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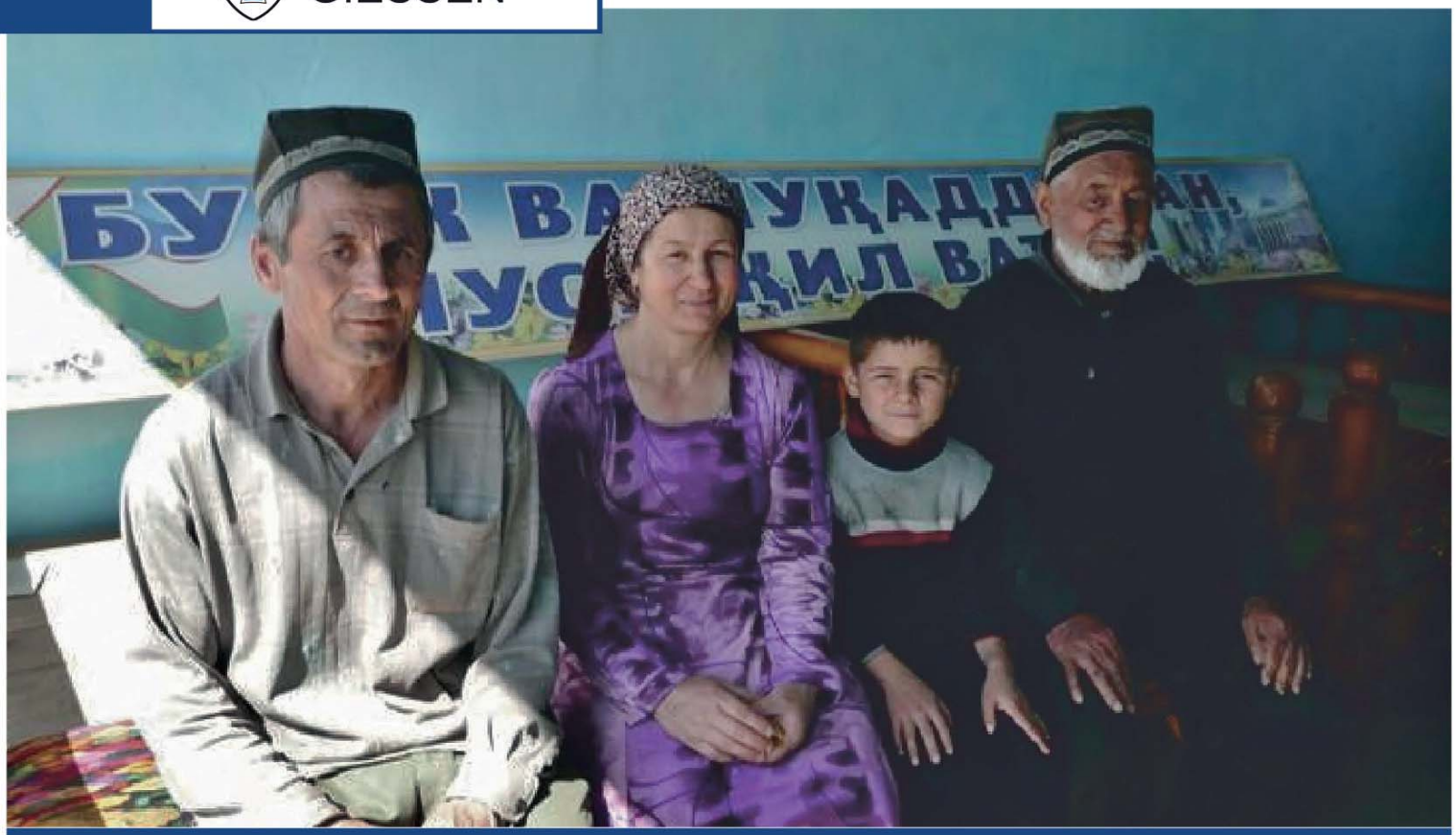

Land use, food and nutrition security – Case study in rural Uzbekistan

Boris Gojenko

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Giessen, June 2014 Boris Gojenko

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LIST OF ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
BMI	Body Mass Index
CFSVA	Comprehensive Food Security and Vulnerability Assessment
CIS	Commonwealth of Independent States
CPI	Consumer Price Index
DD	Diarrheal Diseases
DHS	Demographic and Health Surveys
FAO	Food and Agricultural Organization of the United Nations
FBS	Food Balance Sheet
FCS	Food Consumption Score
GDP	Gross Domestic Product
GIEWS	Global Information Early Warning System
GNP	Gross National Product
GTZ/GIZ	German Agency for Technical/International Cooperation
Ha	Hectare
HBS	Household Budget Survey
HFSSM	Household Food Security Survey Module
HH	Household
ICG	International Crisis Group
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
Kcal	Kilocalorie
Kg	Kilogram
LBW	Low Birth Weight
LSA	Living Standards Assessment
MAWR	Ministry of Agriculture and Water Recourses
OECD	Organization for Economic Cooperation and Development
PEM	Protein-Energy Malnutrition
PPP	Purchasing Power Parity
SCN	Sub-Committee on Nutrition
SD	Standard Deviation
SDC	Swiss Agency for Development and Cooperation
SIC ICWC	Scientific Information Centre of Interstate Coordination Water Commission of Central Asia
UNDP	United Nations Development Program

UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNSCN	United Nations Standing Committee on Nutrition
USA	United States of America
USDA	United States Department of Agriculture
USSR	Union of Soviet Socialist Republics
UZS	Uzbek Soum
UzStat	State Statistical Committee of the Republic of Uzbekistan
VAM	Vulnerability Analysis and Mapping
WB	World Bank
WFP	World Food Program
WHES	World Hunger Education Service
WHO	World Health Organization
WOC	World Organization of Creditors

1. INTRODUCTION

This chapter shortly describes the current statement of food and nutrition situation in the global context. Food and nutrition situation in Central Asian countries and particularly in Uzbekistan are also exposed by this chapter.

1.1 Background of the study

“Halving hunger by 2015” has been defined as part of the First Millennium Development Goal. However, recent statistics paint a very gloomy picture about actually being able to achieve this Millennium Development Goal. Although the relative number of hungry people has decreased, 852 million people are still chronically or acutely malnourished (Klennert, 2005).

According to the FAO (2004) in the last decade alone the number of people affected by malnutrition all over the world has grown by 18 million and now comprises over 852 million. Among these people 815 million are in developing countries, 28 million live in transition countries (former socialist countries), and 9 million reside in developed countries. Every year over 20 million children in developing countries are born underweight and malnutrition results in the death of five million children, while the survivors are susceptible to various diseases (UNDP, 2010).

Hunger and the consequences of hunger causes the death of approximately 40 million people each year, around 13 million of them are children. Moreover, more than 40 percent of the world’s population suffers from micronutrient deficiencies, also called the “Hidden hunger”: roughly 2 billion people, especially women, are affected by iron deficiency and about 1.6 billion people live in regions where iodine deficiency is endemic. Approximately 230 million children worldwide suffer from vitamin A deficiency (FAO, 2002).

Due to the worldwide media coverage of conflicts, crises and catastrophes most people believe these are the main causes of hunger and malnutrition. In fact, 90 percent of the world’s hungry people suffer from chronic food and nutrition insecurity as a result of structural deficits within their own countries and not because of an acute food shortage due to manmade or natural calamities. In particular the poor suffer from chronic food and nutrition insecurity which prevents them from realizing their physical and intellectual potential. This, in turn, hampers the economic development of whole regions (Klennert, 2005).

In order to maintain global food security the global food production has to be doubled in the coming 25-30 years (Schultz et al., 2009).

Guaranteeing food security is of critical importance for the Central Asia region due to its landlocked nature, big numbers and low incomes of rural population, and transition from planned centralized economy to the market economy.

Food security is of paramount importance to Central Asian countries, whose populations are so severely impacted by fluctuations in food prices. The primary concern surrounding food security in the region is the relatively high level of poverty faced by Tajikistan and Kyrgyzstan, and to a lesser extent Uzbekistan (Sedik et al., 2011).

During the transition from planned to market economies, the Central Asian Republics (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan) experienced rising poverty, food insecurity and malnutrition as well as serious degradation of natural resources, in particular of water and land. The transition to a market oriented economy has not been adequately supported by institutional development which resulted in a decline in the living standards of the population and which has further caused in high levels of food insecurity and malnutrition (Babu and Tashmatov, 2000).

Land use strategies in Uzbekistan determine the level of own food security. While the area of rangelands is vast, the livestock farming and production of grains, fruits and vegetables play a major role in food security and also are the basic source of rural population income. During the years of independence (i.e. beginning from the year 1991) Uzbekistan has undertaken a number of measures and has reached food security which is guided on self-sufficiency with a foodstuff. It is basically grain, but does not consider the availability as well as balancing food for the population (Yakhshilikov, 2006).

1.2 Problem statement

Since declaring independence in September 1991, Uzbekistan has adopted a rigid approach to food security that prioritizes self-sufficiency but lacks an emphasis on balanced nutrition and affordable food. According to Yakhshilikov (2006) although Uzbekistan produces adequate calories to supply its population by food, almost 30 percent of its people live below the food poverty line, and large nutritional disparities exist among income groups.

From 2000 to 2007, agricultural production rose steadily by at least 6 percent per year, significantly outpacing the population growth rate. Owing to a successful wheat self-sufficiency policy, the wheat harvest expanded almost nine-fold between 1991 and 2006. At the same time, import restrictions and a policy to produce import substitutes reduced food imports by one-third (Yakhshilikov, 2006).

However, food security also encompasses affordable food and a diverse diet that includes essential nutrients. The poorest Uzbek population spends an average of 60 percent of their income on food and consumes a diet dominated by cereals. Wheat and

cotton together account for almost 80 percent of the country's cultivated land, reducing the area devoted to other crops and livestock fodder, and narrowing the selection of available nutrients. Yet average wheat yields remain quite low and in some provinces have achieved the pre-Green Revolution levels (UNDP, 2010).

1.3 Study objectives

The main objective of the present study is to empirically analyze the current food and nutrition status of farmers' households in two study regions of Uzbekistan: Markhamat region of Andijan province and Denau region of Surkhandarya province.

Following the main objective of the study, the specific objectives were developed. Specific objectives of the present study are as follows:

1. To analyze the income, food and nutrition situation of households according to producing cash and food crops on farmland, and/or on homestead plot (including/excluding the livestock keeping);

2. To analyze the relationship between the number of food crops produced on homestead plots and household's food security.

1.4 Methodological approach

The principal instrument of the present study was a primary data collection through the field study. Field study was conducted by the investigator and his helpers using different questionnaires described in detail in Chapter 4.

First of all, the structured household questionnaire was used in order to obtain the socio-demographic data, socio-economic data, and dwelling unit data.

Additionally, modified Household Food Security Survey Module (HFSSM), Food list recall, and Food Consumption Score questionnaire (FCS) were applied to clarify the food security and food consumption status of investigated households.

The analytical tools were developed based on the investigations of factors influencing food security and food consumption status. Here the data on household composition, education of household head, level of income, and crop production on farmland and homestead plots was used.

Further, the descriptive statistics were used in order to classify the study households into the groups, taking into account their food security and food consumption status. This tool permitted to define the threshold between food secure and food insecure household, as well as the households with a high food consumption and low food consumption status.

U-test and t-test help to understand the dependency of different variables as the linkage between the level of education and level of income, crops production and level of income, level of education and food consumption.

Finally, the logistic regression was used in order to better understand the factors which influence food security and food consumption status of the households.

1.5 Organization of the study

The study is organized in ten chapters. The first chapter provides the introduction and general overview of the food and nutrition situation in the world and in Central Asian countries. This chapter also consists of the introduction to food security situation in Uzbekistan. The problem statement, general and specific study objectives, the methodological approach are also explained in this chapter.

The second chapter shortly describes the main theoretical approaches of food security. The overview of evolution, definitions, dimensions and characteristics of food security are given in this chapter. The main causes, consequences and coping strategies in the context of developing countries are also highlighting by this chapter.

The third chapter provides the literature review on factors influencing food and nutrition security in developing countries and in Uzbekistan. Based on the literature review, study hypotheses were developed. These hypotheses are also described and justified in this chapter.

The fourth chapter introduces the specific conditions of Uzbek land use, agricultural production and food security status. The main stages of agricultural and food policy reforms are presented in this chapter. The main characteristics of study regions are also described here.

Chapter five exposes the study and sampling design, the methods of data collection and data processing.

Chapter six provides descriptive findings of the study. Here only univariate indicators are described.

Chapter seven highlights the results of bivariate analysis which indicate the factors influencing food and nutrition security of investigated households.

Chapter eight describes the logistic regression modeling of food security and food consumption status of investigated households.

Chapter nine is focused on discussion and comparison of obtained results with the data from local and international scientific literature. The limitations of the study are also presented in this chapter

The thesis is finalized by the chapter ten with conclusions and recommendations of the author.

2. THEORETICAL APPROACHES FOR FOOD AND NUTRITION SECURITY

This chapter describes the theoretical background and gives an overview concerning food and nutrition security. The chapter presents scientific definitions, aspects and main characteristics of food and nutrition insecurity as well as the basic measures and indicators of it. This chapter also covers the causes and consequences of food and nutrition insecurity. The final part of the chapter discusses the coping strategies for food and nutrition insecurity as a whole and in particular in developing countries.

2.1 Evolution, concepts and definitions of food and nutrition security

Global food and nutrition security concern has a history of more than sixty years (see Fig. 2.1), and has evolved through a sequence of definitions and paradigms. The concept of a “secure, adequate and suitable supply of food for everyone” was accepted internationally on the historic “Hot Spring Conference of Food and Agriculture” in 1943. After that conference the bilateral agencies from donor countries such as the USA and Canada were created in the 1950s and started to dispose of their agricultural surplus commodities overseas (Gross et al., 2000).

