wild capture fisheries had decreased a lot during 2008-2009. Prices of fish had increased in all villages. Most participants in nearly all FGD villages told that they have decreased their fish consumption because of its price. People

could afford buying smaller fish than before. Nearly all participants in all villages told that also the availability of fish in the market has decreased considerably and thus they were eating less fish and other aquatic foods than before. However, fish was still eaten more than meat. Some respondents in Prey Veng told that they had tried to catch more fish and other types of aquatic food from the flooded rice fields, because they could not afford buying fish from the market.

According to the FGD respondents the reasons for the decrease in fish catches were that many fishermen were using fine catching nets to catch also small fish or used illegal electrical shocking equipment to catch fish. Respondents in one group also mentioned that the flooded jungle or mangrove forest was increasingly destroyed and the fish had no place to reproduce.

Also McKenney and Tola (2002) name destructive and illegal fishing practices as a major threat to fish populations. Fish are caught by electricity, poisoning, pumping water out of fishing grounds, using nets with excessively small mesh sizes, trawling, fishing during seasons when fishing is prohibited and collecting wild fish seed. But the challenges are also related to the fisheries management more generally. It is a well known fact that non-transparent and unjust practices, weak implementation of policies and lack of accountability are very common in the fisheries sector (Tarr 2003, Ratner 2006, Keskinen et al. 2007). Especially the fishing lot system has created significant amount of corruption and exclusive practices harming the local communities. One factor affecting fish populations is illegal extension of fishing lot boundaries and sale of open access fishing areas done by lot owners, local authorities and the military. They take advantage of poorly marked fishing lots and open access boundaries to illegally extend fishing lots beyond their true boundaries.

In general, land and water use in fishing lot areas is prone to conflicts because these resources have a fundamental role in supporting both agriculture and fishing. Irrigation and water control projects improve agricultural yields but decrease fisheries productivity by reducing available fisheries habitats, especially in the dry season. Pesticides and chemical fertilizers reduce water quality and fisheries productivity. Also clearing of flooded forests for agricultural purposes or for firewood reduces the productivity of fisheries because important reproduction areas are lost. Intensive logging may cause increased sedimentation in inland waters and infrastructure projects. (McKenney and Tola, 2002).

Besides destructive and illegal fishing practices, also the construction of hydropower dams in the Mekong mainstream river and its tributaries has major impact on fishing. Plans of large-scale hydropower dams are mushrooming in the Mekong Basin, even though there are no appropriate and commonly agreed tools to make good estimates of their potential impacts. Dams alter flows and water quality, and they have impacts on flooding, erosion, sedimentation, navigation, fisheries and agriculture (e.g. Sarkkula et al., 2009). This is of particular interest in the Tonle Sap ecosystem area. Tonle Sap fisheries provide central livelihood source for over one million people living in the lake and its floodplain area. But directly or indirectly half of the Cambodia's population benefit from lake's resources. (Bonheur, 2001)

There is growing evidence that the cycle of natural flooding and drought in Tonle Sap ecosystem is the main force determining ecosystem productivity.<sup>2</sup> The normal flow of the Mekong River shows enormous natural variations throughout the year. The exceptional flood and drought occurrences are one of the important characteristics of so-called flood-pulsed ecosystem. (Lamberts, 2008) The rapid construction of large dams especially in the Mekong mainstream can alter this flood pulse, and therefore have huge impact on fishing and agriculture. The significance of the flood pulse processes for the Tonle Sap ecosystem means that the impact of flow alterations in the Mekong River caused by the dams cannot be adequately assessed without especially analyzing their consequences for the flood pulse. (Lamberts, 2008)

The Tonle Sap ecosystem is clearly of crucial importance for Cambodia and for the entire Mekong Basin. (Sarkkula et al., 2009) Hydropower development may change the natural flood pulse, directly undermining the productivity of the system by reducing the inundated habitats, delaying the onset of flooding and shortening its duration. All of these changes are estimated to have negative impact upon the fisheries productivity of the Tonle Sap ecosystem. (Sarkkula et al., 2009) This is even more important as those most directly dependent upon fisheries and related aquatic resources are the poorest villagers.

## Livestock



*Photo: Mira Käkönen*

Approximately 10% of the food producing population is self-sufficient with meat throughout the year. Respondents in all the FGD villages told that the amount of pigs and chicken that are raised in their

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<sup>2</sup> Tonle Sap ecosystem is a major component of the Mekong basin, consisting of the Tonle Sap Lake, the Tonle Sap River and their surrounding floodplains. The Tonle Sap Lake is linked to Tonle Sap River through the 100 km long Tonle Sap River tributary.

village had decreased. Sickesses seem to be the main cause, followed by the high prices of livestock feed. The respondents believed that the sicknesses were caused by unusually hot weather. According to the survey data, 60% of the households that raise chicken have had sicknesses on their birds. The sicknesses have done major damage to a third of them and 6% have lost all their chicken.



*Photo: Jyrki Luukkanen*

In those villages where pork and chicken are normally eaten, the FGD respondents told that prices of meat had risen. Most participants in all villages told that they had decreased eating pork and chicken because of the high prices. In some villages many villagers had substituted pork or chicken meat with cheaper and more easily available rat meat.

## Vegetable farming

According to the survey data during dry season 10% and during wet season 20% of the food producing households can produce enough vegetables and fruits for their own consumption. In half of the rural FGD villages garden products had given good harvest because there were many growers and weathers had been favorable. In the other half the yield of vegetables had been poor because of too hot weather, insect pests and reduction of vegetable farming due to land sales. In two of the FGD villages fruit trees had dropped their flowers before maturation of the fruit. The villagers explained it with too hot weather.



*Photo: Jyrki Luukkanen*

According to the FGD data farming vegetables for sale is not very profitable. In most of the FGD villages prices of vegetables in the market had decreased, because there was oversupply. Some farmers told that plenty of cheap vegetables were imported to the market from Vietnam. However, even if the prices are low, many households cannot afford buying vegetables from the market. Those households are either decreasing their consumption of vegetables or trying to grow more vegetables themselves. Also in those villages that had good harvest of garden products the respondents told that they had decreased buying vegetables from the market.

### Availability of clean water

According to the focus group discussions, availability of water is generally good. None of the respondents mentioned lack of water as a major problem in their life. However, the quality of the water is not always good. During dry season almost a third of the population fetches water from natural waters, such as lakes and rivers (Figure 16).

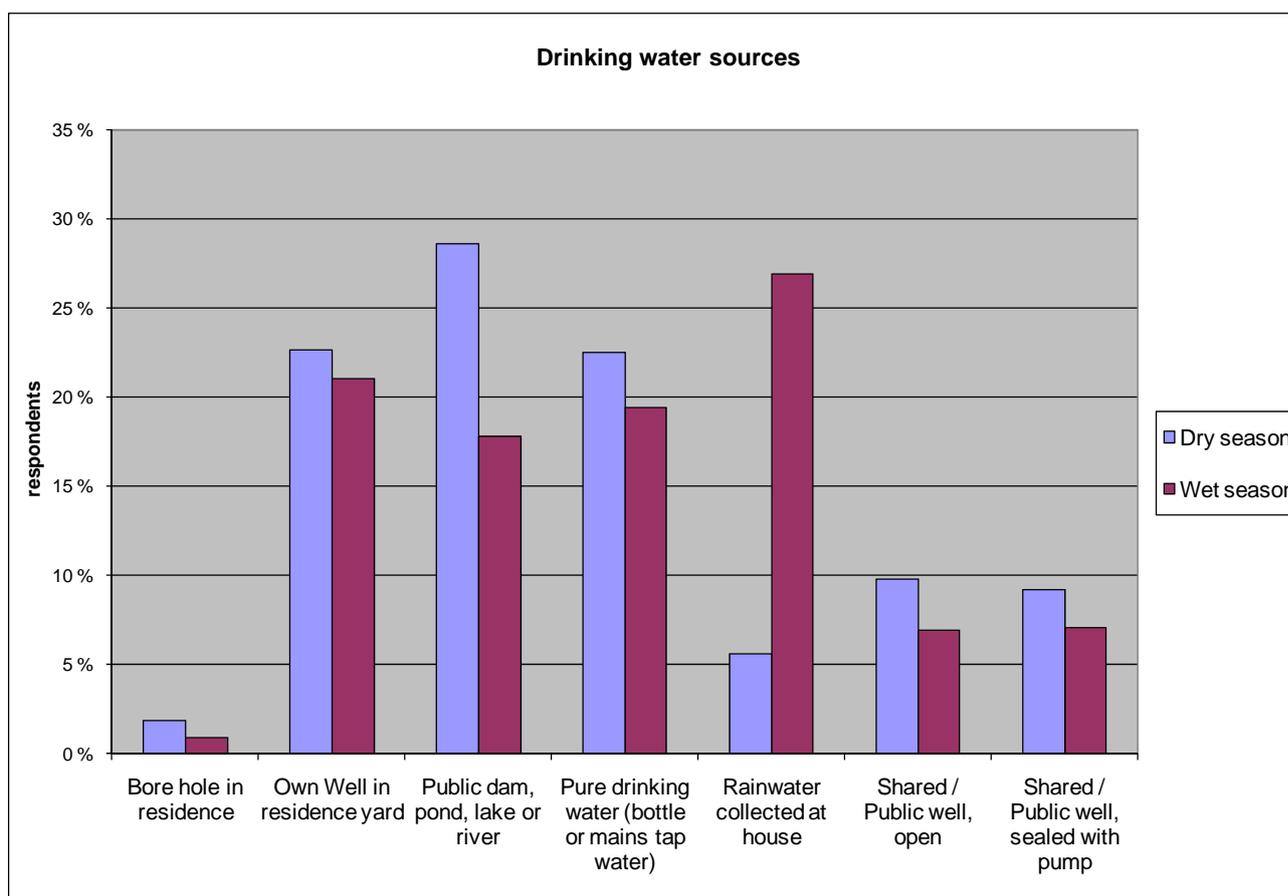


Figure 16: Sources of drinking water

Price of drinking water has not risen like the prices of food, and the affordability of drinking water has remained the same or become better for 92% of the households.

