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Carina Schindecker, BSc

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List of Abbreviations and Acronyms

ALDI	Advanced Livelihood and sustainable Development for Indigenous People
AM	Andoung Meas
BMI	Body Mass Index
CDHS	Cambodian Demographic and Health Survey
CEDAC	Cambodian Center for Study and Development in Agriculture
EE	Environmental Enteropathy
ELC	Economic Land Concession
FANTA	Food and Nutrition Technical Assistance III Project
FAO	Food and Agriculture Organization
FCS	Food Consumption Score
FDA	Food and Drug Administration
FGD	Focus Group Discussion
FNS	Food and Nutrition Security
FNWG	Food and Nutrition Women's Group
GHI	Global Hunger Index
GRAS	Generally Recognized as Safe
HDDS	Household Dietary Diversity Index
HH	Household
IGA	Income Generation Activity
ILIP	Improving Livelihood Condition of Indigenous People in RTK Province
IYCF	Infant and Young Child Feeding
INGO	International Non-Governmental Organisation
IP	Indigenous People
LANN	Linking Agriculture, Natural Resource Management and Nutrition
Lao PDR	Lao People's Democratic Republic
LICADHO	The Cambodian League for the Promotion and Defense of Human Rights
MSG	Monosodium Glutamate
NGO	Non-Governmental Organisation
NRM	Natural Resource Management
NSFSN	National Strategy for Food Security and Nutrition
NTFP	Non-Timber Forest Product
PE	Peer Educator
RTK	Ratanakiri
SEA	South East Asia
TOT	Training of Trainers
TV	Ta Veaeng
UNICEF	United Nations International Children's Emergency Fund
VRO	Village Roll Out
WASH	Water, Sanitation and Hygiene
WHH	Welthungerhilfe
WHO	World Health Organization

1. Introduction

The hunger situation in Cambodia is classified as serious according the Global Hunger Index published by Welthungerhilfe, IFRPI and Concern Worldwide. [von Grebmer et al., 2015] Malnutrition rates are especially high among the marginalised ethnic minorities in the target area Ratanakiri Province. The majority of the rural population are smallholder farmers whose livelihood and food security mainly depend on agriculture and natural resources. [Men, 2011] The primary occupation of the villagers is rice farming, which is the main staple food in Cambodia. It is eaten almost three times per day and is mostly consumed in combination with vegetables and meat or fish. [CDRI, 2008] The villagers' diet gets enriched by wild foods, which provide a great amount of micronutrients and enhance dietary intake. [Bharucha and Pretty, 2010]

However, depending on the survey, food consumption of almost 20 % up to more than 50 % of the households in this rural plateau area is classified as poor or borderline, which represents a low dietary diversity. [CDRI, 2008; NORDECO, 2010] During pregnancy and lactation dietary intake is additionally restricted by widespread food taboos which are primarily followed due to superstition. [Fisher and Sykes, 2002] Besides wild foods other natural resources are of utmost importance for the rural population. For example non-timber forest products (NTFPs) such as rattan and resin are essential as construction materials, firewood is required for cooking, medical plants are used to alleviate diseases, etc. Furthermore natural resources are an important source of income, which enables the villagers to buy foods at markets and to receive health care. [Men, 2011]

Ratanakiri (RTK) is a sought-after economic hotspot due to its location on the boarder to Vietnam and Lao PDR. Therefore economic land concessions (ELCs) are granted to companies who establish huge monoculture plantations. ELCs cause deforestation and are often associated with land grabbing which dramatically impact the villagers' livelihood and food security. Access to food gets much impaired due to the diminution of wild foods and a decreased income, caused by the lack of NTFPs, which reduces the purchasing power. Land grabs mainly affect the villagers' farmland and therefore obstruct agricultural production. [Subedi, 2012] In addition to food security aspects also adequate mother and child care, water, sanitation and hygiene (WASH) and health service need to be considered to combat malnutrition. Due to this complexity a multi-

sectoral approach is required to improve food and nutrition security. [Trentmann et al., 2015]

Welthungerhilfe (WHH) is a German non-governmental Organisation (NGO) which operates in Ratanakiri Province in collaboration with its local Partner-Organisation CEDAC (Cambodian Center for Study and Development in Agriculture) since 2005. The projects mainly focus on agriculture, WASH, land rights, disaster risk reduction and nutrition. To improve food consumption of the rural population the LANN approach is implemented in two districts in Ratanakiri since 2010. LANN is an abbreviation for `Linking Agriculture, Natural Resource Management and Nutrition´. It's a food based approach which aims to improve knowledge and behaviour related to nutrition in order to improve dietary diversity. [Trentmann et al., 2015]

To achieve this goal the approach intends to enhance availability and access of food by intensifying and diversifying agricultural production and by increasing purchasing power via income generation activities. Another key area is the management of natural resources including sustainable harvest and the cultivation of NTFPs. These activities support the villagers to minimise and compensate the loss of natural resources and to diversify their diet. To enhance the use and utilisation of food the LANN approach aims to improve mother and child care and food processing as well as to reduce nutrient loss and the practice of food taboos. The LANN approach does not completely cover all nutrition security dimensions whereby it's necessary to create external linkages with other projects, NGOs, governmental departments, health centers, etc. regarding land rights, WASH, health care and other relevant fields. The crucial elements of the approach are the linkages of the pillars of LANN towards the same goal – nutrition security as well as the inclusion of natural resource management in its widest sense. This provides an additional value through its synergetic effects compared to other nutrition sensitive approaches. [Molina, 2015; Krahn et al, 2014]

Since LANN is a quite new approach, there is a lack of evidence of its effectiveness Therefore this thesis aims to provide information on the impact of the approach regarding knowledge and behaviour change related to nutrition on the basis of ethnic minorities in Cambodia.

2. Food and Nutrition Security Situation in Cambodia

This chapter aims to create awareness on the food and nutrition security (FNS) and hunger situation in Cambodia and to demonstrate the complexity of FNS on the basis of the causal model of malnutrition. Furthermore it focuses on nutrition indicators and the importance of interventions among women and toddlers. This background information facilitates a better understanding of the implementation, target group selection and the pathways of the LANN approach.

2.1. Global Hunger Index

The Global Hunger Index (GHI) provides information about the hunger situation of many lower-income countries. It's calculated and published on a yearly basis by Welthungerhilfe, the International Food Policy Research Institute and Concern Worldwide. Until 2014 the GHI arose from three equally weighted indicators, namely the prevalence of undernourishment, child underweight and child mortality under the age of five. In 2015 the indicator child underweight was replaced by child wasting and child stunting. Each of these new indicators contribute 1/6 of total weight. Previous indexes were recalculated with this new formula whereby the scores are comparable. [1]

The hunger situation in Cambodia is classified as serious, although it is one of the countries which shows the largest improvements. The latest score of 22.6 was cut by half since 1990. [von Grebmer et al., 2015]

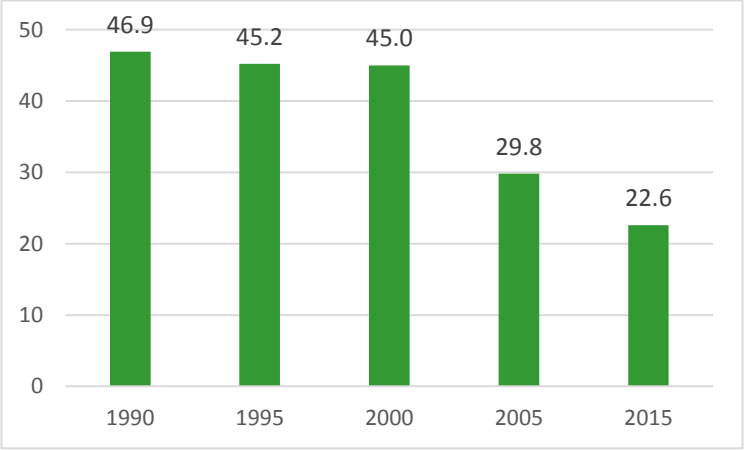

Figure 1: Global Hunger Index Cambodia. Adapted from [von Grebmer et al., 2015]

[1] Note: Previous Global Hunger Index scores which were not recalculated by the new formula of 2015 can't be compared to recent scores.

2.2. Causal Model of Malnutrition

The Causal Model of Malnutrition created by Welthungerhilfe is based on the conceptual Framework of Malnutrition established by UNICEF (1991) and the four dimensions of Food and Nutrition Security, namely availability, access, use and utilisation and the stability of these three elements. This figure shows that malnutrition is the result of many interlinking factors occurring at different levels in society. [Trentmann et al., 2015]

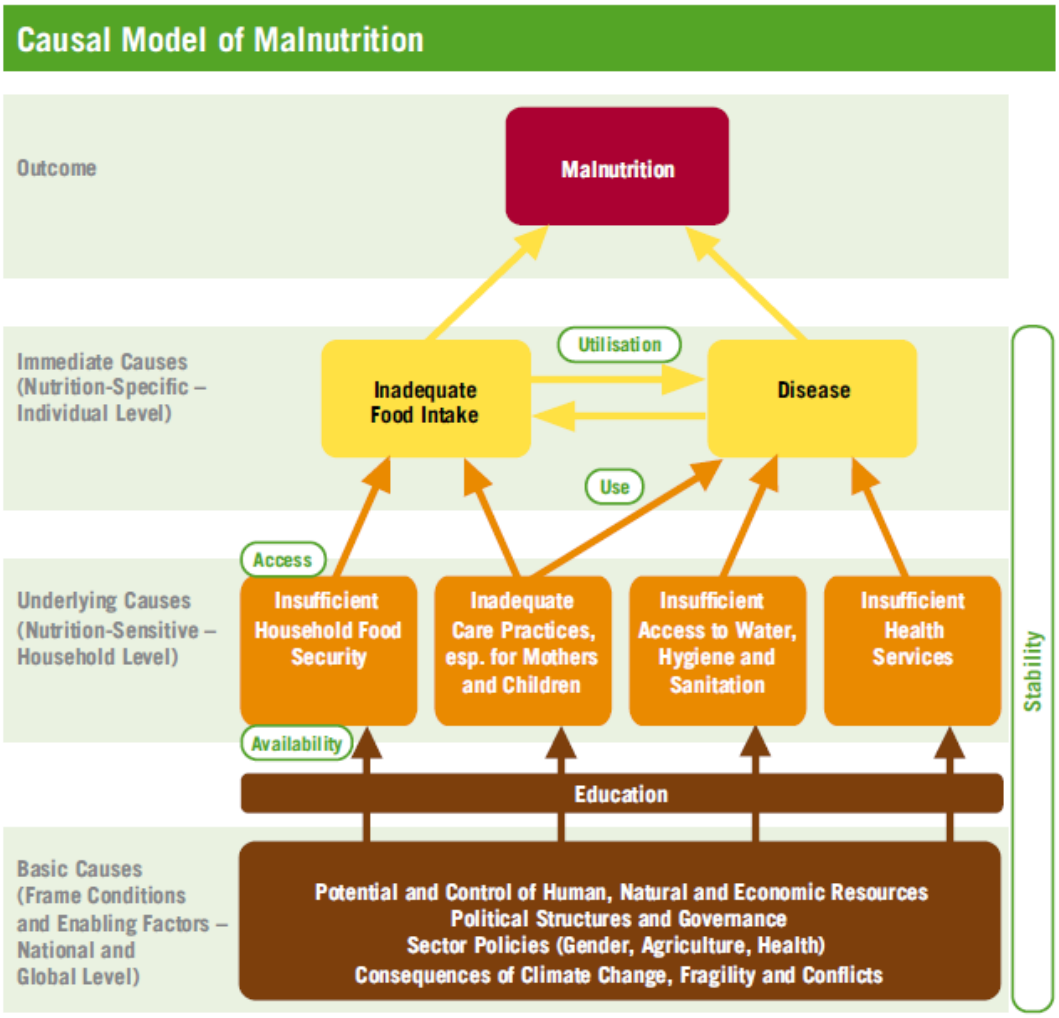

Figure 3, Source: adopted from UNICEF, 1991

Figure 2: Causal Model of Malnutrition. [Trentmann et al., 2015]

Immediate causes of malnutrition affect individuals directly through an inadequate food intake and disease. The two causes are strongly connected to each other since a sick person has a higher demand of nutrients to fight infections whereby appetite and ability

to digest are mostly reduced. A lack of nutrients weakens the immune system and therefore increases the risk of infections. To meet the nutrient requirements food intake needs to be adequate in quantity and quality with consideration to proper combinations to enhance bioavailability. Habits like food taboos as well as knowledge e.g. on food processing and child feeding practices influence the composition of dietary intake.

Four underlying causes at household level are defined which impact the immediate causes of malnutrition, namely household food security (access and availability of food), care practices, health environment (including access to safe water, hygiene and sanitation facilities) and access to health services. Further these determining factors are influenced by socio-economic and political conditions, which are considered as basic causes of malnutrition.

The first underlying cause `household food security´ is determined by access of food (through household production and income for food purchases) and availability of food from own production or markets. Foods which are offered at markets generally deprives from domestic food production/stocks, food imports and food aid.

The determinant `care practices´ refers to the provision of time, attention and support to meet the needs of children and other household and community members. Caring practices include for example child feeding, health seeking behaviours, care and support for children as well as for pregnant and lactating women.

Environmental conditions and health services have a direct effect on health and therefore impact the nutritional status. Diseases like diarrhea, intestinal helminths, etc. can be reduced by access to safe water, sanitary facilities and improved hygiene. [Weingärtner, 2009]

The four dimensions of Food and Nutrition Security (FNS) and relevant FAO indicators

The framework of food security is influenced by a physical and a temporary determinant. The physical factor comprises the food flow `Availability → Accessibility → Use and Utilisation´ whereas the temporal determinant refers to stability which affects all physical elements. [Weingärtner, 2009]

The Food and Agriculture Organization (FAO) determined indicators according to the four dimensions to assess food and nutrition security. A short description of the dimensions and the most relevant indicators is demonstrated below.

- **Availability:** means the physical existence of food, for example from own production or markets, at regional or national level. [Weingärtner, 2009]

  According to FAO the value of food production doubled since 2000 whereby the average dietary energy supply in Cambodia is adequate. The share of calories derived from cereals, roots and tubers is decreasing and account for about 70 % of total calorie intake. The average protein supply is 63 g per person/day which represents an increase by 10 g since 2000. About 30 % of the protein comes from animal origin. [FAO, 2015]
- **Access:** refers to sufficient resources of a household and its individuals to obtain foods for a nutritious diet. [Gross et al., 2000] Access is mainly influenced by household resources like capital, labour and knowledge as well as by prices. [Weingärtner, 2009] In Cambodia the domestic food price index is continuously increasing. However, a raise of the purchasing power per capita can be seen as well. Road density is getting higher which facilitates the access to markets. The depth of food deficits and prevalence of food inadequacy were cut by half since 1990. [FAO, 2015]
- **Use and Utilisation:** demonstrate that nutrition security is more than just food security [Gross, 2000] When sufficient food is available and accessible by the household it becomes relevant which kind and combination of food is purchased, prepared and consumed and how it gets distributed within the household. Biological utilisation represents the link between dietary intake and health status. A healthy environment (including safe drinking water, sanitary facilities and hygiene) to prevent diseases is relevant as well as knowledge of health care, food preparation and storage. [Weingärtner, 2009]

  About 70 % of the Cambodian population has access to improved water sources, which is a great development since the last decade. However, just about 1/3 has access to sanitation facilities. [FAO, 2015] The prevalence of wasted, stunted and

underweight children is getting much less, whereby deficiencies of some specific micronutrients are still widespread. [CDHS, 2015]

- **Stability:** is distinguished between chronic and transitory food and nutrition insecurity. Transitory food and nutrition insecurity can be cyclical (e.g. occurs on a regularly basis before harvest) or temporary (e.g. as a result of natural or man-made disasters). [Weingärtner, 2009]

  In Cambodia the domestic food price index is less volatile compared to 10 years ago. Furthermore a higher stability of per capita food production and food supply can be seen. [FAO, 2015]

The causal model of malnutrition demonstrates that food security isn't the only cause of malnutrition. The nutritional status results from many determining factors and their synergies. Therefore it's crucial to add nutritional aspects (such as caring practices, health services and healthy environments) to food security which leads to the following definition: `*Food and Nutrition Security exists when all people, at all times, have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life´* [CFS, 2012].

2.3. Levels of Food and Nutrition Security

Food and Nutrition Security needs to be analysed at Macro-, Meso- and Microlevel since causes and required interventions differ between those levels.

Macro Level (Nation)

According to the National Strategy for Food Security and Nutrition (NSFSN 2014 – 2018) food security at macro level is not a concern in Cambodia. Availability of food on national level meets the demand of the population at all time due to a large rice surplus and well integrated food markets. [CARD, 2014] However, access to food is unevenly distributed and policies rather focus on quantity of food than on improving quality of diets and sanitation facilities. [von Grebmer et al., 2014]

Meso Level (Province/Community)

Food security varies greatly between the provinces. The highest prevalence of food insecurity (~16%) can be found in the plateau region, including Ratanakiri. [VAM, 2008]

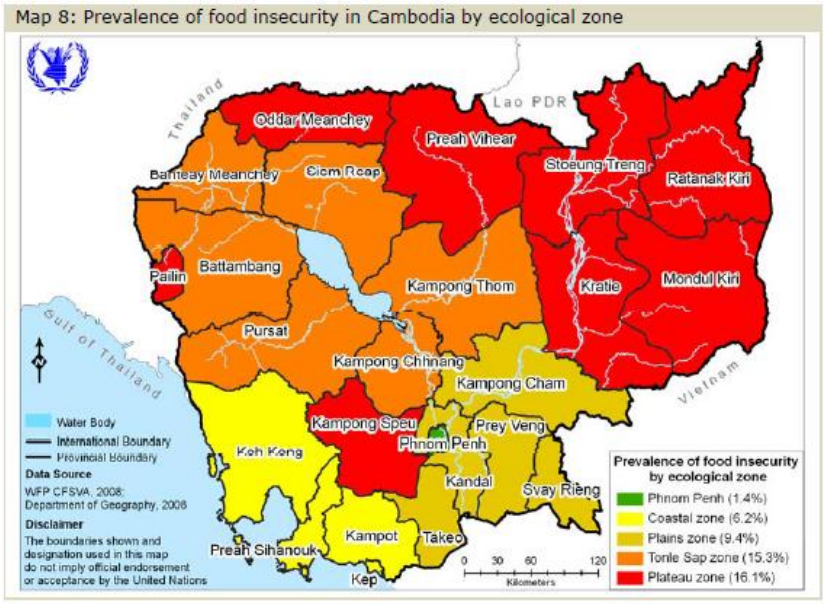

Figure 3: Prevalence of Food Insecurity in Cambodia by Ecological Zone. [VAM, 2008]

Micro Level (Household/Individual)

Food insecurity is highest among the poor and rural households. A large part of the food derives from their own production, whereby the intensification and diversification of agricultural production plays a major role of food security at household level. Furthermore the sustainable management of fisheries and forest products needs to be addressed to improve food security and income. Cambodians spend a large share of their income on food which makes them very vulnerable to price fluctuations. Therefore income generation through market integration and employment opportunities should be enhanced. Furthermore coping capacities need to be increased in case of external shocks caused by socio-economic crises and natural disasters.

Food and nutrition security on individual level depends on an appropriate use and utilisation of food, including intra-household distribution of food, individual health status, mother and child care, etc., which demands nutrition sensitive interventions. [CARD, 2014]

2.4. Nutrition throughout the Life Cycle

Nutrient requirements vary between the different stages of life and are especially high during growth, pregnancy and lactation, sickness and high physical activities. The nutritional status of a pregnant women is crucial for the child's development. Therefore undernourished girls/women tend to give birth to small babies with a low birth weight. Generally underweight children are more vulnerable to diseases due to a weak immune system which causes a further degradation of the nutritional status and the immune system. This vicious cycle leads to irreversible damages of the physical, mental and cognitive development. When the female child grows up and gives birth to an underweight child the intergenerational cycle of malnutrition continues. [Trentmann et al., 2015]

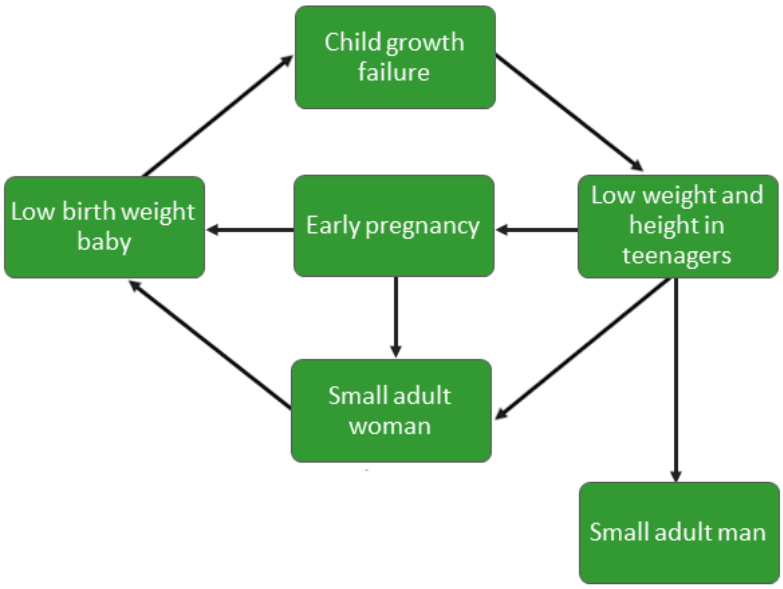

Figure 4: Undernutrition throughout the Life Cycle. Adapted from [Atwood et al., 2003]

The first 1000 days of a child's life are most crucial for the child's development and nutritional status also in later stages of life. Many nutrition interventions focus on this so called `window of opportunity´ since it provides an important entry point of breaking this circle of malnutrition. [Trentmann et al., 2015]

Another very important and often neglected target group are adolescent girls and prepregnant women. Interventions are necessary to ensure a proper family planning as well as good health and nutrition before getting pregnant. Women need to be strongly advised not to get pregnant before completing their own growth, which is usually around

20 years of age. Risks associated to pregnancy are higher in younger females especially under the age of 16. [Atwood et al., 2003]

In Ratanakiri/Mondolkiri the total fertility rate is much decreasing but it is still among the highest in Cambodia. The rate was reduced from 6.3. birth per women in 2000 to 3.3 in 2014. Furthermore median birth intervals are the shortest and the median age of first birth is the lowest compared to other provinces. More than 1/3 of girls at the age between 15 -19 have already begun childbearing which is by far the prevalence among teenaged girls throughout the country. The teenage fertility level is strongly linked with education and wealth. [CDHS, 2001; CDHS, 2015]

2.5. Nutrition Indicators

This chapter provides brief information about the nutritional status of children and women in the target area, Ratanakiri Province. To create an understanding of the importance of FNS interventions this data is considered as relevant background information even though the LANN approach doesn't intend to monitor these indicators.

Nutritional Status of Children

The Cambodia Demographic and Health survey provides data on children's nutritional status, including the prevalence of stunting, wasting and underweight.