In the 1960s when it was acknowledged that food aid may hinder for developing self-sufficiency, the concept of food for development was introduced and institutionalized. The best example to demonstrate this could be the creation of the World Food Program (WFP) in 1963.

According to Weingartner (2005), the food crisis of the years 1972/1974 marked a dramatic turning point from the past era of food abundance of donor countries to highly unstable food supplies and prices on the world market. As a result in the 1970s food security insurance schemes were developed. These schemes assured international access to physical food supplies.

In the 1980s following the Green Revolution achievements which helped to increase food production and availability, it was recognized that food emergencies and even famines were not caused as much by catastrophic shortfalls in food production as by sharp declines in the purchasing power of specific social groups. Therefore, food security was broadened to include both physical and economic access to food supply. Thus, poverty alleviation and the role of women in development were promoted in this decade (Gross et al, 2000).

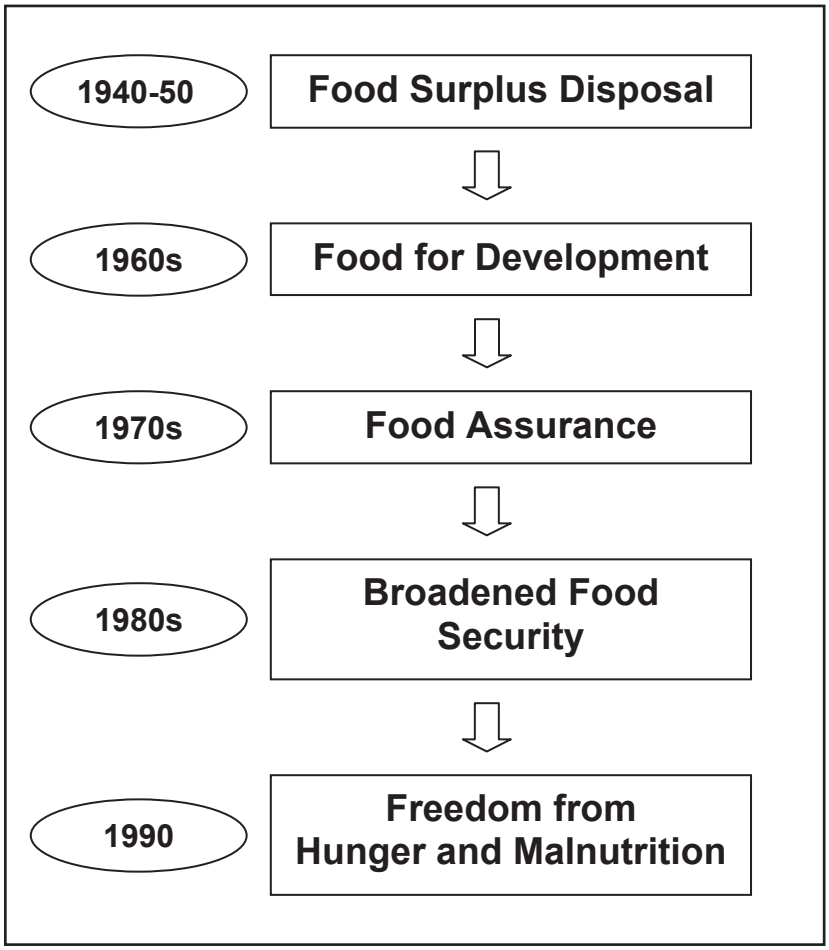

Figure 2.1: The evolution of food and nutrition concerns

Source: Gross et al. (2000), Weingartner (2005)

In order to eradicate or at least to reduce hunger and malnutrition drastically, concrete plans were defined in the 1990s. Moreover, the human right to adequate food and nutrition was internationally reaffirmed and committed national governments to a more proactive role. Finally, reduced international public support of donor agencies reduced food aid to crisis management and prevention (UNDP, 2010).

In the 2000s, decreasing hunger and malnutrition has increasingly come to be seen in the context of overall development, poverty reduction and achievement of the Millennium Development Goals (UNSCN, 2004). Exclusively, in cases if adequate food and nutrition are ensured for all members of a society, these internationally accepted development targets can be achieved (Gross et al., 2000; Weingartner, 2005).

The concept of food security was initially proposed in 1974 at the World Food Summit as *"the availability, at any time, of sufficient global reserves of basic food items to maintain sustainable growth of food consumption and compensate for fluctuations in production and prices"* (FAO, 2006. p.1). In subsequent years the definition of food security was widened to encompass the safety and dietary value of food items, as well as indi-

vidual preferences. The current literature on food security provides over 200 definitions and 450 indicators.

According to a currently accepted definition (FAO, 2008. p. 2), *"Food Security"* is achieved when *"all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life"*. Food is defined as any substance that people eat and drink to maintain life and growth. As a result, safe and clean water is an essential part of food commodities. This definition already includes aspects of nutrition but yet insufficiently (FAO, 2008). Despite of it, this FAO definition of food security had been taken as the own definition for food security in the context of the present study.

The necessity to include nutrition into food security evolved over time. The nutrition focus adds the aspects of caring practices and health services and healthy environments to this definition and concept. This aims at what is more precisely called "*Nutrition Security*", which can be defined as adequate nutritional status in terms of protein, energy, vitamins, and minerals for all household members at all times (Quisumbing, 1995) and thus, in principle is more than food security.

All terms described above shows that the definition of food and nutrition security is the following: *"Food security is achieved, if adequate food (quantity, quality, safety, sociocultural acceptability) is available and accessible for and satisfactorily utilized by all individuals at all times to live a healthy and happy life"* (Gross et al., 2000. p. 4). Consequently, food has to meet physiological requirements in terms of quantity, quality, and safety. Moreover, food must be socially and culturally acceptable.

2.2 Dimensions and characteristics of food and nutrition security

According to Gross et al. (2000), food and nutrition security depends on three dimensions:

- categorical,
- socio-organizational, and
- managerial.

Each of these dimensions (or characteristics) will be detailed discussed below.

2.2.1 Categorical and temporal dimensions of food and nutrition security

There are two determinants influence the framework of food and nutrition security: a physical and a temporal determinant. Figure 2.2 illustrates the relationship among the categorical elements within the conceptual framework of food security.

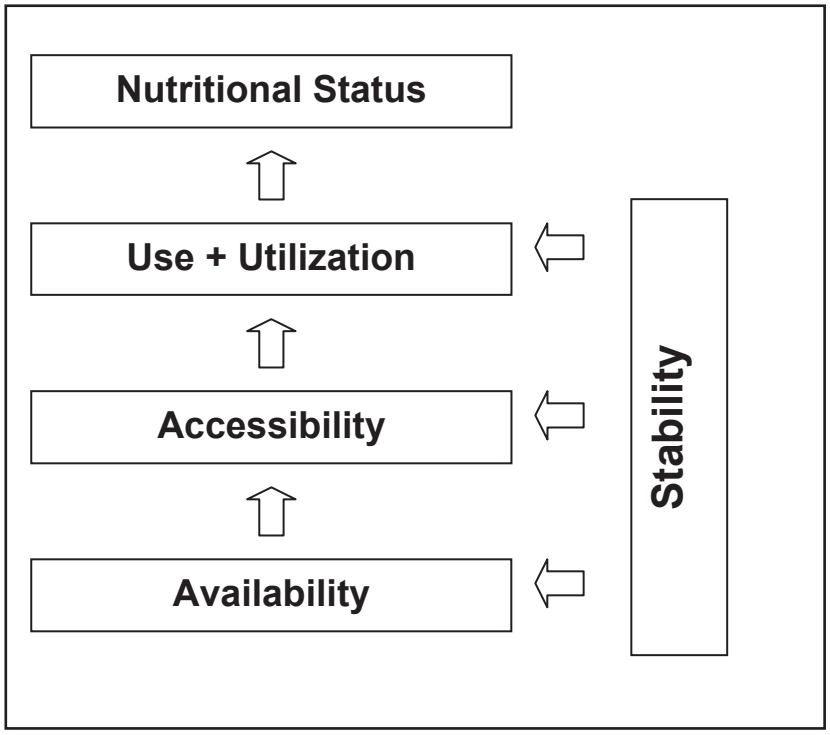

Figure 2.2: The conceptual framework of food and nutrition security

Source: Gross et al. (2000), Weingartner (2005)

The temporal determinant of food and nutrition security refers to stability, which affects all three physical elements, i.e. availability, accessibility, and utilization.

In this context *availability* refers to the physical existence of food from own production and/or from the markets. On the national level food availability is a combination of domestic food production, food imports, food aid, and domestic food stocks. Use of the term availability is often confusing since it can refer to food supplies available at both the household level and at a regional or national level. However, the term is applied most commonly in reference to food supplies at the regional or national level (Riley and Moock, 1995).

Access is ensured when all households and all individuals within those households have sufficient resources to obtain appropriate foods for a nutritious diet (Riley and Moock, 1995). It is dependent on the level of household resources which are: capital, labor, and knowledge; and on food prices. Hence, adequate access can be achieved without households being self-sufficient in food production. More important is the ability of households to generate sufficient income which together with own production can be used to meet food needs (Weingartner, 2005).

Following the definition of food security and accordingly with Dukhovny et al. (2012) three types of access could be marked out:

- Physical access is determined by an ability of the country to produce and/or to import necessary quantities of required food on the basis of food balance reflecting needs and production;

- Social access is determined by the state policy of food supply for all layers of population on the basis of equitable food access. Social access should also include fostering of adequate diets – socially health society neither overeats nor starves;
- Economic access means that all layers of population are able to get sufficient food according to their financial capacities (Dukhovny et al., 2012).

Use of food refers to the socio-economic aspect of household food security. If sufficient and nutritious food is both available and accessible the household has to make decisions concerning what food is to be purchased, prepared and consumed and how the food is allocated within the household. The households which has sufficient access to food but which has not equal distribution could have some individuals which may suffer from food deficiency. The same is true if the composition of the consumed food is unbalanced. Another aspect is the social function that food can have in terms of community cohesion through offerings, ritual meals etc. especially in food deficit times. All mentioned socio-economic aspects are determined by knowledge and habits (Gross et al., 2000).

Focusing on the individual level food security also requires taking the biological *utilization* of food into consideration.

Gross et al. (2000) and Weingartner (2005) refer this to the ability of the human body to take food and convert it into either energy which is either used to undertake daily activities or is stored. Utilization requires not only an adequate diet, but also a healthy physical environment, including safe drinking water and adequate sanitary facilities and an understanding of proper health care, food preparation and storage processes.

Stability refers to the temporal dimension of nutrition security, i.e. the time frame over which food security is being considered (Gross et al. 2000). In much of the food security literature, a distinction is made between two types of food insecurity:

- chronic food insecurity – the inability to meet food needs on an ongoing basis;
- transitory food insecurity – the inability to meet food needs on a temporary nature (Maxwell and Frankenberger, 1992).

Transitory food insecurity is divided into two subcategories:

- cyclical, where there is a regular pattern to food insecurity, e.g., the “lean season” or “hungry season” that occurs basically in the period just before harvest;
- temporary, which is the result of a short-term, exogenous shock such as droughts or floods. Also civil conflict belongs to the temporary category, although their negative impact on food security often continues over long periods of time (Weingartner, 2005).

2.2.2 Socio-organizational dimensions of food and nutrition security

The categorical aspects of food and nutrition security described above are relevant to all levels of social and administrative organizations. It concerns micro level, i.e. individual and household level; meso level, i.e. community, region and province level; and macro level, i.e. national and global level. At higher levels of social organization the overall political, economic and ecological conditions are more important. Hereby, food and nutrition security have to involve aspects of both the natural sciences and the social sciences. As a result, the relevance of food and nutrition security at all socio-organizational levels and the interactions between these levels stresses the necessity of an interdisciplinary approach to food and nutrition security (Maxwell and Frankenberger, 1992).

The merging of the categorical and the socio-organizational dimensions shows that availability, accessibility, utilization of food and the stability of these three elements differ in their nature, causes and effects at the macro, meso and micro level. For example, food may be available in a country but not in certain disadvantaged districts or among some groups of the population, for example – discriminated. The seasonality of food availability and utilization, due to cyclic appearance of diseases, may be a rural but not an urban phenomenon (Gross et al., 2000).

2.2.3 Managerial dimensions of food and nutrition security

The Project Cycle Management in Food and Nutrition Programs

The third dimension is the managerial aspect of food and nutrition security projects and programs. The management follows the classical project cycle shown in the Figure 2.3 and has different names in different organizations and institutions. Hereby, UNICEF calls it “Triple A”: Assessment, Analysis, Action. In GTZ it has a name: Project Cycle Management. However, internationally and scientifically was accepted that program implementation follows a cyclic learning process consisting of the following steps:

Assessment → Analysis → Planning → Intervention → Monitoring and Evaluation (or Reassessment) (Gross et al., 2000).