### Health concerns about chemicals in food

A quite surprising finding from the group discussions is people's general concern about health effects of chemical substances in food. The respondents took up the issue in five of the FGD groups. Some people told they had changed their eating habits because of the chemicals. Some respondents reported getting stomach aches if they were eating vegetables bought from the market without carefully cleaning it. In the rural groups respondents told they had decreased buying meat and vegetables from the market to avoid chemicals. They were growing vegetables and raising livestock themselves, because they knew their own products do not have chemicals, and eating more fish instead of meat because they thought fish does not have as much chemicals as meat. Also both of the urban discussion groups immediately took up the issue of chemicals when talking about food. The urban respondents told that the food they buy in the city contains much more chemicals than food that they eat in the village.

This kind of general concern about chemical contamination of food is an important topic and requires thorough studying, but it is out of the scope of this research project.

## Summary

Unpredictable weather is one of the main concerns of the FGD respondents regarding agriculture. Many respondents mention that last year the weather has been very hot, causing sicknesses to people and losses of crops and livestock. According to the survey data droughts and flooding are posing serious problems to rice farming. 75% of the respondents tell their rice farms have experienced both flooding and drought during 2008-2009. These kinds of changes in the climate patterns are likely to become more common as climate change becomes stronger, causing serious threat to the food security of small farmer households in the developing countries as well as in the global level.

According to the FGD and survey data, the food security situation seems to have worsened during 2008-2009. The reasons can be found from decreasing yields of rice, dramatically declining catches of fish, high food prices and decreasing levels of income. In half of the FGD villages people are experiencing “hungry months”, i.e. months during which people are facing shortage of food, mainly rice. Rice shortage is occurring during rainy season, 1-2 months before rice harvesting. During hungry months the respondents borrow rice from their better-off neighbours.

There is a clear connection between the income level and food security situation of a household. In the lowest income classes (under 100 USD per month) half of the households are not able to have all food stuffs (rice, meat, fish and vegetables/fruit) in their daily diet throughout the year. Prices of food have risen and 21% of the households can afford buying less rice than year before. The clearest changes have happened in the prices of fish and meat, which have become less affordable for approximately a third of the population. A major reason for the rising prices and a general concern for the farmers are the rising prices of fertilizers and fuels needed in cultivation. Some of the FGD respondents also mention soil degradation as a factor that makes agriculture more difficult and less profitable than before.

According to the survey data approximately 70% of the food-producing households are self-sufficient in rice throughout the year. There are less rice self-sufficient households in the lowest income class (less than 100 USD per month) than in the better-off households. Rice yields have decreased and rice prices increased. Four of the five rice farming villages where FGD was organized have experienced decrease in the rice crops during last year. The respondents explain it with unstable rain patterns and damage done by insects, rats and crabs.

Approximately 10% of the food producing population is self-sufficient with meat throughout the year. Respondents told that the amount of pigs and chicken that are raised in their village had decreased. According to the FGD respondents, livestock sicknesses caused by unusually hot weathers are the main cause, followed by the high prices of livestock feed. Prices of meat have risen. Participants told that they had decreased eating pork and chicken because of the high prices and some have substituted pork or chicken meat with cheaper and more easily available rat meat.

According to the survey data during dry season 10% and during wet season 20% of the food producing households can produce enough vegetables and fruits for their own consumption. According to the FGD data farming vegetables for sale is not very profitable. In most of the FGD villages prices of vegetables in the market had decreased, because there was oversupply.

Fish is an essential staple food for Cambodians along with rice and it counts for a significant proportion of the total animal protein consumed by Cambodians. According to the data catches of fish from natural waters have decreased significantly and prices have increased. According to the FGD respon-

dents the reasons for the decrease in fish catches were that many fishermen were using too fine catching nets and illegal electrical shocking equipment and the flooded jungle, or mangrove forest, was increasingly destroyed and the fish had no place to reproduce.

Land and water use in fishing lot areas is prone to conflicts because these resources have a fundamental role in supporting both agriculture and fishing. Besides illegal fishing practices and destruction of reproduction areas, productivity of fisheries is threatened by illegal extension of fishing lot boundaries and sale of open access fishing areas, irrigation and water control projects, decreasing water quality because of use of pesticides and chemical fertilizers, intensive logging which may cause increased sedimentation and infrastructure projects such as building dams and roads.

A surprising finding from the group discussions is people's general concern about health effects of chemical substances in food. Some people told they had changed their eating habits because of the chemicals. This kind of general concern about chemical contamination of food is an important topic and requires thorough studying, but it is out of the scope of this research project.

### 3.4. Energy consumption

Energy issues have been included in this study because energy production and consumption are closely linked to livelihood activities and food security in an agrarian society. Firewood is the most important fuel used in the daily domestic tasks and the collection of wood constitutes a major workload in a household. There is a strong link between the availability of cooking fuel and food security. If firewood or other cooking fuel is scarce, households start preferring foods that can be cooked quickly. Many nutritionally important and cheap food stuffs, such as beans, are cooked more seldom and this can lead to weaker nutrition.

A general feature of the energy use patterns in rural villages is that a wide diversity of energy sources is used. Firewood, car batteries, kerosene, gasoline and diesel are used for different purposes in the domestic and agricultural tasks. In those villages that have been connected to electricity grid, other energy sources have not been displaced by electricity.



*Photo: Jyrki Luukkanen*

According to the survey data, household energy costs are clearly higher in urban areas and rural electrified areas than in rural non-electrified areas. Figure 17 below shows how the households in different ecozones are distributed into classes according to their energy expenditure.

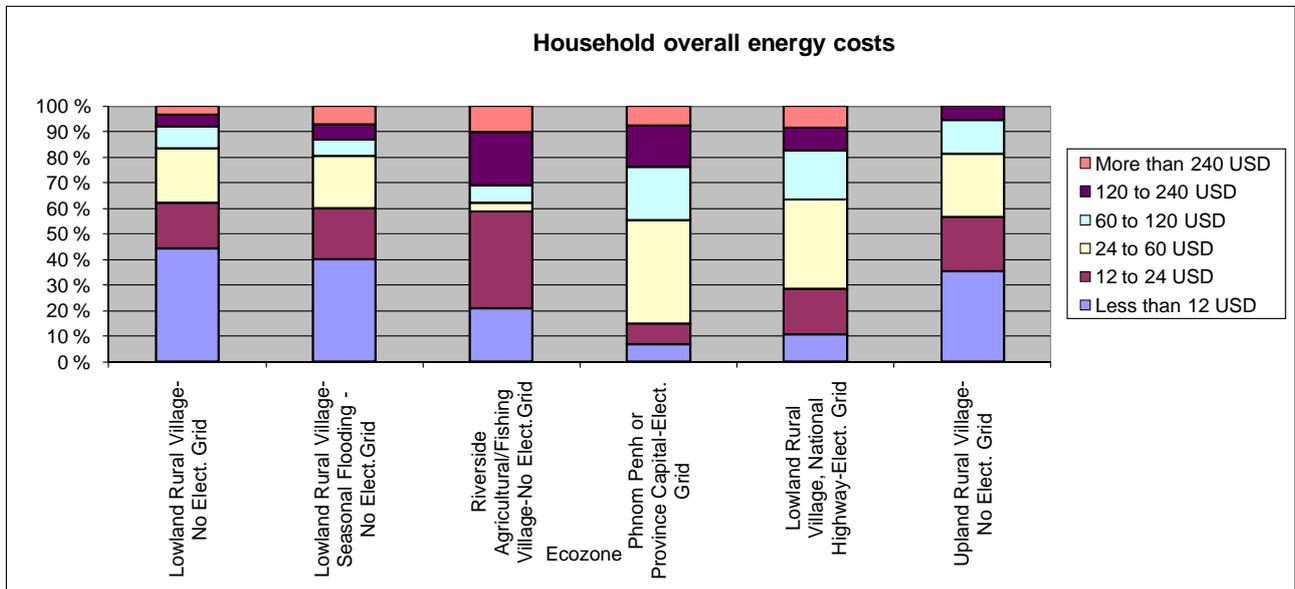


Figure 17: Household energy costs

### Rural villages without electricity

In all the rural FGD villages without electricity the energy sources are similar and a common feature is a wide variety of different energy sources used in the domestic tasks and livelihood activities. Firewood, car batteries and flashlight batteries, kerosene and candles are all commonly used energy sources in household tasks. Gasoline and diesel are used e.g. for charging car batteries and in agricultural machinery, such as water pumps (photo below). According to the survey data, in non-electrified villages kerosene and batteries are the most common energy used for lighting. Approximately 62% of the rural non-electrified households use kerosene and 25% batteries for lighting.