- The height-for-age index (stunting) gives information about the nutritional condition over a long period of time. Therefore children who are stunted (-2 SD) are identified as chronically malnourished.
- The weight-for-height index (wasting) describes the current nutritional status. Wasted children (-2 SD) show an inadequate food intake or recent illness in the period just before the survey was undertaken.
- The weight-for-age index (underweight) represents acute and chronic malnutrition. Children are classified as underweight when their weight for their age is below the 2 SD. (Reference: 2006 WHO Child Growth Standards) [CDHS, 2015]

Figure 5 shows that the nutritional status of many children in Ratanakiri/Mondolkiri is inadequate, but an improvement can be seen since 2010. In those districts nearly 40 %

of the children below 5 years of age are stunted. That's the second highest stunting rate in comparison to all provinces in Cambodia. The prevalence of stunted and underweight children in Ratanakiri/Mondolkiri is much higher compared to urban areas. It was found that household's wealth and the mother's education level correlates strongly with the child's nutritional status. The prevalence of overweight is very low in Ratanakiri. Just 1.2 % of the children below 5 years of age have too much weight for height. [CDHS, 2015]

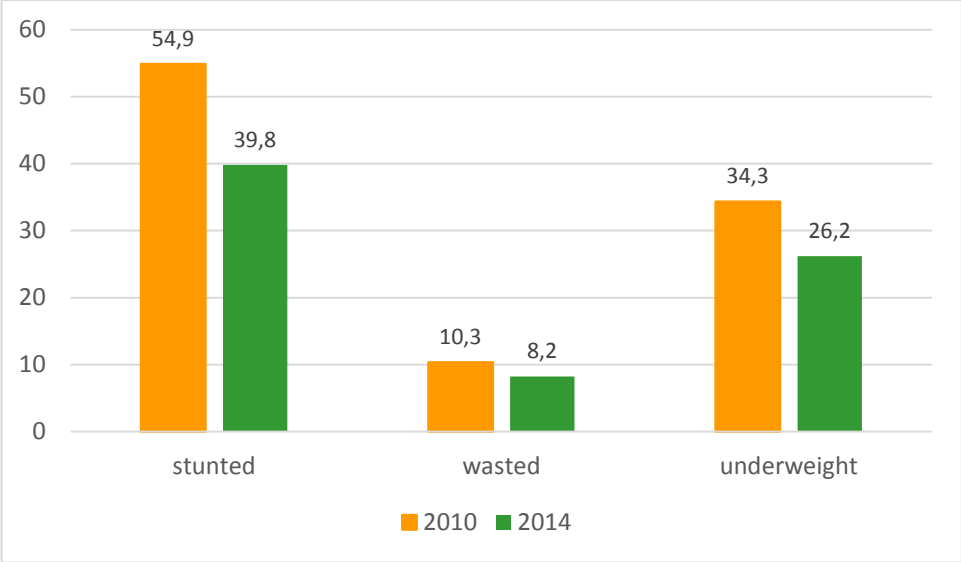

Figure 5: Percentage of Children under 5 Years classified as Malnourished in Ratanakiri/Mondolkiri. Adapted from [CDHS, 2011; CDHS, 2015]

Nutritional Status of Women

In Ratanakiri/Mondolkiri almost 17 % of the women are shorter than 145 cm, which represents a chronic undernutrition. Although the number is decreasing, it is the highest prevalence in Cambodia by far (second highest prevalence is less than 9 %).

10 % of the women have a Body Mass Index (BMI) less than 18.5, which indicates thinness or acute undernutrition. As demonstrated at the figures below the prevalence of underweight women was more than cut by half since 2010 and a rapid increase of overweight women can be observed. The prevalence doubled within five years and constitutes almost 20 %. Furthermore a shift from overweight (BMI ≥ 25 kg/m²) to obesity (BMI ≥ 30 kg/m²) can be seen. [CDHS, 2011; CDHS, 2015]

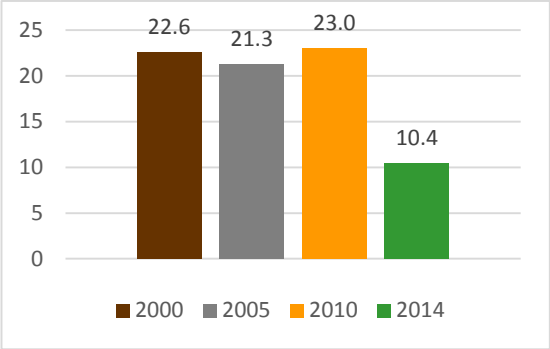

Figure 6: Prevalence of Underweight (BMI < 18.5) among Women in RTK [CDHS, 2001; 2006; 2011; 2015]

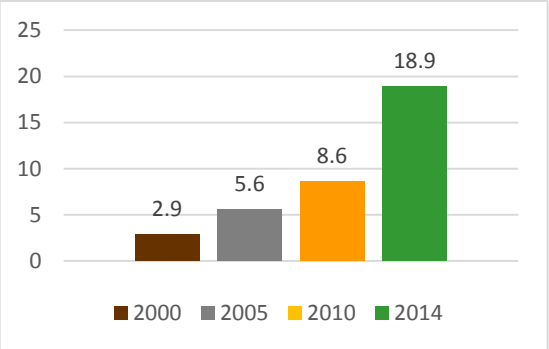

Figure 7: Prevalence of Overweight (BMI ≥ 25.0) among Women in RTK [CDHS, 2001; 2006; 2011; 2015]

The increase of overweight in South-East-Asia is higher than anywhere else, which could lead to a double burden of malnutrition. The double burden is characterised by the co-existence of high levels undernutrition and overweight. It can be defined as a prevalence of stunting of children below 5 > 30 % and overweight rate of women above 25 %. [Haddad et al., 2014] It is known that low birth weight is associated with an increased risk of adult obesity. This gets promoted by a high caloric diet which is mainly driven by an increased consumption of added sugar and fat. [Kolčić, 2012] The changes of traditional diets to energy dense processed foods is called `nutrition transition´. [Trentmann, 2015] So far the percentage of overweight women in Ratanakiri is below 25 % but it seems like the local population is heading towards a double burden of malnutrition.

Micronutrient Deficiencies and Public Interventions

Micronutrient deficiencies occur when the body doesn't receive enough essential vitamins or minerals. This can be result of an insufficient intake, absorption or utilisation of the micronutrients caused by a low dietary diversity, intestine parasites, infectious diseases, etc. [Trentmann et al., 2015]

In Cambodia the most common micronutrient deficiencies are iodine, iron, vitamin A, vitamin B9 and vitamin D. [CDHS, 2015] The LANN approach addresses dietary diversity whereby it is likely that the intervention contributes to a higher micronutrient intake. However, the approach neither intends to evaluate changes of the deficiencies through the intervention nor monitors the intake of foods rich in specific micronutrients.

- **Iodine Deficiency**

Iodine deficiency is a major public health concern which bears serious health risks. It causes goitre, cretinism, mental retardation, infertility, abortion and increases child mortality. In rural areas 80 % of mothers (of children below the age of five) and 70 % of children under five years have insufficient urinary iodine levels (below 100 µg/L), which is the prime indicator of nutritional iodine status. To reduce iodine deficiency most of the salt in Cambodia is iodised. In Ratanakiri/Mondolkiri almost 80 % of the households use iodised salt. [CDHS, 2015] However, it needs to be considered that iodine loss in salt accounts for up to 100 % depending on iodisation process, quality of salt and packaging materials, climatic conditions, moisture, food processing and storage. [WHO, 2014]

- **Vitamin A, Vitamin B9 and Vitamin D Deficiency**

As demonstrated in table 1 about 9 % of children below the age of five and 3 % of mothers in rural areas have a deficiency of vitamin A. Severe vitamin A deficiency can lead to eye damages, increases severity of infections and slows recovery. In 2009 a National Vitamin A Policy was developed which ensures a provision of Vitamin A capsules two times per year for children below the age of 2 years. Vitamin A supplementation reaches almost 50 % of the targeted children in Ratanakiri/Mondolkiri, which is the lowest rate compared to the other provinces.

1 in 5 mothers are affected by a deficiency of folic acid, which can lead to neural tube defects during pregnancy. Therefore folate supplements are provided during pregnancy and postpartum. Furthermore a high prevalence of vitamin D deficiency was found among mothers and children below five years of age. [CDHS, 2015]

Table 1: Vitamin Deficiencies of Children under 5 Years and Mothers in Rural Areas in Cambodia. Adapted from [CDHS, 2015]

	Vitamin A		**Vitamin B9**	**Vitamin D**	
	Marginal (RBP < 1.05 µmol/L)	**Deficient** (RBP < 0.70 µmol/L)	**Deficient** (< 10 nmol/L)	**Deficient** (< 70 nmol/L)	**Deficient** (< 50 nmol/L)
Children	27.9 %	8.7 %	6.8 %	32.7 %	15.3 %
Women	8.6 %	3.0 %	19.2 %	61.1 %	31.6 %

- **Iron deficiency, Anemia and Deworming**

The CDHS shows that in rural areas 2.4 % of mothers (who have born a child since 2009) and 3.1 % of children below the age of five have no iron storage (ferritin concentrations < 15µg/L). When looking at the soluble transferrin receptor it was found that 34 % of mothers and 47.9 % of children are affected by a tissue iron deficiency (sTfR concentrations >8.3 mg/L). To improve the iron status many foods and condiments such as fish sauce, soy milk, common children's snacks, etc. are enriched with iron. Furthermore iron capsules are provided during pregnancy. [CHDS, 2015]

As demonstrated in the table below anemia rates are very high among women (~42 %) and children below the age of five (~58 %). Although iron deficiency is the leading cause of anemia there are many other factors which need to be considered. A lack of micronutrients like folic acid, vitamin B12, vitamin A, as well as infectious diseases such as Malaria and intestinal parasites significantly contribute to the development of anemia. [Tolentino and Friedman, 2007] This is just one of many examples which shows that nutrition interventions need to be linked with proper health care.

Table 2: Percentage of Children under 5 Years and Women with Anemia in Ratanakiri/ Mondolkiri. Adapted from [CDHS, 2015]

	Any anemia (<11.0 g/dl)	**Mild anemia** (10.0-10.9 g/dl)	**Moderate anemia** (7.0-9.9 g/dl)	**Severe anemia** (<7.0 g/dl)
Children < 5	57.7 %	30.3 %	25.8 %	1.6 %
Women	41.7 %	34.4 %	7.2 %	0.1 %

In rural areas 1 in 5 mothers and 1 in 10 children are infected with at least one intestinal parasite. Deworming drugs (Mebendazol) is given together with vitamin A capsules to children below two years of age and to pregnant women. In Ratanakiri/Mondolkiri almost 50 % of children and 72 % of pregnant women received deworming medication in 2014. [CDHS, 2015]

Most of the interventions are based on supplementation and food fortification which mainly address symptoms and not the underlying causes of micronutrient deficiencies. To combat micronutrient deficiencies in long-term sustainable food-based approaches such as dietary diversity strategies and agriculture-based approaches are required as well as WASH interventions, treatment of parasitic infections, etc. [Shetty, 2011]

3. LANN Approach

This chapter provides information on the LANN approach implemented by Welthungerhilfe. The approach is still in its developing phase whereby overall guidelines and principals are not established yet. Although the LANN approach is already part of projects in several countries, most of the information deprives from relevant documents of South-East Asia, namely the `Toolkit for Field Teams implementing LANN in Ratanakiri´ and `LANN Conceptual Guidelines for WHH South East Asia (SEA)´.

3.1. Definition and Objectives

The LANN approach was developed by several NGOs in Lao PDR in 2009. LANN is an acronym for `Linking Agriculture, Natural Resources Management and Nutrition´. It is a community and food based approach which aims to:

- cultivate awareness,
- improve knowledge and to
- change behaviour related to nutrition at household and community level.

The training intends to increase the ability of the rural population to sustainably produce, use and utilise local food and resources for food. [Trentmann et al., 2015]

It's a more holistic approach than typical nutrition sensitive agriculture approaches, since it includes the management of natural resources in its widest sense and gains additional value due to comprehensive linkages of the FNS dimensions. The core areas of LANN collaborate towards the same goal – improving nutrition. To highlight this joint goal it's discussed whether LANN should be renamed to `Linking Agriculture and Natural Resource Management *towards* Nutrition Security´. [Molina, 2015]

3.2. Concept and Methods

The LANN approach addresses all four dimensions of food and nutrition security, namely availability, access, use and utilisation and stability. All dimensions are considered as equally important. This excludes for example food or vitamin supplementation or hybrid seeds which would increase availability but don't correspond to stability. However, LANN focuses on local resources and sustainability by strengthening self-reliance and

resilience of rural households and communities. The dimensions availability and access get improved by intensification and diversification of agricultural production, income generation for food purchases and the management of natural resources. LANN addresses use and utilisation of food by providing training on mother and child care, food processing and the promotion of nutritious locally available food. WASH, health and care aspects are not sufficiently covered within the LANN approach. Therefore it's required to create external food and non-food related linkages which affect nutrition security. These topics and linkages can be addressed by collaborating with other projects, institutions, sectors or authorities (e.g. WASH interventions, health departments, schools, traditional birth attendants, etc.).

The target group can be the local population and/or institutions to create a beneficial environment for smallholder families and communities. So far just women are targeted due to their role in the food system and the function of caretakers of children. Nevertheless it's advisable to include men and villagers of all generations to create an enabling and supporting environment for practicing new behaviour. [Molina, 2015] To achieve sustainable changes of the villagers' practices related to nutrition a long term implementation is required with a minimum duration of two years. [Krahn et al., 2014]

The training methods are based on games, images and demonstrations since most of the women have very low literacy skills. Information, education and communication materials (posters) are created for each of the training topics to visualise the key messages of LANN. For example role plays are used to raise awareness on malnutrition and the possibilities of improving food security.

Cooking classes are conducted during each of the training sessions to promote a high diversity of foods from local food sources as well as improved kitchen and food hygiene. [Krahn et al., 2014] Attracting all senses of the participants, like seeing, touching and doing themselves are defined as success factors for nutrition interventions. [Bokeloh, 2009]

Figure 8: Role Play

Figure 9: Cooking Class

3.3. Pillars of LANN

The crucial elements of the approach are the linkages of the pillars of LANN towards nutrition security, which provide an added value through its synergetic effects. The basic elements of LANN mainly cover food security aspects whereby external linkages with care, WASH and health sectors are required.

The four pillars of LANN are:

- Food consumption (=food)
- Agricultural production
- Natural resource management
- Income generation and markets

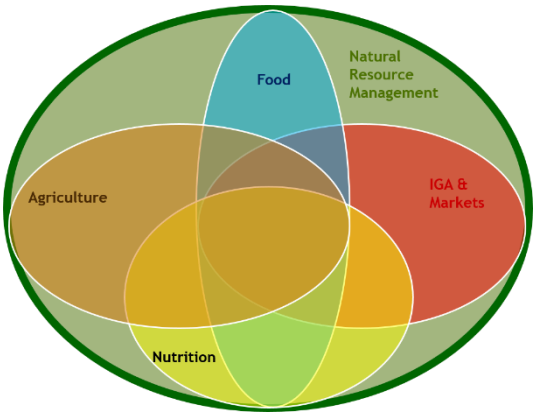

Figure 10: Pillars of LANN SEA [Molina, 2015]

A graph was developed within the Conceptual Guidelines to demonstrate the basic pillars of LANN in relation to each other (see figure 10). The importance of natural resource management is represented by the outer ring which also limits the capacity of nutritious food for production or access of food by income generation. The outer border represent also the boundary of local resources. The different activities/interventions of LANN can be assigned to corresponding areas or overlaps demonstrated at the graph. The yellow

circle `nutrition´ demonstrates the overall goal and it's connection with the pillars. Required external linkages of LANN, e.g. health initiatives, could be placed on the edge of the outer border of the circle nutrition to symbolise the connection. [Molina, 2015]
The initial situation is varying a lot between the countries whereby the approach needs to be adapted to the local context. In Cambodia and Myanmar an additional pillar was added on the topic `Mother and Child Care´ with a focus on the 1000 days window of a child. The contents of the pillars of LANN are described in the following chapters.

Food Consumption

The aim of this pillar is to increase family food and nutrient intake with a focus on diversity. Therefore nutritious food which is locally and seasonally available gets promoted in a sustainable manner. It includes training on food processing, cooking of healthy meals and snacks and storage of food to minimize nutrient loss. Furthermore post-harvest management like fermentation of excessive crops gets promoted to bridge seasonal gaps and temporary food shortages. During the cooking classes the women get sensitised to good kitchen and food hygiene. [Krahn et al., 2014]

Agricultural Production

This pillar focuses on the intensification and diversification of smallholder's agricultural production in order to diversify their diet, compensate the loss of wild food and to increase income. The members receive support and training on establishing home gardens (in dry and wet season – year round cultivation), fish ponds, animal husbandries, etc.
Nutritious and diverse crops are promoted and more efficient gardening techniques are introduced by the staff. Furthermore the members receive training on how to protect themselves from agrochemicals and in what amounts to use them in order to sustain soil quality. [Krahn et al., 2014; Molina, 2015]

Natural Resource Management

The use and management of natural resources is not limited to wild food. It includes all natural products that impact household capacity to produce, access/purchase or use food (e.g. firewood for cooking). Therefore the sustainable use and harvest of all natural resources affecting the households' food security direct or indirectly are addressed. The

NRM pillar aims to protect forests, streams, grassland and the conservation of its biodiversity. Furthermore it supports the environment in which nutritious food is produced whereby there are strong links with agriculture such as the cultivation of NTFP, fisheries management, use of agrochemicals, soil quality, irrigation, etc. [Molina, 2015]
Wild foods are an essential enrichment of the villagers' diet. Therefore awareness is created on the high micronutrient content of wild foods, which are often considered as less valuable than foods at the markets. [Trentmann et al., 2015]

Income Generation and Markets

Income generation activities (IGA) are promoted such as selling homemade dishwashing liquid, healthy snacks, etc. On the one hand this income can be used to buy food at markets and on the other hand it ensures for example access to healthcare services and education. Since cash-economy and the availability of industrialised products in remote areas are rapidly increasing training on planning of expenditures and necessary/unnecessary spending is beneficial to maximise the use of the available money. Women get advised to cut expenditures for example on sweets, snacks, soft drinks, MSG, alcohol, etc. and to choose cheaper alternatives to meat if not enough money is available such as buying protein and iron rich pulses. [Krahn et al., 2014]

Mother and Child Care

This pillar focuses on the different nutritional needs of toddlers, pregnant and lactating women. It aims to achieve an adequate diet and care of women during pregnancy and lactation without the practice of impairing food taboos and heavy workloads. Furthermore special attention is paid to the first 1000 days of a child's life (between a woman's pregnancy and her child's 2nd birthday), which is also called the window of opportunity. Exclusively breastfeeding until 6 months of age gets promoted as well as appropriate infant and young child feeding practices. Furthermore women are encouraged to visit the health centre for antenatal care at least four times and to follow advised practices around postnatal care including deworming and the control of weight gain. [Krahn et al., 2014]

3.4. Implementation in Cambodia

The LANN approach gets implemented in 30 target villages in Ratanakiri since 2010. It was integrated into the project `Advanced Livelihood and sustainable Development for Indigenous People (ALDI)´ and its follow up project called `Improving Livelihood Condition of Indigenous People in Ratanakiri Province (ILIP)´ which was operated until April 2015. Besides the LANN component these projects provided also WASH, agriculture, non-formal education and land rights interventions. However, the target groups are not necessarily the same villagers which is a weak point due to disregard of relevant synergies.

The LANN training in Cambodia follows a cascade training model. The first step of the LANN approach is to establish Food and Nutrition Women's Groups (FNWG). Out of each FNWG 2-3 peer educators (PE) get selected, who receive the LANN trainings by the INGO staff, which is also called training of trainers (TOTs). It is supposed that the FNWG members meet on a monthly basis where the PE share their knowledge with the rest of the group. Trainings in the village, either by peers and occasionally by the staff is generally called village roll out (VRO). [Krahn et al., 2014] Through this cascade concept many people can benefit from the training. In addition advices from people living under similar conditions are generally more sustainable and accepted. [Trentmann, 2015]

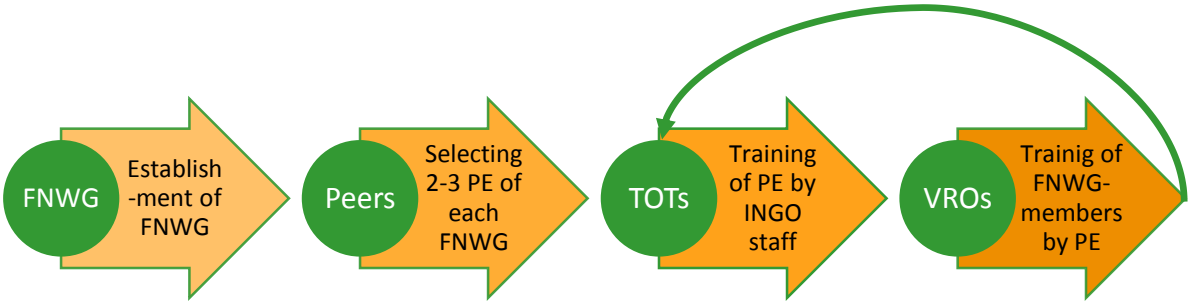

Figure 11: Training Model

The LANN Trainings are organised and facilitated by the local Project Manager, the Nutrition Coordinator and two Nutritionists, who belong to local ethnic minority groups. Although most of the recruited PE are able to speak at least basic Khmer (the national language of Cambodia), most of the trainings are supported or conducted by the indigenous nutritionists in order to avoid communication problems.

Furthermore the recipes for the cooking classes are created with support of the nutritionists. Their knowledge on local foods and food processing methods ensures that the training meets the women's needs.

FNWG were established in each of the target villages (30) with an group size of 10 – 15 members. In total there are about 210 FNWG members in Andoung Meas District and 150 members in Ta Veaeng District. So far the groups just consist of women in reproductive age (15 – 49 years) because they are primarily responsible for food production, processing, storing, etc. However, it is discussed whether men should be included to create an enabling environment for women to make sustained behavioural changes.

The trained topics cover the four basic pillars of LANN and an additional topic on Mother and Child Care. Furthermore some extra trainings for peer educators (PE) were conducted for example on the issues Women and Leadership and Basic Facilitation. [Krahn et al., 2014]

4. Description of Study Site

This chapter characterises the target area of the survey with focus on LANN related topics such as agricultural production, natural resources and nutrition.

4.1. Target Area

The survey was conducted in two districts in Ratanakiri (RTK) Province, which is located in the northeast of Cambodia. The distance to the capital city, Phnom Penh, is around 600 km. The Province borders Lao PDR on the north and Vietnam on the east and is therefore centre of the so called `development triangle´. The total Population of RTK is around 183.700 [MOP, 2013] and covers about 12.500 km². [Fox et al, 2009] RTK which literally means `the mountain of precious stones´ [Fox et al., 2009] is marked by a hilly landscape covered by forests and a growing amount of rubber- and cashew plantations and gem mines. [Ironside, 2015].

Ban Lung, the provincial capital, is surrounded by eight districts which are populated mainly by Indigenous Peoples. [Sau, 2012] Large areas in the province are still uninhabited whereby settlement and land use is concentrated along main roads, centres and the Sesan and Srepok River. [Ironside, 2015]

The climate can be described as tropical and is classified in the two distinct seasons `wet´ and `dry´. The monsoon season begins in May or June and lasts until October or November. [Fox et al., 2009]

The LANN approach was implemented by Welthungerhilfe and its local Partner-Organisation in the districts Andoung Meas and Ta Veaeng, which are highlighted on the map below. To measure the impact of the LANN-training the same districts and villages were selected as study sites.

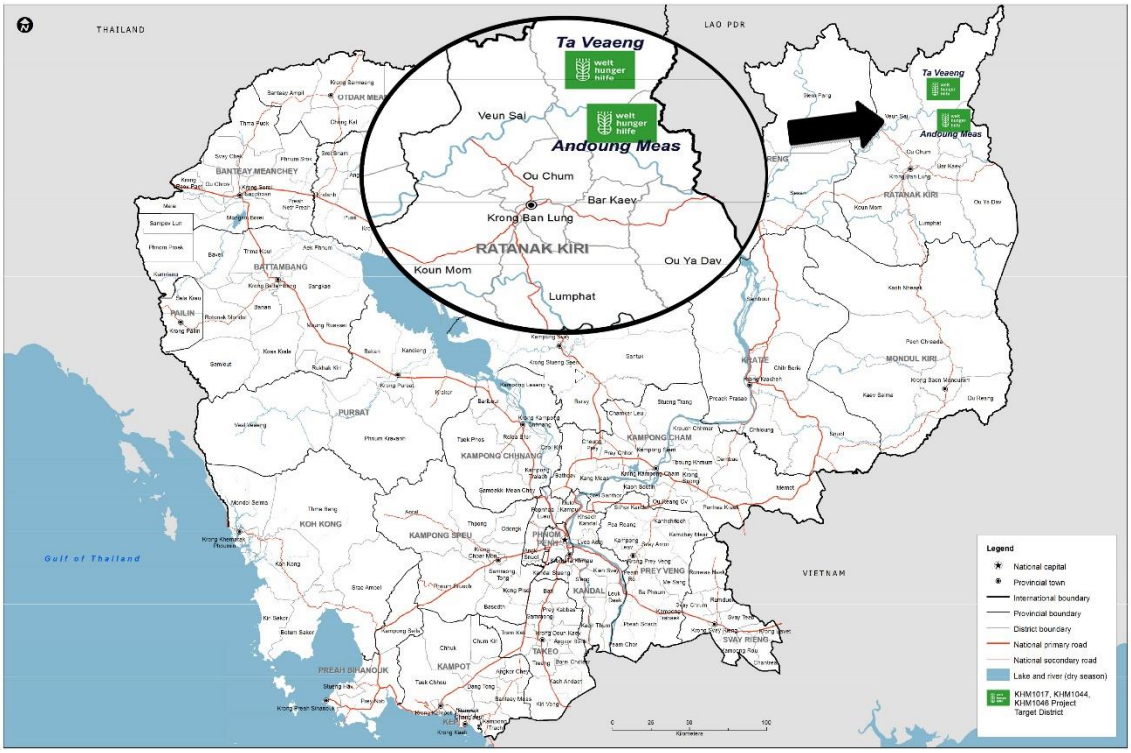

Figure 12: Target Area [Krahn et al., 2014]

4.2. Sociodemographic and Economic Background

This chapter provides information on the marginalised ethnic minority groups located in the target areas and their livelihood. Furthermore the immense impact of the establishment of plantations on the indigenous peoples due to economic land concessions is highlighted.