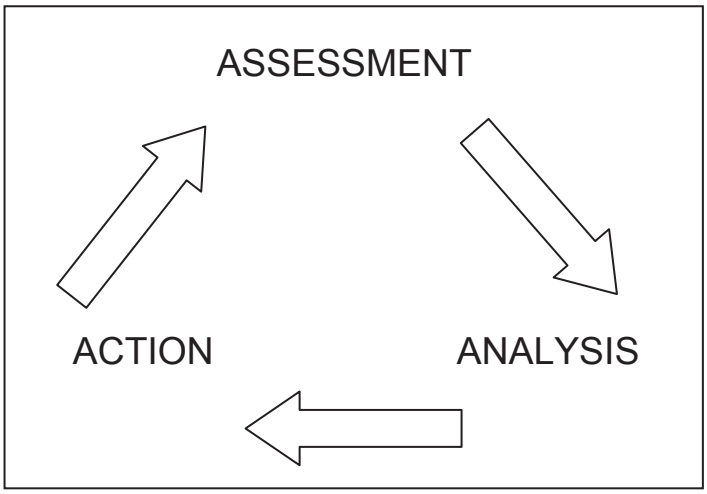

Figure 2.3: Concept of Triple A or Project Cycle Management

Source: Gross et al. (2000), Weingartner (2005)

Thus, problems, their causes and causal relationships should be identified through assessment. Potential solutions could be also identified through the assessment and feasible solutions can then be elaborated through a comprehensive analysis that includes all program participants. This process is essential to implement the efficient, sustainable, and acceptable actions required to improve the food and nutrition security status of the targeted risk groups (Gross et al., 2000).

Instruments for assessment food and nutrition security

As was mentioned above, the food and nutrition security has three dimensions: categorical, socio-organizational, and managerial. First of all instruments and processes must be selected for assessment. Assessment of the availability of food at the macro level is different from those used at the meso or micro levels because all elements are interrelated vertically and horizontally by nature, cause and effect. For example, inappropriate assessment of food availability may lead to the formulation of ineffective interventions that actually reduce access and utilization (Weingartner, 2005).

In turn, Gross et al. (2000) asserts that food and nutrition security is a complex system and at different socio-organizational levels is caused by different factors which require specific solutions for each of them. As a consequence, an effective food and nutrition security programs need a holistic program approach.

During each stage of the Project Cycle Management there is a need for continuous data and information collection. It is strictly necessary for the target definition, to select appropriate interventions, and to monitor and evaluate food and nutrition security program progress, process and impact (Robinson, 1999). Table 2.1 provides examples of assessment instruments sustaining to the different elements of food and nutrition security at macro, meso, and micro levels.

Table 2.1: Assessment of food and nutrition security situation at different social levels

Social level	Availability	Accessibility	Utilization	Stability
Macro	Precipitation Record, Food Balance Sheet	Vulnerability Analysis and Mapping (VAM)	Demographic and Health Surveys (DHS)	Global Information Early Warning System (GIEWS)
Meso	Food Market Survey	Food Focus Group Discussion	District Health Survey	Anthropometric Survey
Micro	Agricultural Production Plan	Intra-household Food Frequency Questionnaire	Immunization Chart	Weighing Chart

Source: Adapted from Gross et al. (2000), Weingartner (2005)

At the macro level, precipitation records can predict future food production. Moreover, food balance sheet provides information on food availability at the national level. The World Food Program (WFP) developed the Vulnerability Analysis and Mapping (VAM) project to analyze the vulnerability to food insecurity of target populations and an important part of VAM is related to food availability. The Demographic and Health Survey (DHS) provides health data for a number of countries for national policy design. FAO has developed the Global Information Early Warning System (GIEWS), in order to collect the data related to temporary food insecurity. Under the leadership of the World Health Organization (WHO), several health surveillance systems have been developed. These surveillance systems were implemented for monitoring the epidemiology of selected diseases (Gross et al., 2000).

At the meso or sub-national level, food market surveys provide data on the availability of food. Qualitative surveys, such as food focus group discussions and other information on the accessibility of food are in greatest need for this social level. District health surveys describe health conditions that may reflect food utilization problems. Food and nutrition security programs assisted by GTZ use the standardized BASELINE survey method for quantitative analysis (Gross et al., 2000).

Finally, in order to assess the availability, accessibility, and utilization of food and its stability at micro level, the agricultural production surveys, intra-household food frequency interviews, immunization surveys, and anthropometric surveys for children under five years old can be used (Weingartner, 2005).

The main indicators of food and nutrition security

There exist a number of indicators for measuring food and nutrition security taking into account the social level. Table 2.2 provides the most common of them.

Table 2.2: Most common indicators for food and nutrition security at different social levels

Social level	Availability	Accessibility	Utilization	Stability
Macro	• Fertility rate • Food production • Population flows	• Food price • Wages • Per capita food consumption	• Stunting rate • Wasting rate • LBW rate	• Food price fluctuation • Regional gaps
Meso	• Harvesting time • Staple food production	• Market and retail • Food prices	• Latrine coverage • DD rate	• Pre-/post- harvest food • BMI
Micro	• Food storage • Consumption of wild foods	• Meal frequency • Food frequency • Employment	• Weight-for-age • Goiter • Anemia	• Pre-harvest food practices • Migration

Source: Adapted from Gross et al. (2000), Weingartner (2005)

National food availability depends on supply and demand. Therefore, data on different food commodities production, fertility rate and the trends in internal population should be recognized in order to determine the national situation of food availability. Food prices and per capita food consumption indicates the national food accessibility. The rates of stunting, wasting in children and adults, and low birth weight (LBW) are food and nutrition impact indicators that designate the extent to which food is adequately utilized. Fluctuations in food prices and regional gaps of food availability or accessibility are sensitive indicators for national food and nutrition instability (Weingartner, 2005)

At the meso level delayed harvest time and reduced staple food production are indicators of reduced food availability. At this level, food prices are sensitive indicators for accessibility. Types of sewage disposal and diarrheal diseases (DD) rates provide information on the effectiveness of food utilization. The comparison between pre- and post-harvest food availability and accessibility as well as low Body Mass Index (BMI) of women indicates temporal food and nutrition insecurity (Maxwell and Frankenberger, 1992).

The lack of food storage and the consumption of wild foods indicate reduced food availability at the household level. A reduced number of meals per day and increased rate of

under or unemployment indicate low food accessibility. Appearances of wasting, goiter or anemia among household members are outcome indicators of reduced food utilization at micro level. Finally, changes in pre-harvest food consumption practices and migration may be sensitive indicators for temporal food insecurity (Gross et al., 2000).

2.3 Chronic and transitory food insecurity and linkages between them

Maxwell and Frankenberger (1992) assert that chronic and transitory food insecurity refers to the time dimension of food insecurity. Chronic food insecurity is a long-term or persistent inability to meet minimum food consumption requirements. Table 2.3 indicates that transitory food insecurity is a short-term or temporary food deficit. An intermediate category is cyclical food insecurity, such as seasonality. Despite being conceptualized in terms of duration, definitions of chronic and transitory food insecurity rarely specify time periods. Another source of ambiguity relates to the temporal and severity dimensions of food insecurity. Although 'chronic' and 'transitory' are linked together, implying different durations. Hereby 'transitory' is used to imply 'acute' with the corollary assumption that 'chronic' equates to 'moderate' food insecurity. To avoid this confusion, FAO (2009) recommended to use 'moderate' and 'severe' to describe the severity of food insecurity, while 'chronic' and 'transitory' to describe the temporal aspect.

Table 2.3: Chronic and transitory food insecurity

	CHRONIC FOOD INSECURITY	TRANSITORY FOOD INSECURITY
is…	long-term or persistent.	short-term and temporary.
occurs when…	people are unable to meet their minimum food requirements over a sustained period of time.	there is a sudden drop in the ability to produce or access enough food to maintain a good nutritional status.
results from…	extended periods of poverty, lack of assets and inadequate access to productive or financial resources.	short-term shocks and fluctuations in food availability and food access, including year-to-year variations in domestic food production, food prices and household incomes.
can be overcome with…	typical long term development measures also used to address poverty, such as education or access to productive resources, such as credit. They may also need more direct access to food to enable them to raise their productive capacity.	transitory food insecurity is relatively unpredictable and can emerge suddenly. This makes planning and programming more difficult and requires different capacities and types of intervention, including early warning capacity and safety net programmes.

Source: Adapted from FAO (2009)

The notion of 'transitory food insecurity' as a sudden collapse from adequate to inadequate food intake ignores the reality that there are strong negative synergies between chronic and transitory food insecurity, and between moderate and severe food insecurity. A major risk factor for severe food insecurity is being 'moderately chronically' food insecure before a transitory shock (Nurul, 1995).

Following the WFP (2008), there are two basic linkages between different dimensions of food insecurity: the first is a "transitory-to-chronic" and the second is "moderate-to-severe" linkages.

Transitory-to-chronic linkages: Chronic poverty and food insecurity are often the consequences of a series of 'short, sharp shocks' such as a sequence of droughts with insufficient recovery periods in between. Repeated transitory shocks can set up 'food insecurity ratchet', forcing households to dispose of their asset buffers and productive assets to survive, until they fall below a minimum 'asset threshold' and face destitution as well as heightened vulnerability to famine (WFP, 2008).

Moderate-to-severe linkages: Most people who are vulnerable to food crises already subsist in marginal environments on the edge of survival, such that a relatively minor shock can fatally compromise their ability to cope. Slow-onset processes can push households ever closer to the edge. When the causes of food insecurity are political, famine conditions may be deliberately inflicted on certain groups (WFP, 2008).

The concept of 'composite food insecurity' was introduced, to address this reality of overlapping and multiple vulnerabilities. Severe food insecurity tends to affect disproportionately people who are already chronically food insecure. Hence, 'composite food insecurity' applies to households that are chronically vulnerable at the best of times, and are also susceptible to periodic food shocks. In this case, 'vulnerability to food insecurity' is a misleading concept. Relatively few households are food secure most of the time but vulnerable to becoming food insecure some of the time. Rather, there are many chronically food insecure households that are vulnerable to a deterioration of their status – from 'moderate chronic' to 'severe chronic' food insecurity. Since 'severe chronic food insecurity' is not sustainable for extended periods of time, it is a temporary or transitory state before those affected either die from hunger-related causes or are assisted to return to moderate food insecurity – or, ideally, to achieve food security (Devereux, 2006).

2.4 Causes of food and nutrition insecurity

2.4.1 The conceptual framework for food security

As was mentioned above a person is food secure when he or she has access at all times to enough food for an active and healthy life. Accordingly, people are food secure when their consumption of food is sufficient, secure, and sustainable (Maxwell, 1996).

The list of causes of food insecurity is long and multifaceted. They range from political instability, war and civil strife, macroeconomic imbalances and trade dislocations to environmental degradation, poverty, population growth, gender inequality, inadequate education, and poor health. However, all causes can be related in some fashion to two basic causes: insufficient national food availability and insufficient access to food by households and individuals (Kennedy et al., 2011).

Figure 2.4 shows the broad conceptual framework for food security, in which is seen part of an overall process linking global and national food availability, households' and individuals' access to food, and individuals' nutrition security.

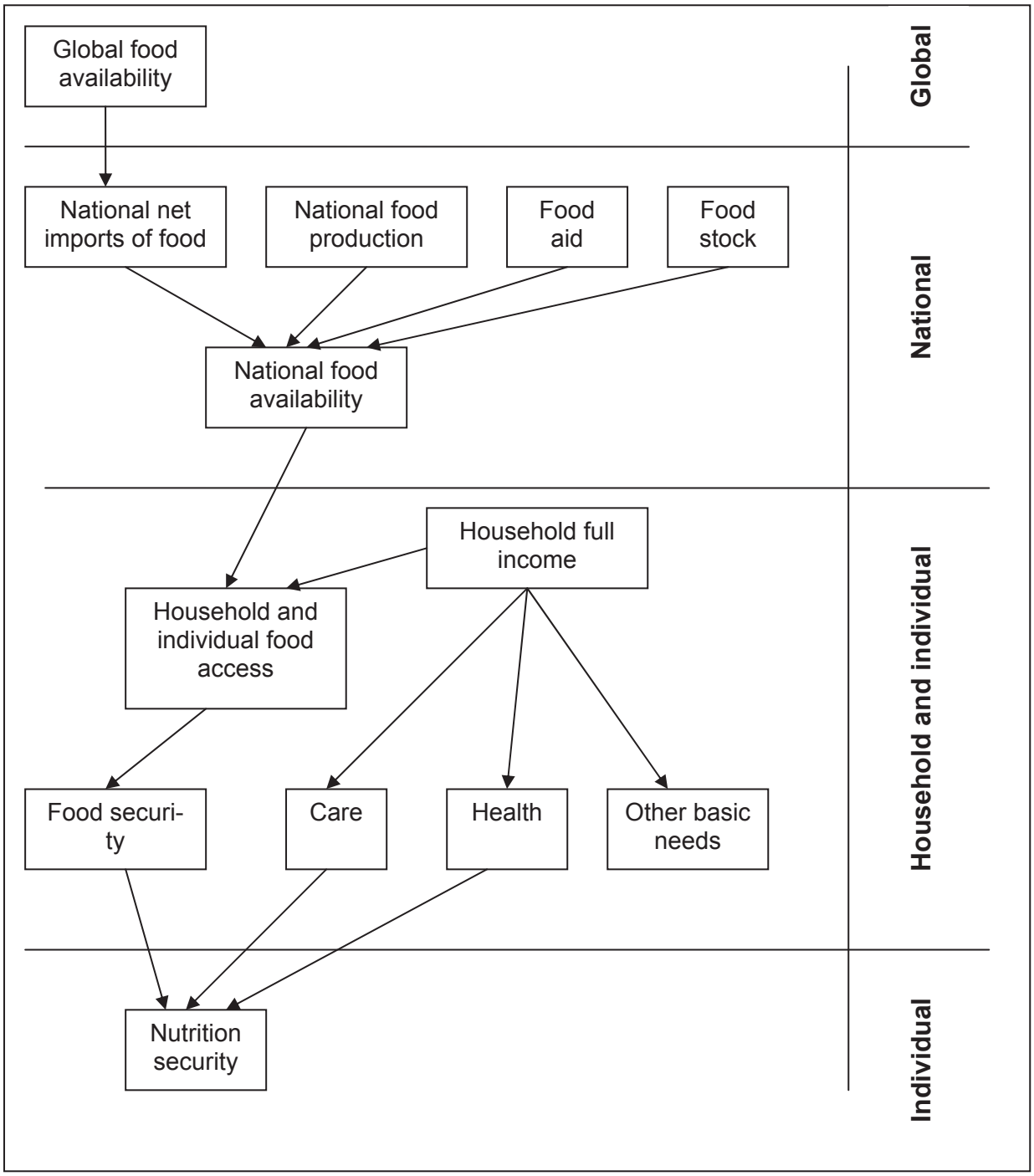

Figure 2.4: The conceptual framework for food security: from global food availability to peoples' nutrition security

Source: Adapted from Frankenberger et al. (1997)

Global and national food availability stands at the macro level of the food security equation. Global food availability is determined by total world food production. National food availability in any given year is determined by country's own food production, its stocks of foodstuff and its net imports of food (i.e. imports minus exports), as well as it includes the food aid (Dukhovny et al., 2012).