*Photo: Jyrki Luukkanen*

Firewood is clearly the most common energy source used for cooking. A few FGD participants told that their household sometimes uses charcoal for cooking, but only occasionally because of its high price. Charcoal is used in situations where firewood is not available or there is no time to collect it, for example during the busiest fishing season. All the other respondents in the rural FGD villages without electricity told that their household uses only firewood for cooking. LPG was not used in any of the studied households in the non-electrified FGD villages.



*Photo: Jyrki Luukkanen*

Firewood is usually acquired by gathering from community forests around the village, gathering from the trees around the house and in the urban areas by buying. Those FGD households where firewood is bought told that the prices have increased. In some cases the community forest had been turned into a nature reserve and the villagers did not have permission to use it. The respondents from a village in Prey Veng told they do not have any community forest left around the village, so they gather firewood from coconut trees, palm trees and mango trees around the house. In Kampong Cham some households have started using cassava culms for burning because firewood is no longer available. The respondents told that it is very difficult to acquire sufficient amount of wood fuel from this kind of secondary sources.

## Electrified rural villages

Two of the eight rural villages where FGDs were organized have access to electricity. Both villages are located in the Kandal province. One of the villages has had connection to electricity grid for 7 years and the other one for 10 years. In these villages electricity is basically available 24 hours a day, but the FGD respondents told there are frequent power blackouts. There is a big variation in the electricity consumption of the households, from 3 kWh to 120 kWh per month. Most of the respondents told their household is consuming 20 to 50 kWh per month.

The FGD respondents told that they are using electricity mainly for domestic purposes, i.e. for lighting, cooking rice, ironing, electric fans, watching TV, pumping water for domestic use and charging mobile phone. Only a few respondents from the two electrified villages used electricity for business purposes, such as pumping water for irrigation or cleaning pigs in a pig farm, tailoring, using electricity shocks to catch fish, or lighting in a mango planting farm.

Although the households now have electricity, it has not substituted for other sources of energy. Firewood is still the main energy source used in cooking, supplemented in some households with charcoal and Liquefied Petroleum Gas (LPG). According to the survey data 90% of the households in electrified rural villages use firewood for cooking. All FGD respondents told their household uses an improved Lao cooking stove, which is used for boiling water and food and grilling meat and fish. Some households have an electric rice cooker, which it is used only for cooking rice. According to the survey data kerosene and diesel generator electricity are still commonly used for lighting together with grid electricity.

The general opinion of the FGD respondents was that their life had become easier and more comfortable because of electricity. Especially the entertainment opportunities had increased because people were able to use color TV. Electricity has made some domestic tasks easier, for example water pumping and cooking for those who have electric rice cooker. Electric light at home gives new possibilities to e.g. studying in the evenings and some respondents told that electric lighting has made their village more charming, especially during community ceremonies when most of the houses are lighted. The negative points that the respondents mentioned about electrification were accidents, such as burning, explosion or short circuits, caused by broken electronic appliances or badly installed power systems.

Energy consumption and especially electricity is one of the areas where households cut costs during economical difficulties. All respondents in the two FGD villages told their energy costs are now higher than before having electricity. However, all the respondents thought that electricity has brought them a better life, and would not want to renounce it, even if it costs more.

## Urban areas

All the urban FGD respondents are living in rented apartments or houses, which are connected to electricity grid. However, they are using electricity only for lighting, fan and charging telephone. The FGD respondents told they are using electricity for lighting as it is not allowed to use kerosene lamps in the rented apartments because of risk of fire. However, according to the survey data grid electricity, kerosene and charcoal are most common sources of lighting in urban areas.

Some of the urban female FGD participants had tried using electricity for cooking, but gave it up soon because of the high price of electricity. All the urban FGD respondents told their household is using LPG for cooking and charcoal for grilling some specific dishes. No one in the urban discussion groups used firewood but according to the survey data also in the Phnom Penh area 56% of households use firewood for cooking. The participants told that cooking is much faster with LPG than with firewood or charcoal, and that fits well with their new urban lifestyle. All urban participants told that in the city their energy costs are much higher than in the village because of the use of electricity.

## Summary

Energy production and consumption are closely linked to livelihood activities and food security in an agrarian society. Firewood is the most important fuel used in cooking and if firewood or other cooking fuel is scarce, households start preferring foods that can be cooked quickly. Beans and other nutritionally important but slowly cooking food stuffs are cooked more seldom.

A general feature of the energy use patterns in rural non-electrified villages is that a wide diversity of energy sources is used. Firewood, car batteries, kerosene, gasoline and diesel are used for different purposes in the domestic and agricultural tasks. Firewood is clearly the most common energy source used for cooking. Firewood is usually acquired by gathering from community forests around the village, gathering from the trees around the house and in urban areas by buying. Availability of firewood has decreased significantly in all the rural FGD villages and the respondents have difficulties in obtaining sufficient amount of wood fuel for cooking. In the absence of firewood households start using coconut shells, cassava culms and other biomasses for cooking, but the respondents told it is very difficult to acquire sufficient amount of wood fuel from this kind of secondary sources.

In those villages that have been connected to electricity grid, other energy sources have not been displaced by electricity. Households are using electricity mainly for domestic purposes, i.e. for lighting, cooking rice, ironing, electric fans, watching TV, pumping water for domestic use and charging mobile phone. Only a few respondents from the two electrified villages used electricity for business purposes. Firewood is still the main energy source used in cooking, used in 90% of the households.

The respondents who had access to grid electricity were happy about it, because electricity has made some domestic tasks easier (e.g. water pumping) and given them new entertainment opportunities (TV). However, all respondents in the electrified FGD villages told their energy costs are now higher than before having electricity. Energy consumption and especially electricity is one of the areas where households cut costs during economical difficulties. According to the survey data, household energy costs are clearly higher in urban areas and rural electrified areas than in rural non-electrified areas.

### 3.5. Coping strategies

When the FGD respondents were asked about difficulties in their lives and their coping strategies, nearly all participants told that during the previous year they could not earn enough money to provide for sufficient amount of high quality food, health care for the family or the costs of educating their children. The most typical sudden needs for money result from sickness or accident in the family. Money is also needed for agricultural inputs, such as rice seed, fertilizer, pesticides and worker's wages.

Nearly all participants in all the FGD villages told that trying to work harder or find work to do during free time are the best ways to cope with economic difficulties. If work opportunities are not available, people are borrowing money, cutting costs from food, electricity and water and selling family assets. All participants in all the rural FGD villages had had to borrow money from private money lenders or micro-finance institutions. Selling assets seems to be the last option for many of the respondents. One female participant told she had to sell her house to be able to cover health care costs for her sick husband.

#### Borrowing money to cover basic costs

One fourth of all the surveyed households have had to borrow money during 2008-2009 to buy food or health care. Indebtedness because of these basic needs has been highest in Pursat province, where almost half of the studied households have borrowed money for both purposes.

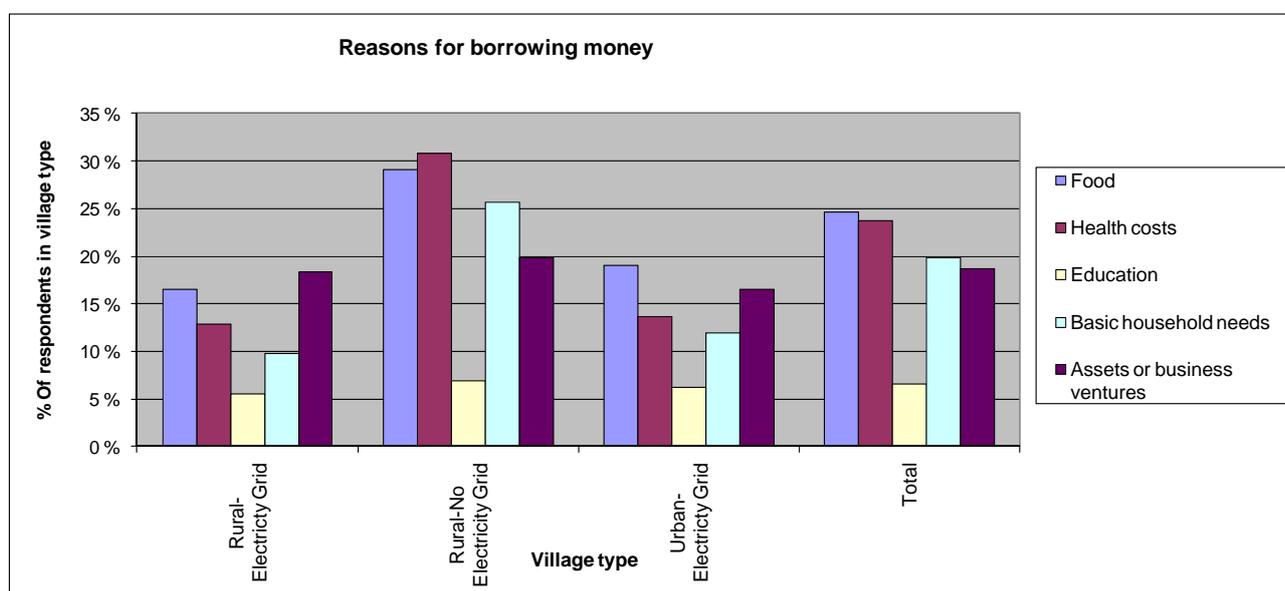


Figure 18: Reasons for borrowing money

25% of the households tell they have had to borrow money for basic household needs more often in 2009 than in 2008. Taking loans has increased especially in rural non-electrified villages, where 30% of the households have borrowed more. In the Pursat province the need for taking loans has increased more than elsewhere. A little less than half of all the households tell they never have to borrow money, or

at least very rarely, but in rural non-electrified villages the proportion of these households with a sustainable economy is smaller, 35%. However, 20% of the households in these villages and 11% of households in rural electrified villages and urban areas have been able to strengthen their economy and need to borrow money less than before. 35% of all the households have had to take loans of more than 500 000 riels (120 USD) to cover health care costs. In these cases it can be expected that a household member has had a serious accident or illness and is not able to work, which leads to even poorer ability of the household to repay the loan and cover other costs.