Indigenous Peoples

About 1 to 2% of the Cambodian population belong to the so called Indigenous Peoples (IPs) or Ethnic Minorities. There are 24 different groups of IPs in Cambodia, whereas most of them are resident in the Northeast. [Mikkelsen, 2014]

In Ratanakiri 75% of the population are IPs, who mainly belong to the ethnic groups Tompuonn, Charay, Kroeung, Kachak and Praov. [Sau, 2012].

Table 3 demonstrates the composition of the ethnic groups in the two target districts. Furthermore it demonstrates that the Khmers (the major ethnic group in Cambodia) are rarely present in these districts.

Table 3: Indigenous Peoples located in the Target Districts. Adapted from [NCDDa, 2009; NCDDb, 2009]

Ethnic group	Number of people in 2008	
	Andoung Meas	**Ta Veaeng**
Tompuonn	1.544	2
Charay	5.413	0
Kroeung	3	880
Kavet	0	6
Lun	0	116
Kachack	2.409	4
Praov	273	4.883
Khmer	97	0
Laos	468	0
Total population	**10.207**	**5.891**

Each of the ethnic groups speak their own tongues even though there is no written form of their languages. The history of the several groups is expressed in myths, legends, songs and stories which are passed to younger generations by the elders. [Thomas et al., 2013]

Due to the marginalisation of IPs and very little school education most of the IPs are not able to communicate in Khmer, the national language of Cambodia. [Riddell, 2006]

The percentage of people who have no school education in RTK is the highest in Cambodia by far. [CDHS, 2015]

In Ta Veaeng (TV) the proportion of children aged 6 – 11 years who are not enrolled in school is almost 60 % and in Andoung Meas (AM) with 70 % even higher. Interestingly in AM the enrolment of girls is higher than of boys whereas in TV it is inverse. Due to the little education 75 % of the villagers in AM and 65 % of the villagers in TV between the ages of 15 – 60 years are illiterate whereas younger people are more likely to be literate than elderly. In TV a higher proportion of illiterate women compared to men was determined. [NCDDa, 2009; NCCDb, 2009]

The poverty rate amongst IPs is generally higher compared to the Khmers. [Mikkelsen, 2014] The main reasons of the impoverishment are expropriation of their land, reduced access to forests and natural resources as well as limited cultivation fields, which hinders

the villagers to practice their traditional shifting cultivation technique. Although traditionally villagers in RTK are unaccustomed to cash economy [Sau, 2012] money is becoming increasingly important in order to compensate the loss of natural resources. [Erni, 2015] A raise in the significance of motorbikes, telephones and television even in the remote areas of RTK can be observed. [Ironside, 2015] Already many families own a motorbike [Fox et al., 2009] and in TV and AM around 10 % of the households own a TV, indicating a strong increasing trend. [NCDDa, 2009; NCCDb, 2009]. This transformation is significantly changing the lifestyles of the IPs. However, most of the IPs still live without running water or electricity. [Ironside, 2015]

Livelihood

The livelihood of IPs in Ratanakiri mainly rely on agricultural production, such as rice and cash crop cultivation as well as livestock production. Furthermore the collection of non-timber forest products (NTFP) is an essential part of their livelihood. A new source of income which is strongly increasing is employment, especially on rubber plantations. [Men, 2011] In AM about one third of the villagers earn cash from nearby plantations, though in TV it's just around 10%. However, most of them work on the plantations just in off-farm seasons or in case of urgent need for money. [Neth et al., 2014]

Especially elderly villagers who are used to autonomous family-scale farming consider work in private companies as forced labour and a restriction of their freedom. [Leuprecht, 2004] Nevertheless, a shift from a self-sufficient subsistence livelihood to an employment dependent labour force among IPs can be observed. [Scheidel et al., 2013]

In recent years livelihoods became more diverse due to the cultivation of cash crops and the employment at concession companies. Land loss and market integration can be seen as the main drivers of the livelihood changes. In addition, education and mainstream media cause changes of values and views which have an impact on the livelihood preferences especially of young people. [Erni, 2015]

However, around 70 % of the villagers in AM and TV just have one or two sources of income, which makes them more vulnerable in case of harvest loss and unsteady or deficient income generation activities. [WHH and CEDAC, 2013]

In the target districts the average yearly income is approximately $ 925, excluding non-cash income such as collected NTFP, home grown vegetables, raised animals, etc. [Neth et al., 2014] About 50 – 60 % of total expenditure is spent on food items. [NORDECO, 2010; Schelzing, 2014] This proportion is especially high among the poor. Hence they are more vulnerable to food price inflation which bears the risk of food shortages. [CDRI, 2008] Other significant expenses arise from health care services or medication, social events, clothes and materials for agriculture [Neth et al., 2014] as well as petrol, mobile phones and education. [Ironside, 2015]

Problems affecting livelihood conditions

Table 4 shows that natural disasters are the greatest problem affecting livelihood. The high impact of natural disasters on villagers' livelihood in Ta Veaeng can be explained by floods which are recurring every year due to power dams in the upper Mekong region. Furthermore epidemic diseases and land conflict including access to NRM are considered as main problems.

Table 4: Main Problems affecting Livelihood Conditions. Adapted from [Neth et al., 2014]

Problem	Andoung Meas	Ta Veaeng
Natural disasters (flood, drought, land slide)	64.4 %	90.2 %
Epidemic diseases	46.6 %	53.8 %
Conflicts over land and NRM access	49.3 %	32.7 %
Decline or loss of livelihood sources	54.8 %	38.5 %
Competing with new skills and knowledge of in-migrants	27.4 %	7.7 %
Rapid economic development	31.5 %	17.3 %

Economic Land Concessions and its Impact on IP's Livelihood

Currently Ratanakiri Province is experiencing a lot of changes. In 2004 the Cambodia-Laos-Vietnam Development Triangle Area was decided, in which RTK plays a major role. The main targets of the Development Triangle are to improve economic growth and to reduce poverty. [Sau, 2012]

This seems to be promising for Ratanakiri, as it is the third poorest province in Cambodia, according to the Country Poverty Analysis in 2014. [Schelzig, 2014]

On the one hand the establishment of an economic hotspot brought benefits to the province like an improved infrastructure and the creation of jobs. On the other hand economic land concessions (ELCs) cause deforestation due to the plantation of monocultures like rubber, cassava and cashew. Furthermore ELCs are often related to land grabs which influence the livelihood of the indigenous peoples dramatically. Due to the history of the Khmer Rouge regime until 1979, which deprived the population of all private ownership, there is a widespread lack of land registration and titling. According to the 2001 Land Law IPs can request a communal land title for residential and agricultural land. [Subedi, 2012] The first communal land title in Cambodia received a village in Ratanakiri in December 2011. [OHCHR, 2011] However, until 2013 only eight communities out of 400 received a land title. [Mikkelsen, 2014, p.292]

According to the Human Rights Organisation `LICADHO´ there are already 273 ELCs granted with a total amount of 2.119.082 hectares, which accounts for 11.7 % of the total area of Cambodia. [LICADHO, 2015] In 2012 the area of ELCs was 1.204.750 hectares, so the extent of ELCs doubled within only 3 years. [MAFF, 2012]

Figure 13 shows the Ownerships of Land Concessions in Cambodia. It can be seen that in Ratanakiri the majority are Vietnamese or Cambodian companies, which mainly produce rubber. [LICADHO, 2015]

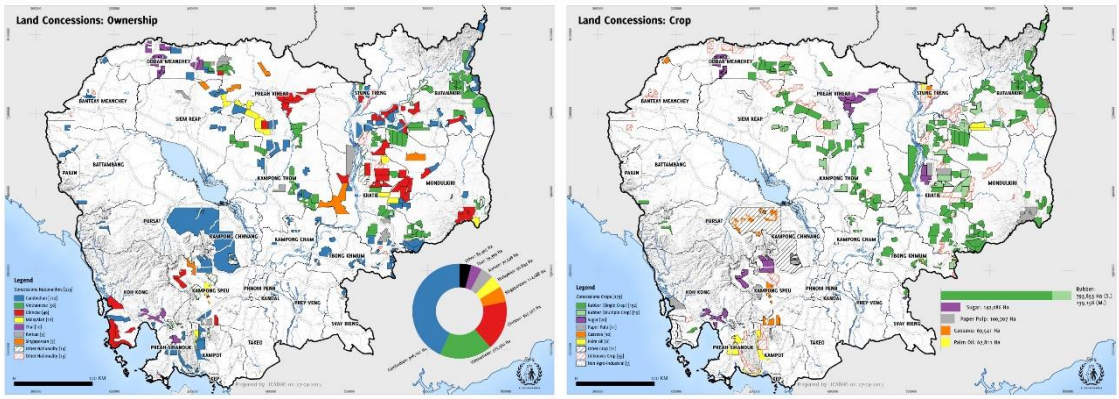

Figure 13: Ownership and Crops of ELC [LICADHO, 2015]

Impact of ELCs on Indigenous Peoples

By giving land to investors livelihood and nutrition security of IPs, which is mainly based on agriculture and natural resources, get threatened in many aspects. ELCs enormously impair the interventions of LANN which demands the inclusion of land rights as an extensions to the approach.

- **Destruction of Environment**

Deforestation is immense throughout Ratanakiri Province, which leads to a reduction of biodiversity and the degradation of wildlife species. [Subedi, 2012, p.47-57]

Furthermore it has a crucial impact on the livelihood, spiritual and cultural life of IPs. Availability of NTFPs decreased dramatically due to deforestation. In addition villagers are not allowed to access the remaining forests which are occupied by the companies. Therefore ELCs cause a shortage of income, food, medical plants and construction materials. [Men, 2011]

A survey from 2014 shows that the annual environmental income of a village affected by ELC is decreased by around 25 %. Furthermore the distance to the forest is increased by 20 – 26 %. [Jiao et al., 2015] The greater distance to the forest leads to a more time consuming and exhausting walk for the villagers, who are carrying a heavy basket on their back when going into the forest. In addition villagers claim that water gets polluted because of the pesticides used by the companies. [Men, 2011] Subsequently these impacts result in a negative effect on health and nutritional status. [Riddell, 2006]

The figure below shows the forest density in 1973 compared to 2014.

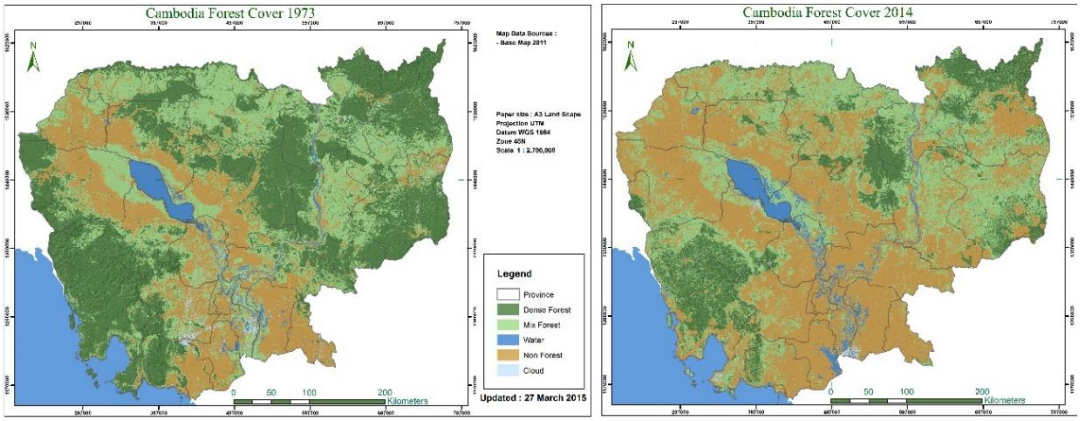

Figure 14: Forest Cover 1973 vs. 2014 [Open Development Cambodia website, 2015]

Besides the already mentioned negative effects of deforestation, it is also one of the main man-made reasons for climate change. Reports show that climate change already threats agricultural production and food security due to changes in rainfall, temperatures and availability of water. [Moul and Seng, 2012]

- **Land Grabbing and Relocation**

Land grabbing is a great concern especially in Ratanakiri which seriously affects livelihood of ethnic minorities. [Moul and Seng, 2012]

Usually companies give the villagers three options for compensation. The first option is to sell their land for around $ 200 per hectare. Second, villagers plant rubber (or other cash crops) on their land whereas the company gets half of the harvest or third, villagers are resettled, mostly far away from their community. Since villagers are persuaded to take the first option, it is the most frequent one. Sometimes villagers are even forced to accept the company's offer or have no choice because their land has already been cleared. In a focus group discussion (FGD) conducted in Mondolkiri and Ratanakiri in 2011 just 16 % of affected villagers stated to have received a compensation of the company. Although few villagers received a compensation it is usually not enough to buy new farmland in the community. Land grabs mainly affect the shifting cultivation land, which can cause a reduction of rice yield by 60 – 70 %. [Men, 2011, p. 27]

In addition land loss results in a decrease of livestock holdings by 50 % due to a shortage of grazing areas. [Jiao et al., 2015]

- **Employment**

The creation of jobs is mostly below expectations [Subedi, 2012, p.47-57] and is not necessarily beneficial for locals as workers are often brought from other provinces. The salary of $ 1.25 to $ 2.50 per day is quite low and there is no guarantee of a fixed monthly income. [OHCHR, 2007] Commonly farmers are not adapted to the new farming techniques and have difficulties to communicate in Khmer or other languages with the company staff. Labour conditions on the plantations are assumed to be below domestic and international standards. [Subedi, 2012]

According to the results of the FGD just 24 % of the participants are willing to work for a concession company. The main reasons for not working for the companies are `hard work with no freedom´, `being too angry for taking their land´, `too little salary and competition with in-migrant workers´ and `health issues´. [Men, 2011]

- **Loss of Culture and Traditions**

Shifting agriculture, NTFP collection and spirit forests are the main traditional practices of IPs which are all heavily impaired by ELCs. [Men, 2011]
Even spirit forests and temples, where villagers pray for peace, prosperity and rainfall, are destroyed by ELC companies. Furthermore, the communities are less isolated due to the influx of in-migrant workers, which impacts IPs culture and tradition. [Subedi, 2012]

- **Safety Concerns**

Since the new presence of `outsiders´, who are working on the plantations, concerns increased related to robbery, theft and physical violence including rape. Women report to build groups when going into the forest instead of moving alone like before. Furthermore there is armed personnel to protect the concession companies. Cases of violence and shootings which even result in death are reported. [Subedi, 2012]

Land concessions only benefit a minority [Subedi, 2012] and there are no indicators that ELCs reduce rural poverty in directly affected villages. [Scheidel et al., 2013]
Quite the contrary shows a survey in which ELCs cause a decrease of household income by 15 – 19 %. [Jiao, 2015] Furthermore over 90 % of the participants of the FGD in Ratanakiri and Mondulkiri claim that the concessions have brought no economic benefit. [Men, 2011] Also 59 % of the villagers and 41 % in TV reported to experience negative impacts on livelihood due to ELCs. [Neth et al., 2014]
Because of the predominant negative effects on smallholders, concerns are raised that `The governmental development policy bears the risk to foster 'getting rid of the poor' rather than 'getting rid of poverty'´. [Scheidel et al., 2013]

4.3. Agricultural Production

Agriculture is the primary occupation of the villagers whereat rice farming is the most common agricultural activity. However, there is rapid transformation of subsistence agriculture to a market oriented agriculture due to better road connectivity and market accessibility. Therefore rice cultivation is (partly) replaced by cash crops like cashew nut, cassava and rubber. [Li et al., 2014] In addition livestock is raised by the majority of the villagers. [NCDDa, 2009; NCDDb, 2009]

Rice Cultivation

More than 90 % of the HH in AM and TV grow rice [NCDDa, 2009; NCCDb, 2009] which is primarily used for family consumption, though some sell a part of their rice to traders. [El-Noush, 2010] The size of the rice field is on average about 1 ha per family. [WHH and CEDAC, 2013]. Wet rice cultivation is predominant in this area due to inappropriate irrigation systems. [Neth et al., 2014] Thus, the main harvesting time starts in November, which represents the end of the rainy season. [CDRI, 2008]

The cultivation technique which is used by most of the IPs in Ratanakiri is the so called swidden agriculture. This traditional technique is also known as shifting cultivation or slash-and-burn farming and it represents cultural identity and fire relatedness. [Li et al., 2014] Therefore bushes and trees get cut, dried for a few months and burned afterwards. The ashes provide the soil with important nutrients, which increase fertility. [Andersen et al., 2007] After four to six years the fields are rotated so that the fallow fields can regenerate nutrients. [Moul and Seng, 2012]

The agriculture technique is closely related to local belief. Before clearing the forest the villagers are asking the gods to offer them that land and are waiting for signs like a good dream or an animal's cry. In case of a bad dream, the villagers search for a different location. Furthermore three Rice Ceremonies are conducted to call the gods to protect their property, thank them for the harvest and ask to provide sufficient food in the next year. However, a trend of moving away from their traditional belief can be observed. [Hor et al., 2014]

Due to increasing land pressure, fallow land has been much reduced whereby the practice of swidden agriculture gets increasingly impaired and instead of rotating fields many farmers are now rotating crops like rice, cassava and soybeans. Fertility is attempted to be maintained by avoiding to plant the same crop for too many years. [Ironside, 2015]

Vegetable and Fruit Production

Most of the villagers grow vegetables for their own consumption in their upland rice field, especially during rainy season. An average household plants about 4-5 kinds of vegetables within one year. Common crop species are cucumber, sesame, gourd, pumpkin, mung bean, sweet potato, cassava, maize, long bean, eggplant, chili, ridge gourd and sponge gourd, morning glory, cabbage, onion, etc. [Hor et al., 2014; NORDECO, 2010] Furthermore nearly 90 % of the HH own fruits trees with mainly 1-4 different types of fruits whereat the yield is reported as extremely low. [WHH and CEDAC, 2013]

Cash Crop Production

Recently a shift from rice cultivation to the production of cash crops like cashew nut, cassava and rubber an be observed due an improved access to markets. [Li et al., 2014] Farmers who cultivate cassava earn around $375 - $1.500 per hectare, which is quite attractive for them. [Ironside, 2015] An internal baseline study in 2013 found that almost 80 % of the villagers in AM and TV plant cash crops like cassava and cashew on a surface of mostly less than 1 ha. [WHH and CEDAC, 2013]

However, market-oriented production is more risky due to fluctuating prices. Thus some farmers prefer to grow sufficient rice instead of cash crops to reduce the dependency on the market. [Erni, 2015]

Livestock

Among the IPs animals are mainly raised for consumption as part of religious ceremonies and to make sacrifices for gods. Selling animals is quite rare and the amount which is sold quite small (e.g. two pigs per year). [Ironside, 2015] Although the market for animal

products is rising, most villagers are not disposed to raise livestock for selling. [Neth et al., 2014]

In Andoung Meas and Ta Veaeng about every second family raise cattle or buffalo with an average of two cattle per family. Around 75 % of the families raise pigs and chickens, though most of the families own less than three animals of these species. Fish raising among the villagers is quite rare. Just 1 % of the families in TV and 2 % of the families in AM were raising fish in 2008. [NCDDa, 2009; NCDDb, 2009]

Use of Agrochemicals

The application of agrochemicals like chemical fertilisers, pesticides and herbicides has been rapidly popularised. Agrochemical are used by farmers to increase crop production and maintain high levels of crop yields. However it adversely impact human health and threatens the sustainability of land use and ecosystem. According to a survey conducted in a village of Kampong Cham province in 2013 all farmers applied agrochemicals on their rice- and vegetable fields. [Pin and Mihara, 2013]

Agrochemicals are often used inappropriate regarding timing, frequency, concentration and type of products. Safety measures are frequently ignored or misunderstood by the farmers. Furthermore the labelling is often inadequate, can't be read by illiterate villagers or are even written in foreign languages. [EJF, 2002]

Organic farming practices would be advisable to improve soil condition and crop yields. However, most farmers claimed that organic fertilisers and pesticides are less effective than agrochemicals. [Pin and Mihara, 2013]

4.4. Natural Resources

Besides agricultural production the livelihood and food security of the rural population heavily depend on natural resources such as Non-Timber Forest Products (NTFPs), wild foods, wood and timber. [Sau, 2012]

Non-Timber Forest Products

NTFPs like rattan, resin, medical plants etc. are used directly by the local population or are sold at the markets. [Sau, 2012] These products, especially resin [Andersen et al., 2007], are an essential source of income for nearly all indigenous families (96%), yielding on average $115 per year. [Men, 2011] Natural resources are declining dramatically, which can be explained by a growing population, exploitation of land and forest resources and large scale economic development projects. [Neth et al., 2014]

Wild Foods

Wild foods are a major part of the villagers' livelihood and food security since these foods constitute a certain extent of their diet. Vegetables, bamboo shoots and mushrooms are collected from forests, riverbanks and fallow areas. Wild fish and animals such as squirrels and rats are trapped or hunted with traditional weapons and are primarily used for family consumption. [Ironside, 2015] Wild foods enrich the villagers' diet since they provide a great amount of micronutrients and are essential to achieve a high dietary diversity. [Bharucha and Pretty, 2010] Furthermore families who sell wild meat and fish get an average income of $151 per year from this activity. [Men, 2011]

However, wildlife is threatened by the clearance of forests for the establishment of monoculture plantations. Also the long period of war had a strong negative impact on wildlife. [Ironside, 2015] In the case of wild fish unsustainable harvest seems to be the biggest threat to its population. [Bharucha and Pretty, 2010]

Wood and Timber

Wood and Timber cutting and selling belongs to the top five income generation activities in AM and TV and is operated by about one third of the villagers. Partly this is tolerated by local patrons, who control logging activities. Sometimes they allow IPs to secure their earnings at least for daily expenses. [Neth et al., 2014]

4.5. Nutrition

This chapter gives information about the villagers' diet and food taboos to get an understanding about the nutrition situation in the target area.

Food Sources

Agricultural products and wild foods from forests, streams and fallow land are the main food sources traditionally. Recently an increasing dependency on markets can be seen due to scarcities of agricultural land, shift to cash crop cultivation, loss of wild foods and labour on plantations. [Ironside, 2015] Access to foods at markets helps to bridge minor seasonal food shortages and to prevent severe food scarceness. [Erni, 2015]

However, the distance to larger markets is a big concern. Village markets and mobile traders are crucial for villages which are far away from the larger district market. Village markets usually sell toiletries, snacks, vegetable oil and sometimes vegetables. If the distance to larger markets is big, they mostly sell eggs, fish and meat too. Mobile traders are coming with motorcycles to most of the villages which don't sell fresh food items like vegetables or meat. The prices are about 10-15 % higher than at the district market. Women have a dominant role at food markets as buyers and sellers. It could be found that more than 90 % of the traders are women. [El-Noush, 2010]

Diet

The most common type of daily diet is rice with vegetables and meat or fish (AM: 53.4%, TV: 71.2 %) or rice with just vegetables (AM: 43.8 %, TV: 25.0%). Nearly all of the villagers report to have three meals per day. [Neth et al., 2014]

Dietary diversity is assumed as very low whereby studies show different results. According to a national survey conducted in June 2008, almost 20 % of the households in rural plateau areas show a borderline food consumption [CDRI, 2008] whereat the baseline survey in March 2010 classifies more than 50 % of the households in the target districts as poor or borderline. The investigation at varied months might contribute to the great differences in their findings. The villagers are experiencing a deficit of rice for almost three months per year, which occurs mainly between April and September. However,

the most food insecure period is from February to May, which means that during this time there is a general shortage of food. Villagers report that their most common coping strategies during this time is to rely on less preferred and less expensive food and also to reduce the amount of food eaten in a day. [NORDECO, 2010]
Furthermore in times of rice shortages and food scarcities rice gets supplemented or replaced by cassava, corn and sweet potatoes and eaten with just garlic, chilies and salt or monosodium glutamate (MSG). [Fisher and Sykes, 2002]

- **Staple Food**

Rice is the most important food item in daily diet which is eaten almost three times per day. It provides about 70 % of total caloric intake [CDRI, 2008], 35 % of protein and 32 % of iron intake per capita. [IFReDI, 2013]
Although almost all of the villagers grow their own rice, they have to buy rice in case the harvest is not enough. Rice is cheaper than other foods at the market but prices are rising which affects especially the poor. Tubers like sweet potatoes, taro and cassava are eaten just about once a week. Also pulses, which provide valuable vegetal protein, are consumed less than once a week. To increase the consumption of this source of protein would be beneficial especially when animal protein intake is low. [CDRI, 2008; NORDECO, 2010]

- **Vegetables and Fruits**

Vegetables are consumed on about five days a week and therefore the second frequent consumed food group. According to the baseline survey in 2010 the frequency of wild vegetable intake is almost twice as high as the consumption of domestic vegetables.
Fruits are consumed just once within two weeks which demonstrates a very low fruit intake. The most common fruits are banana, mango, papaya, jackfruit and oranges. [NORDECO, 2010]

- **Fish, Meat and Insects**

Fish is a very important component of the villagers' diet. In the mountain areas 70 % of animal protein intake derive from fish, just 24 % come from meat and 6 % from poultry.