Still closer to food security is household and individual access to food which, in addition to national food availability, is determined by a household's full income. Along with cash income, full income includes the value of goods produced and services provided in households that do not enter the market, as well as in-kind transfers of goods and services. Access to food may be gained through: production or gathering of food; purchase of food on the market with cash income; and/or receipts of in-kind transfers of food. Within households, individual food access is influenced by intra-household food distribution decisions. A household's expenditures of full income for achieving food security compete with expenditures on other basic needs (e.g. health care, housing, and basic education) as well as non-necessities. A household or individual unable to meet all basic needs can be considered to be in absolute poverty (Frankenberger, 1996).

At the individual level of the food security equation is nutrition security. Food security is not translated into an active and healthy life without nutrition security. "An individual is nutritionally secure when he or she has secure access to a nutritionally adequate diet and the food consumed is biologically utilized such that adequate performance is maintained in growth, resisting or recovering from disease, pregnancy, lactation, and physical work" (Frankenberger et al., 1997). In addition to food security, nutrition security has two other determinants. The first is 'care', or 'the provision in the household and the community of time, attention, and support to meet the physical, mental and social needs of the growing child and other household members' (FAO/WHO, 1992). Examples of important child care behaviors are the timing and frequency of breast-feeding, the degree of stimulation and interaction with parents, investments in disease prevention and domestic hygiene, the use of health services and regular growth monitoring. The second non-food determinant of nutrition security is health. Poor health, or illness, affects nutrition security by depressing appetite, inhibiting the absorption of the nutrients in food and consuming calories and other nutrients while fighting off and recovering from illness, leaving less energy and nutrients available for growth and weight maintenance (Ramalingaswami et al., 1996).

2.4.2 Causes of food and nutrition insecurity in developing countries

Drought and conflict are the main factors that have exacerbated the problem of food production, distribution and access. High rates of population growth and poverty have also played a part, within an already difficult environment of fragile ecosystems. The fact that almost 80 percent of the world population is rural and depends almost exclusively on agriculture for its consumption and income needs, means that measures to address the problems of poverty and food insecurity must mainly be found within the agricultural sector (FAO, 2009).

Poverty

According to FAO (2002), the connection between poverty and food insecurity is important. Food production is significant because, for the majority of the poor, agriculture is the main source of livelihood. However, it is only when poverty can be alleviated or diminished that the level of food insecurity is reduced. Consequently, the long-term solution to food insecurity lies beyond the production of additional food and includes the need to address rural livelihoods in general. Social safety nets of various sorts are also part of the solution to absolute poverty and food insecurity, not only in exceptional circumstances such as drought, but also over the long periods required to arrive at socially inclusive sustainable solutions (FAO, 2008).

The causes of poverty include poor people's lack of resources, an extremely unequal income distribution in the world and within specific countries, conflict, and hunger itself. The World Bank (1986) has estimated that there were 1.345 million poor people in developing countries who live on $1.25 a day or less. This compares to the later FAO (2009) estimate of 1.02 billion undernourished people. Extreme poverty remains an alarming problem in the world's developing regions. Progress in poverty reduction has been concentrated in Asia, and especially, East Asia, with the major improvement occurring in China. In Sub-Saharan Africa, the number of people in extreme poverty has increased. Thereby, the statement that 'poverty is the principal cause of hunger' is correct (FAO, 2009).

Population growth

The population on developing countries is steadily increasing (Schultz et al., 2009). Yearly population growth rates have historically been high, and are still at least 1.1 percent in Asia and 3.5 percent in Sub-Saharan Africa (FAO, 2008). The momentum for future increases in population remains strong because of the age structure and youthfulness of the population. Family sizes are large, especially in rural areas, and the dependency burden is high (FAO, 2009).

Harmful economic systems

The principal underlying cause of food insecurity, poverty and hunger is the economic and political systems in the world. Essentially control over resources and income is based on military, political and economic power that typically ends up in the hands of a minority, who live well, while those at the bottom barely survive, if they do at all (FAO, 2008).

Conflicts

At the end of 2005, the global number of refugees was at its lowest level in almost a quarter of a century. Despite some large-scale repatriation movements, the last years have witnessed a significant increase in refugee numbers, due primarily to the violence taking place in Iraq, Afghanistan, Somalia, Syria, etc. By the end of 2008, the total number of refugees under UNHCR's mandate exceeded 10 million. The number of conflict-induced internally displaced persons reached approximately 26 million worldwide. Providing exact figures on the number of stateless people is extremely difficult to obtain. Although important, (relatively) visible though it is, and anguishing for those involved, conflict is less important as poverty as a cause of hunger (FAO, 2008).

Climate change

Climate change is increasingly viewed as a current and future cause of food insecurity, hunger and poverty. Increasing drought, flooding, and changing climatic patterns require a shift in crops and farming practices (Schultz et al., 2009).

Hunger

By causing poor health, low levels of energy and even mental impairment, hunger can lead to even greater poverty by reducing people's ability to work and learn, thus leading to even greater hunger. Hunger is representing the cause and in the same time the consequence of poverty, and thus of hunger (FAO, 2013).

2.5 Hunger and malnourishment as consequences of food and nutrition insecurity

Undernourishment, or malnourishment, occurs when a person consumes fewer calories than his or her body needs. This may be due to extreme dieting or certain diseases or conditions that limit or prohibit food intake, like celiac disease or old age. Malnourishment may also occur when someone eats an adequate amount of food, but the foods do not contain necessary vital nutrients. Infants, young children and the elderly persons are the most likely to suffer from malnutrition (Smith et al., 2000).

Hunger portal of FAO (2013) defines hunger as a state of inability to acquire enough food, defined as a level of food intake insufficient to meet dietary energy requirements.

The Oxford English Dictionary (Simpson and Weiner, 1989) indicates three meanings for "hunger":

1. The uneasy or painful sensation caused by want of food; craving appetite. Also the exhausted condition caused by want of food
2. The want or scarcity of food in a country

3. A strong desire or craving

World hunger refers to the second definition, aggregated to the world level. According to Smith et al. (2000), the related technical term is “malnutrition”.

Malnutrition is a general term that indicates a lack of some or all nutritional elements necessary for human health. There are two basic types of malnutrition. The first and most important is protein-energy malnutrition – the lack of enough protein and food that provides energy which all of the basic food groups provide. This is the type of malnutrition that is referred to when world hunger is discussed (FAO, 2010).

Protein-energy malnutrition (PEM) is the most lethal form of malnutrition. It is basically a lack of calories and protein. Food is converted into energy by humans, and the energy contained in food is measured by calories. Protein is necessary for key body functions including provision of essential amino acids and development and maintenance of muscles (WHES, 2013).

The second type of malnutrition following WHES (2013) is micronutrient (vitamins and minerals) deficiency. This is not the type of malnutrition that is referred to when world hunger is discussed though it is certainly very important.

Recently there has also been a move to include obesity as a third form of malnutrition. Considering obesity as malnutrition expands the previous usual meaning of the term which referred to poor nutrition due to lack of food inputs. It is poor nutrition, but it is certainly not typically due to a lack of calories, but rather too many (although poor food choices, often due to poverty, are part of the problem) (UNSCN, 2004).

The number of hungry people has increased since the last two decades. According to FAO (2013) the increase has been due to three factors: 1) neglect of agriculture relevant to poor people by governments and international agencies, 2) the current worldwide economic crisis, and 3) the significant increase of food prices in the last several years which have been devastating to those with only a few dollars a day to spend.

The FAO first statistically estimates the total food supply of a country and derives the average per capita daily food intake from that. The distribution of average food intake for people in the country is then estimated from surveys measuring food expenditure. Using this information and minimum food energy requirements, the FAO estimates how many people are likely to receive such a low level of food intake that they are undernourished.

Undernutrition is a relatively new concept, but is increasingly used. It could be taken as similar to malnutrition (WFP, 2008). Children are the most visible victims of undernutrition. Children who are poorly nourished suffer up to 160 days of illness each year. Poor nutrition plays a role in at least half of the 10.9 million child deaths each year. Undernutrition magnifies the effect of every disease, including measles and malaria. The estimated proportions of deaths in which undernutrition is an underlying cause

are roughly similar for diarrhea (61%), malaria (57%), pneumonia (52%), and measles (45%). Malnutrition can also be caused by diseases, such as the diseases that cause diarrhea, by reducing the body's ability to convert food into usable nutrients (WHES, 2005).

Geographically, more than 70 percent of malnourished children live in Asia, 26 percent in Africa and 4 percent in Latin America and the Caribbean. In many cases, their plight began even before birth with a malnourished mother. Undernutrition among pregnant women in developing countries leads to one out of six infants born with low birth weight. This is not only a risk factor for neonatal deaths, but also causes learning disabilities, mental retardation, poor health, blindness and premature death (Smith et al., 2000).

2.6 Coping strategies against food insecurity

2.6.1 Definitions of coping strategies

Devereux (2001) defines coping strategies as a response to adverse events or shocks. The definition by Snel and Staring (2001) captures the broad notion of coping strategies, namely that "all the strategically selected acts that individuals and households in a poor socio-economic position use to restrict their expense or earn some extra income to enable them to pay for the basic necessities (food, clothing, shelter) and not fall too far below their society's level of welfare" (Snel and Staring, 2001. p. 7). The latter definition implies that coping strategies involves a conscious assessment of alternative plans of action. Nevertheless this does not mean that their choice of strategies is always successful in achieving their objectives. In fact, the coping strategies often have unintended negative effects (WFP, 2008).

Ellis (2000) defines coping strategies as the methods used by households to survive when confronted with unanticipated livelihood failures. The strategies pursued by households differ in several aspects, that is, within the household and between households (Maxwell et al., 2003). Different coping behaviors are adopted by households at different poverty levels due to varying degrees of wealth among households. However, some coping strategies are common to all households although the extent to which such strategies enable a household to remain afloat depend on the assets at their disposal (Devereux, 2001). Above all, the general tendency is that the lower the household asset status, the more likely the household would engage in erosive responses such as selling off productive assets such as farm implements (Hoddinott, 2004).

Literature indicates two different terms in order to characterize coping strategies: risk management and risk coping strategies. The former attempts to reduce the ex-ante risk impact e.g. through income diversification. Faced with an income or food shock, households may either protect their food consumption by purchasing or receiving food from some other sources (Davies, 1993). Risk coping strategies deal with consequences of

risk. Risk coping strategies involve self-insurance and informal group-based risk-sharing (Davies, 1993). Household can insure itself by building up assets in so-called 'good' years, to deplete these stocks in 'bad' years (Dercon, 2000). Households may modify their food consumption by reducing and/or modifying food or by reducing the number of consumers or meals. Consumption soothing strategies generally increases as income generating strategies coming under strain (Corbett, 1988).

2.6.2 Coping strategies against food insecurity in developing countries

People across the world can cope with the most terrible disasters by using various coping strategies. Households which are vulnerable to food security adopt different strategies to reduce, mitigate, and cope with the risks and shocks affecting them (Devereux, 2001).

There are different studies that present a variety of coping strategies households are likely to adopt when they face a problem of food deficit. The results of some of them are indicated below.

The study in rural and peri-urban areas of South Africa described by Mjonono et al. (2009) shows that households employed coping strategies to mitigate food shortages which resulted from insufficient crop production. These strategies include the following: relying on less preferred/inexpensive food; borrowing food, or relying on help from friends or relatives; gathering wild food, hunting or harvesting immature crops; consuming seed stock held for the next season; sending household members to eat elsewhere; limiting portion size at meal times; restricting adult consumption in favor of small children; reducing the number of meals eaten per day; skipping entire days without eating and begging from neighbors or friends. The frequency to apply coping strategies was minimized through income from sales of produce and consumption of food from own production. Therefore income from sales of produce and consumption of food from own production protected households from food insecurity (Mjonono et al., 2009).

Month-by-month research on coping strategies for food insecurity among rural households in Nepal shows that households with longer food self-sufficiency may be able to manage overall calorie requirements by adopting combination of coping strategies. However, these strategies are helpful for less food self insufficient households to sustain their life rather than to make them food secure. These food deficit coping strategies fulfill household food demand. So Nepalese people use the following coping strategies: casual laboring; occupational work; paper and handicraft making; service and business; sale of agriculture and livestock products; temporary migration; consumption of wild foods; use of saving and use of pensions; etc (Khatri-Chhetri and Maharjan, 2006).

The most frequently used coping strategy by the households in rural Nigeria was reduction in food consumption though most of the respondents ate at least once in a day.

Other strategies adopted by the respondents included skipping meals, consumption of unconventional food, reliance on help from relatives or friends outside the household, reduction in quantity served to children, purchasing food on credit and skipping meals (Adekoya, 2009).