Taking loan to pay for education of children has been much less common than borrowing for other purposes. Only 6% of the households have borrowed money for education. The primary school enrolment fees were abolished in Cambodia in 2001, but there are still school fees for secondary school (WFP, 2010b). Enrolment rates for secondary school are thus considerably lower than for primary school (UNICEF, 2010).

There is a connection between food security situation and borrowing money to buy food (Figure 19). 68% of the households in the weakest food security situation have to borrow money for food, while in the best food security situation 19% of the households have borrowed money for food.

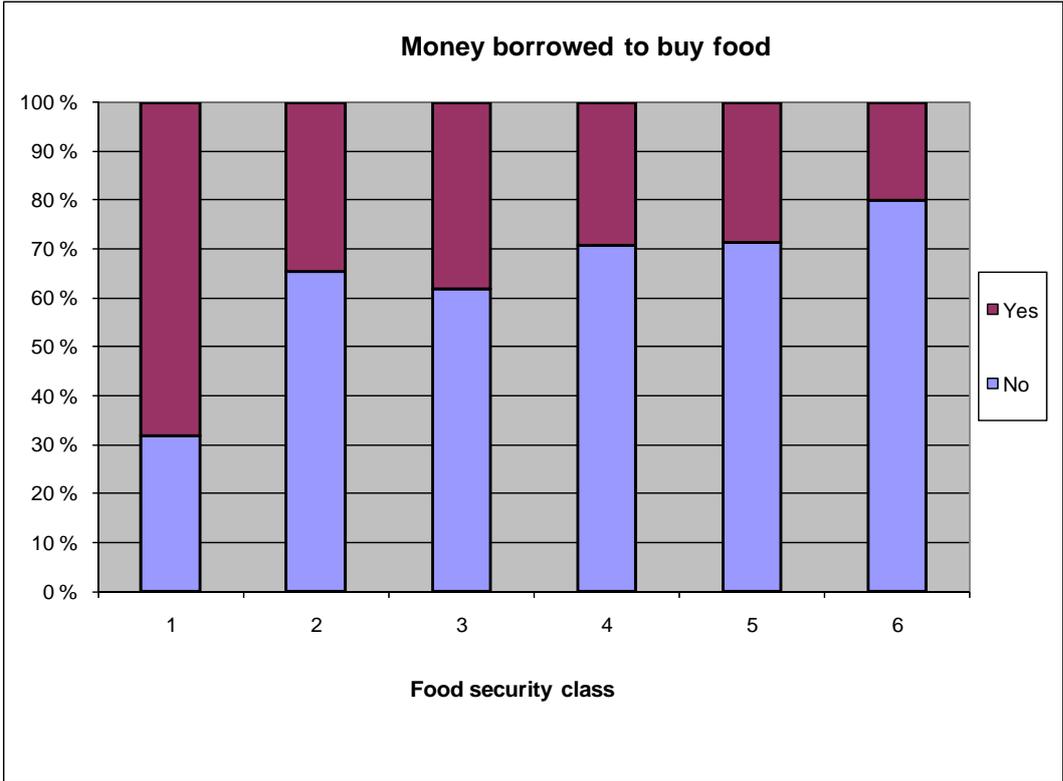


Figure 19: Borrowing money to buy food

For short term loans, such as borrowing money for food and health care people most often borrow from their friends and relatives. Banks and credit agencies are used when people have to borrow bigger amounts of money, such as investing in a business. Also private money lenders are used in all borrowing needs and they often demand high interests. Almost half of the households have loans of more than 100 000 riels (24 USD) and these big loans are most common in rural non-electrified villages (59%).

Borrowing money is a common but a risky way to cope with economic difficulties. The financial sector is still weak in Cambodia and banking services are not available for the majority of Cambodians especially in rural areas. This gap has been filled with microfinance organisations, lending small sums of money for poor people. Microfinance has given millions of poor people in developing countries a possibility to start an own business and lift the family out of poverty. However, microcredits can be very expensive sources of money especially for illiterate customers who have no previous experiences in banking services. Annual rates of interest can vary between 20 -30 % and the repayments of even a small loan may end up too high for a household living in subsistence economy.

## Selling assets

Selling land assets is one of the coping strategies used in responding to increasing food prices and decreasing incomes. People may be forced to sell their land when they need money to cover health care expenses or food shortages. For a small scale subsistence farmer selling land – the most fundamental asset of agriculture – is a highly unsustainable way for acquiring money. The FDG participants who own land wanted to avoid selling it as long as possible.

In rural non-electrified villages 10% of the households have had to sell their land assets to cover basic household needs. In rural electrified villages 6% of the households have had to sell their land and in urban areas 4%. From all the households who have had to sell their land, 76% are living in rural non-electrified villages. Selling land for covering basic costs has been most common in provinces of Kandal (15%), Kampong Speu (11%) and Battambang (12%). As could be expected, selling land as a way to cover necessary costs or pay back loans has been most common (16%) in the households that have lowest incomes, under 50 USD per month.

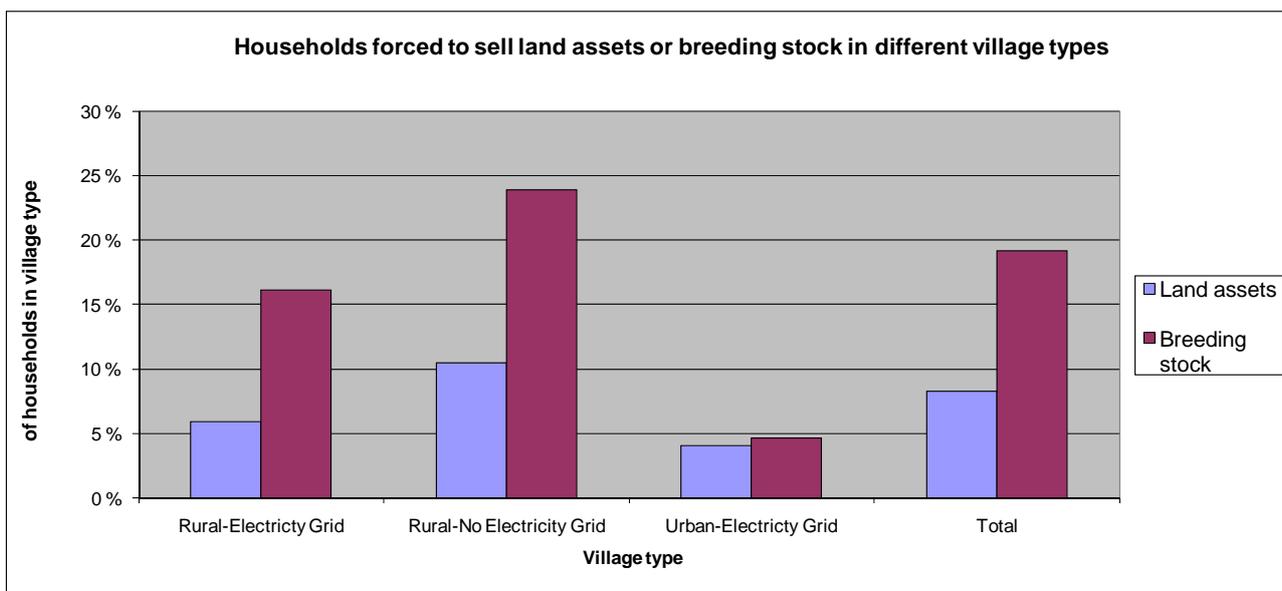


Figure 20: Selling land and animals

Selling breeding stock is a more common way to get money quickly in the rural areas. 24% of the households who own livestock in rural non-electrified villages have sold their animals and also in electrified villages 16% have done so. In Pursat and Kampong Thom provinces 35% of the households owning livestock have resorted to this strategy. Again selling these assets is most common in the lowest income classes.

According to the survey data there is no clear connection between asset selling and food security situation (Figure 21). It may be caused by the small number of respondents in the weak food security classes. However, the respondents of the focus group discussions clearly took up the importance of own farming land as the most important asset to safeguard the food security of a household.