Furthermore fish provides about 25 % of fat intake and around 37 % of iron intake, which has a high bioavailability. Although the lowest fish consumption can be found in the mountain areas, fish and fish products are eaten more often than meat. According to the Ministry of Agriculture, Forestry and Fisheries the average fish consumption in this region is about 140 g per person and per day. [IFReDI, 2013]

However, the baseline survey shows that in the target districts fish is consumed on just about two days per week. The frequency of fish consumption is almost three times higher than meat intake, which is just consumed about once a week. [NORDECO, 2010]

Fish and also crabs and frogs can be caught from lakes, raised in ponds or rice fields and purchased at markets. The prices are usually cheaper compared to other animal products. In the rural plateau about 70 % of fish was purchased, 30 % derived from fishing/gathering and just 2 % from own production in 2008. [CDRI, 2008]

Fresh fish and preserved fish, especially fermented fish paste known as `Prahok', plays a big role in the villagers diet. Cambodia has a long tradition of processing freshwater fish into products like fish paste, dried/salted/smoked fish and fish sauce. [FAD, 2011]

Insects are a part of IPs diet in Ratanakiri Province, but they are just consumed in small amounts due to lack of effective trap techniques. Therefore Annâdya Project funded by the EU is developing cricket breeding techniques which are more economic and time efficient. The continuous supply of insects enables an enhancement of the villagers' protein intake. However, this method isn't widely used so far. [Megido et al., 2015]

- **Oil, Milk and Sugar**

Vegetable oil is used for cooking on average on 2 - 3 days per week. [NORDECO, 2010]

Milk consumption, except sweet milk, is almost not present in rural areas. The intake of milk is part of an urban lifestyle, where consumption is much higher. [CDRI, 2008]

The intake of sugar is still quite low, but an increase can be expected in near future due to a higher availability and better access of industrialised products like sweets, soft drinks, etc. [NORDECO, 2010]

- **Condiments**

The most common condiments in Cambodia are salt, soy sauce, fish sauce, monosodium glutamate (MSG) and Prahok (fish paste). [CDRI, 2008]

MSG used to be blamed for the `Chinese Restaurant Syndrome´ causing headache, flushing, nausea, etc. in sensitive individuals. However, the Food and Drug Administration (FDA) is considering the addition of MSG to foods to be `generally recognized as safe´ (GRAS). The described effects can't be confirmed by the FDA and also the Federation of American Societies for Experimental Biology is stating that MSG is safe. [FDA, 2012]

Infant and Young Child Feeding Practices

There are several recommendations of WHO and UNICEF about infant and young child feeding (IYCF), such as early initiation of breastfeeding within one hour of birth, exclusively breastfeeding for the first six months of life and the introduction of nutritionally-adequate and safe complementary foods at six months in combination with continued breastfeeding up to two years of age. [WHO, 2015]

In Ratanakiri/Mondolkiri nearly all children born in two years preceding the CDHS in 2014 were breastfed at some point of time. However, just 16 % of the children were breastfed within one hour of birth and about 3/4 were breastfed within one day. In Cambodia only 65 % of children under the age of six months are exclusively breastfed. In contrary to the recommendations the mean duration of breastfeeding is 4.5 months with a decreasing trend.

About 3/4 children begin eating complementary foods at the age of 6-8 months in Cambodia. When looking at the IYCF indicators minimum dietary diversity (≥ 4 food groups)[2] and minimum meal frequency[3] it was found that in Ratanakiri/Mondolkiri less than 50 % of children aged 6-23 months respectively fulfil these recommended minimum levels.

[2] Minimum dietary diversity: 7 foods groups were used for the calculation of this indicator: 1. grains, roots and tubers, 2. legumes and nuts, 3. dairy products (milk, yogurt, cheese), 4. flesh foods (meat, fish, poultry and liver/organ meats), 5. eggs, 6. vitamin-A rich fruits/vegetables, 7. other fruits/vegetables [WHO, 2010]

[3] Minimum meal frequency: breastfed children aged 6-8 months: 2 times, 9-23 months: 3 times; non-breastfed children aged 6-23 months: 4 times. [WHO, 2010]

Furthermore in Cambodia only 37 % are continued breastfed until the age of two years. More than 1/3 children (12 – 23 months) are fed with a bottle and the trend is increasing. Typical foods given in bottles are formula, sweetened condensed milk or other canned milk thinned out with water and very watery rice porridge. [CDHS, 2015]

Food Taboos

Food taboos are unwritten social rules that impact human social life and might also contribute to manage the local natural environment. [Colding and Folke, 1997]

Restrictions mainly occur during certain phases of the human life cycle, like childhood, pregnancy, childbirth and lactation. The reasons for food taboos are very complex and the restrictions can persist for a very long time. [Meyer-Rochow, 2009]

The food taboos are mostly promoted and enforced by elderly villagers. Younger people may break taboos if they are certain that nobody sees them. In case they get caught they usually have to pay a fine in order to compensate the provoked bad luck for the village. The types and reasons of food taboos differ between villages and also between families. Superstition and the protection of human health seem to be the most common reasons for food taboos among Charay and Kroeung minorities. [Fisher and Sykes, 2002]

Many of the restrictions to not seem to have a health related scientific explanation, while in some cases the threat to a person's health might be obvious. For example pigs are hosts to sickness causing parasites which could explain the common food taboo of pork. Another example is the widespread taboo of snakes (see chapter 6.4.), which might be restricted due to their dangerousness which outweigh their nutritional value. [Meyer-Rochow, 2009]

The following tables show the food taboos of the two ethnic groups Charay and Kroeung during different steps and situations in life.

- **Family Foods**

Table 5: Food Taboos on Family Foods. Adapted from [Fisher and Sykes, 2002]

	Charay	**Kroeung**
Food Taboos	Beef, parrot, pork, bull frog, forest lizard, cow-like animal from forest	Wild chicken, wild bamboo shoots, pumpkin

Consequence	Fever, skin lesions, pain all over the body Buffalo sacrifice is required to remove the symptoms	Leprosy and other skin diseases

- **Children**

Table 6: Food Taboos for Children. Adapted from [Fisher and Sykes, 2002]

	Charay	**Kroeung**
Food Taboos	All children: certain type of fish (skan fish), sour foods, ripe banana, ripe papaya, mouse, musk melon, lemon	Children starting to eat solid food should not be given mouse, eggs, catfish or wild pig All children: ripe papaya, sweet foods, chicken, pig fat
Consequence	Infection and death (fish) Itch, recurrence of fever	Recurrence of illness (cold)

- **Pregnant Women**

Table 7: Food Taboos for pregnant Women. Adapted from [Fisher and Sykes, 2002]

	Charay	**Kroeung**
Food Taboos	Tortoise, eggs, certain insects, red muntjac, sander pangolin, skan fish, sweet potatoes, taro, green jackfruit, sugar cane	Tortoise, egg, catfish, crab, shrimp, bamboo shoots, sambour (Khmer vegetable), certain insects, jackfruit, green banana, oil
Consequence	Difficult delivery, uterine prolapse, severe bleeding, retained placenta	Difficult delivery, uterine infection

The taboos for pregnant women are also meant to protect the health of the women and their offspring and to ease the delivery. Unfortunately the restricted foods are often high in important nutrients which would be very beneficial during pregnancy. [Meyer-Rochow, 2009]

Especially food rich in protein like eggs, fish or meat and foods which provide extra energy like oil get restricted during pregnancy. Nutrition advices should be given carefully. Women are afraid of a difficult birth and therefore prefer to deliver a small baby although they are less likely to survive. Instead of promising a big baby the messages should be focused on increasing strength for delivery. The mentioned consequences like uterine prolapse and infection can be explained by a high fertility rate of women in this area and poor hygiene during and after delivery. [Fisher and Sykes, 2002]

- **Newly delivered Mothers**

Table 8: Food Taboos for newly delivered Mothers. Adapted from [Fisher and Sykes, 2002]

	Charay	Kroeung
Permitted food	First 5 days only rice with salt (eventually green leafy vegetables)	First 5 to 15 days only rice with salt and ginger (some women) Others: rice with fish, dry pork, chicken or banana flower
Food Taboos	Most meat (incl. pork), skan fish, certain mushrooms	Most meat (incl. pork), catfish, eggs, pumpkin, cucumber, bitter melon, string beans, ripe papaya
Consequence	Uterine infection, reduced amount of breast milk Breastfed infant will become upset stomach and diarrhea	Uterine infection, breastfed child will get a rash

Many women are giving birth in the village with support of Traditional Birth Assistants (TBAs). Usually they also give advice on food taboos whereby TBAs should be targeted for nutrition education to reduce the restriction of nutritious foods. [Riddell, 2006]

- **Sick People**

Table 9: Food Taboos for sick People. Adapted from [Fisher and Sykes, 2002]

	Charay	Kroeung
Permitted food	Porridge, sugar cane, fried fish, fried chicken, soup with vegetables	Rice with fish, squirrel, chicken, kateiv leaves
Food Taboos	Papaya, ripe banana, sour foods (i.e. sour mango, tamarind), musk melon, cucumber, water melon	Ripe banana, ripe papaya, jackfruit, sugar cane, food that smells bad, chicken (if patient has a cold)
Consequence	Recurrence of the illness	Recurrence of the illness

Food taboos doesn't only regulate human social life it also manage local natural environment. To protect certain species can also be a reason for taboos. It could be found that in general about 30 % of the taboos belong to threatened species according to the International Union for Conservation of Nature. [Colding and Folke, 1997]

Also the fact that some food taboos in Ratanakiri differ from village to village could be a result of ecological necessity. Generally food taboos are similar within certain groups, which support the togetherness and confidence of a group by representing uniqueness. [Meyer-Rochow, 2009]

4.6. Health Care

The health status of the IPs in Ratanakiri is much poorer compared to Khmers. The reasons for this are rather bad access to healthcare due to poverty, geography and cultural factors than social marginalisation. [Heineke and Edwards, 2012]

Each of the target districts has one health centre, which just fulfil minimum levels and standards of equipment and supplies. The closest referral hospital is situated in Ban Lung, around 60 km from the districts. There are many problems for IPs to receive 'modern' health care. Money is seen as the biggest barrier for receiving health service. Another main obstacle is transportation since the nearest hospital is approximately 10 km from the villages. In some villages the distance can be even much more. Although if they overcome the distance it's not sure that the villagers receive any treatment. The working hours of the staff is irregular and the availability of medicine is not guaranteed. In addition most of the IPs have difficulties to communicate with the staff due to language barriers and sometimes they are facing discrimination, like being typified by health staff as backward, uneducated and stubborn. Furthermore traditional beliefs are leading to a delayed access of health care. In case of a serious illness a ritual sacrifice to ancestor spirits has to be performed before they leave the village. [Riddell, 2006]

About 80 % of the villagers in the target districts assess the available medical treatment in the health centre as effective. Villagers are mostly prone to communicable diseases like diarrhea, respiratory diseases, malaria, dengue fever, viral infection, stomach ache, etc. [Neth et al. 2014]

Table 10 illustrates the high incidence of diarrhea among women and children below the age of five years.

Table 10: Incidence of Diarrhea. Adapted from [NORDECO, 2010]

	Past 24 hours	**Past 2 weeks**
Children below 5 years	48.1 %	65.4 %
Women	28.4 %	53.2 %

4.7. Water, Sanitation and Hygiene

The effectiveness of safe water supply, sanitation and hygiene in improving health has widely been studied. It could be found that handwashing with soap leads to a reduction in diarrhea of approximately 50 %. The evidence according to sanitation is weak but it is estimated to reduce diarrhea by 36 %. [Cairncross et al., 2010]

In Cambodia one of the major causes of childhood morbidity and mortality is dehydration from severe diarrhea. Thus these findings can be beneficial for health strategies. [CDHS, 2015] Furthermore there is a strong link of diarrhea with malnutrition. It can be considered as a vicious cycle as malnourished children suffer more often from diarrhea which in follow has a negative impact on the nutritional status. [Brown et al., 2013]

Several studies show that WASH indicators are strongly associated with growth of children. [Ngure et al., 2014] Humphrey hypothesises that stunting due to poor WASH is mainly caused by environmental enteropathy (EE) whereas diarrhea only plays a minor role. EE is provoked by the ingestion of faecal bacteria which explains the positive influence of WASH interventions. The characterisation of EE includes an increased intestinal permeability, inflammation and reduced nutrient absorption. The chronic immune stimulation lead to catabolic consequences and therefore to a growth impairment. [Humphrey, 2009; Ngure et al., 2014]

Besides better growth, less diarrhea and improved gut functions of children in clean households less parasite infections could be found as well. [Lin et al., 2013]

Even though the benefits of good WASH are well known, the situation in Ratanakiri is still not satisfying. As demonstrated at the figures below 70 % of the villagers have access to improved water sources at their main house, like tube wells or protected dug wells, whereat 30 % still use unsafe water sources like ponds, lakes and rivers. Usually villagers live at their Chamkar (farm house) for three months per year, where the availability of safe water is much worse. Just 36 % of the villagers have sustainable access to improved water sources at their Chamkar. [NORDECO, 2010]

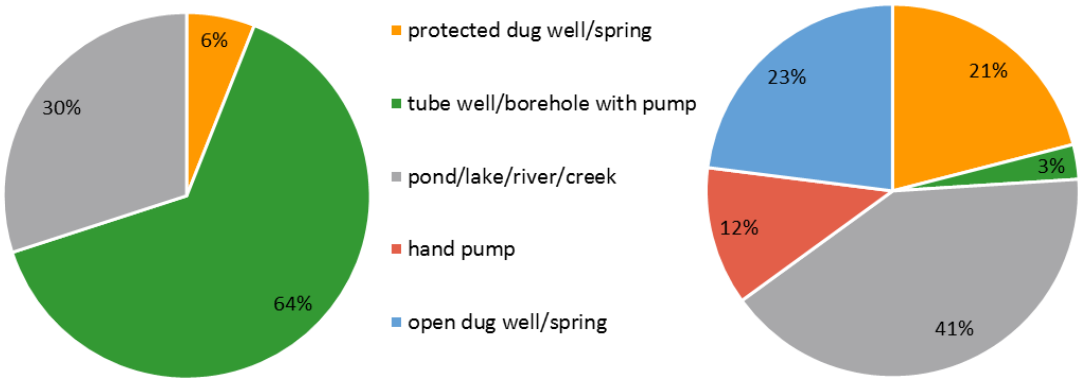

Figure 15: Water Sources at main House (left) and at Chamkar (right). Adapted from [NORDECO, 2010]

Furthermore open defecation seems to be an issue in the target districts. The District Data Books show a people to latrine ratio of 139:1 in AM and 74:1 in TV. However, there seem to be a great improvement since the data was recorded in 2008. [NCDDa, 2009; NCDDb, 2009] According to the baseline in 2010 ~ 45 % of the households in the target districts have a latrine which outnumbers the other surveyed districts in RTK by far. [NORDECO, 2010] Reason for this might be the implementation of WHH-Projects, with focus on hygiene, since 2005.

5. Methodology

In order to evaluate the impact of the LANN approach and its possibility to sustainably improve dietary intake a survey was conducted in Ratanakiri Province in February 2015. Detailed information on the research question, study design and population as well as a description of the data collection and analysation tools are provided in this chapter.

5.1. Research Question

Since LANN is a quite new approach which is still in its development stage there is a lack of evidence of its effectiveness. So far no study was conducted to analyse the impact of LANN regarding knowledge and behaviour change related to nutrition.

Therefore this thesis aims to provide information on the effectiveness of the approach, which is illustrated on the basis of ethnic minorities in Cambodia. The research question of this thesis is defined as followed:

`LANN approach as a possibility to sustainably improve dietary intake in Cambodia´

To assess the impact of the LANN approach household surveys and focus group discussions (FGD) were conducted. These research methods are described in chapter 5.4.

5.2. Study Design

The study was designed by the author and assisted by the local project manager and nutrition coordinator. The empirical research consists of quantitative (HH survey) and qualitative (FGD) data collection tools.

The aim of the HH survey is to compare the knowledge and practices of peer educators, members of the Food and Nutrition Women's Group (FNWG) and non-members (reference group). Before the interviews were conducted, the questionnaire and the agenda were discussed and finalised with support of the field staff, including indigenous peoples who know the local circumstances best. Due to the high illiteracy rate among the target group structured interviews were conducted to collect the data of predetermined questions instead of simply distributing the questionnaires. Mainly the interviews took place in the villages because it is most suitable for the participants. The interviewees were selected by the staff according to defined criteria after arrival in the village. The duration

of an interview was approximately one hour. The questioning was carried out by WHH and CEDAC staff and it took place from 09.02.205 to 12.02.2015.

Furthermore FGDs were carried out in order to gain additional qualitative information about villagers' food and nutrition situation and their view and experiences on the LANN approach. One village of each district which is affected by ELCs was selected by the nutrition coordinator. One or two villagers were informed to build groups a few days prior the discussion in order to prevent difficulties in finding motivated participants. Mainly the FGDs were facilitated by an indigenous staff (nutritionist) to prevent communication problems and to ensure a good discussion in their local language. Furthermore the discussions were guided and monitored by the author and the nutrition coordinator, who was also responsible for translating the main statements into English. The focus group discussions were conducted from 16.02.2015 to 18.02.2015.

5.3. Study Population

The study was undertaken in the districts Andoung Meas and Ta Veaeng which are part of the rural and mountainous province Ratanakiri. In this province food insecurity is among the highest in Cambodia. [VAM, 2008]

The population consists mainly of IPs who have long lived isolated and rely mainly on agriculture and forest products as described in chapter 4. IPs which are included in the survey belong mainly to the Charay, Praov, Kroeung and Kachak ethnic groups.

For the household survey 150 women in reproductive age were selected, preferably with children below five years of age. Therefore the sample size is 50 women per group (peer educators, members and non-members). The survey took place in 21 out of the 30 target villages of the project (10 villages in Andoung Meas and 11 villages in Ta Veaeng). Villages which are far away of the district centre or difficult to reach were excluded.

The focus group discussions were conducted in the villages Chuoy (TV district) and In (AM district) which are both affected by ELCs. The participants were divided into three groups in each village. One group consists of peer educators and members of the FNWG, another group of women who are non-members and the third group consists of men. In total six FGDs were conducted with an average group size of 6 participants.

5.4. Data Collection Tools

Quantitative and qualitative research tools were used to evaluate the impact of LANN. Those methods are described in detail within this chapter.

Household Survey

A household questionnaire was used to collect quantitative data on knowledge and behaviour related to nutrition at household level. The results of peer educators, members and non-members are compared in order to assess the impact of the training.

Figure 16: Household Interview in Tang Chi Village

The HH questionnaire is divided into nine parts based on the core areas of the LANN approach and relevant related fields. It includes questions on knowledge and behaviour about social mobilisation, perception of malnutrition, food consumption, mother and child care, food taboos, agriculture, wise spending and natural resource management. The questionnaire of the control group differ slightly from those of the peer trainers and members. Some questions were eliminated or adapted especially at the chapter about social mobilisation.

Food Consumption Score

In order to determine behavioural change according to dietary diversity, differences between peer educators, members and non-members were analysed. Suitable tools to measure dietary diversity are for example the household dietary diversity score (HDDS) created by FANTA/FAO or the Food Consumptions Score (FCS) established by WFP. The calculation of the FCS seems appropriate since there is baseline data available from a survey conducted in March 2010 which enables to observe a trend of the food consumption among the villagers.

The FCS arises from dietary diversity, food frequency and the relative importance of different food groups. Food items get classified into nine standard food groups according to their nutrient contents. It is investigated on how many days during the 7 days before

the survey the participants consumed the different food items. Then all the consumption frequencies of the food items belonging to the same food groups are added (max. frequency = 7). Afterwards the frequencies get weighted by a factor between 0 and 4 depending on the nutrient density of the food group. The sum of the weighted food groups creates the FCS. [ODAV, 2008]

At the baseline survey in 2010 some of the food groups were investigated more detailed. For example meat, fish and wild fish consumption was assessed separately to gain additional information. The same model was followed in this survey in order to receive comparable results. Afterwards the frequencies of the additional food groups were summed up so that the FCS could be calculated according to the standard food groups. Therefore the results are comparable to other FCS and it allows the classification of the Food consumption according to the standard thresholds. [ODAV, 2008]

The following table shows the food groups and their standard weight according to the WFP Technical Guidance Sheet. Furthermore it demonstrates the surveyed food items, which were adopted from the baseline survey.

Table 11: Food Groups and Standard Weights used for calculating the FCS. Adapted from [NORDECO, 2010; ODAV, 2008]

Standard Food Groups	Food items (Examples)	Weight
Cereals/Tubers	Rice, maize, other cereals, etc.	2
	Cassava, potatoes, sweet potatoes, etc.	
Pulses	Beans. Peas, groundnuts, cashew nuts, etc.	3
Vegetables	Wild vegetables, leaves, etc.	1
	Domestic vegetables	
Fruit	Papaya, mango, pineapple, etc.	1
Meat/Fish	Meat, poultry, eggs, etc.	4
	Wild fish, wild aquatic animals, etc.	
	Fish, aquatic animals, etc.	
Milk	Milk, yoghurt and other diary	4
Sugar	Sugar, honey, sugar products, soft drinks, etc.	0.5
Oil	Oils, fats, etc.	0.5
Condiments	Spices, coffee, tea, salt, etc.	0

The FCS can be classified in three different groups representing a poor, borderline or acceptable food consumption. [ODAV, 2008] The typical thresholds are demonstrated in the following table.

Table 12: FCS Thresholds. Adapted from [ODAV, 2008]

FCS	Profiles
< 21	Poor
21.5 – 35	Borderline
> 35	Acceptable

Focus Group Discussions

Focus group discussions (FGD) belong to the most common qualitative methods. FGDs are useful to explore a particular topic, to increase understanding of participants' experiences and believes and to receive information on collective views. The composition of the group regarding age, gender, etc. should be considered in advance because it influences the data. Six to eight participants are considered as optimal, but a group size of three up to fourteen participants can create an effective discussion. [Gill et al., 2008]
The purpose of the FGDs is to gain additional information on the villagers' experiences and views according to difficulties of food and nutrition security, food consumption, food sources and its changes in the recent years. Another major part was to assess the publicity and impact of the LANN training as well as its strength and weaknesses. Furthermore differences in the food consumption of February and March were investigated in order to assess whether it is possible to compare the FCS of the endline survey with the results of the baseline survey in 2010.

Figure 17: FGD in In Village

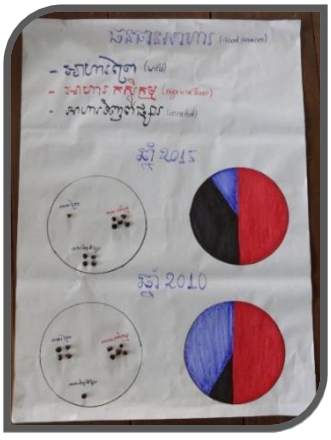

Figure 18: FGD-Tool Food Sources

5.5. Data Analysis

The analysis of the household survey was undertaken by using Excel 2010 and IBM Statistics SPSS Version 21.0. All data was entered in Excel and the frequencies of the given answers calculated by using pivot tables. The statistical software SPSS was used to characterise the study population and to determine the significance of FCS differences between the groups. To gain this information one-way ANOVA (analysis of variance) was used and Post Hoc tests (Tukey) were undertaken to determine which groups differ from each other. The tool `case processing summary´ provided information on mean values, frequencies and percentages. Furthermore it was investigated whether women, who's intake of fruits/vegetables/meat/fish is below average are aware that their intake of these foods is little. It has to be noted that an average consumption can't be equalised with an adequate consumption. However, it provides information on the women's awareness on their food consumption since an intake below the average is more likely to be insufficient. To gain this information, women were classified in groups (intake below/above average and assessment of intake as insufficient/sufficient) and via Cross tabulations it was determined if there is a difference of the awareness between peer educators, members and non-members. Univariate linear model was used to investigate whether women who own a vegetable garden/fish pond/animal husbandry show a higher intake of vegetables/fish/meat.