UNDP (2010), WFP (2008) and Yakhshilikov (2006) describe some of the common coping strategies against food insecurity in the context of Uzbekistan. They explore the follows coping strategies: production of food crops in homestead plot for own consumption; selling the food crops, livestock and its production; replacement of expensive food products by the others (for example to consume more vegetables instead of meat); conducting additional business in order to earn more cash; urban or international labor migration; storage of fresh vegetables for winter season; marinate, salt, dry the vegetables and fruits.

2.7 Summary

This chapter describes theoretical approaches for understanding, assessment and measuring food and nutrition insecurity. It was also indicated that food and nutrition security varies from the different social levels and has to be assessed with the own approaches.

This chapter also highlights the different types of food insecurity and main causes of it.

The definition of coping strategies against food insecurity is summarized in this chapter. Coping strategies are also depending on the social level and on the stage of development on which the country stands on.

Following the theoretical approaches of food and nutrition security the secondary data for purposes of the present study was collected. National and international literature was studied in order to develop hypotheses of the study which are described in the next chapter.

3. LITERATURE REVIEW AND JUSTIFICATION OF STUDY HYPOTHESES

3.1 Secondary data sources

Secondary data collected contains a number of published and non-published reports, articles, papers, journals and books obtained from different sources.

The main sources of local secondary data were Scientific Information Center of Interstate Coordination Water Commission of Central Asia (SIC ICWC) and Ministry of Agriculture and Water Recourses (MAWR). From these institutions the data concerning water and land use was obtained. The data on sown area under the different food and cash crops on provincial level, as well crop production, crop yield and crop budget was obtained from these sources.

Andijan and Surkhandarya provincial branches and Markhamat and Denau regional branches of Uzbekistan Statistical Department (UzStat) help with the official statistical databases on population, land use, etc.

Offices of local authorities (Hokimiyats) of Andijan and Surkhandarya provinces and particularly of the Markhamat and Denau regions and other small branches of local authorities as “Village Soviet” in the Markhamat and Denau regions were the main sources of secondary data on regional level. Data on local demography, land use (area of farmland and homestead plots), and socioeconomic conditions was obtained from these sources. The maps of study regions were also obtained here.

Besides local secondary data and taking into account the international level of the study some secondary data was obtained from different international databases and literatures: United Nations Development Program (UNDP), Food and Agricultural Organization (FAO), World Bank (WB), Asian Development Bank (ADB), Swiss Development and Cooperation Agency (SDC); International Commission on Irrigation and Drainage (ICID). The data from their reports of research conducted in Uzbekistan and concerning food security, well-being of population, poverty, and socioeconomics was obtained.

During the data collection several meetings were made with the representatives of some of the international organizations in Uzbekistan in order to understand deeper obtained information and data.

The combination of secondary data and literature related to the topic permitted to formulate objectives and hypotheses as well as to achieve the main goals of the present study.

3.2 Factors influencing food and nutrition security in developing countries

The list of factors influencing food and nutrition security is long and multifaceted. Each country has own factors influencing food and nutrition security, but some of them could be overall for all developing countries.

Sharafkhani et al. (2011) conducted the cross sectional study conducted on 2,500 households in Iran. In order to analyze the factors influencing household food security they collected the primary data using a modified Household Food Security Survey Module and univariate logistic regression for their analysis. Their results show that the family size, education level and household level of income had significant relation with food security status. For example, family size following their logistic regression has a negative impact on food security. Moreover, Sharafkhani et al. confirms that food insecurity has significant relation with socioeconomic condition and having children under the age of 18. Further, Sharafkhani et al. discusses their results with research from AliHosseini (2005), who studied demographic and social factors that explain the severity of food insecurity in Iran. They show that household head level of education and family size also identified as the most important variables, which explain the severity of food insecurity.

Adekoya (2009) investigates the food insecurity and coping strategies among 120 rural households in Nigeria. A structured questionnaire was used in gathering the primary data which was analyzed using descriptive and inferential statistics. Adekoya also indicates the household size as a major factor influencing demand for food and when it is large, members are forced to seek alternative means of meeting food needs. Adekoya confirms that household level of income and education of their members are significant factors influencing food security.

Khatri-Chhetri and Maharjan (2006) in the context of research on food security among 128 farm households in Nepal also confirm the relations between household's food security status and variables such as the number of children, household composition, education of household members and particularly education of household head. They found as well the relations of food security and the level of income with the positive sign.

Household food security was significantly associated with the level of income and primary caregiver's education in the context of research of food and nutritional security of children of 296 urban farmers in Uganda conducted by Yeudall et al. in 2007. Correlations were calculated and bivariate and exploratory path analysis was conducted to explore relationships and to indicate the high statistical significances of these factors.

The results of binary logistic regression of Abdalla (2012) shows that the socioeconomic factors consisting of total household income, household size, and education are important factors that shape food and nutrition security among 200 farm households in Sudan during the agricultural season of 2008-2009. She found that the household size

negatively and significantly impacts on the food security status of farm households. She also confirms the negative impact of household size on food and nutrition security is mainly due to the higher number of dependent members. The research of Abdalla (2012) confirms as well the education of the household head is significant and positive with regards to food and nutrition security. She also affirmed that the households with an educated head are more likely to be food secure than those with an uneducated one.

The size of the households was slightly associated with food insecurity, with smaller families more likely to be food secure than larger families. This is a summary of food security research in rural Tajikistan, jointly conducted by WFP, FAO, UNICEF and the government of Tajikistan in 2008 with the sample size of 798 households. Following their hypotheses this may be explained by the fact that it is the absence of working-able and income-earning members which is the main determinant of food insecurity, rather than just the size of the households. As such, large families including one or two income-earning members and/or receiving remittances regularly and in large amounts may be better-off than small families with an under-employed adult member. Thus, the significance of income level was also discussed. Such kind of explanation could also be valid for Uzbekistan. This Tajik research also indicates that large families and/or families with many children reflects a perception of heightened vulnerability of these households as food, clothing and schooling expenditures are felt to contribute to food and economic insecurity (WFP et al., 2008).

An interesting fact was found during this research: food expenditures in Tajikistan represented by 81 percent of all basic expenditures for the majority of households. This means that a low share of income is left for other essential expenditures including health, education, energy and transportation, and even less for clothing, housing etc (WFP et al., 2008).

Food security assessment in Kyrgyzstan conducted by WFP in 2012 comprised of 2,000 households including 652 in urban areas and 1,348 in rural areas. Food insecurity levels were determined by combining the WFP standard Food Consumption Score (FCS) with the level of income as the food access indicator. They found that households with a larger family size are more likely to be food insecure. Household sizes were larger in rural than in urban areas. The difference was statistically significant. Kyrgyz food insecure households spent 61 percent of their budget on food, indicating high dependency on food purchases, leaving them vulnerable to market developments, such as the recent price hikes. Wheat, wheat flour and its products accounted for 22 percent of their budget (WFP, 2012).

3.3 Factors influencing food and nutrition security in Uzbekistan

The literature review on factors influencing food and nutrition security in Uzbekistan is limited by only three reports: “Uzbekistan’s road to food security” by Yakhshilikov (2006), “Food security in Uzbekistan” by UNDP (2010), “Poverty and food security in Uzbekistan” by WFP (2008), and partly Household Budget Survey by World Bank and GTZ and Living Standards Assessment by the World Bank (2003 and 2007). Most of the other information is out of date or closed by the government for publishing.

According to these reports, one of the most significant factors influencing food security is the household level of income. Yakhshilikov (2006) in his report “Uzbekistan’s road to food security” in the frame of IFPRI research indicate that the poorest population of Uzbekistan spends more than 60 percent of their income for food.

UNDP research on food security was based on data of 3,000 households in three regions of Uzbekistan in 2006; they summarize that the poorest population spends 61.34 percent of their income for food. In the same time households with the highest level of income following the UNDP (2010) spend 31.28 percent for food of their total income.

Yakhshilikov (2006) also asserts that almost 30 percent of Uzbek people live below the food poverty line.

Further, the results of UNDP (2010) and Yakhshilikov (2006) indicate that the poorest households consume the diet dominated by cereals and large nutritional disparities exist among income groups. These results confirmed by the fact that the share of cereals in the diet of poorest households is represented by 71 percent.

UNDP (2010) also indicates that the level of household head education is the significant factor influencing both food security and food consumption status of household. They found that the head of Uzbek food insecure households have an average 10.1 year of education and the head of food secure households has an average of 11.7 years of education.

One more indicator influencing food and nutrition security following UNDP (2010) is the number of household members or household composition. The number of household members has a negative impact on food security and on food consumption. The average members’ number in food insecure households is 6.4, versus 4.8 members in food secure households.

The number of children under the age of 14 years old is also negatively influencing food consumption. Using the binomial probit regression modeling UNDP (2010) found that this factor has high statistical significance. They found that the number of children under 14 years old has a high marginal effect with the sign of 0.0625.

Finally, WFP (2008) analysis of poverty and food security in Uzbekistan shows that despite the small size of household homestead plots they play a major role in terms of ag-

ricultural production and, more importantly, in household food security and food consumption. Homestead plots are vital for the survival of farm households as they provide more than a quarter of the food consumption of rural households (WFP, 2008).

3.4 Study hypotheses

Following the literature review the study hypotheses were developed.

The studies of UNDP (2010), Yakhshilikov (2006), Sharafkhani (2011), Abdalla (2012), Adekoya (2009) and others show the importance of household head education with regard to farming knowledge, level of income and the household food security. Therefore, the following hypotheses have to be tested:

Hypothesis 1: The more the head of household is educated, the more his/her household is food secure.

Hypothesis 2: The more the head of household is educated, the more income his/her farm and household have.

The studies of Adekoya (2009), WFP (2008) in Uzbekistan and WFP (2012) in Kyrgyzstan indicate that the food crops producing on the household homestead plot has an influence on food security status. Thus, the following hypothesis has to be tested:

Hypothesis 3: The more kinds of food crops household produces on its homestead plot, the more this household is food secure and the less it is dependent on the seasonal food market.

The studies of Yakhshilikov (2006), Adekoya (2009), WFP (2008) in Uzbekistan and WFP (2012) in Kyrgyzstan indicate that the food crops producing on the household homestead plot has an influence not only on food security status, but also on the well-being of farm households. Thus, the following hypothesis has to be tested:

Hypothesis 4: If household cultivates a plot of farmland for producing food crops as cash crops, than it wants to earn income instead of using it for own food supply.

Moreover, UNDP (2010), WFP (2008) and Yakhshilikov (2006) describe some of the common coping strategies against food insecurity in the context of Uzbekistan (see Chapter 2.6.2). One of the main coping strategies by their opinion is storage of fresh vegetables for winter seasons; marinate, salt, dry the vegetables and fruits. Thus, the following hypothesis has to be tested in the present study:

Hypothesis 5: The more household stores/preserves foodstuff for the winter season, the more possibilities to prevent seasonal food insecurity.

3.5 Summary

This chapter describes the secondary data sources as well as the national and international literature review on food and nutrition aspects.

Following the short literature review the study hypotheses were developed in order to achieve the objectives of the study.

General overview of food and nutrition security in Uzbekistan will be discussed more in detail in the following chapter.

4. LAND USE, FOOD AND NUTRITION SITUATION IN UZBEKISTAN

This chapter provides the overview of Uzbekistan, its geographical and natural conditions, main economic and demographic indicators. The main agricultural productions under specific conditions of Uzbekistan are also described here. Uzbekistan is a developing country and its main stages of agricultural and food policy reforms are presented in this chapter. The final section of the chapter includes the general information of both study regions. Literature data and an overview of study regions are also presented here.

4.1 General overview of Uzbekistan

4.1.1 Macroeconomic indicators

Uzbekistan has a border with Tajikistan, Turkmenistan, Kyrgyzstan, Kazakhstan and Afghanistan. Uzbekistan has an area of 450,000 square kilometers, similar in size to Morocco or California, and is a so-called double land-locked country completely surrounded by countries that also do not have direct access to the sea (see Figure 4.1). It has a dry arid climate with agriculture restricted to 11 percent of intensely cultivated and irrigated river valleys (ADB, 2004). The population is estimated to be 30 million and of which nearly 60 percent live in densely populated rural areas (UzStat, 2011). Uzbekistan is recognized as one of the world's biggest producer and exporter of cotton. The country is also a large producer of gold, oil and gas, and a significant producer of minerals and machinery (UzStat, 2011).

Figure 4.1: The map of Uzbekistan

Source: ADB (2009)

Uzbekistan gained its independence from the Soviet Union in 1991 and since that time the government has embarked on its own cautious transition to a market oriented economy while maintaining features of the old Soviet command economy with subsidies, trade restrictions and tight controls on production and prices. Although the transition is not completed, cumulatively Uzbekistan is recognized as having achieved respectable progress (ADB, 2004).

Uzbekistan's economy declined after 1991 during the first years of transition but recovered after 1995 as the cumulative effect of policy reforms took effect and positive growth occurred. Gross Domestic Product (GDP) grew at an annual rate of four percent between 1998 and 2003 and then increased to seven percent – eight percent. According to the International Monetary Fund (IMF), GDP in 2008 is estimated to be almost double its 1995 value in constant prices with growth in GDP for 2008 estimated to be eight percent, stimulated by high commodity prices and buoyant external demand ADB (2009).

According to ADB annual report (2008) Uzbekistan has a low GDP per capita (US$ 950.34 in current dollars in 2008) giving a purchasing power parity (PPP) equivalent of US$ 2,551.28 in 2008, and a ranking of 169 among 209 countries. In the same time, among the twelve Commonwealth of Independent States (CIS) countries, only Kyrgyz-

stan and Tajikistan had lower GDP per capita in 2006. However annual growth in GDP PPP per capita has increased from 4.5 percent in 2002 to over 10 percent in 2007 and an estimated 8.8 percent in 2008 (ADB, 2009).