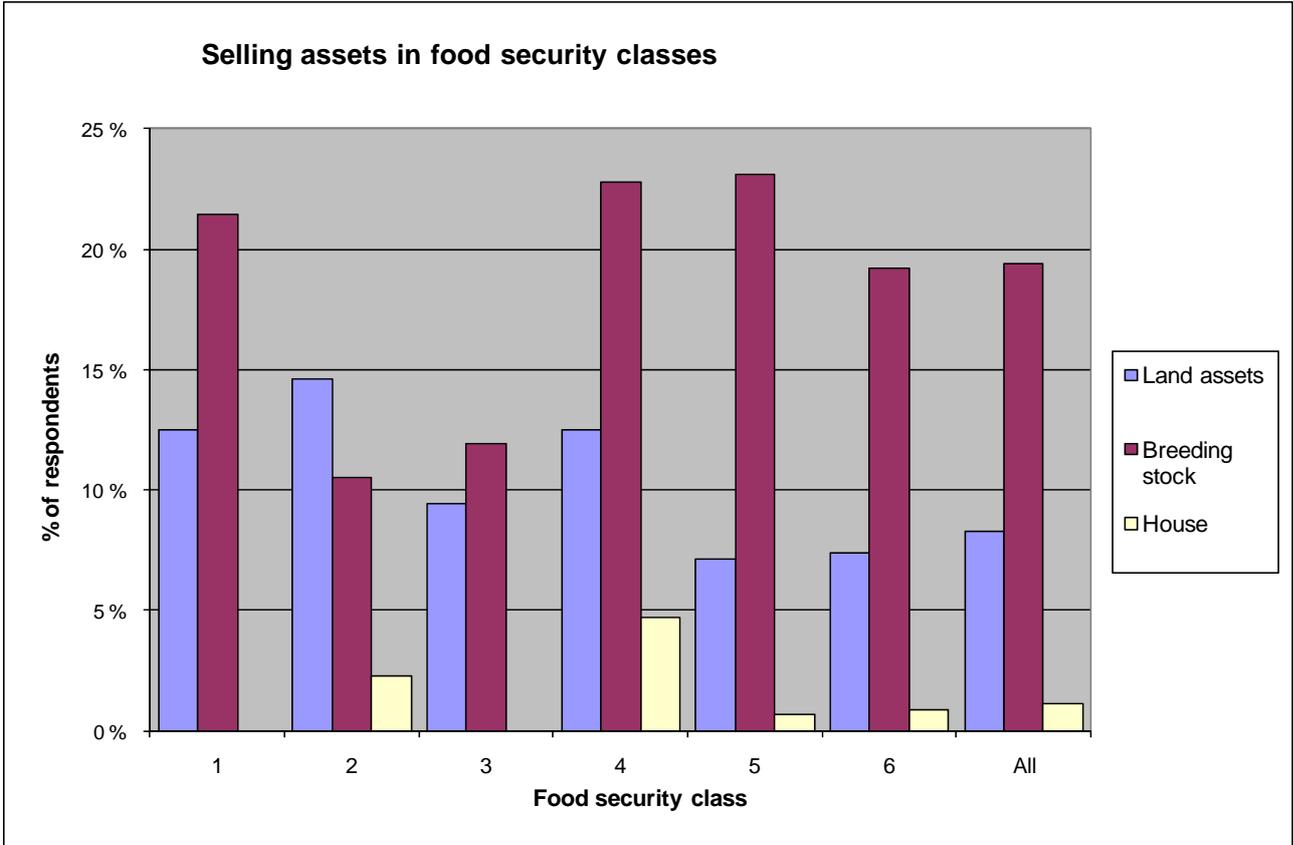


Figure 21: Selling assets in food security classes

Migration as a coping strategy

Migration is a large scale phenomenon in Cambodia as well as in many other developing countries. People migrate between rural areas according to the seasons to do agricultural work, fishing and construction work but the strongest stream of people moves from rural areas to cities.

In the survey people were asked if any of their household members has been forced to move to find work somewhere else or to return to their home village because they have lost their job. According to the data this kind of “forced” moving is practically non-existent. However, these survey results may also indicate some misinterpretations in the questions.

From six of the rural FGD villages men often leave to do agricultural work in some other rural location and women move to towns to work in garment factories. In three of the rural FGD villages respondents told that people were not migrating away from their village for work. One of these villages, a fishing village in the Tonle Sap region, had migrants moving in to the village for fishing. The respondents told that last year the fish catches were smaller than before and fewer workers migrated to their village. One of the villages, in Kandal province, had migrants moving into the village for agricultural work.

Two urban FGD groups were organized in Phnom Penh, one male and one female group. The respondents were people who have migrated to the city within three years. All the male respondents worked as motorbike taxi drivers and almost all the female respondents worked in garment factories. Few of the women worked as porridge sellers. The discussions focused on migration from countryside to towns.

The **male** FGD respondents moved to Phnom Penh to be able to support their parents and other family members in the home village and to earn money for agricultural inputs. All the male respondents worked as motorbike taxi drivers. All of them were married and had moved to city with their wife, who in most cases worked in a garment factory. Most of these couples had 1 or 2 children, whom they had left to their home village to live with the grandparents.

More than half of the male respondents were seasonal migrants. They told that they had come to Phnom Penh because they were currently free from agricultural work in the home village. They worked to support the family and save money for agricultural investments and returned to their home village when rice farming season starts. Some of the male participants brought food with them when they visited their home village. Some had migrated because their last rice crop was bad and could not provide enough for the family. Some of the male respondents told they did not have enough farming land in their village and thus decided to move to work in the city.

All the male respondents planned to stay and work in Phnom Penh if work is available. The men were happy about the possibility to earn money, but for some of them the situation had not really become better. Some of the male participants had been unemployed for some time in the city. Those men had solved the difficult situation by looking for a new job and borrowing money from friends or relatives who had also migrated to city.

All the **female** FGD respondents who had moved to Phnom Penh had done so for similar reasons, to be able to support their family in the home village. Nearly all the female participants were single and had come to Phnom Penh alone. Only a couple of them had come to Phnom Penh with their husband or other relative. Half of the female participants told they were seasonal workers and returned to their home village during the rice farming season to help their family. The women wanted to continue working in Phnom Penh, if work is available. None of the women had ever been unemployed in Phnom Penh and they told that if they would become unemployed, they would return to their home village.

A major change that the women had experienced after moving to city was the ability to earn own money. Most of the women told that they had learned a lot about life after moving to city and taking care of their own work and money. They felt that in the village life was much more restricted and that in the city they had more freedom to decide about their own life.

According to the FGD respondents, women's work in the garment factories is a crucial factor in the migration. Women who migrate to towns are typically single, but the migrating men are married and move to the city with their wife, who goes to work in a garment factory. Nearly all participants in both

male and female FGD groups told that if the factory work would end, the husband and wife would return to their home village together and also the husband's additional income would be lost. Most of the participants believed that some of the factories would be closed because of the economic recession.

All of the urban FGD participants believed that if they are able to stay in the city, their life would get better. They believed they will be able to save enough money to start an own business, and some of the women were planning to study new skills. The respondents told that returning to their home village would make their life more difficult and they would prefer to continue working in the city. If they would have to return to their home village, the female participants told they would help their parents in farming and sell garden products and groceries. The male participants would continue rice farming and raising livestock if they would return to their village.

## Summary

Nearly all FGD participants told that during the previous year they could not earn enough money to provide for sufficient amount of high quality food, health care for the family or the costs of educating their children. Working harder and trying to find new job, borrowing money, cutting household costs and selling assets are the means that households use to obtain money during economical difficulties. All participants in all the rural FGD villages had had to borrow money from private money lenders or micro-finance institutions. One fourth of all the surveyed households have had to borrow money during 2008-2009 especially to cover costs of food or health care. One fourth of the households also have had to borrow money for basic household needs more often in 2009 than in 2008. For short term loans, such as borrowing money for food and health care people most often borrow from their friends and relatives. Banks and credit agencies are used when people have to borrow bigger amounts of money, such as investing in a business. Also private money lenders are used in all borrowing needs and they often demand high interests.

Selling assets is the least favoured coping strategy for the FGD respondents, because it may lead to even weaker household economy and further impoverishment. In rural non-electrified villages 10% of the households have had to sell their land assets to cover basic household needs. For a small scale subsistence farmer selling land – the most fundamental asset of agriculture – is a highly unsustainable way for acquiring money. The respondents of the focus group discussions clearly took up the importance of own farming land as the most important asset to safeguard the food security of a household. Selling land as a way to cover necessary costs or pay back loans has been most common in households that earn less than 50 USD per month. Selling livestock is a more common way to get money quickly in the rural areas. 24% of the households who own livestock in rural non-electrified villages have sold their animals and also in electrified villages 16% have done so.

Migration is a large scale phenomenon in Cambodia as well as in many other developing countries. People migrate between rural areas according to the seasons to do agricultural work, fishing and construction work but the strongest stream of people moves from rural areas to cities. For this study two migrant discussion groups (one female, one male) were conducted in Phnom Penh. All the migrants had moved to the city for similar reasons: to be able to support their parents and other family members in the home village. More than half of the interviewed male respondents were seasonal migrants who worked in the city to support the family and save money for agricultural investments and returned to

their home village when rice farming season starts. Some had migrated because their last rice crop was bad and could not provide enough for the family. Some of the male respondents told they did not have enough farming land in their village and thus decided to move to work in the city.

Half of the female participants told they were seasonal workers and returned to their home village during the rice farming season to help their family. A major change that the women had experienced after moving to city was the ability to earn own money and freedom to decide about their own life.

According to the FGD respondents, women's work in the garment factories is a crucial factor in the migration. Women who migrate to towns are typically single, but the migrating men are married and move to the city with their wife, who goes to work in a garment factory. If the factory work of the wife would end, the husband and wife would return to their home village together and also the husband's additional income would be lost.

All of the urban FGD participants believed that if they are able to stay in the city, their life would get better. They believed they will able to save enough money to start an own business, and some of the women were planning to study new skills. The respondents told that returning to their home village would make their life more difficult and they would prefer to continue working in the city.