To analyse the results of the FGD each question was filed in Excel and all answers of the FGDs were assembled into the corresponding chapter. Then specific answer patterns were examined and unexpected answers detected. Following the most relevant findings of each question were summarised and presented among the results of the HH questionnaire at the next chapter.

6. Results

This chapter demonstrate the results of the household survey and the FGDs. If not specified otherwise the results arise from the household survey. The chapter is divided into nine sections. The first characterises the study population and the following two present the results according to social mobilisation and malnutrition. The other topics correspond to the four basic pillars of LANN – food consumption, agriculture, income generation and market, natural resource management and to the additional training on mother and child care.

In the end of the chapter the evaluation of the training undertaken by the peers and members during the FGDs is summarised.

6.1. Characterisation of the Study Population

Socio-Demographic Characterisation of the HH Survey Population

Table 13: General Information of the Study Population

General information	Peers	Members	Non-Members	Total	P-value
Age (mean)	31 years	32 years	30 years	31 years	0,474
≤ 20 years	16 %	17 %	31 %	21 %	0,591
21 – 30 years	43 %	34 %	31 %	36 %	
31 – 40 years	27 %	28 %	22 %	26 %	
41 – 50 years	12 %	13 %	12 %	12 %	
≥ 51 years	2 %	8 %	4 %	5 %	
Adults in HH (mean)	4.5	3.3	3.8	3.9	0,227
Children in HH ≤5 years (mean)	1.0	1.0	1.3	1.1	0,552
Children in HH 6 – 18 (mean)	2.5	1.6	2.3	2.1	0,158
No children (%)	8%	16%	4%	9%	0,110

Table 13 shows that there is no significant difference between peer educators, members and non-members according to age, household size and number of children. The average age of the participants is 31 years. Looking at the different age groups it shows that most of the women are between 21 and 30 years. A tendency can be seen that non-members are younger and members are older compared to peers. On average the

women have one child ≤ 5 years of age and two children from 6 to 18 years whereby almost 10 % of the interviewed women have no children.

Table 14: Distribution of Ethnic Groups in %

Ethnic groups in %	Peers	Members	Non-Members	Total	P-value
Charay	28	33	28	30	0,868
Kachak	18	18	20	19	
Praov	40	43	38	40	
Kroeung	8	6	10	8	
Tompoun	2	0	0	1	
Khmer	4	0	2	2	
Lao	0	0	2	1	

The distribution of ethnic groups between the study population groups can be considered as equal. The most frequent ethnic group is Praov followed by Charay and Kachak.

Table 15: Localisation of Survey Population in % per District

Localisation in %	Peers	Members	Non-Members	P-value
AM District	50	50	50	1,000
TV District	50	50	50	

The percentage of interviewed peers, members and non-members is equally distributed in both districts. Two to four women of each group were interviewed of each of the following villages:

Table 16: Selected Villages for the HH Survey

District	Village
Andoung Meas	Tang Chi, Tang Ma Leu, Ket Thum, Peng, Nay, Ka Nong, In, Ka Chut Kraom, Ka Nat Toch, Dal Veal Leng
Ta Veaeng	Sieng Say, Tumpuonn Roeung Thum, Ke Koung Toch, Ke Koung Leu, Phlueu Thum, Bang Ket, Phlueu Toch, Ta Bouk, Chuoy, Tun, Sanh

Looking at the available socio-demographic data and the local distribution no significant difference can be seen between peer educators, members and non-members.

Characterisation of the Focus Groups

Table 17: Focus Group Characterisation

Location	Group	# of people	Ø age	# < 50	# > 50	ELC affected
Village: In District: AM	Peers, Members	3	N/A	N/A	N/A	Not directly
	Non-Members	5	27	5	0	Not directly
	Men	4	42	2	2	1x
Village: Chuoy District: TV	Peers, Members	8	32	7	1	1x (3ha)
	Non-Members	7	43	4	3	1x (1ha)
	Men	10	41	8	2	1x (2ha)

The group size varies from three to ten participants whereby the average size is six persons. The duration of the FGD was between 1.5 and 2.5 hours. Primarily it depended on the understanding and communication abilities of the participants, which were greater among men. The mean age of the group ranges from 27 to 43 years. About 1/4 of the participants are older than 50 years. The participants mainly belong to the ethnic groups Kachak (In Village) and Kroeung and Praov (Chuoy Village). In four out of six groups one person is directly affected by ELCs, who lost between 1 and 3 ha of their land.

The FGDs were held directly in the villages so the venue was easy accessible for the villagers. However in In Village it was difficult to get enough participants because the distance between the houses is quite big and the village is separated by a river.

The sample size of two villages is quite small whereby the received information might not be representative for other villages and ethnic groups.

6.2. Social Mobilisation

Food and Nutrition Women's Group (FNWG) were established in each target village. It is intended that the FNWG meets once a month on a regular basis. This specification seems to be fulfilled as about 70 % state to meet every month and the rest claim to have a meeting even several times per month. The overall attendance rate is assessed to be approximately 75 %.

Nearly all of the peers and about 85 % of the members indicate to give information of the training also to other villagers (non-members). The information is mostly spread during casual chats with friends and neighbours or at regular meetings. Therefore it can be assumed, that by providing training to the FNWG also other villagers can benefit.

Furthermore most of the women also give information about the training to their husband. It is noticed that peer educators assess their husband's interest in nutrition greater compared to members. Nearly 90 % of the women think that men should be included in the training. According to the focus group discussions women expect that men would support them more if they join the training. The women mention that they already have seen an improvement of a few men who are already taking part at the meetings. The participants claim that generally there is a positive development of their husband's support since the establishment of the Women's Groups.

The tasks of men related to nutrition are to collect wild foods (if forest is far away), to cut fire wood, bring water from the well, support cooking (a few times per months, depending on HH) and clean dishes. Furthermore some men take care of child's hygiene (bathing, etc.), buy food at the market and build fences for the home garden. However, some women claim that they don't get any support of their husband unless they are sick. It was found that women long for an increased involvement of men regarding food preparation and child care.

The HH interviews with non-members show that about 1/3 of the women have a member of the FNWG in their family. More than half of the interviewed non-members received trainings from a peer or a member, primarily at regular meetings or during chats with friends and neighbours. The frequency of the training is mainly between one to five times.

Within the FGD the reasons for not being a member of the FNWG were discussed. Most of the non-members argue that they don't have time because of the heavy workload at their farm. In many cases their husbands don't allow them to join, because they want the women to work at home and to take care of the children. They are also jealous because their wife could meet other men at the trainings. Other reasons for not being a member are that they don't see any benefit or that they were not asked by the nutritionist when the groups were established.

6.3. Perception of Malnutrition

The survey shows that more peer trainers and members can name symptomes of malnutrition. Besides those shown in the graph below, peers and members mentioned symptoms like paleness, eye problems, sickness, concentration problems and limited intelligence. It could be found that almost 75 % of the peer trainers associate good nutrition with intelligence compared to 28 % of the non-members.

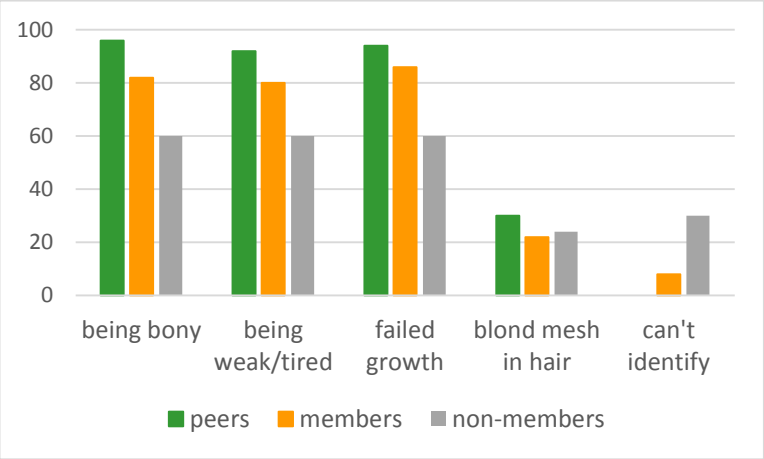

Figure 19: Symptoms of Malnutrition

The following graph shows that peer educators and members can name more causes of malnutrition compared to non-members. Regarding diversity in the diet it seems like peer trainers understand its importance much better than the other groups. Hygiene is associated with malnutrition by all of the groups, which could be result of the hygiene trainings provided by WHH since 2005.

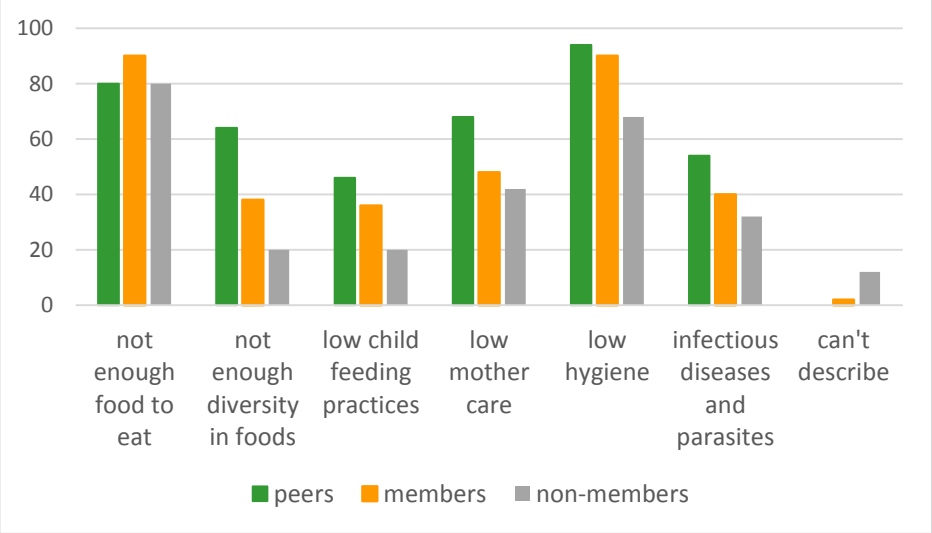

Figure 20: Causes of Malnutrition

Figure 21 demonstrates that improving hygiene is the most common idea for moving out of malnutrition followed by eating more and eating more diverse food. Diversifying food production, managing wild food resources, exclusively breastfeeding for 6 months and deworming are much more often mentioned by peers, which represents a better understanding.

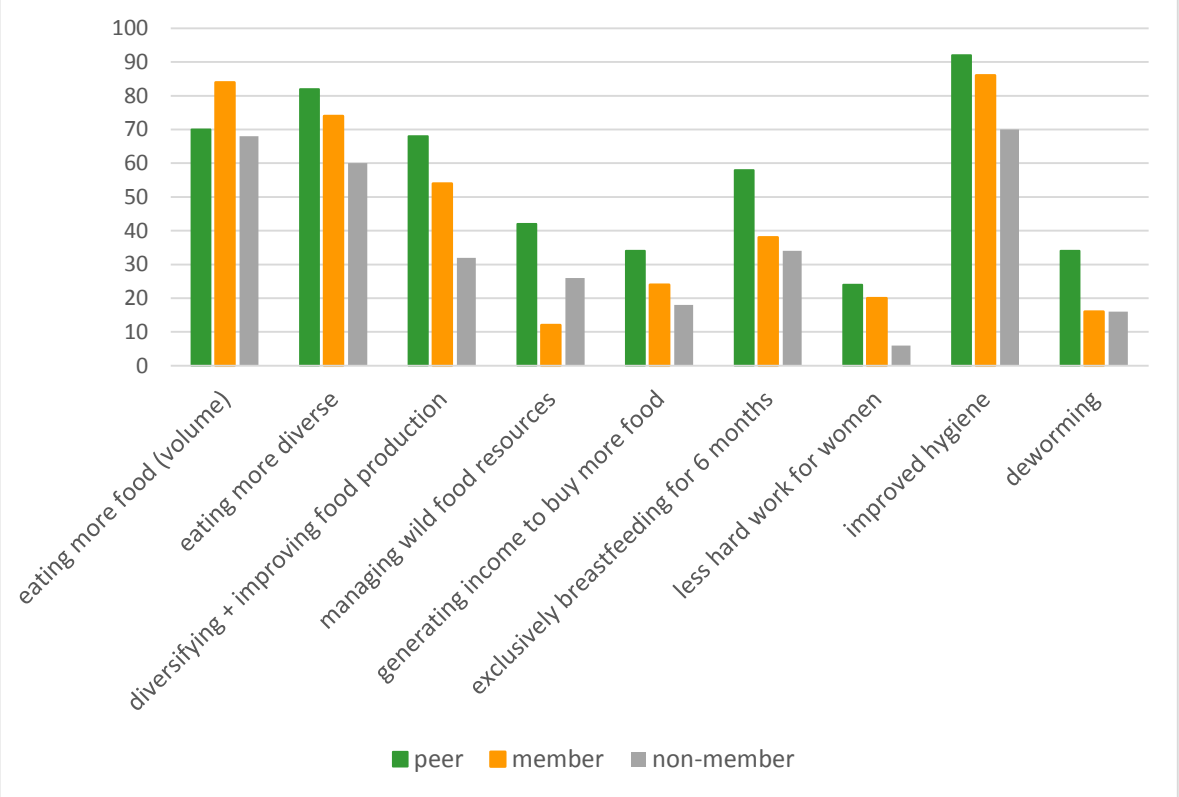

Figure 21: Ideas for moving out of Malnutrition

Cleaning vegetables and fruits, washing hands before cooking and after toilet, drinking safe water and using latrine are mainly mentioned as examples of good hygiene practices. It could be found that peer educators could give the most examples and assess their practice better compared to members and non-members.

However, about 1/3 of the households of each group still don't have access to a latrine. 60 % of the peer trainers claim to drink mainly safe water compared to 40 % of members and non-members. At the FGD the participants argue that they have struggle to follow good hygiene practices because they don't have enough clean water due to a lack of wells and a high rate of malfunctioning. Furthermore many families don't have bathrooms and claim that children are not willing to wash their hands before eating.

6.4. Food Consumption

The survey shows that more than half of the interviewees think that diversity in their diet is not enough. The food groups which are assessed as consumed too little are mainly fruits, calcium rich food, meat, fish, eggs and plant alternatives (like beans, soya bean, etc.) (see figure 22). Furthermore 30 % of the members and non-members think that they don't eat enough vegetables. All groups assessed those food groups as consumed too less which are in fact critical. This shows that the women are aware in which way their diet is likely to be inadequate.

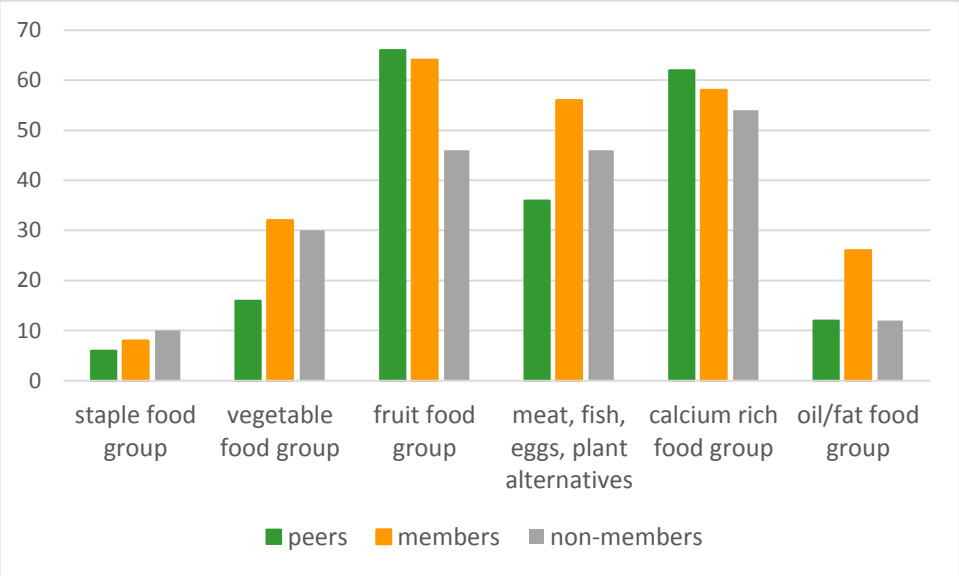

Figure 22: Food Groups considered as consumed too less

The diversity of the vegetable consumption was assessed at the FGDs. Since 2010 the types of vegetables consumed per week reduced from 7.5 to 4.5 different kinds. According to the participants this is mainly caused by the clearance of the forest, which leads to a reduction of wild vegetables. Furthermore villagers claim that domestic vegetables don't grow well because the soil quality is getting worse and villagers don't have enough vegetable seeds and water for growing plants. The most common consumed vegetables are cassava leaves, cabbage, eggplant, taro, morning glory, rattan, pokrev, lemon grass, water convolvulus, gourd, water lily, pumpkin, long bean, green mustard, onion, cucumber, bamboo shoot and several kinds of wild vegetables depending on the season.

The diversity of fruits reduced from 5.5 in 2010 to 3 types of fruits consumed per week in 2015. The same reasons are mentioned by the participants as described above.
The fruits which are consumed most frequent are tamarind, mango, jackfruit, milk fruit, kuy fruit, rambutan, apple, banana, guava, pineapple, coconut, pomelo and wild fruits.
The participants explained that an insufficient meat consumption is caused by a lack of money and a great distance to the market. The amount of wild animals is getting much less and they don't have enough equipment (like chicken rack and young animals for raising) and knowledge about raising techniques. At the HH survey the women were asked about alternatives to meat which provide a similar nutritional value. Peer trainers and members could name more examples especially regarding plant alternatives which are rich in protein like beans, soya beans, amaranth, etc.

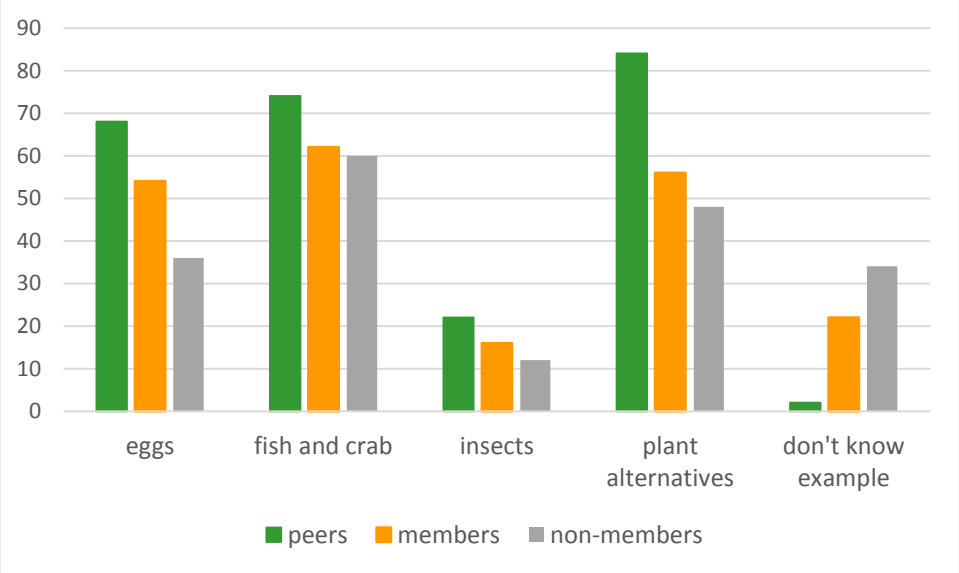

Figure 23: Alternatives to Meat

In the FGDs fish is considered as consumed too less because of overfishing by using electrics. Furthermore some villagers lost their access to streams because companies dried them up. Regarding the estimation on the consumption of calcium rich foods it's not sure whether it was assessed accurate by non-members because almost 3/4 couldn't name examples. In contrast most of the peer trainers and members can give examples of foods rich in calcium like small fish, small shrimp, crickets, beetles, etc.

It’s very likely that those who received nutrition trainings gained this knowledge by demonstration of the food flag consisting of six different food groups (staple, vegetables, fruit, meat/fish/egg/plant alternatives, calcium rich food and oil/fat food group). The women were taught to eat foods from each food group of the flag every day to ensure a diverse diet. Most of the peers and about 60 % of the members could answer the question correct when asking about how many food groups should be eaten per day. Clearly women who didn’t receive the training and therefore don’t know the classification of the food groups couldn’t answer this question appropriate.

Another question of the HH survey was about how to avoid nutrition loss. Peer educators much more often mentioned to store foods dry, dark and cool. Furthermore some stated that washing vegetables before cutting help to avoid nutrient loss. When asking whether they wash their vegetables before or after cutting it was found that 94 % of the peers, 84 % of the members and 76 % of the non-members wash the vegetables first. This shows that a higher percentage of peer educators are practicing this nutrient-protective method.

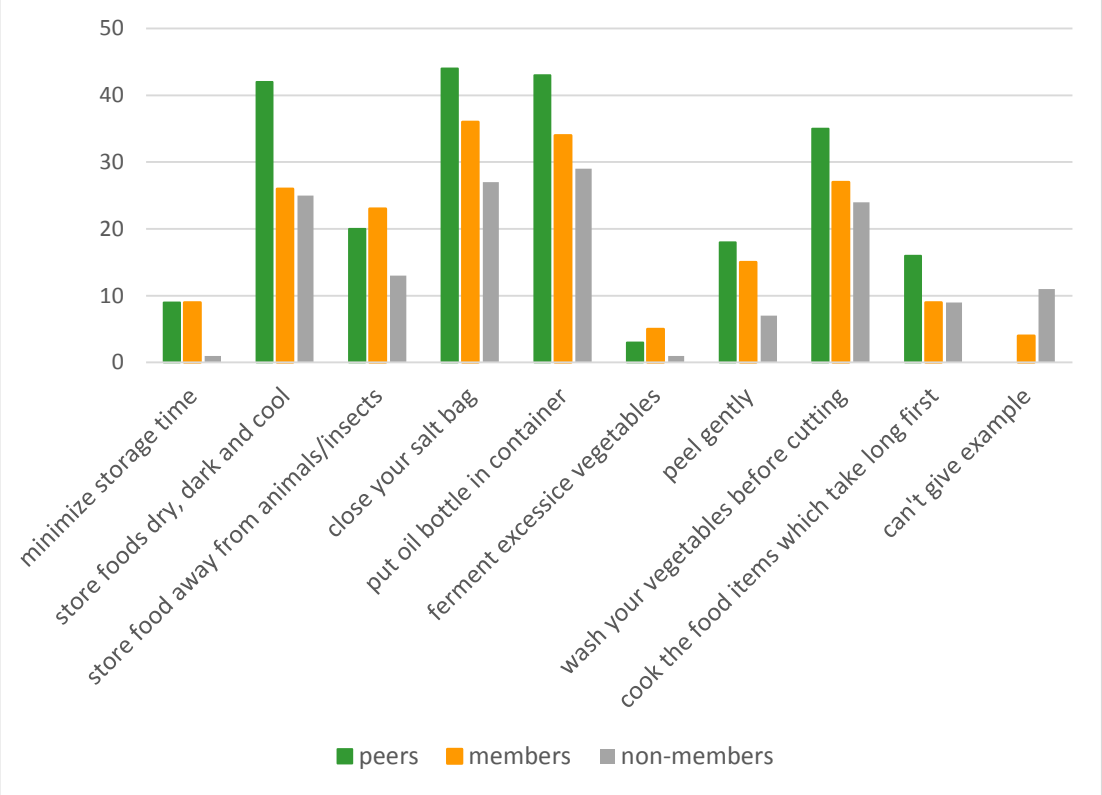

Figure 24: Examples of avoiding Nutrient Loss

Since the nutritionists claimed that the villagers `don't know how to cook´ and put all ingredients in the pot at once, it was hypothesised that villagers don't know in which order it's best to add the ingredients depending on their required cooking time. However, it could be found that most of the women know in which sequence to add the ingredients and none of them answered to add everything at the same time.