According to the World Organization of Creditors, the Uzbekistan economy was almost unaffected by the global economic crisis of 2008/2009. In 2008-2010, Uzbekistan GDP increased by 8.1-9.0 percent, due to favorable commodity prices and government stimulus package. Nevertheless, the Uzbekistan economy still faces such important issues as increasing inflationary pressures and the increasing role of government in the economy (WOC, 2012).

4.1.2 Labor migration

The wellbeing of the population in the context of Uzbekistan strictly depends on labor migration, urban as well as international. This is why the level of income and labor migration must be examined together.

There is little reliable information about average wage rates in Uzbekistan as no official statistics are published (WFP, 2008). A recent analysis using the monthly old-age pension of $30 per month (which is indexed to the Consumer Price Index) as a proxy for movement in the average wage, and assuming that average wages are three to four times the pension rates indicate wages in 2006 at $90-$120 per month, or $3-$4 per day. Allowing for movement in the CPI of almost 25% from 2006 to 2008 would indicate that the average monthly wage is around $130 (ADB, 2009). In 2010 the minimum wage raised to 63,000 Uzbek soums per month (UzStat, 2011) which is equivalent of $31. However, an increasing majority of the labor force is employed in inefficient and low-paid jobs both within the formal and informal sectors. Usually these jobs do not ensure a sufficient level of earnings to provide for the needs of their families as well as to provide their protection from poverty. Consequently most families supplement their livelihood with produce from their household homestead plots. Remittance income from family members working abroad is extremely important (WFP, 2008).

A consequence of the low level of income and restricted employment opportunities is the large number of Uzbekistan's labor force who works aboard, especially in Russia, Kazakhstan and rarely in Southeast Asia. Uzbekistan does not record the number of Uzbek migrants working abroad, but the Russian Federal Migration Service (2008) reports that there are 2.5 million Uzbek workers in Russia and there are indications that there are up to 1 million Uzbek illegal workers in Kazakhstan. The US Department of State estimates that between 3 and 5 million Uzbek citizens of working age live outside Uzbekistan. Thus it is likely that 3.5 to 4 million people or 25 percent of the labor force of 15.8 million were working abroad in 2008. A number of surveys conducted within the different framework show that about 25 percent of families had at least one family

member who had left to earn money abroad. In most cases the migration had a positive effect on the family income with the average income from a labor migrant up to ten times higher than from other sources of household earnings. Consequently inward flows of remittances have contributed to the current account surplus of $4.3 billion or 21.1 percent of the country GDP in 2007 (ADB, 2009).

4.1.3 Agriculture and agricultural production

Uzbekistan is predominantly a rural society and agriculture has always been and is nowadays the dominant sector of the country's economy. While two-thirds of Uzbekistan's population lives in rural areas, agriculture employs around 60 percent of the rural population and 35 percent of the total active population in the country. The share of agriculture is nearly a third of Uzbekistan's GDP. The export of agricultural production (in particular of cotton fiber) accounts for approximately 40 percent of total exports (UzStat, 2010). Agriculture is also the key source of government revenue, primarily through cotton production and taxation. Moreover, the processing of primary agricultural output (food processing, dairy products production, cotton processing, etc.) represents a significant part of industrial activities and contributes to about 5 percent of the GDP.

The largest category of Uzbek land use is unimproved natural pastures for grazing and hay – 53 percent; approximately 36 percent is non-agricultural and about 10 percent is cultivated, of which 82 percent or 4.4 million ha are irrigated (WFP, 2008). Main agricultural areas are located in the basins of the Amu Darya and the Syr Darya rivers which supply about 70 percent of irrigation water. Large expansion of irrigated lands during 1960s to late 1980s resulted in excessive water takeoff from these rivers causing drying out of the Aral Sea, increasing soil salinity, and other adverse environmental impacts (ADB, 2009).

Uzbekistan's crop sector is dominated by cotton and by wheat, which are also called "strategic crops" or "state order crops". Approximately sixty percent of the value of agricultural production comes from the crop sector and the remainder from the livestock sector. Cotton is the most important crop economically. This "strategic crop", produced in irrigated areas throughout the country, accounts for about forty percent of cultivated land and makes up about forty percent of export earnings (UNDP, 2010). It makes Uzbekistan the fifth largest cotton producer and the second largest cotton exporter in the world.

Since declaring independence and as a result of the self-sufficiency food policy adopted by the Uzbek government, the wheat was admitted as the second "strategic crop". It accounts for about thirty percent of the cultivated area (UNDP, 2010). The rest of the cultivated area is used for growing fruits and vegetables. Uzbekistan continues to be

one of the major suppliers of fresh and processed fruits and vegetables in Central Asian region (WFP, 2008).

The state maintains tight control over the production of cotton and wheat, but state planning controls on all other crops have been removed allowing farmers individual choice regarding production. For cotton the state order is a hundred percent of production, while for wheat it is fifty percent (i.e. another fifty percent of production can be sold on the open market). The amount of the state order for cotton and wheat is fixed by the government annually and refers not only to the quantity of each crop to be produced in each region but also the crop areas to be assigned to these two crops. At the regional and local levels, these overall quotas are broken down into specific quantities and areas for each farm (SDC, 2011).

In addition to setting quotas for the production of cotton and wheat, the state also controls inputs through the annual credits (state loans) for production costs. These are tied to specific quantities of the various inputs and disbursement of the funds is controlled by the bank where the farmer's account is located. The whole system is detrimental to improving productivity because the farmer has little flexibility to vary inputs according to the particular needs of his land or to adjust methods to improve outputs (SDC, 2011).

The production of all other crops are not controlled by the state, but since the state order specifies area as well as output, many farmers do not have land available (or only small areas) for other, often more profitable crops. Some farmers are able to grow second crops on some of the wheat area after the wheat has been harvested, if irrigation water is available. Restrictions on the availability of water, however, means that the extent of this practice appears to be limited (ADB, 2009).

Animal husbandry in Uzbekistan is specialized not only in production of foodstuffs as meat, dairy products and eggs, but also in the production of raw materials that include cocoons of mulberry silkworms and karakul (sheep's fell) that are highly demanded in the world markets (WFP, 2008).

Summarizing all above mentioned, Uzbekistan's agricultural policy has been determined by several objectives: stabilization of cotton export revenues; achieving self-sufficiency in wheat production; insuring government revenues through implicit taxation of agricultural products (cotton and wheat) and keeping low food prices on local market. To achieve these objectives the Uzbekistan government has adopted a slow and regulated approach to land reform, and has maintained state controls over the production, procurement, pricing and marketing of "strategic crops". The government has also maintained the state monopoly on the supply and marketing of agricultural inputs, and restricted trade by banning exports of key agricultural commodities (cereals and livestock) and importing most key foods (sugar, vegetable oils) in a centralized manner through a state trading company. Thus, the liberalization of production and domestic markets have been limited to some agricultural sub-sectors such as livestock, fruits and vegetables

(World Bank, 2003; ADB, 2008). Others agricultural reforms as well as food policy reforms will be described in the following section.

4.2 Agricultural and food policy reforms in Uzbekistan

Following the World Bank (2012) classification, Uzbekistan is a developing country with low level of Gross National Product (GNP) per capita. Thus, reforms in all sectors of economy including agriculture are continuing till nowadays (UNDP, 2010).

4.2.1 Agricultural reforms with regard to estate category

The Soviet agricultural system in Uzbekistan was characterized by the dominance of large collective and state farms: kolkhozes and sovkhozes. Land reforms consisted in dismantling the large state farms, by introducing shirkat collective farms (with the area of around 5,000 hectares) and private family farms (10–250 hectares) and by expanding the program of dehkan or household homestead plots (WFP, 2008). However, land reforms did not institute the right of private ownership. The state continued to be the owner of the land and farmers were given time-bound rights for land use. Moreover, the command and control system was preserved in fact that the state heavily regulated the area size and types of crops cultivated, severely limiting the amount of land that could be devoted to particular activities, i.e. the area for other crops production (Babu and Tashmatov, 2000).

Each kind of agricultural producer is discussed in detail below.

Collective farms (Shirkat)

The shirkat is essentially a new version of the old Soviet collective farm. In theory, shirkats are independent entities which are technically joint-stock companies that the former workers hold shares in. However, in most cases the shirkat is basically a continuation of the kolkhoz, including the same leadership. Most of the shirkat farms are generally devoted to the production of cotton and wheat. According to the data of UzStat (2010), in 2003, shirkat farms occupied 52 percent of the cultivated land and produced 62 percent of cotton and 49 percent of wheat of the country.

The shirkats provided little incentives for workers who are paid small wages. Sometimes they only receive goods, such as cotton-oil, in kind. According to the ADB (2004), shirkat workers received 23 percent of their salaries in kind in 2003. Moreover, in order to be paid (in some combination of cash and in kind), the shirkat should met its procurement target. However, since most shirkats tend to be loss making or only marginally profitable, the cash income of their workers tends to be very low. Worse, sometimes it is withheld for months before it is actually paid out. In most cases workers remain in the

collective because they also receive small plots on short leases on which they grow vegetables and other crops, and/or because they benefit from informal arrangements such as permissions to use extra land, diversion of inputs, fuel, and services to their household plots, grazing their livestock on shirkat lands (ADB, 2004).

Since 2007 shirkats no more exist by virtue of their lack of efficiency. Shirkats only function in the sphere of livestock karakul production and exist in only two regions of Uzbekistan. All lands occupied by them were transmitted to private farms (WFP, 2008).

Private farms

Private farmers receive land on a lease for thirty to fifty years. Most of these farms are family farms and have a rather small area. An average size of private farm in 2003 was 25 hectares but some were as large as 250 hectares. In 2003, Uzbekistan had about 100,000 private farms occupying 37 percent of cultivated land (ADB, 2004).

Beginning from the year 2008 the process of private farms optimization was started. This implied the minimum private farm size of 60 hectares. Thus, farms have a smaller area and were obliged to unite with other farms in order to accomplish necessary area (SDC, 2011).

Private farms are usually obliged to grow a certain percentage of cotton and/or wheat and sell their production to the state at procurement prices. Failure to comply with the mandatory cropping plans may result in the expropriation of the private farmland by the state (UNDP, 2010).

According to SDC (2011), private farms are marginally profitable because of their lower production costs compared to shirkats and their relatively greater freedom to cultivate and sell other crops on the remaining 10–20 percent of lands that are not dedicated to cotton and wheat.

However, private livestock farmers are significantly more independent than private crop farmers as they do not depend on the state for irrigation and other essential inputs. They occupy an average of 65 hectares and possess an average of 400 heads of livestock (WFP, 2008).

Dehkan farms or household homestead plots

During the Soviet era, such plots were allocated by the state for all rural and a limited number of urban households for constructing dwellings and for having a supplementary source of food. However, since the independence in 1991, the number of these farms increased from 2.3 to 4.3 million. This dramatic increase is certainly one of the most important social and economic features of the agricultural sector. According to the “Food Balance Sheets” (FBS) for Uzbekistan, 82 percent of all households at the na-

tional level and 97 percent of all rural households had access to household homestead plots (Babu and Tashmatov, 2000). FBS for 2003 and 2006 indicate misrepresented data. Moreover, 2009 is the last year, when FBS for Uzbekistan was presented by FAO. Due to these two reasons, FBS for 2001 better indicates the real situation and the main achievements in Uzbekistan.

The size of the land in urban areas is small and more than half of it is covered by buildings or housing. Rural population on the other hand has more land on the average and a larger fraction. Hence, around 60 percent of the land is useable for agricultural purposes (WFP, 2008).

The average size of dehkan farms is about 0.02 ha and are limited by law to less than 0.04 ha each (SDC, 2011). However, despite being very small and occupying only 11 percent of total cultivated land, they play a major role in terms of agricultural production and, more importantly, in household food security. Dehkan farms are vital for the survival of farm workers as well as for many poor and unemployed urban households as they provide more than a quarter of the food consumption of rural households and 7 percent of the food consumption of urban households (WFP, 2008).

In reality, dehkan farms are the only private and dynamic segment of Uzbekistan's agriculture. Despite most of these farms operate on the basis of primitive manual labor, there has been rapid and strong productivity gains leading to increases in household incomes. Thus the overall growth in production witnessed since the mid 1990s has been impelled by household homestead plots and small farms, which were in fact the driving engine for the overall growth since 1996 and for the relative recovery of the agricultural production. Most smallholders are part-time private farmers and they grow a wide variety of crops. Some cultivate for subsistence while others produce cash crops for income. They account for about 75 percent of food other than wheat that is produced in the whole country (WFP, 2008).

4.2.2 Food policy reforms

Achieving food security is the most important condition for establishing a stable and safe atmosphere in any country and guaranteeing an effective economy. This problem is an integral part of a country's overall socioeconomic status and is closely tied to demographic growth and improving ecological processes (Schultz et al., 2009).

In our modern era, when the countries of the Commonwealth of Independent States (CIS) enter into market-driven economics, the problem of food security is especially crucial (UNDP, 2010). Following Babu and Tashmatov (2000), the provision of food security in any state depends on:

- basic potential for agricultural production;
- investment to food production sectors, including agro industrial system;
- provision of appropriate services to food producers;
- establishment of essential socioeconomic conditions for fruitful activity.

Uzbekistan has had to establish its food production system anew because within the former Soviet Union's specialized and concentrated production process, Uzbekistan had focused primarily on the agricultural production and supply of cotton (ADB, 2004).