## 4. CONCLUSIONS

As a general outcome from this project we have produced a wide, updated, logically justified, and versatile data set describing essential phenomena that are related to Cambodian households' livelihoods, resources use, food security concerns, coping strategies, agriculture, energy, and the environmental issues including climate change considerations. More than 1300 Cambodians have been given the possibility to tell about their lives and the challenges they face in composing their livelihoods. The results from this final report offer researchers and decision-makers firsthand knowledge about the different factors that advance or hinder sustainable livelihood strategies and food security in Cambodia. In future, collected data can be used for a number of additional analyses, and thus offers material making the potential extent and scope of future studies much wider than what is now presented in this research report at hand.

The following list presents the major conclusions of this study:

- The effects of deforestation, changing weather conditions, increasing land sales and diminishing agricultural incomes emerge from the qualitative Focus Group Discussion data as the most important issues affecting the food and energy security of rural households.
- Unpredictable weather conditions seem to be directly affecting the food security situation in Cambodia, by increasing the risk of crop failure and reducing crop sizes. It is likely that climate change will increase the frequency and strength of unusual weather phenomena, thus making climate change prevention and mitigation one of the most important measures in strengthening the food security situation in Cambodia and also in many other developing countries.
- The effects of climate change will make natural resource based livelihoods increasingly difficult, but it is important to remember that the use of natural resources in the area at the moment is in some cases and areas unsustainable even without the effects of climate change. Deforestation rates are high causing losses to biodiversity, fertility of soils weakens and fisheries productivity suffers from overfishing, illegal fishing practices and infrastructure projects such as building dams. Even if climate change did not exist, the environment and livelihoods in Cambodia would face serious problems in the future without more sustainable management of natural resources.
- Vulnerability of subsistence farming is highlighted. Droughts, floods, pests, livestock sicknesses etc. may lead to crop and livestock losses and have serious negative impact on the food security of a household. To survive from crop losses or other economically difficult situations, household may be forced to take loans or sell its assets, such as land and breeding stock. These kinds of unsustainable coping strategies lead to even weaker possibilities for securing the household food security by farming.
- There seems to be a clear and growing inequality between farmers in remote rural areas and in urban or rural electrified areas. The remote rural farmers are getting smaller and decreasing incomes from their agricultural production and their households are highly dependent on the successfulness of farming for their food security. Rural areas are often far away from markets and because of lack of markets the farmers do not have possibilities to effectively sell their products

or ask for better price. Because of the self-subsistence nature of the agriculture of rural small farmer household, the farmers are lacking assets to invest in agriculture and are unable to increase the productivity of their land.

- The land business in Cambodia seems to function as a means to transfer wealth from poor to the better-off farmers or large scale commercial agricultural actors. In economically difficult situations the poor may be forced to sell their land to pay back loans or cover basic costs of food and health care, whereas the buyers are often those better-off farmers who want to extend their business.
- In the Cambodian diet fish has a major role as the most important source of animal protein. Fishing can be practiced with considerably lower investments than raising livestock and it is an important factor in securing the food security of poor households. However, Cambodia's fisheries are under strong pressure and fish catches are declining rapidly because of overfishing, illegal fishing practices, pressures on land use and infrastructure projects such as building large scale hydropower dams. Large dams alter river flows and water quality, and they have impacts on flooding, erosion, sedimentation, navigation, fisheries and agriculture. This is of particular interest in the Tonle Sap ecosystem area which provides directly and indirectly a livelihood basis for at least one million people.
- According to the FGD data, electrification of rural villages does not seem to have a profound impact on the village livelihoods. Electricity is mainly used for lighting, entertainment appliances and some household tasks but only few people use it for any livelihood purposes. Due to high prices electricity is in many households the first expense to be cut down during economical difficulties. However, the villagers who have received access to electricity feel that it has greatly increased the quality of their life and made many domestic tasks easier.
- Introduction of grid electricity has not reduced the consumption of firewood in rural households. 90% of the households in electrified rural villages still cook their meals on fire.
- Migration from rural to urban locations as well as between rural villages is a major force shaping Cambodian livelihood strategies. It probably also has social impacts on the rural villages from where people move, in some areas big part of the village's young women are away from the village at least part of the year.

#### 4.1. Possibilities for further use of the data

Comprehensive household data produced by the Survey project provides a good basis for a variety of additional analyses beyond the scope of this report. The data at hand may be offered to a large number of development partners for their specific needs including e.g. UN agencies that are resident in Cambodia. For example, UNDP Cambodia has been interested in utilizing Survey project data as part of organization's Poverty and the Environment Initiative (PEI).

Survey data could also be utilised and developed for producing relevant and up-to-date baseline data for various development interventions in the country. Survey data and results will later on be introduced to potential development agencies such as FinnChurch Aid in Finland, just to mention one.

## 4.2. Lessons learnt

A few important lessons have been learned during this research project. First, more time should yet have been devoted to the preparation phase of the study because by the time of writing the application, authors were unaware of some projects that were underway in Cambodia. Opportunities for cooperation and elaboration of some of the research tasks were missed.

A major challenge in the project was the mismatch between the size of the project budget and the planned scope of fieldwork. The original plan was to conduct the survey in Cambodia and Laos and with 2000 households in both countries. FFRC and IRL had negotiated about the project and the price of the fieldwork earlier, in year 2007, but the prices had doubled by the starting of this project. The considerable rise in the prices may have been caused by a misunderstanding in the first negotiations; the price that was given then, probably did not include all the services that were needed in the data collection, such as training of the fieldwork staff, travel expenses and data treatment. The price of the fieldwork should have been checked and re-negotiated during the planning of the application.

The considerably higher costs of fieldwork resulted into needs to cut down the scope of the fieldwork in one way or another. Finally, after negotiations with the Ministry for Foreign Affairs, it was decided that the project be implemented in Cambodia only, and leaving out Lao PDR. Including both countries would have yielded to reducing the sample size too much. By the time of this decision, the data collection had well progressed in Cambodia, whereas the preparations for fieldwork in Laos had not yet effectively started. This made it a self-evident choice to leave Laos out.

Livelihood is complex concept by nature, and in order to get a good grasp of Cambodian livelihoods there has been a very wide range of topics included in one research project. The complexity of the research topics has been a challenge for the fieldwork, data processing and analysis. Planning of the FGD and survey questions took longer time than was expected, because all aspects of a household needed to be included in the questions and yet the questionnaires and interviews needed to stay as short and simple as possible. When planning interviews of rural subsistence farmers it needs to be remembered that their days are usually full of work, and the time they spend in answering to the questions of some western research institution, is away from more important tasks, such as producing food to their families. Also if the questionnaires are too long and complicated the risk of misunderstandings and boredom during the interviews increases, leading to low quality data. Eventually the FGD and survey questionnaires came out well and the fieldwork teams reported that the interviewers or respondents did not find the interviews too weary.

The wide range of topics has been challenging also in the analysis of the data. Because of the tight budget, the size of the research team actually involved in the analysis and writing has been very limited. One researcher has been in charge of the data analysis, assisted by the other members of the team, who have given valuable comments and advice. Handling such a wide scope of topics, from spheres of work in the Cambodian society to food security and energy consumption, has been academically challenging.

The experience gained from conducting empirical fieldwork through a local sub-contractor, IRL, has also been instructive. IRL is a well established research company in Cambodia and it is doing fieldwork for large contractors such the World Bank, Asian Development Bank, UNDP and large international companies. The FFRC project was probably quite small and low-budget project for IRL and at some

points it seemed that the schedules of the FFRC project needed to give way to other assignments. There were some considerable delays in the timetables of both fieldwork and reporting, which forced FFRC to reorganize its work. If sub-contractors are used in data collection in future projects, it should be more clearly defined in the contracts how delays in timetables are viewed and sanctioned.

## 5. POLICY RECOMMENDATIONS

Policy recommendations are given below in two formats. First, essential research findings are converted into highlighted policy views. Second, research findings are critically reflected to the present priority areas of the Finnish development cooperation (Table 5).

- Negative effects of climate change pose a major threat to food security in Cambodia. Climate change prevention and mitigation must remain a high priority of the Finnish development policy.
- Strong emphasis must be put on curbing deforestation because forest cover loss is another major threat to food security.
- Land ownership issues should be raised in development agenda: more attention should be put on negative effects of large scale private land ownership partly due to land sales by poor. Improving the livelihood of rural poor reduces their need for obtaining cash income by selling land and other assets. More emphasis needs also be put on strengthening the legal and social position of community lands.
- Fisheries need to be protected by curbing illegal fishing and protecting important fish habitats, such as flooded jungle and mangrove forests. This is crucial as those most directly dependent upon fisheries and related aquatic resources are the poorest villagers. Also, it should be recognised that hydropower development in the region is a major threat to fishing.
- Continuous dependence on traditional firewood for energy should be addressed: even with access to the grid power, rural population continues using wood as a primary source of energy. It is important to integrate livelihood projects into the energy projects in order to develop income generating activities that use the available energy sources, especially in the case of electrification projects. There is need to consider the priorities of securing sustainable firewood availability and electrification schemes producing energy that poor people cannot always afford.
- Energy related aid and development resources should be increased for promoting renewable energy sources and technologies, which would allow local people to profit from energy projects increasing the livelihood resilience at household and village level. The potential for promoting small-scale and distributed biodiesel production could be considered.
- New approaches to aiming at holistic village and household level livelihoods development should be tested and introduced. These could include efforts of combining e.g. renewable energy production, climate change mitigation efforts, and soil fertility improvements in a single development package with access to easy financing.