One of the most important condiment seems to be monosodium glutamate (MSG). Although MSG is `generally recognized as safe´ by the FDA it can be seen as an unnecessary food item since MSG doesn't provide any essential nutrients.

Nearly all of the interviewed women use it at every meal and almost 25 % of all groups reported an increase of their MSG consumption. However, around 40 % of the peers and members and 26 % of the non-members assess that their usage is becoming less or much less compared to five years ago.

Furthermore it was asked whether sweets are healthy for children. Half of the non-members answered this question with yes (38 %) or don't know (12 %). In contrary just 16 % of the peers and 18 % of the members think that sweets are healthy for children. Naturally, sweets are very energy dense and provide a lot of carbohydrates however those are empty calories and it would be much more beneficial to spend that money on foods which are also high in micronutrients like fruits.

Cooking classes are conducted regularly as part of the LANN training in Cambodia, at which healthy snacks and dishes as well as a good kitchen and food hygiene get promoted. 60 % of the peers report to cook the shown recipes several times per week, whereby most of the members cook them several times per month. The majority of the non-members said that they have been taught some of the recipes by the peers or members. Difficulties for cooking the recipes at home could be identified. The greatest problem seems to be that the ingredients are more expensive compared to those for traditional meals followed by difficulties to get the ingredients because of the great distance to the market. Furthermore some of the members and non-members don't know how to cook the recipes because they can't remember the ingredients and can't read the recipes.

Food Consumption Score

The Food Consumption Score is a tool developed by WFP for measuring dietary diversity. As described in chapter 5.4. the score is calculated by multiplying the consumption frequencies of the defined food groups (number of days per week) by a specific weight which reflects the nutrient density. [ODAV, 2008]

Baseline data from March 2010 is available which allows to determine a trend of the food consumption. Therefore the food groups were adopted from the baseline, whereby instead of using the nine standard food groups the amount was expanded to 13 food groups. The advantage of this modification is that the data is comparable with the baseline and the received information is more detailed (see table 18). Afterwards the food groups are combined according to the standard food groups of the original FCS by WFP. This ensures the comparability with other FCS and the classification of the food consumption according to the standard thresholds.

Table 18: Average Food Group Consumption (Number of Days per Week)

		Cereals	Tubers	Pulses	Wild veg.	Domestic veg.	Fruit	Meat	Fish (wild)	Fish (pond)	Milk	Sugar	Oil	Condiments
Baseline 03.2010 [NORDECO, 2010]		7.0	1.0	0.7	3.0	1.7	0.6	0.8	2.1	0.1	0.1	1.4	2.3	0.4
Endline 02.2015	Peers	7.0	3.2	2.2	3.3	3.7	1.3	2.7	3.1	2.3	1.0	4.4	5.5	1.7
	Members	6.9	2.9	1.4	2.8	3.2	1.8	2.5	3.3	1.7	1.0	4.0	4.3	1.0
	Non-members	6.9	2.7	1.1	2,8	3.3	1.4	2.1	2.8	2.5	0.6	3.2	4.4	1.4

According to the focus group discussions the food consumption does not differ between February and March whereby the baseline and endline data are comparable.

It could be found that the frequency of most of the food groups increased since 2010. At the FGDs the trend of the food consumption within the past five years was assessed. The participants stated that more wild food (animals, fish, insects, vegetables and fruits) was available in 2010 due to a higher forest density and better access to fallow land and rivers. The consumption of fish from ponds was much lower because almost no one owned a fish pond back then. Since 2010 the intake of meat and fish strongly increased.

Although wild fruits and vegetables are becoming less, the overall consumption is increasing because the villagers intensified their agricultural production. Furthermore the production of tubers and pulses increased, on the one hand to extend rice supply by supplementing rice with potatoes, etc. and on the other hand for generating income. According to the participants the consumption of sugar, milk and oil increased due to an improved access to the district centre where they get in touch with Khmers from whom they adapted this behaviour. A few years ago the consumption of these products was almost not present and widely unknown.

The current FCS (calculated with the standard food groups) shows a great improvement since 2010. As demonstrated above the enhancement of the FCS especially results from an increased meat and fish consumption as well as a higher intake of vegetables, fruits, sugar and oil. Looking at the current FCS of the different groups it can be seen that peer educators and members have a higher mean FCS compared to non-members. The difference between peers and non-members (12 %) is statistically significant according to SPSS analysis. The FCS represents dietary diversity whereby the food intake of peers and members is more likely to meet the nutrient requirements.

Figure 25: Mean Food Consumption Scores

According to the standard thresholds [ODAV, 2008] nearly all of the interviewees have an acceptable food consumption. Just 4 % of members and non-members show a borderline consumption, which represents a great improvement of dietary diversity since 2010.

Table 19: Classification of the Food Consumption

Food Consumption	Peers	Members	Non-Members	Baseline [NORDECO, 2010]
Acceptable (> 35)	100 %	96 %	96 %	44.8 %
Borderline (21.5 – 35)	0 %	4 %	4 %	36 %
Poor (< 21)	0 %	0 %	0 %	19.2 %

The following graph shows how many days each food group is consumed on average in relation to the FCS. The increase of the frequencies towards a higher FCS is very similar between peers, members and non-members. Therefore just one graph with combined data is demonstrated.

It can be seen that the frequency of staples (cereals and tubers) is stable at all FCS, whereat the frequency of pulses is increasing when scores get higher. The consumption of vegetables, sugar and oil is more or less constant throughout all scores. In contrary the frequency of fruit, milk and condiment intake is much increasing at a FCS of about 60. Also the frequency of meat and fish consumption rises slightly as the FCS increases.

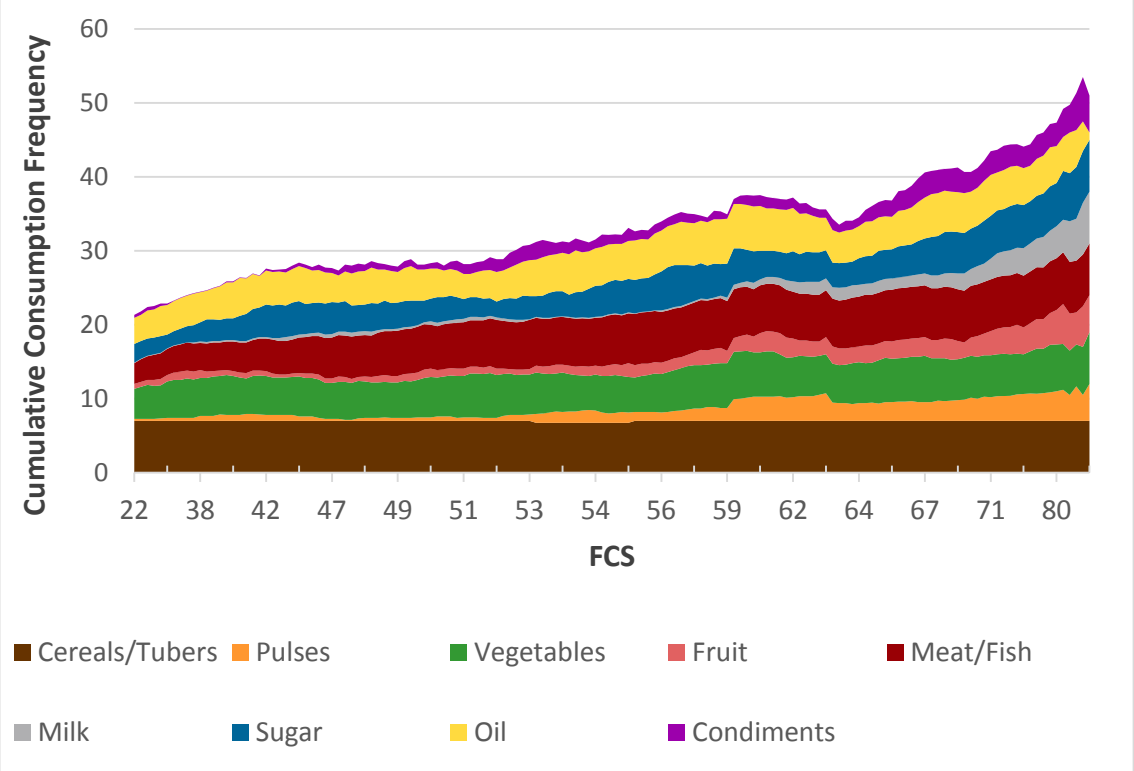

Figure 26: Cumulative Consumption Frequency of Food Groups

To integrate the portion size of the consumed food the overall food consumption is calculated by multiplying the frequency of the consumed food groups with the average portion size. The highest reachable amount is 21 which means a big portion (=3) of a certain food group was consumed every day within the last week (=7). It has to be noted that the portion sizes are not standardised an the data is based on self-assessment of the interviewees.

Table 20: Food Consumption (Frequency/Week x Portion Size)

	Peers	Members	Non-Members	Total
Cereals	20.1	20.0	20.0	20.1
Tubers	6.8	5.5	5.4	5.9
Pulses	3.9	2.6	2.1	2.9
Vegetables (wild)	7.4	5.8	5.8	6.3
Vegetables	9.2	7.3	7.9	8.1
Fruit	2.4	3.1	2.9	2.8
Meat	6.6	5.0	3.8	5.1
Fish (wild)	7.4	8.2	6.1	7.2
Fish	5.5	3.3	5.4	4.7
Milk	1.7	1.9	0.8	1.5
Sugar	9.8	8.7	6.7	8.4
Oil	14.3	8.2	10.3	10.9
Condiments	3.6	1.9	2.4	2.6

The food consumption of several food groups was compared with the previous self-assessment regarding those food groups the women considered as consumed too less. (see page 57). Looking at the consumption of fruits it was found that 2/3 of the peers and members who's fruit intake is less than average are aware that their consumption is insufficient, whereas less than 50 % of non-members know that their consumption is low. More than 90 % of the peer educators, who's vegetable consumption is above average think that they eat sufficient vegetables. However, the majority of women at all groups who eat less than average vegetables assess their consumption as sufficient as well. Interestingly most of the peer educators evaluate their intake of meat and fish as too little also if their consumption is above average. This shows that they know about the importance of these foods and assume the average consumption as too little. 2/3 of members and less than 50 % of non-members who's consumption of meat and fish is less than average are aware that their consumption is low. This shows that peers and

members have a higher awareness on whether their consumption of foods from different food groups is sufficient. However, the average intake of the food groups can't be equalised with an adequate consumption but an intake above average is at least more likely to meet the recommendations.

Furthermore it was assessed whether households who own a fish pond have an increased intake of domestic fish. By using the univariate linear model in SPSS, no statistic significant correlation was found between the consumption of domestic fish and fish farming. This might be an indication that raised fish is sold rather than consumed by the family after reaching a certain extent.

When looking at meat consumption, the intake was even lower when the HH is raising animals. As described in chapter 4.3., just very few animals are raised by the HH which are mostly slaughtered in case of ceremonies sacrificial offerings and therefore don't influence ordinary meat consumption. However, it's likely that animal products like eggs are consumed more frequent if the HH is raising chickens.

Regarding the intake of vegetables it was found that consumption is significantly higher among women who have a vegetable garden.

Table 21: Correlation between Agricultural Production and Food Consumption

Fishpond	**Average domestic fish consumption**	**P-value**
Yes	4.6 (= frequency/week x portion size)	0.881
No	4.8 (= frequency/week x portion size)	
Animal husbandry	**Average meat consumption**	0.037
Yes	4.4 (= frequency/week x portion size)	
No	6.4 (= frequency/week x portion size)	
Vegetable garden	**Average domestic vegetable consumption**	0.046
Yes	8.8 (= frequency/week x portion size)	
No	7.6 (= frequency/week x portion size)	

Food Taboos

Food taboos among pregnant and lactating women are widespread in the target districts. Just 28 % of the members and nearly 50 % of the peer trainers and non-members don't practice food taboos during pregnancy. The frequency of food restrictions during lactation is almost the same between the groups but much higher (85 %) compared to

the taboos during pregnancy. Unfortunately most of the forbidden foods are rich in protein like chicken egg, catfish, pork, etc. and provide a lot of micronutrients like jackfruit, banana, egg plants, etc. In general those foods belong to the frequent consumed foods which would be very beneficial during pregnancy and lactation and it can't be assumed that the prohibited foods are substituted with equivalent alternatives. Alarming statements were made by two non-members who said that just rice and fish is allowed during pregnancy and that all vegetables are also prohibited during lactation. Although it's just a minority who follow extreme food taboos it's still a big issue which should be combated. The most common restrictions during pregnancy and lactation can be found in the table below.

Table 22: Food Taboos during Pregnancy and Lactation

During pregnancy	Total		During lactation	Total
Jackfruit	37%		Catfish	66%
Chicken egg	24%		Pig head	53%
Banana	22%		Buffalo	51%
Pumpkin	15%		Pork	48%
Turtle	11%		Egg plant	36%
Pig head	6%		Pumpkin	27%
Snake	5%		Cassava leave	25%
Buffalo	5%		Wax melon	23%
Coconut	5%		Chicken	11%
Catfish	5%		Chili	7%
Crab	3%		Beef	6%
Type of wild animal	3%		Prahok	5%
No taboo	41%		No taboo	15%

The food taboos are mainly enforced by grandmothers (and grandfathers) due to tradition. Husbands and neighbours seem to play a minor role in enforcing taboos.

Around 80 % of the peer educators and the members assess that the practice of food taboos among the FNWG members decreased or much decreased compared to five years ago, whereby just 54 % of the non-members report a reduction.

Nearly all peers and members assert that the training caused a decrease of the food taboos. However, when looking at the frequencies of the food taboos of each group separately no great difference can be found. Other reasons for the decrease are education by NGOs in general, government and radio. Also recommendations of doctors, adaption of Khmers and a better understanding of the parents play an important role.

At the FGDs the food taboos and the consequences if they were broken were investigated. It was found that the villagers mainly fear health problems which would come along, like uterus disease and prolapse, stomach ache, diarrhea and other sicknesses of the baby. Another main reason is superstition. It is believed that problems in the village could occur if the taboos are not followed, like no peace, death of leader or other villagers and a reduced rice harvest. The villagers report to be told about the tabooed food within dreams given by their ancestors and that tradition obligates them to follow the taboos.

So far the LANN training in Cambodia provides some education on food taboos but it's not a main part. Since restricted food is still widely practiced, especially during the critical part of the life circle, it would be beneficial to address this issue more deeply within the LANN approach. Furthermore traditional birth assistants should be trained since they provide information on tabooed food.

6.5. Mother and Child Care

In Cambodia the topic mother and child care was added to the LANN training whereby this topic was included in the survey as well. The results of the interviews show that 3/4 of the women know that it is recommended to exclusively breastfed a child until 6 months of age. However, the term `exclusively´ might have not been understood from all interviewees since some of the women answered 12 and 24 months. 4 % of peers, 10 % of members and 8 % of non-members think that it is recommended to breastfed a child for four months or even less. Nearly all of the peer educators and around 90 % of the members and non-members know that the colostrum should be fed to the baby. However, the women were not that sure about whether fresh milk or sweet milk should be given to babies. 20 % of peers and members and almost 30 % of non-members think that those are good alternatives to breastmilk. These results show that education regarding breastfeeding practices is still needed.

Furthermore the women were asked how many times during their last pregnancy they have been to the health centre (HC) for antenatal care. Peers and members visited the HC mostly between 4-6 times, whereas the majority of the non-members visited the HC just 1 -3 times.

Figure 27: Frequency of Antenatal Care

Hard work for pregnant women, like cutting fire wood, is still widespread in the target villages. About 60 % of the women reported to often have worked very hard during their last pregnancy. The percentage among peers (52 %) is slightly lower compared to the other groups. The majority of women know benefits of good nutrition during pregnancy for mother and child, such as improved recovery from delivery/pregnancy and increased health and weight for the baby. More peers and members can name those examples, especially regarding the impact on the baby's weight.

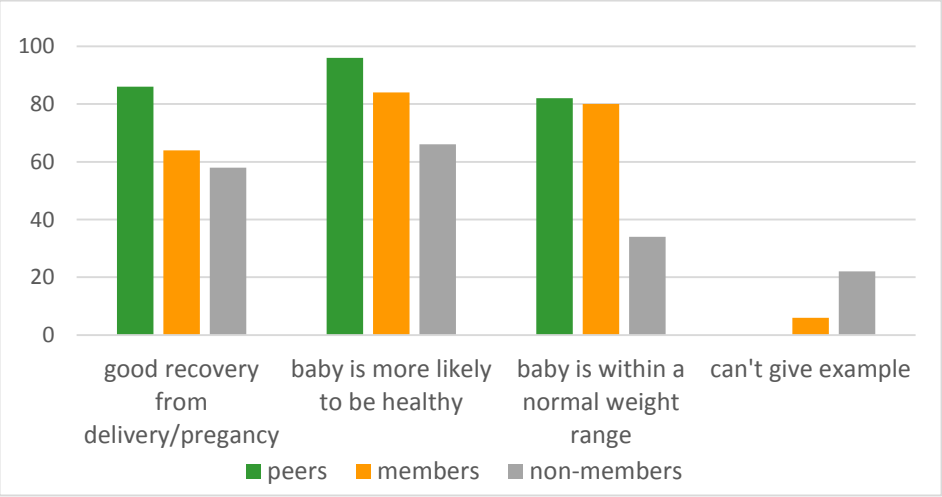

Figure 28: Benefits of good Nutrition for pregnant Women

6.6. Agriculture

The interviewees were asked about how their agricultural production (amount and diversity) changed within the last five years. Figure 29 shows that peers and members could increase their production more than non-members. In addition it was found that the diversity of agricultural production was much more enhanced among peers compared to members and non-members.

Figure 29: Change of Amount (left) and Diversity (right) of Food from own Production compared to 5 Years ago.

Furthermore the types of agricultural production were assessed. Peers are three times as likely to have a fish pond compared to non-members. About 1/2 of non-members own a livestock though approximately 3/4 of the peers and members raise animals. The cultivation of vegetables in wet season is three times higher among peers and members compared to non-members. Peers are about twice as likely to have a vegetable garden in dry season compared to the other groups. Almost 40 % of the non-members don't perform any of the mentioned agricultural production types, which is more than four times as frequent compared to peer educators.

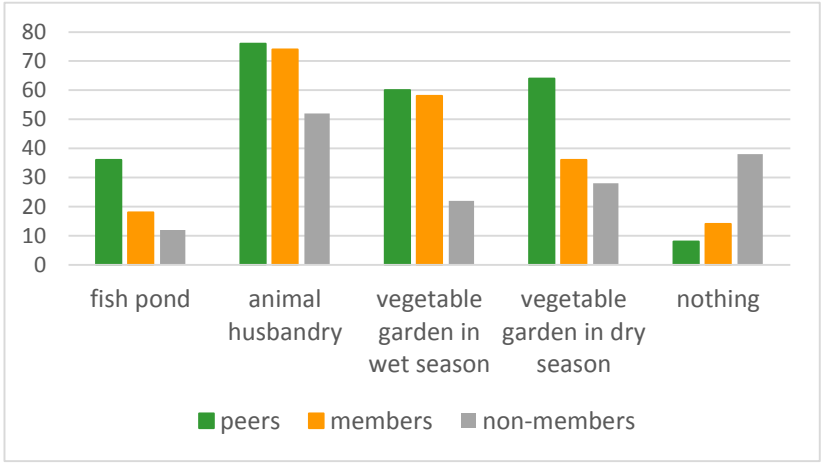

Figure 30: Types of Agricultural Production

Nutritious crops which are high in protein were promoted by the project. Since the peers received seeds from WHH/CEDAC it is explicable that their cultivation of crops increased. To assess if they are going to plant these crops also in future the interviewees were asked about which crops they plan to grow also after the support of the project. A list of the most common crops can be found in the following table. On average the peers plan to grow 7.5 crops, the members 7 crops and the non-members 6.5 crops.

Table 23: Common grown Crops

Crop	Total frequency		Crop	Total frequency
Long eggplant	71%		Morning glory	20%
Cucumber	65%		Pokrev	17%
Chili	57%		Cabbage	16%
Pumpkin	54%		Long bean	15%
Ivy gourd leaves	43%		Shallots	13%
Papaya	41%		Gourd	12%
Wing beans	35%		Peanuts	11%
Wax gourd	35%		Moringa	11%
Bottle gourd	31%		Luffa gourd	9%
Amaranth	28%		Chinese leek	7%
Long sponge gourd	28%		Soy bean	5%
Sweet potatoes	27%		Non	3%

Looking at figure 31 it can be seen that protein rich crops like amaranth, wing bean, moringa, peanuts and soya bean are mentioned more frequent among peers.

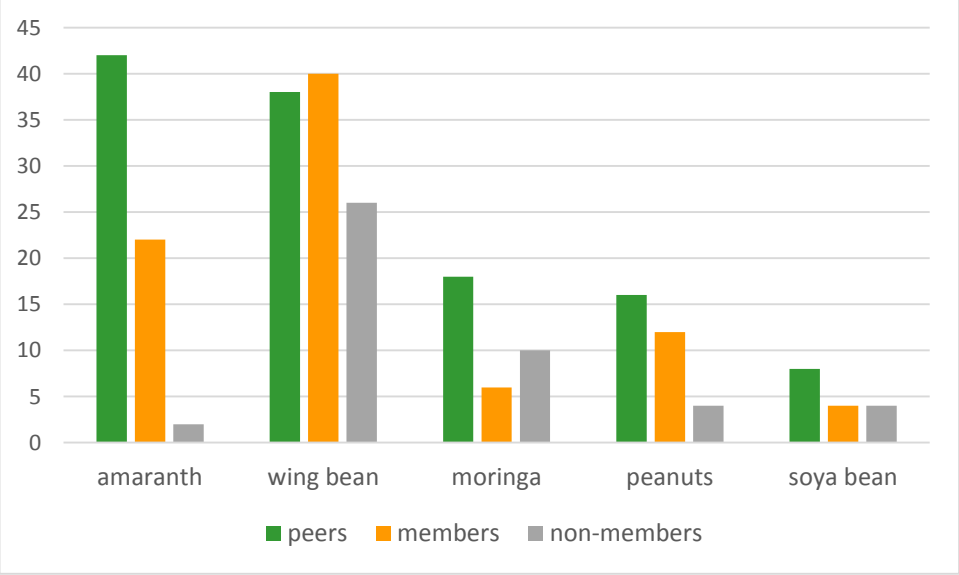

Figure 31: Cultivation of Protein-Rich Crops

Another part of the training is to demonstrate food preservation techniques. More than half of the peers and members ferment excessive vegetables whereas not even 1/4 of women who didn't receive a training use this method.

6.7. Income Generation and Market

One of the basic pillars of LANN is to increase and diversify income generation. The beneficiaries were trained to ferment excessive vegetables, produce dishwashing liquid and to make sweets/homemade snacks for selling. The data show that about 1/3 of the peers and members sell excessive or fermented vegetables, which is much more frequent compared to non-members (2 %). In addition peers generate income by selling dishwashing liquid or homemade sweets more often. On average non-members earn from these activities $ 1.25, members $ 8.75 and peers even can generate an additional income of $ 32.3 per month. In comparison to the mean yearly income of $ 925 [Neth et al., 2014] this is quite a lot and account for almost half of the mean monthly income.

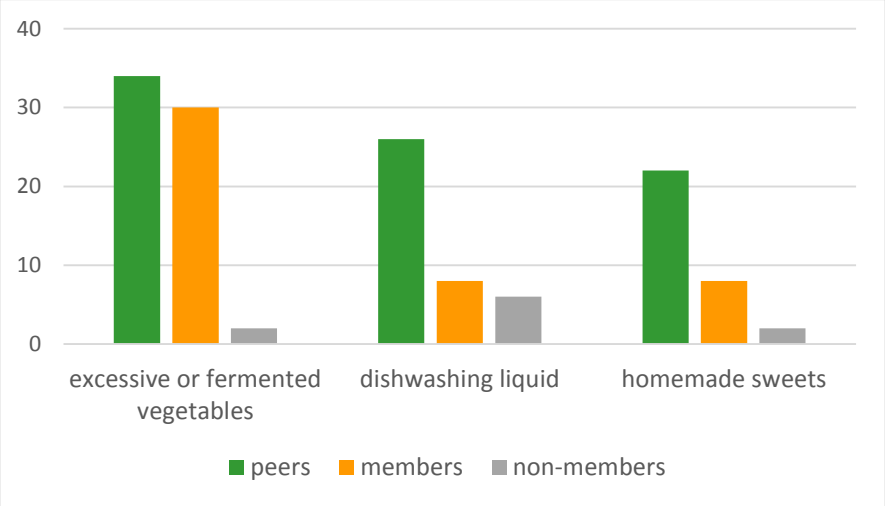

Figure 32: Income Generation Activities

The participants of the FGDs highlighted the increasing importance of food purchased at markets since 2010. While the amount of agricultural production remained constant (45 %) the share of wild food was reduced by 25 %. A difference between beneficiaries and non-beneficiaries was not assessed due to the small sample size which is not representative (two FGDs per group).