The most fertile lands were allocated to cotton and the potential to increase food production was used very poorly. Sown areas for vegetables, fodder crops, orchards, and grapes fell constantly. Basic types of pastry products, potatoes, sugar, livestock, and a number of other foods were imported from other Soviet regions. Norms regarding diversity of diets were not followed and the greatest caloric value of the food diet was represented by pastry products (such as wheat bread). In the former Soviet Union, the largest volume of pastry products consumption per capita was in the Central Asian republics (WFP, 2008).

Babu and Tashmatov (2000) assert that the irony of the food security situation became clear when certain kinds of fruit and vegetables had to be imported to Uzbekistan from abroad.

Naturally, the imported products satisfied public demand in neither quality nor quantity. Besides this, Soviet regulations limited the size of household plots and the number of livestock owned by rural families (WFP, 2008). This complicated the already difficult situation in terms of the provision of food products to the population.

After independence, it was necessary to reform the overall food security policy of the country. The first step in this direction was to enlarge household plot sizes in rural areas and to afford land plots to those families who had none previously. According to Babu and Tashmatov (2000) on this stage the plots of 1.5 million families were enlarged from 0.18 hectares to 0.25 hectares, and 580 thousand families were provided with land during the year 1991. This stage had some positive results in the improvement of the food situation of the population. Many rural families began to sell some surplus in the market, meaning that they turned from consumers into net producers. The allocation of land to rural families was occurring in the context of decreasing irrigated area per capita (ADB, 2004).

The decision to revise cropping patterns was an important step toward food security. Thus, the government decided to increase the wheat cropping area in order to produce the amount needed by its population. This is indicated in the Figure 4.2. As a result wheat areas and production grew significantly. Uzbekistan achieved self-sufficiency in wheat by 1998 (ADB, 2004).

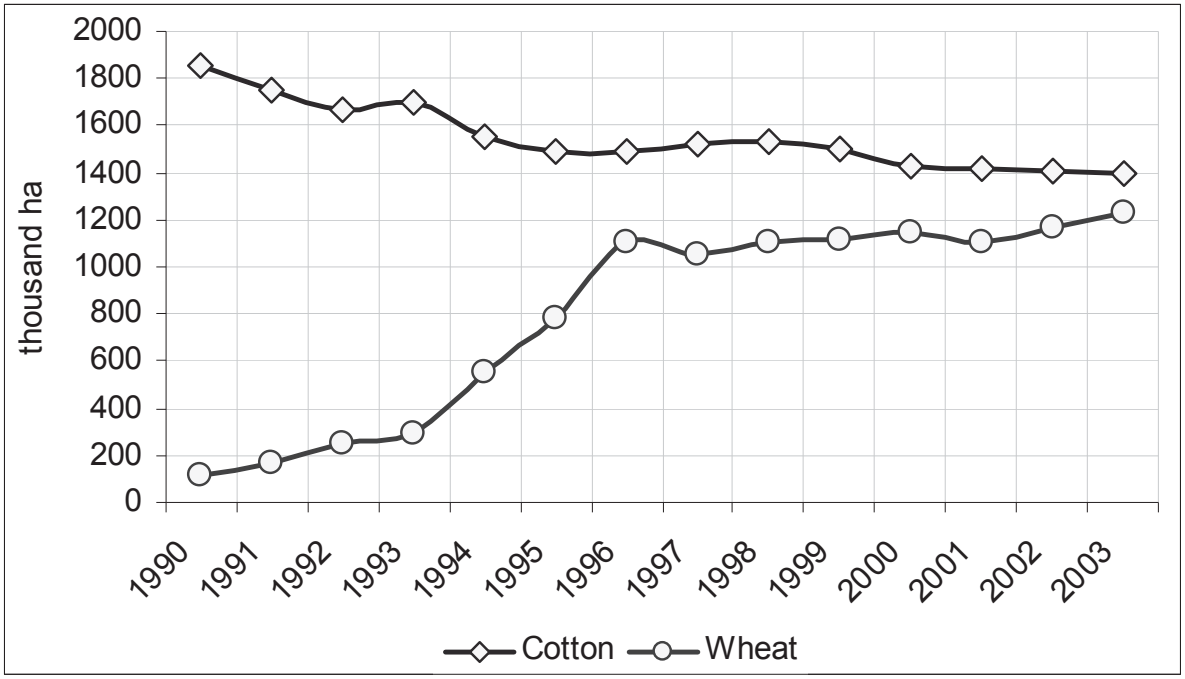

Figure 4.2: Cotton and wheat cropped area in 1991-2003

Source: ADB (2004)

However, the opportunity costs of this self-sufficiency had been high. The increases in wheat acreage and production had a large effect on crop production as a whole. Winter wheat areas increased from about 4 percent in 1991 to 37 percent in 2003 and partly replaced cotton and maize, fodder crops and vegetables. Fodder areas declined by two thirds between 1991 and 2003. Detrimental to soil fertility, over 80 percent of irrigated cropped land is planted by cotton (40%) and grains (40%) subjected to mandatory production targets. This has caused significant reduction of areas planted to potatoes, vegetables, melons and other crops (7%) (WFP, 2008).

In addition, it has resulted in serious land fertility degradation and added to environmental problems. Area planted to fodder declined by two-thirds to 9 percent during 1991 – 2003. Moreover, the yearly wheat sowing in autumn over the growing cotton without proper treatment and salt leaching have increased soil salinity and contributed to increased groundwater level (Babu and Tashmatov, 2000).

Additionally, the conversion of land from feed crops to wheat also reduced fodder production which, together with a sharp decline in the imports of mixed fodder, has reduced livestock productivity (WFP, 2008).

During the next stage of food policy reforms a special program on wheat self-sufficiency was adopted in 1998. The decision to increase wheat production allowed Uzbekistan to stop importing wheat and to provide itself with locally produced wheat. It was a timely and bold political and economic decision which continues to prove its worth (Yakhshilikov, 2006).

The food policy of Uzbekistan also envisaged self-provision of such food products as potatoes, rice, fruits, and vegetables, and envisaged increasing livestock production. In large part, those tasks are being resolved successfully. Thus, Uzbekistan provides itself with potatoes, basic fruits, grapes, and vegetables through its own production (UNDP, 2006; UzStat, 2011).

A new sector is being established to produce sugar. Sugar beet planting areas have been enlarged and several sugar producing plants have been established as well.

Hence, the use of existing potential has allowed Uzbekistan to strengthen its food security and minimize its dependence on other countries (Babu and Tashmatov, 2000).

Another important aspect of food security is livestock and cooking oil production supply. In the context of Uzbekistan cooking oil means the cotton seed oil in most cases and rarely means sunflower oil. During the Soviet regime, these products were imported from other Soviet republics. In the same time the local production was at a low level. Since independence, a reform of the livestock sector was carried out. Some livestock farms were privatized and others were sold to private owners through auctions. Today, almost every rural family has its own cattle which along with providing production for own consumption can supply the market with these products as well (WFP, 2008).

During privatization, some orchards and grape farms were also transferred to private ownership. Now, fruit and vegetable production is entirely assigned to the private sector.

State orders for agricultural production were abolished for all types of agricultural production except cotton and wheat (Rudenko et al., 2008).

A mechanism of balanced agricultural development is being created to provide not only social stability but also economic independence for the country. Following Babu and Tashmatov (2000), these are the basic components of Uzbekistan's food security policy.

On the way to a market economy, the state policy aims to achieve its priorities of providing the population with food products, eliminating malnutrition, and establishing the conditions necessary for a normal and long life. To achieve these goals, the Uzbek president has issued a decree ensuring the availability of nine essential food products at all retail outlets with price monitoring to avoid price increases (Babu and Tashmatov, 2000).

It is necessary to underline that Uzbekistan possesses soil-climatic conditions favorable for growing many kinds of crops on a year round basis. The potential for production significantly exceeds the republic's needs. Thus, Uzbekistan can export excess production in both fresh and processed forms. This was already done in the past. After the Soviet Union's collapse, export levels decreased because of the complexity of customs procedures and transportation causing significant damage to Uzbekistan's economy and hampering the food security of its neighbors (Yakhshilikov, 2006).

In summary, since independence the priority of agrarian reform in Uzbekistan was first to diversify agriculture, then to liquidate cotton monocrop production, to improve self-sufficiency of food production, and to develop the processing branch of the agricultural sector. These are the basic aspects for achieving food security in Uzbekistan (Babu and Tashmatov, 2000).

Nevertheless reforms in both agricultural and food sectors are on course and aims to increase the agricultural production in order to achieve the high levels of population food security and well-being.

4.3 Food and nutrition situation in Uzbekistan

4.3.1 Food availability

Food supply in a country or food available for consumption is normally presented by Food Balance Sheets (FBS). These are published by FAO annually and provide data on the amounts of ninety-five food commodities available for human consumption based on the statistics countries provide to FAO (UNDP, 2010).

FAO describes food balance sheets as providing a comprehensive picture of the pattern of a country's food supply during a specified reference period calculated from the annual production of food, changes in stocks, imports and exports, and the distribution of food over various uses within the country (FAO, 2007).

In general, the food supply is calculated from domestic food production plus imports and food taken from stocks. Exports and food added to stocks are then subtracted to yield an estimate of the gross national food supply or total food available. The net food supply or the net amount of food available for human consumption, reported in thousand metric tons or metric tons, is obtained by subtracting from the gross national food supply the amounts of foods diverted to non-human food uses (animal feed, seed, sugar in the brewing industry) and an estimate for waste (FAO, 2008).

The daily per capita supply reported in Food Balance Sheets is obtained by dividing the net food supply by the number of inhabitants in a given year. It is reported in terms of kilo per year per capita of individual food commodities and major food groups (FAO, 2008).

FBS are used by policy makers for formulating policies related to agricultural production, export, import and consumption of food. They allow the year to year comparison of the progress that a country has accomplished towards achieving its goals, as well as the comparisons between countries on food supplies (FAO, 2009).

FBS also permits to calculate the Food Self-Sufficiency Ratio, which indicates the percentage of and the extent to which a country's domestic food relies on its own production resources and supplies. The Self-Sufficiency Ratio for a specific food group can be

estimated directly by finding the percentage from the amounts of domestic production and the amounts of domestic supplies, i.e. domestic production divided by domestic supply (WFP, 2008).

Table 4.1 below indicates the production, import, export, domestic supply and self-sufficiency ratio for main food groups for 1992, 2003 and 2009.

This table indicates that Uzbekistan achieved significant results with regard to food self-sufficiency due to agrarian and food policy reforms. Main achievements are observed between the year 1992 and 2003 when Uzbekistan was transformed from the mono-crop cotton producer to almost food self-sufficient country. Moreover, this stable situation is observed in many food groups until 2009 with some minor decreasing.

Table 4.1: Production, import, export, domestic supply and self-sufficiency ratio for major food groups in Uzbekistan – comparison between 1992, 2003 and 2009

	Years	Food groups									
		Cereals (total)	Wheat	Vegetable oil	Sugar	Potato	Meat	Milk	Eggs*	Fruits	Vegetables
Production**	1992	1998	964	385,1	8	365,3	468,7	3799	106,8	1143	4380,7
	2003	5932	5400	281,3	2,4	827,8	533,2	4030	90,6	1160	3882,8
	2009	7294	6638	303	2	1525	766	5779	153	2443	6776
Import**	1992	4720	4449	6,3	437,3	290	58,9	36,4	0	2,6	1,3
	2003	2912	253,5	36,8	113	4,8	14	53,6	0	6,7	0,4
	2009	1471	1380	91	612	27	5	14	0	6	2
Export**	1992	0	0	0	0	0	0	0	0	85,7	138,9
	2003	1,5	1,4	10	0,2	1,7	0	0	0	184,8	267,5
	2009	74	74	27	0	0	0	0	0	353	134
Domestic supply**	1992	5248	4153	339,5	276,8	655,3	527,6	3736	106,8	1060	4243,2
	2003	5698	5092	308,1	115,3	830,9	547,2	4084	90,6	982	3615,8
	2009	8690	7944	367	612	1551	771	5793	153	2095	6644
Self-sufficiency ratio	1992	29,7	17,8	98,4	1,8	55,7	88,8	99,1	100	107,8	103,2
	2003	95,3	95,5	91,3	2,1	99,6	97,4	98,7	100	118,1	104,4
	2009	83,9	83,6	82,6	0,3	98,3	99,4	99,8	100	116,6	102

Source: Adapted and modified from FAOSTAT (2006) and FAOSTAT (2010)

Notes: Calculation based on FBS for Uzbekistan 1992, 2003 and 2009;

*- thousand pieces; **- in thousand ton

In detail this table shows that Uzbekistan has become almost self-sufficient in major foods between 1992 and 2003. The food Self-Sufficiency Ratio has increased, between 1992 and 2003 for: wheat from 17.8 percent to more than 95 percent; potatoes from 55.7 percent to 99.6 percent; meat from 88.8 percent to 97.4 percent and to 99.4 percent in 2009. In the same time some indicators stay as high as it was in 1992. These are vegetables and vegetable oil, milk, eggs, and fruits. The Self-Sufficiency Ratio re-

mained quite low and witnessed no change from its level of 1992 for sugar. Nevertheless the major part of the food consumption in Uzbekistan is provided by domestic food production (WFP, 2008).

Dependence on imports has decreased tremendously for wheat since 1992. The import to production ratio of wheat dropped from 461 percent in 1992 to 4.69 percent in 2003. In spite of this, even Uzbekistan achieved over-production of wheat, but for production of high quality local bread (called "*Non"*) the local wheat is not very acceptable due to the low gluten content. Uzbekistan having more than 1500 ton of wheat overproduction is in need for the same quantity (1420 ton) of Kazakh wheat for meeting of local demand (Dukhovny et al., 2012). Due to this reason, the wheat import in 2009 has increased nearly five times in comparison to 2003.