Table 5: Policy recommendations

Finnish development cooperation priority areas promoting sustainable development	Policy recommendations by FFRC study
<p><b>Environment</b></p> <ul style="list-style-type: none"> <li>• Multilateral environmental agreements MEAs</li> <li>• Environmental programmes and projects               <ul style="list-style-type: none"> <li>- sustainable use of renewable natural resources</li> <li>- models of urbanisation</li> <li>- sustainable patterns of production and consumption</li> <li>- adoption of clean technology</li> <li>- waste management</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Develop integrated natural resource management systems that provide synergetic poverty reduction and environmental improvement possibilities.</li> <li>- Pay <u>practical attention</u> to agricultural and domestic wastes in rural and urban areas and their better management and use e.g. for energy production and business opportunities</li> </ul>
<p><b>Energy</b></p> <ul style="list-style-type: none"> <li>• Energy is a key factor in combating climate change. Finland supports programmes and projects that focus on               <ul style="list-style-type: none"> <li>- saving energy</li> <li>- increasing energy efficiency and</li> <li>- producing renewable energy</li> </ul> </li> <li>• The production of renewable energy (bio-, solar and wind energy) provides work and income for the local population.</li> <li>• Bioenergy projects can be linked with the promotion of sustainable forestry, which involves the use of wood from thinnings and logging residues in power generation.</li> <li>• Local production of renewable energy and linking it with forestry generates sustainable economic growth.</li> </ul>	<ul style="list-style-type: none"> <li>- Producing renewable energy is the first priority in Cambodia</li> <li>- Energy saving and efficiency improvement should be emphasized in Cambodia, especially improving the efficiency of cooking stoves, which provides a cheap way of reducing fuelwood and charcoal consumption and reducing the time needed for fuel collection</li> <li>- Wood from thinnings and logging residues should be used in power generation, preferably using this biomass in direct combustion for e.g. cooking</li> <li>- Utilization of waste biomass, such as rice husk, for energy production</li> </ul>
<p><b>Forests</b></p> <ul style="list-style-type: none"> <li>• Developing forestry eliminates poverty directly and generates sustainable economic development, which eliminates poverty indirectly.</li> <li>• Finland supports agroforestry development as a means to combine poverty reduction with biodiversity preservation.</li> <li>• Forestry and energy production are linked to social sustainability, social stability, organised land ownership and functioning legislation</li> </ul>	<p>Pay practical attention to</p> <ul style="list-style-type: none"> <li>- preventing deforestation, especially loss of primary forests</li> <li>- sustainable community forestry management</li> <li>- agroforestry with energy production</li> </ul>
<p><b>Agriculture</b></p> <ul style="list-style-type: none"> <li>• Farming and animal husbandry provide               <ul style="list-style-type: none"> <li>- food, fibers, leather, raw materials for pharmaceuticals</li> <li>- energy</li> </ul> </li> <li>• Strengthening national food production               <ul style="list-style-type: none"> <li>- reduces malnutrition</li> <li>- other health hazards arising from a homogeneous diet</li> </ul> </li> </ul>	<p>Pay practical attention to</p> <ul style="list-style-type: none"> <li>- integrated livelihood development for rural poor in order to avoid the need for selling productive assets (land, cattle) in case of loss of harvest</li> <li>- promotion of small-scale production</li> </ul>

<ul style="list-style-type: none"> <li>• Farmers other income sources: <ul style="list-style-type: none"> <li>- forestry, fishing, hunting, gathering natural products (NTFPs)</li> </ul> </li> <li>• Providing tourist services can become a source of extra income for farmers and rural communities.</li> <li>• Agro-processing industries provide jobs and diversify economic life in rural areas.</li> <li>• Successfully functioning rural areas are important for promoting social stability throughout the world.</li> <li>• Agriculture must be developed in an ecologically sustainable manner.</li> <li>• Projects and programmes should focus not only on agriculture and other rural occupations but also enable training, logistics, health care and other services to be developed.</li> <li>• Holistic viewpoint in development cooperation promoted</li> </ul>	<p>investments</p> <ul style="list-style-type: none"> <li>- promotion of markets for agricultural products and the access of also small scale farmers to those markets</li> <li>- development of coping strategies and resilience for climate change</li> <li>- development of local agro-processing possibilities to improve the possibilities for local income generating and employment opportunities</li> <li>- introducing bioenergy as a new agricultural product</li> </ul>
<p><b>Water</b></p> <ul style="list-style-type: none"> <li>• Ensuring access to clean water and appropriate treatment of sewage are preconditions for reducing poverty and promoting health in many developing countries.</li> <li>• Competition for insufficient water resources often provokes conflicts within and between countries.</li> <li>• Water projects can eliminate poverty, promote economic development, protect the environment and avert conflicts.</li> </ul>	<p>Pay practical attention to water conflicts</p> <ul style="list-style-type: none"> <li>- consider critically the funding of projects and institutions, which promote building of large scale hydro-power in Mekong region.</li> <li>- integrate fishery development to agricultural development projects</li> <li>- improve clean water supply for rural poor</li> </ul>
<p><b>Trade</b></p> <ul style="list-style-type: none"> <li>• The private sector and entrepreneurship play a key role in economic development in developing countries.</li> <li>• Progress in business, industry and commerce is supported through Aid for Trade.</li> <li>• Private sector development increases the use of developing countries' own economic resources and promotes the creation of decent jobs.</li> <li>• Development cooperation must support the ability of partner countries to engage in trade negotiations and benefit from existing agreements.</li> <li>• Projects and programmes are needed to help developing countries to export their products and increase added value.</li> </ul>	<p>Pay practical attention to</p> <ul style="list-style-type: none"> <li>- small-scale renewable energy business promotion</li> <li>- The on-going EEP Mekong programme provides a potential and practical forum for addressing e.g. energy-related trade issues in Cambodian development cooperation. Data and the results from the Survey project should be introduced to EEP Mekong project board.</li> </ul>
<p><b>Structure of development cooperation</b></p> <ul style="list-style-type: none"> <li>• Multilateral cooperation</li> </ul> <p>Finnish Government underlines the importance of international financing institutions:</p> <ul style="list-style-type: none"> <li>- International Development Association (IDA) of the World Bank Group</li> <li>- African Development Bank (AfDB),</li> <li>- Asian Development Bank (AsDB) and</li> <li>- Inter-American Development Bank (IADB).</li> </ul>	<p>Do these institutions really support the above FFRC recommendations regarding e.g. energy issues?</p>



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# APPENDIX 1: DESCRIPTIONS OF THE FOCUS GROUP DISCUSSION VILLAGES

**Kouk Srok village in the Kampong-Cham-East province.** Kouk Srok is an upland village, where livelihoods are based on rice and cassava cultivation. Kouk Srok is the only FGD village, where rice yields have increased during the past year. This has happened because of favorable rain conditions and use of fertilizers. However, the price of rice increased also in this village, causing difficulties to those families who have to buy all or part of the rice they are using. Production of garden products decreased, because fewer villagers were growing them than before. As a result prices of garden products sold in the market increased. On the contrary, fruits were well available and their prices decreased. Meat production decreased because of livestock sicknesses that killed a lot of chicken and cattle. Price of chicken sold in the market increased, and many families started using more rat meat in their diet. Some respondents have been selling cattle in the market, but the prices that are paid are low compared to the inputs of raising cattle, such as livestock feed and medicine. Availability of fish declined a lot and the villagers believe it is due to overfishing. Frogs and crabs were well available.

An NGO built four new wells in the village year 2008, and recently the villagers have not had problems with water supply. The economical situation of many villagers is very difficult, and many of them have sold their agricultural land to be able to pay back debts. Renting land for agricultural purposes is difficult, because land is not readily available and prices are high. There is not much migration out of the village for work.

The energy use in the village is based on firewood, car batteries, diesel and kerosene. Firewood is very difficult to acquire in the area, because nearby forest have been converted into farming land. Firewood has to be fetched from 10 kilometers away and price of firewood sold in the market has increased. Many families are using cassava culms for cooking energy instead of firewood. Positive thing is that gasoline, diesel and battery charging are cheaper than last year.

The respondents find it too difficult to imagine what their village will be like in the future, after one or three years.

**Chanlak and Tuol Tnaot villages in Kandal province.** These villages are rural villages located along a national highway leading to Phnom Penh. The villages are connected to electricity grid but recently there have been a lot of power cuts. Agricultural production includes cassava and chamkar production, i.e. corn, beans, vegetables and herbs. Rice is not cultivated. Other income sources are fishing and paid work. Women migrate to work in the garment factories of Phnom Penh. Men do casual work in other peoples farms, as mototaxi drivers or as construction workers. Migrants also move into these villages for agricultural work.

The economical situation of many villagers has become harder because the income received from selling agricultural products has decreased while manufactured goods and agricultural inputs are more expensive than before. Many women have lost their jobs in the garment factories of Phnom Penh as the

factories have closed. Many villagers have sold their land to earn profit in the beginning of year 2008, when land price was high. The buyers often came from outside the village. Because of selling their land some families are now in trouble because rental agricultural land is difficult to find and expensive. Some have become mototaxi drivers because they cannot farm anymore as they have sold their land. During year 2008 a large poultry farm has been established near the village, which causes bad smell and increasing number of flying insects in the village. The villagers complain about the road being in bad condition because trucks are passing constantly. The villages have had problems with water supply and more ponds have been dug to overcome the problem. During water shortage families had to buy water from a distant supplier, which was expensive.