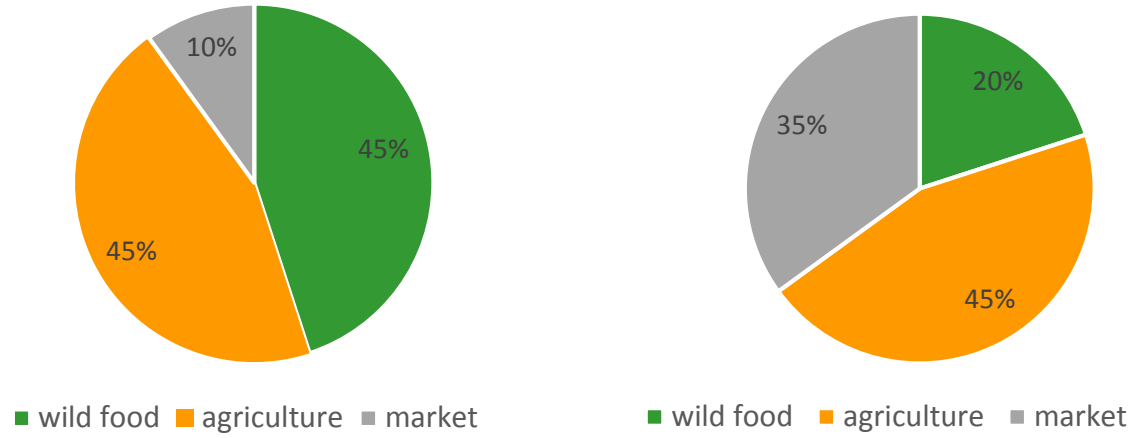

Figure 33: Food Sources in 2010 (left) compared to 2015 (right)

As demonstrated in table 24 the expenditures on food vary between the groups. Peers spend about $ 55 per month, whereas members spend almost $ 65 and non-members $ 59. The differences between the groups mainly can be explained by the different expenditure on rice. Peers spent around $ 7 less than the other groups. The reasons for this only can be speculated. It could be that they own more land for rice cultivation or that their rice yield was increased by using the system of rice intensification (SRI method) which is promoted by WHH/CEDAC as well.

Comparing the expenditure on sweets between the groups, it can be seen that beneficiaries spend more money on sweets than non-members. This shows that knowledge isn't always turned into practice since they know that sweets are unhealthy and unwise to buy. The availability of commercial snacks and sweets is rapidly increasing and a desire to purchase those products can be observed. The expenditure on industrial sweets is higher compared to fruits in each group.

Furthermore the data show that if more money is available it is not necessarily spent on (healthy) food. The expenditures on non-food items among the peers is about 30 % higher than of members and non-members. Therefore it can be assumed that more money is available, but the expenditures on fruits, vegetables and meat are comparable to the other groups. However, a higher expenditure on non-food items could be explained by a sufficient food supply through own agricultural production as well.

The total expenditure of non-members was about 10 % less compared to the other groups which leads to the assumption that their income might be less as well.

The share of food expenditures (excl. alcohol) accounts for 63.5 % of peers' total expenditures, 78.1 % of members' and 75 % of non-members'.

Table 24: Expenditures in US-Dollar ($)

Food item	Peers	Members	Non-members
Meat, fish, eggs	15.6	16.9	14.7
Staple food	8.8	15.2	15.8
Vegetables	6.8	6.0	6.8
Sweets/soft drinks	4.6	5.7	3.6
Fruits	3.6	4.3	3.0
Oil/fat	4.0	3.3	4.0
MSG	2.6	2.6	2.5
Salt	1.8	2.1	1.3
Other food items	7.1	7.5	7.2
Sum	**54.9**	**63.6**	**58.9**
Alcohol	11.1	14.6	7.8
Non-food items	31.5	17.8	19.6
Total expenditure	**97.5**	**96.0**	**86.3**
Ratio food : non-food (excl. Alcohol)	1.7:1	3.6:1	3.0:1
Share of food exp.	63.5%	78.1%	75.0%

Furthermore the interviewees were asked which spending on food and drinks they assess as unwise (in general). Figure 34 shows that peers and members name sweets, unhealthy snacks, soft drinks, alcohol and also MSG much more frequent compared to non-members.

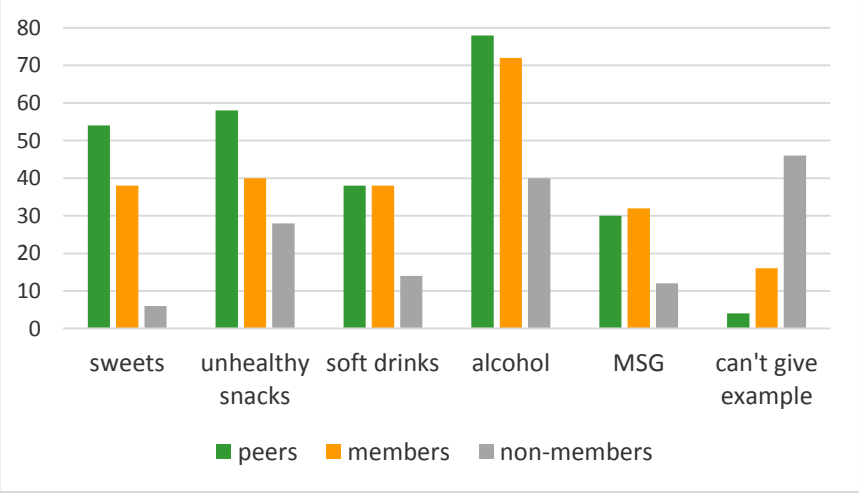

Figure 34: Examples of unwise spending

Since meat is quite expensive it's important to know which alternatives provide similar nutrients to cover the requirements. When asking the women about cheaper alternatives to meat (besides fish) it shows that peers and members can name alternatives like eggs, insects and plant alternatives (beans, soya bean, amaranth, etc.) twice as often as non-members. Almost half of the non-members can't give any example.

As it is advisable to reduce the amount of MSG it was asked what can be used instead to improve the taste of a meal. Sugar was mentioned most frequent, especially by the peers, which isn't a recommended alternative. Advisable substitutes would be for example fresh herbs which was mentioned by just 16 % of the peers and 4 % of the non-members.

6.8. Natural Resource Management

Since deforestation and the degradation of natural resources is a major concern in the target villages its impact on wild food supply was assessed. The majority of the women (ca. 80 %), independent on the group, report that the consumption of wild food is becoming less. Furthermore almost all women are worried that their grandchildren will not have enough wild food to eat in future.

Conservation zones for animals and plants are essential for the recovery of its population. Around 60% of the women mention to have such conservation areas in their village. The data in Figure 35 show that more peers and members can name possibilities of how to assure food security in future, e.g. keeping forest and water resources and sustainable harvest of wild food. However, when asking whether they would harvest all of the mushrooms found in the forest or just as much as the family needs, around 60 % of each group would harvest all of them. This shows that knowledge about sustainable harvest is not turned into practice in this case.

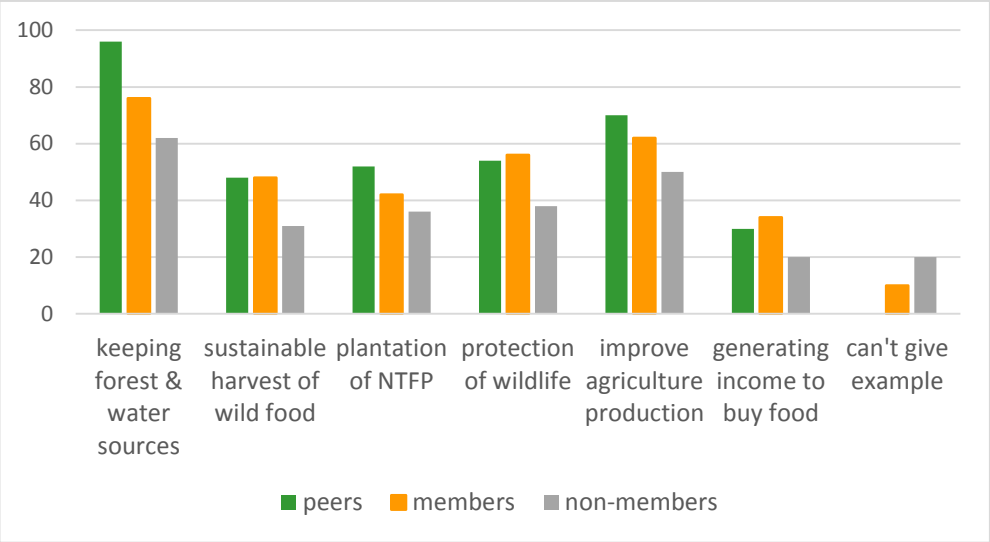

Figure 35: Possibilities to assure Food Security

A peer's suggestion of how to keep natural resources was to avoid agrochemicals. Besides negative impacts on the environment agrochemicals impair human health. Those who received training know more short term and especially long term effects of agrochemicals. For instance 3/4 peer educators know that pesticides are stored in the body and mobilised during pregnancy while just 1/3 of the non-members know this fact. Furthermore the interviewees were asked about possibilities to protect themselves from agrochemicals. As demonstrated at the graph below, peers and members could name more examples. However, when asking about how they actually protect themselves it was found that not all of them turn their knowledge into practice. Around 75 % of the peers and about 60 % of the non-members apply the mentioned protection methods.

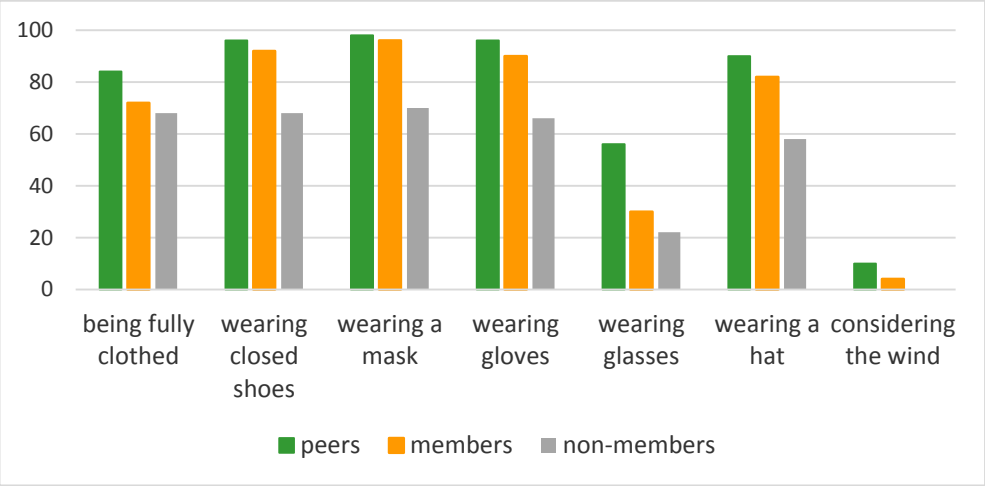

Figure 36: Protection from Agrochemicals

6.9. Evaluation of the Training

At the FGDs the FNWG members were asked about the changes through the training and its strengths and weaknesses.

The women reported that their food production has improved due to the training. They learned new recipes which are considered as more tasty and healthy. In addition they mentioned to use more different kinds of vegetable since they learned about the importance of diversity. Furthermore the women claimed to have improved hygiene related to food as well as personal and family hygiene.

Due to the provided seeds the women were able to grow an increased amount and more diverse crops. Excessive vegetables get preserved through fermentation, which was taught by the staff. The fermented vegetables can be sold at the market and contribute to an improved food security throughout the year. The women appreciate to know how to produce dishwashing liquid on their own, which helps them to safe money or to increase income by selling it at the market.

Furthermore the women reported a decrease of food taboos for lactating and pregnant women since they know the importance of the nutrients provided by those foods. The women stated that they also share their gained knowledge with other villagers by showing them banners which are provided by the project and by demonstrating new recipes.

As strengths of the training the improved food processing and their increased understanding about healthy nutrition were mentioned. The concept of recruiting peer educators who are trained by the staff and then provide training to the FNWG is considered as a strength of the project. Other positive aspects which are mentioned by the beneficiaries is the intense training on how to grow vegetables and improve hygiene.

The participants also reported some weaknesses of the training. In contrast to the statement before it was criticised that the training of peers is not enough and that there should be more training in the villages by the staff. The sharing of information doesn't work well and the leader of the FNWG doesn't invite the members for the monthly meetings properly. Furthermore some women have difficulties to attend the training

because their houses are far away. This shows that the concept of training peer educators works well in some villages but isn't expedient in others. Furthermore women mentioned difficulties about the demonstrated recipes. They don't have enough ingredients to cook the dishes at home and some are not sure about the components, because they can't read and don't remember them.

Non-members and men were asked whether they have heard about the training and what they know about its contents. It was found that all except two participants (who claim to live far away from the village) have heard about the nutrition training.
The participants know that the training is about food processing, making healthy sweet dishes and eating more diverse food. Also they mention that members of FNWG receive seeds, learn how to grow crops and ferment excessive vegetables. Furthermore the non-members and men know that the training addresses hygiene practices as well.

7. Discussion

The survey aims to provide information about the impact of the LANN approach on knowledge and behaviour change regarding nutrition. It needs to be considered that behaviour is difficult to measure apart from observational studies. The demonstrated data is based on self-assessment of the interviewees whose perception might vary. Although knowledge could be determined it can't be inferred that gained knowledge is turned into practice. Furthermore there is a shortage of distinct indicators assessed within the baseline survey which limits the outcome of the current study.

One of the most significant indicator used to measure the impact of the LANN approach is the Food Consumption Score (FCS) established by WFP. Another adequate tool to measure the diversity of food intake is the Household Dietary Diversity Score (HDDS) by FANTA/FAO. Advantage of the HDDS is that it assesses Vitamin A rich foods separately and therefore gives information on specific micronutrient intake. However, it was decided on the FCS firstly, because this tool allows to capture information about households' habitual diet due to its longer day recall period (7 days) and secondly, this tool was also used within the baseline survey and therefore provides comparable results.
It needs to be considered that the baseline survey was undertaken in March and the endline survey in February. Potential differences in the food consumption between these months were investigated within the focus group discussions. Although no differences could be found slight variations in the consumption can't be excluded. Another weak point is that it was not differentiated between milk consumed in larger quantities and milk used as condiment. Since milk is mainly consumed as sweet milk, which is used for coffee in small amounts, it leads to an overrating of the FCS. However, milk is consumed less than once a week whereby it doesn't contribute much to the FCS.
Besides the consumption frequencies of the different food groups, portion sizes were assessed. The portion sizes were classified into `big portion´, ``medium portion´ and `small portion´. Since the portion sizes were not standardised the perception of the interviewees might vary.

The results demonstrate that peer educators generally show the best outcomes. It has to be noted that women, who were selected to be peer educators are more likely to speak Khmer, the national language of Cambodia. Therefore it is hypothesised that peers have a higher education and income which could lead to better results in addition to extensive training. However, also members whose education and wealth status is assumed to be comparable to non-members achieved remarkable results what demonstrates the impact of the approach appropriate.

8. Conclusion

The evaluation of the household survey and the focus group discussions conclude that most of the objectives of the LANN approach could be achieved. However, the survey determines some knowledge gaps of the beneficiaries and practices which couldn't be modified as well.

The results show that the knowledge on nutrition relevant topics is more advanced among beneficiaries of the approach. To name a few examples, peer educators and members have a proper perception of malnutrition especially regarding the necessity of consuming diverse foods and an improved understanding of how to store and prepare foods in order to reduce nutrient loss. Most of the beneficiaries are aware of wise and unwise food choices at the markets and are able to name many cost-efficient alternatives to meat including crops high in protein. Furthermore peer educators and members know that agrochemicals cause short- and long-term effects on human health and how to protect themselves from these chemicals. In addition they have greater awareness on the importance of the protection of natural resources from forests and rivers including sustainable harvest and the cultivation of NTFPs in order to assure food security in future.

However the survey also identified some knowledge gaps especially regarding mother and child care. It was found that 4 % of peer educators and 10 % of members suppose that breastfeeding is recommended for four months or even less. Furthermore 1/5 of the beneficiaries believe that fresh milk or sweet milk are good alternatives to breastmilk. Although the results are better compared to non-members knowledge on these topics need to be improved.

To measure behaviour change is more complex and not that distinct since the data is based on self-assessment of the interviewees. However, the results demonstrate that some behaviours could be modified in a beneficial way whereas other practices show no improvement compared to the control group. Regarding agriculture, especially peer educators state that they intensified and diversified their production since the last five years. It was found that they are much more likely to have a fish pond, animal husbandry and a year round vegetable garden. In addition beneficiaries could generate an additional monthly income of $ 32,3 (peer educators) and $ 8,75 (members) by demonstrated income generation activities. The increased purchasing power and enhanced agricultural production improve availability and access of food. In combination with proper knowledge this probably distributes to an improved food consumption among the beneficiaries.

The study determines that the Food Consumption Score, which represents dietary diversity, is 12 % higher among peer educators and 7 % higher among members compared to non-members. Furthermore a better use and utilisation of food can be assumed due to improved food processing, post-harvest management (e.g. fermentation of excessive vegetables) and hygiene practices (self-assessment).

However, the study identified practices which couldn't be modified as well. For example there weren't any differences between the groups according to the practice of the widespread food taboos during pregnancy and lactation. This behaviour is hard to change, due to superstition and the enforcement by family members and other villagers. Another example which shows that knowledge isn't always turned into practice is that peer educators and members spend much money on sweets and alcohol even though they know that these products are unhealthy. Desire for high caloric industrialised products which have recently become available for remote villagers seems to be increasing. High consumption of these products might be a major factor for the growing overweight rates whereby further interventions are required.

The management of natural resources is a key element of the LANN approach but its potential was not fully used within the project. For example the cultivation of NTFP

would be beneficial but wasn't turned into practice so far. Furthermore the survey shows that training on sustainable harvest doesn't show any change in behaviour.

Investigation regarding the effectiveness of external linkages was very limited within this survey, however, positive effects could be identified. For example peer educators and members show improved practices concerning WASH, they visit health centres more often during pregnancy and have a greater protection against agrochemicals which plays a role in the prevention of illnesses.

In conclusion it can be said the LANN approach provides great potential to improve knowledge and behaviour related to nutrition in order to increase dietary diversity.

9. Recommendations for Improvement

This thesis demonstrates great achievements accomplished by the LANN approach but there could also be identified potentials for improvement.

In Ratanakiri the LANN approach was implemented as part of a bigger project whereby the objectives and used indicators were not specific to LANN. To improve monitoring and evaluation of the approach it's advisable to define clear indicators on household and individual level, which are surveyed within a comprehensive baseline study. Intended outcomes and goals could be defined in collaboration with the beneficiaries within focus group discussions. This ensures that the provided support responds to the villagers needs and enhances their motivation and compliance.

Since Welthungerhilfe carries out the approach through its local partner Organisation a common understanding of `what is LANN´ and how it is implemented is required. The development of specific LANN-Guidelines would be supportive to facilitate a proper implementation and to enhance commitment to the approach. Also it needs to be clarified that all parts of this multisectoral approach are intended to be provided to the same target group to achieve synergetic effects.

So far, the LANN approach in Ratanakiri targets just women at reproductive age. It would be beneficial to include men and other decision makers such as elderly villagers as well in order to create an enabling environment for women and to allow sustainable behavioural changes. According to this survey the idea of targeting men as well is generally supported by the FNWG members.

The management of natural resources is a key element of LANN, but its potential isn't fully tapped so far. LANN understands natural resources in its widest sense, including wild foods, NTFPs but also soil, water, forest, garbage and environment in general. This wide perspective provides potential to scale up the NRM pillar such as domestication of wild foods and NTFPs, construction of conservation zones, improvement of cooking methods which require less firewood, usage of biological fertilisers to improve soil quality, etc.

Cooking sessions are a well-established training element, which is much appreciated by the FNWG members. However, the survey detected some difficulties regarding the implementation at home. FNWG members claim that some of the ingredients are more expensive and harder to get compared to those for traditional meals. Therefore it's advisable to rework some recipes and prioritise the local availability and easy accessibility of ingredients. Furthermore it was noted that those recipes mainly established for income generation are not necessarily healthy, such as artificially coloured rice flour cake. This demonstrates a missing link between income generation and nutrition, which needs to be addressed. Healthier alternatives are for example sweet dishes which include protein and micronutrient rich plants like beans, amaranth, pumpkin, etc. A possibility to extend the cooking demonstrations are to create recipes for a specific target group, such as complementary food for infants, oral rehydration solutions for villagers with diarrhea, easy digestible food for sick people, etc.

Illiterate women stated that it's difficult for them to remember the ingredients and instructions of the recipes. To manage this issue it would be advisable to hand out picture-based recipes, which was already introduced to a certain extent.

Food taboos especially during lactation are still widely practiced among FNWG members. Those restricted foods provide an important source of protein and micronutrients which are important for the infant's growth and mother's health. Therefore training on the importance of those foods should be intensified.

The `L´ in LANN stands for linkages within the LANN approach but also with other departments or institutions in order to address all aspects which influence Food and Nutrition Security. These linkages are not necessarily interlinking but rather heading towards the same goal – improved FNS. Some gaps could be identified whereby especially external linkages need to be strengthened. For example, women claimed that they know about good hygiene practices but can't turn them into practice because they don't have a latrine or access to improved water sources. Furthermore the partnership with the provincial department of health, which provide training on mother and child care,

should be intensified since there is still a lack of knowledge on IYCF. Furthermore teen-age fertility level is very high whereby it would be appropriate to provide additional trainings on family planning which target young women.

Many of the target villages are affected by ELCs which threatens Food and Nutrition Security. Some community land titles could already be granted with support of WHH/ CEDAC, whereby villagers obtain rightful access to land, forest and its resources. Although progress can only be achieved slowly this issue is essential in order to ensure sustainability of LANN interventions.

10. Abstract (English)

Cambodia is facing a serious hunger situation according to the latest Global Hunger Index. The highest rates of malnutrition and food insecurity are found in rural and mountainous areas in the northeast of Cambodia which are mainly inhabited by marginalised ethnic minority groups. Most of the indigenous peoples are smallholder famers whose livelihood and food security mainly depend on agriculture and natural resources. Availability and access of food is increasingly impaired due to land scarcities and reduction of non-timber forest products and wild foods which results in an inadequate food intake.

LANN is an abbreviation for `Linking Agriculture, Natural Resource Management and Nutrition´. It is a food based approach which aims to enhance knowledge and behaviour related to nutrition in order to optimise dietary intake. To achieve this goal the approach intends to intensify and diversify agricultural production, strengthen natural resources and generate income to enable villagers to buy foods at markets. Furthermore it enhances the use and utilisation of food by optimising food processing, avoiding nutrient loss, reducing food taboos and improving mother and child care. To fully cover all Food and Nutrition Security dimensions the approach collaborates with complementary departments and institutions.

Welthungerhilfe and its local partner Organisation CEDAC are implementing the LANN approach in Ratanakiri Province since 2010. So far there is a lack of evidence regarding its effectiveness. Therefore this survey aims to provide information on the impact of the LANN approach. To assess knowledge and behaviour of beneficiaries and non-beneficiaries (reference group) quantitative data was collected by conducting household surveys. The Food Consumption Score established by World Food Programme was used to determine dietary diversity. Furthermore focus group discussions were undertaken in order to gain additional information on villagers' perceptions and experiences on the LANN approach.

The survey determines that beneficiaries have a greater knowledge about nutrition sensitive topics compared to non-beneficiaries. Furthermore many practices could be modified in a positive way. One of the most important findings is that dietary diversity could be increased significantly.

11. Abstract (Deutsch)

Kambodscha ist dem aktuellen Welthungerindex zufolge von einer ernsten Hungersituation betroffen, wobei sich in den ländlichen und bergigen Gebieten im Nordosten des Landes die höchste Mangelernährungsrate, sowie die größte Nahrungsmittelunsicherheit finden. Diese Gebiete sind vor allem von marginalisierten ethnischen Minderheiten besiedelt. Die meisten indigenen Bewohner sind Kleinbauern, deren Lebensgrundlage und Nahrungsmittelsicherheit stark von der Landwirtschaft und den natürlichen Ressourcen abhängt. Die Verfügbarkeit und der Zugang zu Nahrungsmitteln werden durch Landknappheit sowie durch die Verringerung von Nichtholz-Waldprodukten und wild wachsenden Lebensmitteln zunehmend verschlechtert. Die Folge ist eine inadäquate Nahrungszufuhr.

Die Abkürzung LANN steht für `Linking Agriculture, Natural Resource Management and Nutrition´. Der auf Nahrungsmitteln basierende Ansatz, zielt darauf ab, Wissen und Verhaltensweisen in Bezug auf Ernährung zu verbessern, um die Nahrungsaufnahme zu optimieren. Um dieses Ziel zu erreichen, soll die landwirtschaftliche Produktion intensiviert und diversifiziert werden. Weitere vorgesehene Maßnahmen sind die Stärkung natürlicher Ressourcen und die Erwirtschaftung von Einkommen, um den Einkauf von Lebensmitteln am Markt zu ermöglichen. Durch die Optimierung der Lebensmittelverarbeitung sowie die Verminderung von Nährstoffverlusten und tabuisierten Nahrungsmitteln soll außerdem die Verwertung von Lebensmitteln verbessert werden.
Um alle Dimensionen der Nahrungsmittel- und Ernährungssicherheit abzudecken, ist eine Zusammenarbeit mit ergänzenden Departments und Institutionen vorgesehen.

Die Welthungerhilfe und ihre lokale Partnerorganisation CEDAC wenden den LANN Ansatz bereits seit dem Jahr 2010 in der Provinz Ratanakiri an. Bisher gibt es jedoch noch keinen Nachweis über seine Effektivität. Daher war es das Ziel der vorliegenden Studie, Informationen über die Auswirkungen des LANN Ansatzes zu gewinnen.
Um Wissen und Verhaltensweisen von Leistungsempfängern und Nicht-Empfängern (Referenzgruppe) zu ermitteln, wurden quantitative Daten mittels Haushaltsstudien erhoben. Der `Food Consumption Score´, entwickelt vom Welternährungsprogramm, wurde zur Bestimmung der Vielfalt der Nahrungsmittelzufuhr verwendet. Des Weiteren wurden Fokusgruppendiskussionen durchgeführt, um zusätzliche Informationen im Hinblick auf die Auffassung und Erfahrungen der Dorfbewohner bezüglich des LANN Ansatzes zu bekommen.

Im Rahmen der Studie wurde festgestellt, dass die Leistungsempfänger ein größeres Wissen über ernährungsrelevante Themen haben als die Nicht-Empfänger. Einige Verhaltensweisen konnten ebenfalls positiv verändert werden. Eines der bedeutendsten Ergebnisse ist, dass auch die Diversität der Nahrungsaufnahme signifikant gesteigert wurde.

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13. Annexes

The annex contains the questionnaire for the household interviews, central questions of the focus group discussions and the author's curriculum vitae.

13.1. Household Questionnaire

LANN Household

Questionnaire (February 2015)

Village _____ District _____ Date _____

Name of household (head)_____ Interviewee Name _____

Ethnic group _____ Age of interviewed person _____

# of people in household Adults (>18+) [ ] Children 0 – 5 [ ] Children 6 - 18 [ ]

Peer educator [ ] or Member [ ] or Non-Member [ ] Identification-number [ ]

1. Social mobilisation

Peers and Members:

1.1. How often does your Food and Nutrition Women Group have a meeting?

1. □ One time per week
2. □ A few times per month
3. □ One time per month
4. □ Every half year
5. □ Every year

1.2. How many percent of the members usually attend the meeting?

1. □ >90%
2. □ ~75%
3. □ ~ 50 %
4. □ ~ 25%
5. □ <10%

1.3. Do you give your information about nutrition also to other villagers (not FNWG members)

2. □ Yes
3. □ No

1.4. If yes, how do you spread the information?

1. □ Set up regular meetings
2. □ Set up occasional meetings
3. □ Chatting with friends and neighbours about nutrition
4. □ Others:_____

1.5. Do you give your information about nutrition also to your husband?

1. □ Yes
2. □ No

1.6. How do you assess his interest in nutrition?

1. □ Very interested
2. □ A little bit interested
3. □ Not much interested
4. □ Not interested

1.7. Do you think men should be included in the nutrition trainings provided by the project?

1. □ Yes
2. □ No
3. □ Don't know

Non-Members:

1.1. Is one of your family members a member of the Food and Nutrition Women's Group?

1. □ Yes
2. □ No

1.2. Did you receive a training about nutrition from a peer trainer or a member of the Food and Nutrition Women's Group?

1. □ Yes
2. □ No
3. □ Don't know

1.3. If yes, how did you receive the information?

1. □ Set up regular meetings
2. □ Set up occasional meetings
3. □ Chatting with friends and neighbours about nutrition
4. □ Others:_____

1.4. How many times have you been trained within the last 5 years?

1. □ Never
2. □ 1 time
3. □ 2-5 times
4. □ 5-9 times
5. □ 10-19 times
6. □ >20 times

2. Perception on malnutrition

Knowledge questions, don't read the answers!

2.1. Do you know what malnutrition is?

1. □ Yes
2. □ No

2.2. If yes, can you identify some indicators on the picture here showing a malnourished boy?

1. □ Being weak/tired
2. □ Failed growth (too thin, too short)
3. □ Bones showing
4. □ Blond mesh in hair
5. □ Can't identify

2.3. Do you know what causes malnutrition?

1. □ Yes
2. □ No

2.4. If yes, can you describe some causes on the picture here? Look at the boy again; what can be the reason for his situation?

1. □ Not enough food to eat
2. □ Not enough diversity in foods
3. □ Low child feeding practices (including breast feeding
4. □ Low mother care
5. □ Low hygiene
6. □ Infectious diseases and parasites which hampers the body makes use of the food eaten
7. □ Can't describe

2.5. What is your idea about moving out of malnutrition? What are good practices a family can take?

1. □ Eating more food (volume)
2. □ Eating more diverse
3. □ Diversifying and improving food production
4. □ Managing wild food resources
5. □ Generating income to buy more food which cannot be collected in wild or pu chased
6. □ Exclusively breastfeeding for 6 months
7. □ Less hard work for women (improved mother care)
8. □ Improved hygiene
9. □ Deworming
10. □ Others:_____
11. □ Can't give example

2.6. What are good hygiene practices? (

1. □ Using latrine

2. □ hands after using toilet
3. □ Washing hands before cooking and before eating
4. □ Cleaning vegetables
5. □ Clean kitchen
6. □ Drinking safe water
7. □ Others: _____
8. □ Can't give example

2.7. Which practices do you follow to improve the nutritional status of your family?

1. □ Eating more foods (volume)
2. □ Eating more diverse
3. □ Diversifying and improving food production
4. □ Managing wild food resources
5. □ Generating income to buy more food which cannot be collected in wild or pu chased
6. □ Exclusively breastfeeding for 6 months
7. □ Less hard work for women (improved mother care)
8. □ Improved hygiene
9. □ Deworming
10. □ Others:_____
11. □ Can't give example

2.8. Do you drink unboiled water when you are in the field/ forest?

1. □ Yes, always
2. □ Yes, but only if running out of boiled water
3. □ Never

2.9 How do you assess the hygiene practices of your family members?

Hygiene practice	Good	Moderate	Bad	Not available
Using latrine				
Washing hands after using toilet				
Washing hands before cooking and eating				
Cleaning vegetables				
Clean kitchen				
Drink safe water				

3. Food Consumption

3.1 Do you think the diversity in your family's diet is enough?

1. □ Yes
2. □ No
3. □ Don't know

3.2. If no, from which food groups do you think you eat too less?

1. □ Staple food group

2. □ Vegetable food group
3. □ Fruit food group
4. □ Meat, fish, eggs, plant alternatives food group
5. □ Calcium rich food group
6. □ Oil/fat food group
7. □ Don't know example

Knowledge questions, don't read the answers!

3.3. How many different food groups should you eat per day?

1. □ ≤ 3 food groups
2. □ 4 food groups
3. □ 5 food groups
4. □ 6 food groups
5. □ ≥ 7 food groups
6. □ Don't know

3.4. Which food can be eaten as an alternative to meat?

1. □ Eggs
2. □ Fish
3. □ Insects
4. □ Plant alternatives (beans, soya beans, amaranth, etc.)
5. □ Others: _____
6. □ Don't know example

3.5. Which food is rich in Calcium?

1. □ Crickets
2. □ Worms
3. □ Beetle
4. □ Small Fish
5. □ Shrimp
6. □ Others: _____
7. □ Don't know example

3.6. Please give 5 examples about how to avoid nutrient loss (during storage, food preparation, cooking)

1. □ Minimise storage time
2. □ Store foods dry, dark, cool (away from fire, cover vegetables, etc.)
3. □ Store away from animals
4. □ Close your salt bag
5. □ Put oil bottle in container
6. □ Ferment excessive vegetables
7. □ Peel gently
8. □ Steam roots/tubers with skin
9. □ Wash your vegetables before cutting
10. □ Cook those food items which take long first
11. □ Others: _____
12. □ Can't give example

3.7.What are the benefits of a good nutrition?

1. □ Strong body
2. □ Lots of energy and being active
3. □ Good immune system, being healthy
4. □ Support intelligence
5. □ Able to concentrate/work
6. □ Can't give example

3.8. Do you think sweets are healthy for children?(*candies, ice cream, crips, cookies, soft-drinks, jellies*)

1. □ Yes
2. □ No
3. □ Don't know

3.9. How do you usually prepare your vegetables before cooking?

1. □ Cut first, then wash
2. □ Wash first, then cut

3.10. Imagine, you cook a meal with <u>meat and vegetables</u>, in which sequence do you put the following ingredients in the pot

1. □ Oil, salt, vegetables, meat
2. □ Salt, vegetables, meat, oil
3. □ Meat, vegetables, oil, salt
4. □ Oil, meat, vegetables, salt
5. □ Everything at the same time
6. □ Others: _____

Non-Members:

3.11. Did the members of the food and nutrition women's group show you how to cook some of the promoted recipes?

1. □ Yes
2. □ No

3.12. How often do you cook the shown recipes at home?

1. □ Every day
2. □ Several times per week
3. □ One time per week
4. □ Several times per month
5. □ One time per month
6. □ Every half year
7. □ One time per year

3.13. What are the difficulties for cooking the recipes at home?

1. □ No difficulties at all
2. □ Difficult to get ingredients
3. □ Ingredients are more expensive than for other dishes

4. □ Don't know how to cook recipes
5. □ Does not taste good
6. □ Husband hinders you from changing cooking habits
7. □ Mother or other people hinder you from changing cooking habits
8. □ Others: _____
9. □ Can't give example

3.14. Where do you store your (vegetable) oil?

1. □ Next to the cooking place where it is warm
2. □ Somewhere where it is cool
3. □ Exposed to light
4. □ Kept away from light
5. □ Others: _____

3.14. How often do you use MSG?

1. □ Every meal
2. □ One meal per day
3. □ Sometimes per week
4. □ Sometimes per month
5. □ Never

3.16. Since the last 5 years, is your usage of MSG becoming:

1. □ Much less
2. □ Less
3. □ Stable
4. □ More
5. □ Much more

4. Food Consumption Score

1) Could you please tell me how many days in the past week (last 7 days) your household has eaten the following foods (fill in the number of days, write 0 for items not eaten over the last 7 days). A day counts when a food item is eaten a minimum one time per day. Please ask how many days per week and not how many times per day. A day counts if it is eaten only one time or several times.

2) From those food items listed please indicate the volume consumed (1=low portion, 2=medium portion, 3=big portion).

Food Groups	Examples of food Items	# of day (Last 7 days)	Volume
Cereals	Rice, maize, other cereals, etc.		
Tubers	Cassava, potatoes, sweet potatoes, etc.		
Pulses	Beans, peas, groundnuts, cashew nuts, etc.		
Vegetables (wild)	Wild vegetables, leaves, etc.		
Vegetables (domestic)	Domestic vegetables		
Fruit	Papaya, mango, pineapple, etc.		
Meat	Meat, poultry, eggs,		

Fish (wild)	fish, aquatic animals etc.		
Fish (from fish pond)	aquatic animals etc.		
Milk	Milk and related products		
Sugar	Sugar, honey, sweets, soft drinks, etc.		
Oil	Oils, fats, etc.		
Condiments	Coffee, tea, Soya Sauce, Fish Sauce, etc.		

5. Mother and child care

Knowledge questions, don't read the answers!

5.1. Is it good to feed the colostrum (yellow breast milk which comes first) to the baby?

1. □ Yes
2. □ No
3. □ Don't know

5.2. How long is it recommended to exclusively breastfed a child?

Number of months (age): [ ]

5.3. Is fresh milk or sweet milk a good alternative to breast milk?

1. □ Yes
2. □ No
3. □ Don't know

5.4. At which age should you start giving supplementary food?

Number of months (age): [ ]

5.5. What are the benefits of a good nutrition for pregnant women?

1. □ Good recovery from delivery/pregnancy
2. □ Baby is more likely to be healthy
3. □ Baby is strong and within a normal weight range (more than 2,5 kg)
4. □ Others: _____
5. □ Can't give example

5.6. How long did you exclusively breastfed your youngest child?

Number of months (age): [ ]

5.7. How often have you been to the health centre during your latest pregnancy?

Number of antenatal HC visits [ ]

5.8. How often did you have to work hard during your last pregnancy?

1. □ Very often
2. □ Often
3. □ Sometimes
4. □ Rarely
5. □ Never

6. Food Taboos

6.1 Which food is taboo during pregnancy?

1. □ Jack fruit
2. □ Banana
3. □ Pumpkin
4. □ Chicken egg
5. □ Buffalo
6. □ Pig head
7. □ Others: _____
8. □ Non

6.2 Which food is taboo During lactation

1. □ Chicken
2. □ Buffalo
3. □ Catfish
4. □ Pork
5. □ Pig head
6. □ Egg plant
7. □ Pumpkin
8. □ Wax melon
9. □ Cassava leave
10. □ Others: _____
11. □ Non

6.3 Who is enforcing the taboo?

1. □ Myself/mother
2. □ Husband
3. □ Grandmother
4. □ Tradition
5. □ Others: _____

6.4. How do you assess the practice of food taboos among the FNWG members compared to 5 years ago?

1. □ Much increased
2. □ Increased
3. □ Stable
4. □ Decreased
5. □ Much decreased

6.5. If the food taboos are becoming less, what is the reason for this?

1. □ NGO, Governor, Radio promotion
2. □ Peer and FNWG member promotion
3. □ Better understanding of parents
4. □ Others: _____
5. □ Can't give example

7.Agriculture

Knowledge questions, don't read the answers!

7.1. What are the negative short-term health effects of agrochemicals?

1. □ Dizziness
2. □ Vomiting
3. □ Headache
4. □ Skin reaction
5. □ Others: _____
6. □ Can't give example

7.2. What are the negative long-term effects of agrochemicals?

1. □ Store at body – mobilised during pregnancy
2. □ Damage on liver
3. □ Damage of nervous system
4. □ Damage on reproductive system
5. □ Weakening immune system
6. □ Others: _____
7. □ Can't give example

7.3. How can you protect yourself from agrochemicals?

1. □ Being fully clothed
2. □ Wearing clothed shoes, boots
3. □ Wearing a mask
4. □ Wearing gloves
5. □ Wearing glasses
6. □ Wearing a hat
7. □ Considering the wind
8. □ Others: _____
8. □ Can't give example

7.4. How do you assess the <u>amount</u> of food from own production compared to 5 years ago?

1. □ Much increased
2. □ Increased
3. □ Stable
4. □ Decreased
5. □ Much decreased

7.5. How do you assess the <u>diversity</u> of food from own production compared to 5 years ago?

1. □ Much increased
2. □ Increased
3. □ Stable
4. □ Decreased
5. □ Much decreased

7.6. Do you have a fish pond, animal husbandry, vegetable garden?

1. □ Fish pond
2. □ Animal husbandry
3. □ Vegetable garden in wet season
4. □ Vegetable garden in dry season
5. □ Others: _____
6. □ Nothing

7.7. Which of the promoted crops do you plan to grow also after the support of the project?

1. □ Wing beans	12. □ Shallots
2. □ Peanuts	13. □ Sweet Potatoes
3. □ Soy bean	14. □ Chili
4. □ Moringa	15. □ Bottle gourd
5. □ Amaranth	16. □ Long eggplant
6. □ White Amaranth	17. □ Cucumber
7. □ Long sponge gourd	18. □ Leafy Amaranth
8. □ Pumpkin	19. □ Chinese Leek
9. □ Wax gourd	20. □ Pokrev
10. □ Ivy Gourd Leaves	21. □ Others: _____
11. □ Papaya	22. □ Non

7.8. **Do you ferment excessive vegetables?**

1. □ Yes
2. □ No
3. □ Don't know

7.9. How do you protect yourself from agrochemicals?

Protection	always	sometimes	never
Being fully clothed			
Wearing clothed shoes, boots			
Wearing a mask			
Wearing gloves			
Wearing glasses			

8. Wise Spending

Knowledge questions, don't read the answers!

8.1. Can you give examples of unwise spending of food/drinks?

1. □ Sweets
2. □ Unhealthy snacks
3. □ Soft drinks
4. □ Alcohol
5. □ MSG
6. □ Others: _____
7. □ Can't give example

8.2. What are cheaper alternatives to meat?

1. □ Eggs
2. □ Insects
3. □ Plant alternatives (beans, amaranth, soya bean, …)
4. □ Others: _____
5. □ Can't give example

8.3. What can be used instead of MSG to improve the taste of a meal?

1. □ Fresh herbs
2. □ Spices
3. □ Oil/fat
4. □ Sugar
5. □ Others: _____
6. □ Can't give example

8.4. Do you know 2 possibilities of how to increase your income?

1. □ Selling excessive or fermented crops
2. □ Selling homemade dishwashing liquid
3. □ Selling homemade sweets
4. □ Selling banana chips
5. □ Others:_____
6. □ Can't give example

8.5. How much money do you spend on food per month?

Riel per month [KHR]

8.6. In the past month, How much money did your family spend on the following food?

		Expenditure
1	Staple food (e.g. rice, potatoes)	KHR
2	Meats, fish, eggs	KHR
3	Fruits	KHR
4	Vegetables	KHR
5	Oil / vegetable & animal fat	KHR
6	Sweets/soft drinks	KHR
7	Salt	KHR
8	Monosodium Glutamate (MSG)	KHR
9	Other food items: _____	KHR
10	Alcohol	KHR
11	Non-food items (fuel, clothes, medicine,...)	KHR

8.7. Can you sell excessive crops or fermented vegetables?

1. □ Yes
2. □ No
3. □ Don't know

8.8. Can you create some income by selling dishwashing liquid?

1. □ Yes
2. □ No
3. □ Don't know

8.9. Can you create some income by selling homemade sweets like, Nom Korng cakes?

1. □ Yes
2. □ No
3. □ Don't know

8.10. How much income do you get per month by selling these products?

Riel per month [KHR]

9. Natural Resource Management, Future food sources & food security

9.1. Please describe the trend of wild food (plants and animals) consumption over the last 5 years in your household

1. □ Increasing
2. □ Decreasing
3. □ Stable

9.2.Are you worried that your grandchildren will not have enough wild foods (plants and animals) to eat in the future?

1. □ Yes
2. □ No

Knowledge questions, don't read the answers!

9.3. Do you know practices how to protect wild fish?

1. □ No explosives
2. □ No shocking
3. □ No illegal fishing
4. □ No usage of big nets
5. □ Others: _____

9.4. What are possibilities to substitute the loss of wild food?

1. □ Establish a vegetable garden
2. □ Establish livestock
3. □ Build a fish pond
4. □ Purchase wild food alternatives at market
5. □ Others: _____
6. □ Can't give example

9.5. What can be done to assure food security in the future?

1. □ Keeping the forest & water sources
2. □ Managing wild food resources, sustainable harvest of wild food
3. □ Plantation of NTFP

4. □ Protection of wildlife
5. □ Improve agriculture production
6. □ Generating income to buy more food which cannot be collected in wild or purchased
7. □ protect forest
8. □ Others: _____
9. □ Can't give example

9.6. If you find many edible mushrooms in the forest, do you harvest:

1. □ All of the mushrooms
2. □ As much as the family/household needs
3. □ Nothing

9.7. Do you have conservation zones for wild animals or plants in your village?

1. □ Yes
2. □ No
3. □ Don't know

9.8. How do you keep wild food?

1. □ Keeping the forest & water sources
2. □ Managing wild food resources, sustainable harvest of wild food
3. □ Plantation of NTFP
4. □ Protection of wildlife
5. □ Improve agriculture production
6. □ Generating income to buy more food which cannot be collected in wild or purchased
7. □ Protect forest
8. □ Others: _____
9. □ Can't give example

13.2. Focus Group Discussion Questionnaire

LANN Questionnaire
Focus Group Discussion
(February 2015)

Village _____ District _____ Date _____

Total number of participants [ ] # of participants > 50 years [ ]

1. Which problems related to nutrition does your household/village have?
2. Please demonstrate the proportion of the different food groups you eat per week. How did it change within the last five years?
3. What are the most common vegetables and fruits (max 10 each group) and how many times do you eat them per week?
4. How did your food sources change within the last five years?
5. Which food taboos do you have? (in general, pregnant women, lactating women)
6. What are the reasons for the food taboos?
7. Did you hear about the nutrition trainings provided by CEDAC/WHH? If yes, what do you know about the nutrition trainings and its contents? (Additional Question for non-members and men)
8. Which changes did the nutrition trainings bring? What is now done different in your household/village?
9. What are the strengths and weaknesses of the training?
10. What could be reasons why other women are not members of the FNWG? (Question for members)
11. Why did you decide not to be a member of the FNWG? (Alternative question for non-members)
12. What are the tasks of men related to nutrition?
13. Which impact would it have to include men in the nutrition trainings? Do you think they would join? (Men: Would you join?)
14. Are there differences in the food intake of February compared to March? If yes, what are the differences?

13.3. Curriculum Vitae

Personal Information

Name:	Schindecker Carina
Address:	Bruckmuehlweg 4, 5300 Hallwang
E-Mail:	carina.schindecker@sbg.at
Date and place of birth:	1. May 1990, Salzburg
Nationality:	Austria

Education

10.2013 – until now:	Master's degree course: Nutritional Sciences *University of Vienna, Austria*
09.2010 – 06.2013:	Bachelor's degree course: Dietetics *FH Campus Vienna, Austria*
09.2004 – 06.2009:	High school diploma, HBLWM Salzburg, Austria

Professional Experience

07.2015 – 09.2015:	Dietitian (Holiday Replacement), *Public Hospital Hallein*, Austria
02.2015:	*Welthungerhilfe* (aid organisation), Cambodia Assignment: Field research on LANN approach (endline survey)
10.2014 – 01.2016:	Tutor for sensory course, Department of Nutritional Sciences, *University of Vienna*, Austria
09.2014 – 12.2014:	Internship, *Welthungerhilfe* (aid organisation), Cambodia Assignment: Finalising LANN Toolkit
09.2014 – 02.2016:	Receptionist, *MINI MED* gemeinnützige GmbH, Austria
07.2014:	Internship, *Allin Diätetik GmbH*, Austria
03.2014 – 08.2014:	Internship (EDDY-Study), *Austrian Academic Institute for Nutrition Medicine* (ÖAIE), Austria
07.2013:	Dietitian (Holiday Replacement), *Private Clinic Döbling*, Austria
04.2013 – 05.2013:	Internship, *Public Hospital Hallein,* Austria
11.2012 – 01.2013:	Internship, *Frontier Lifeline Hospital Chennai*, India
10.2012 – 11.2012:	Internship, *Christian-Doppler-Clinic Salzburg*, Austria
08.2012 – 09.2012:	Internship, *Salzburg Regional Hospital*, Austria
05.2012 – 06.2012:	Internship, *Charité University Hospital Berlin*, Germany
01.2012 – 02.2012:	Internship, *Public Hospital Oberndorf*, Austria
04.2010 – 07.2010:	Internship, *Melasan GmbH - Nutritional Supplement Manufacturing*, Austria

Personal Skills and Competences

Languages

German:	Mother tongue
English:	Full working proficiency
French:	Basic knowledge

Computer Skills

Microsoft Office:	Word, Excel, Power Point
Nutritional value program:	Nuts
Clinical software:	Patidok, OrgaCard
Statistical program:	IBM SPSS Statistics