There is some contradiction in opinion of the respondents on the successfulness of garden production. Some respondents tell that the yield has been good and more people have started farming garden products. On the other hand, others see that production has decreased due to land selling and crops have been destroyed by insects or hot weather. Prices of garden products have decreased and the male respondents believe it is because lots of cheap vegetables are imported from Vietnam. Many people are growing fruit trees, making mango fruits more available and cheaper. Meat production has decreased because livestock feed and medicine are expensive. Prices of pork and chicken meat have increased. Number of rats has decreased, possibly because more people are substituting pork and chicken with rat meat. Also availability of fish and shrimps has decreased a lot and their prices have increased. Families have had to cut down their food consumption because less income is available for buying for example garden products and fish.

The villages have had electricity for 7 and 10 years. However, firewood is still the main fuel used for cooking. Some families are using also charcoal and some households have an electric cooker for cooking rice. Availability of firewood has decreased, but there is more charcoal available sold by traders who come from outside the villages. The respondents tell that they are spending more money on energy now than before electricity. Yet they are very happy with having electricity, because it has made their lives more comfortable and easier and village more appealing. Electricity is used almost only for domestic purposes, such as lighting, cooking rice, watching color TV and videos, charging mobile phones and using electric fans. Only few villagers have used electricity for livelihood purposes for example by changing their gasoline operated irrigation water pump to an electric one.

**Chhnoeng Chumnir village in Prey Veng province.** In this village production of rice and vegetables are the main livelihoods. During 2008 the villagers have suffered from decreasing food production and unpredictable weathers. According to the respondents their income has been insufficient. The villagers complain of lack of trees because of deforestation. The climate has been very hot, causing sicknesses.

*“The weather was very hot and children always got sick. Fever and malaria were the most common diseases.” “The very hot weather is very different from before.”*

Flooding has destroyed rice fields and there has been a storm. Water supply in the village is good, because according to the respondents every house has an own well. Renting land for agriculture is easy and affordable. The respondents are worried about health effects of chemical substances in food. There is not much migration for work away from the village.

In this village the production of all food stuffs has decreased during 2008. Rice production in the village decreased because of unpredictable rain. Rain came normally during crop growing stage but there

was not enough rain during the grain hardening stage. The respondents tell that the price of rice decreased, which sounds contradictory with the poor yield. It is possible that the price has fallen because the quality of rice has not been good. Also the production of garden products and fruit decreased, because the weather was too hot. Fruit trees dropped a large part of their flowers and respondents explain it with the hot weather. Prices of garden products increased but prices of fruit decreased. Meat production decreased and prices of pork and chicken increased. Eating pork decreased because of high price and people converted to eating rats. The population of rats increased and prices of rat meat remained the same. Availability of fish declined a lot and prices increased. The respondents think that the fish catches decrease because many fishermen are overfishing by using electrical fishing equipment. Many respondents told they would rather eat fish than meat, because they believe that fish does not have as much chemical substances as meat. Also the number of frogs decreased and the respondents believe it has to do with using fertilizers and pesticides in farming. The soil gets firmer because of these chemicals and frogs cannot burrow in the ground. No mushrooms were available for eating. Because income was not sufficient for buying enough food and especially sources of protein, people increased catching animals such as crabs, frogs and shrimps themselves.

The villagers rely on firewood for cooking. This village is the only one of the FGD villages where the availability of firewood has not become poorer, but this is only because the situation has been very difficult already earlier.

“There is no community forest; we collect firewood around our house. It is difficult especially in the dry season when my children and I collect them by digging the roots of plants along the dike in the rice fields.”

The respondents do not know the prices of firewood and charcoal, because they never buy them. Diesel, kerosene and candles are used for lighting, car batteries for electric lights and other small appliances (TV, VCD). Gasoline and diesel, which are used for motorbikes, water pumps etc, were cheaper than year before.

**Sdei and Rohal Suong villages in Battambang province.** Main livelihoods in these villages are rice and vegetable production. The income situation of many villagers is difficult. In some families children have had to quit school because parents cannot afford it. Available forest resources have diminished, because natural fire has burned a nearby forest and mangrove forest has become protected area. Weather conditions have been unpredictable: there was too much rain during rainy season, which destroyed crops and also drought has occurred. More people have been sick than earlier. The respondents tell that the quality of soil has become poorer.

*“In the past, it was easy to grow crops because of the very rich soil, but now without adequate application of fertilizers, we cannot achieve a good harvest.”*

The villagers are happy with construction of a better road and a new school in the village and a health clinic close by. Water supply in the area is good. As the population in the villages is growing, agricultural land is divided into smaller and smaller plots. Those farmers, who are wealthy enough, are renting additional land from other farmers.

Rice production in the villages decreased because too much rain, flooding, water crabs and mice destroyed the crops. Garden products gave good harvest and more people were growing them than before. Prices of garden products fell, because there was so much supply. Many respondents also tell that they prefer to cultivate their own vegetables, because they are afraid of the chemical substances in products

sold at the market. Fruit supply declined because fruit trees dropped their flowers, possibly because of too hot weather and fruit prices increased. Meat production decreased and eating pork and chicken decreased because they were expensive. Rat meat became cheaper. Many respondents told they prefer to eat fish instead of meat, because fish does not have chemical substances in it. However, availability of fish decreased, prices increased and people could afford buying less fish than before. Villagers believe that fish catches diminish because fishermen are using fine nets that catch also small fish and electrical equipment and also the mangrove forests have been destroyed. Shrimps and crabs were not available.

In these villages some households use charcoal for cooking along with firewood. Firewood supply decreased in these villages and more charcoal was brought for sell from outside. Firewood and charcoal were expensive.

In one of the villages people believe that during the next year their village will improve, because new roads and electricity grid will be constructed. In the other village people are more pessimistic. They feel that their livelihood, rice farming, is under a lot of stress and gets even more difficult because renting fees of land and water pumps get higher and pests damage the crop.

**Kampong Preah village in Kampong Chhnang province.** Main livelihoods in this village are fishing and chamkar production (corn, beans, vegetables, herbs). Rice is not cultivated. In this village people have experienced lack of money to buy food. Income from selling livestock or garden products in the market has decreased. Nearby forest has been destroyed and converted to farm land. Weather has been very hot and there have been lots of sicknesses. Water situation in the village is good, because there is enough water available in the wells and rivers and purified drinking water is delivered to homes, although it is expensive. Nobody is renting land in this village. Year 2008 there were seasonal immigrants moving into the village for fishing work, but during 2009 the number of migrants decreased because fish catches had declined considerably. The respondents tell that the catches are smaller because fishermen are using big nets and electric shocking equipment and the river level rose in the wrong season, disturbing the reproduction of fish. There was not enough fish to sell, and fish was expensive. Production of garden products decreased, according to the respondents because of very hot weather. However, the prices of garden products also decreased because there has been oversupply. Some products, such as pumpkin, are difficult to export and that's why wholesale dealers are not willing to buy them. Also fruit prices decreased. Meat production decreased and number of rats increased. In this village fish is eaten much more often than meat and respondents tell that they are eating meat only in special occasions, such as ceremonies.

Only firewood is used for cooking and it is difficult to find. People have to go far from the village by boat to collect firewood. The respondents do not know prices of firewood or charcoal, because they never buy them.

**Angkoul village in Kampot province.** In this village livelihoods are based on fishing and rice cultivation. Income of many villagers has decreased. They are getting less money from fish and crabs but input products are more expensive. Lots of land has been sold and the forest nearby has been destroyed. On the other hand, there are also signs of increased wealth in the village, such as new brick houses and motorbikes. A company has established a sand pumping machine on the sea shore close by. There are no problems with fresh water supply in this village. Land renting is not common. Many men are migrating away for work, but only for short periods, 1-2 months. The respondents find it difficult to predict the future of their village and they think that it depends on the performance of the village chief.

Rice production in the village decreased, because there was insect pests and lack of rain. Garden products gave good harvest because the weather was favorable for them and there were more growers. Fruit prices decreased. Meat production decreased because lots of animals died. Fish catches declined a lot and the consumption of fish in the families is directly dependent on the size of the catch.

Most households use only firewood for cooking. Availability of firewood declined, because forest has been destroyed and converted to farming land. The villagers collect firewood from far away and dead wood from a mangrove forest that is protected. Sometimes they have to use coconut shells when wood is not available. Firewood and charcoal are not usually bought, but someone knows that charcoal has become more expensive.

## RECENT FFRC eBOOKS

- 8/2010 Lauttamäki, Ville & Heinonen, Sirkka: Vähäisten päästöjen Suomi 2050. Raportti ilmas- to- ja energiapoliittisen tulevaisuusselonteon skenaario-työstä
- 7/2010 Varho, Vilja & Joki, Laura: Suomen liikennesektorin tulevaisuus. Ensimmäisen Delfoi- kierroksen perusteluja.
- 6/2010 Siivonen, Katriina: Taiteen särmällä nuorille hyvinvointia. Sitoumuksia ja toiminta- ajatuksia nuorten tueksi.
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Jenny Turunen, Juha-Pekka Snäkin, Juha Panula-Ontto, Heikki Lindfors, Hanna Kaisti, Jyrki Luukkanen, Stefano Magistretti & Chinda Mang

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