Food exports remain very limited in Uzbekistan. Taking into account the natural and climatic conditions of Uzbekistan, food exports have always been concentrated in fruits (WFP, 2008). These commodities witnessed a sharp increase in the exported volume between 1992 and 2009.

4.3.2 Food access

Level of income is clearly one of the most important determinants of food security. As the access to food is strongly related to the level of income, poverty measures could give an accurate indication of the likelihood of food insufficiency at the household level. However, the pertinence and the usefulness of income-based poverty measures as indicators of food access depend on the ability of these measures to take into account the different kinds and sources of income. Traditional and restrictive measures based on wages and monetary income gives a misrepresented description of poverty as well as of food access. It becomes clearer when the informal economy and self-employment constitute the source of income of an important part of the population (WFP, 2008).

In the context of Uzbekistan own production, stored wealth, self-employment, in-kind payment and food transfer to employees, use of assets, migrant remittances, family and community aid, and government transfers are all possible sources of food. Thus, the more the poverty measures and indicators take into account the diversity of income and food sources, the higher the probability that they can be accurately used as indicators of household food access and food security (UNDP, 2010). Moreover, incomes, particularly in a transition context, are often instable and fluctuant even in the short run. This is why the consumption or expenditure-based data and indicators rather than the sole income data and indicators are likely to be appropriate in the context of transition and in less developed countries. As consumption is generally smoother and less susceptible to fluctuation than revenues, consumption data can be relatively easily obtained and can

give a more accurate picture of the household's well being and of their level of poverty and food insufficiency (Yakhshilikov, 2006).

Before the transition, the great majority of the Uzbek population did not suffer from food insecurity and absolute poverty even though Uzbekistan was the second poorest republic of the former Soviet Union (WFP, 2008).

Despite the lack of available data, there are many indications that Uzbekistan witnessed a sharp increase in poverty in the first few years of independence at the beginning of the transition.

In the first years of independence, GDP did not collapse and the recession was apparently less severe in comparison to the other former Soviet Union counties. Nevertheless, the large falls in per capita GDP (20% between 1988 and 1993), the rising inflation and unemployment led to a sharp drop in household incomes and to high increases in poverty. Thus, mean income fell from US$ 28 to US$ 11 between 1988 and 1993; real wages severely collapsed and in 1994 reached less than 10 percent of the 1991 level (Milanowic, 1998).

The lack of reliable and regular data sources and the paucity of good quality information are a major problem for poverty analysis as a main indicator of food insecurity in Uzbekistan. It is especially pernicious for analyzing the trend of poverty and measuring the change of its incidence since the beginning of the transition (World Bank, 2003).

Until 2001, the old and biased Household Budget Survey (HBS) had been the sole data source. The HBS dates from the Soviet period. Falkingham et al. (1997, p. 48) characterize this HBS as *"a survey with a long history and a terrible reputation"*. The HBS sample of 4,000 households was biased and not nationally representative. After gaining independence the State Statistical Committee (UzStat) continued to field the HBS by following the same methodology and on the basis of the same sample without rotation. As the sample became more and more biased, the results were more and more misleading. Moreover, the raw data from this household survey were guarded jealously by the UzStat whilst the published results were limited and unreliable (WFP, 2008).

Based on the biased household budget survey, the UzStat was estimating the level of poverty using the income below the official minimal monthly wage. The assumption was made that the minimal wage was regularly raised by the government to the level required to satisfy food and non-food basic needs (WFP, 2008).

Based on such a criterion, the UzStat claims that Uzbek population having a monthly income (per person) below the minimum monthly wage fell from 44.5 percent in 1994 to 19 percent in 1998 and to only 16 percent in 2001.

In fact, there is no reason to see in the decrease of the number of people having a per capita income below the minimum wage an indication of improvement in the poverty situation, as the real value and the purchasing power of the minimum wage were greatly

and rapidly decreasing. Thus, during the period 1996-2002 while the nominal minimal monthly wage in Uzbek sums (UZS) was increased from 100 to 3,945, its value in current $US at current exchange rates declined from about 10-12 $ to about 4$ at the official exchange rate and to less than 3$ at the black market rate. Average wage during the same period declined from $54 to $29 at the official exchange rate and from $37 to $17 at the parallel market rate (WFP, 2008).

The new and the last HBS in Uzbekistan was conducted by the World Bank in 2001. According to obtained data, the purchasing power in 2000-2001 was even less than the cost of a consumption basket that could provide 1,500 kilocalories per person per day (World Bank, 2003).

The 2001 HBS is the first reliable source of information on poverty. It was introduced with technical assistance from the German Agency for Technical Cooperation (GTZ) and the World Bank. Based for the first time on a nationally representative sample (10.000 households, rotating monthly) this survey is the only data source that provides the basis for reliable estimates of food insecurity and income poverty in Uzbekistan.

However, in spite of its good quality, this survey has some drawbacks: the data related to non-food consumption do not allow the construction of a robust total consumption aggregate. In addition, the data does not permit to estimate the other measures of poverty such as inequality, depth, and severity (WFP, 2008). This is why in its Uzbekistan Living Standards Assessment (LSA) (2007) the World Bank considered that only a robust food consumption aggregate could be constructed and consequently estimated poverty rates on the basis of the food poverty line. Using other words, the assessment measured and analyzed in the first place food insecurity and took the results as an indication for income poverty.

National food poverty line was set in 2001 at the cost of a consumption basket that will provide 2100 kilocalories per person per day. The consumption basket was based on actual consumption patterns of the poorest population and was converted into local currency (World Bank, 2007).

In addition to this “absolute” food poverty line, an “extreme” food poverty line was calculated based on intake of 1,500 kilocalories per person per day. The value of the absolute food poverty line thus obtained in October 2000 prices and was 3601 UZS per month. It is about PPP$ 30 per month (PPP$ 1 per day) and about US$ 10 (US$ 0.32 per day). It is worth remarking that this food poverty line is about 50 percent higher than the value of the minimum wage in 2000, but about 50 percent lower than the cost of the minimum subsistence food basket determined by the World Bank to set the absolute poverty line for the region (World Bank, 2007).

Moreover, the minimum subsistence food basket that was chosen as reference is a wheat-based basket that does not take into account the protein and micronutrient

needs. Reflecting the actual food consumption of poorest households, it comprises mainly carbohydrate foodstuffs rather than animal and plant proteins. The meat and dairy products included in this basket accounts respectively for 2.2 percent and 1.3 percent of the total caloric intake (World Bank, 2007). Thus, even though it provides an adequate caloric intake, this food basket does not provide for other essential nutritional needs such as proteins and micronutrients. It is therefore highly probable that an important proportion of Uzbek population classified as non-food poor has actually an inadequate intake in proteins and micronutrients (WFP, 2008).

The results of the World Bank LSA in 2007 indicate that about 30 percent of the population in 2003 had total food consumption below 2,100 Kcal per capita per day. Approximately 11 percent of the population has total food consumption below the extreme food poverty line of 1,500 Kcal per capita per day. In contrast to the slight decrease of the food poverty rate, the level of extreme poverty remained stable during more than three years. This rate of extreme food poverty and its persistence are all the more alarming that the food consumption level of 1,500 Kcal per person per day is unsustainable and can lead to serious health consequences (World Bank, 2007).

World Bank (2007) also indicated that a large number of Uzbek people are close to the food poverty line and therefore might be considered as highly vulnerable to small risks and shocks. Thus, 7 percent of the population has a food consumption basket whose value is between 2,100 and 2,310 Kcal. Similarly, another 7 percent of the population has a food consumption basket whose value is between 1,890 and 2,100 Kcal/person/day. This important proportion of households having consumption levels just below and just above the poverty line explains how notable change in the food poverty rates can occur in the short run (World Bank 2007).

4.3.3 Geographic distribution of food insecurity

With 60 percent of the Uzbek population living in rural areas, the World Bank data suggest that around 70 percent of the food poor and of the extremely food poor live in rural areas. Most of the poverty analyses underline the gap between urban and rural areas and the higher incidence of poverty and food poverty among the rural population. The incidence of food poverty is 22.5 percent in urban areas compared to 30.5 percent in rural areas. Similarly, the rate of extreme food poverty in rural areas is 11.2 percent and is higher than in urban areas which are 7.1 percent (World Bank, 2007).

In fact, a wider gap exists between Tashkent – the capital city and the other urban secondary towns where poverty and food poverty rates are close to the levels observed in rural areas. Actually, a large part of the rural-urban gap results from the fact that Tashkent city, which accounts for a quarter of the total urban population and about 9 percent of the total population, registers relatively very low incidences of poverty and food pov-

erty: 24 percent and 9.2 percent respectively in 2001 (UNDP, 2010). Poverty and food poverty rates in Tashkent city in 2001 were more than three times lower than those in rural areas. The comparison of both household surveys shows that this gap has considerably widened. The poverty level in Tashkent city is almost thirteen times lower than its level in the other urban areas and fourteen times lower than its level in rural areas. Thus, although the rural areas have the highest poverty and food poverty rates, the most significant gap is between the capital city and the rest of the country, including secondary cities and small towns, rather than between urban and rural areas (WFP, 2008).

4.4 Food and nutrition situation in study regions

4.4.1 General overview of study regions

As was marked above, the study area is represented by two regions of Uzbekistan: Markhamat region of Andijan province and Denau region of Surkhandarya province.

Markhamat region

Andijan province is the most eastern province of Uzbekistan occupying east part of Fergana valley and has an area of 4,240 km². Administrative centre is Andijan city (UzStat, 2010).

Andijan province has borders with Kyrgyzstan, Fergana province and Namangan province of Uzbekistan (see Figure 4.3). It has the smallest area between twelve Uzbek provinces and occupied less than one percent of the total area of Uzbekistan. In the same time it is the most densely populated province of Uzbekistan with a population of 2,672,300 persons (UzStat, 2010). Almost ten percent of the total Uzbek population lives here.

Andijan province is divided into fourteen administrative regions and one out of them is Markhamat.

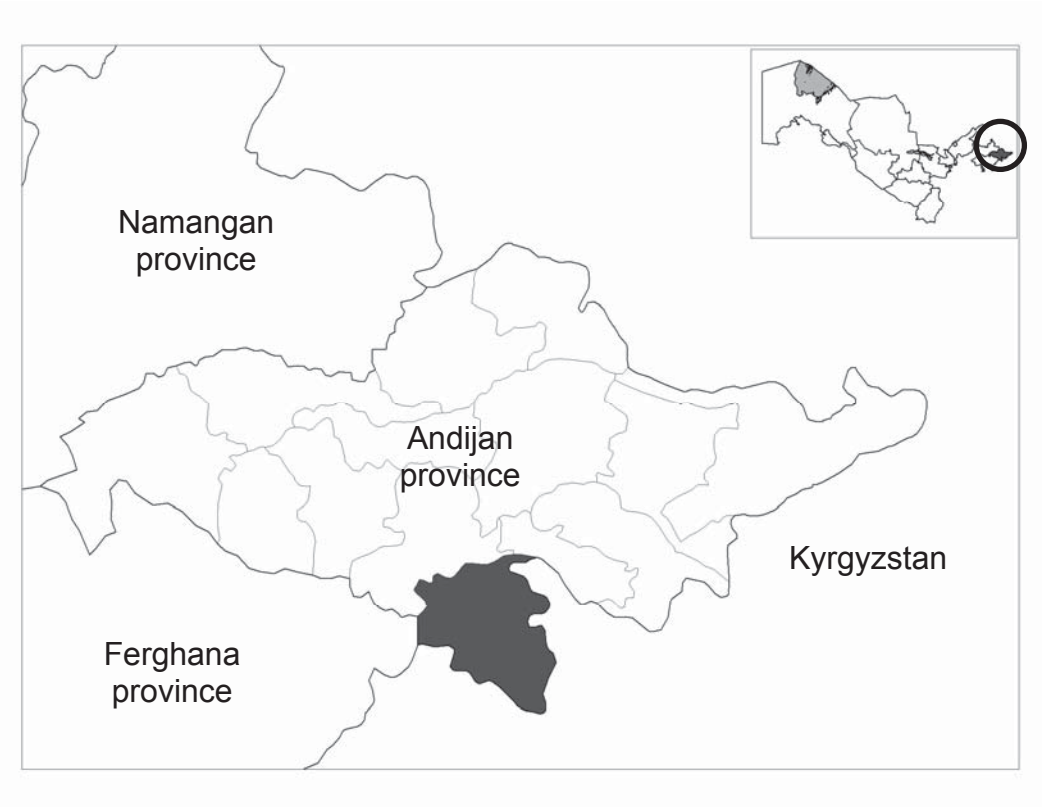

Figure 4.3: Markhamat region of Andijan province

Source: Hokimiyat of Markhamat region (2010)

Note: also available on www.andijan.uz and www.gov.uz

Markhamat region is located in the south of the Andijan province with the capital in Markhamat city.

Markhamat region consists of one city, one urban settlement and five rural settlements also called from Soviet times “Village Soviets”, which include forty-eight villages (Markhamat Hokimiyat, 2010). The study was conducted in Shukurmergan rural settlement joining three villages.

Natural and climatic conditions allow for the growing up of cotton, subtropical crops, melons, and other fruits and vegetables. Moreover, the yield of crops like cotton, apples, apricots and wine are higher than the average yield of these crops in the whole Uzbekistan. This fact could be explained due to one of the highest soil fertility rate (also called in Uzbekistan as “bonitet point”) which is 60 out of 100 (Markhamat Hokimiyat, 2010). Only Andijan and Surkhandarya provinces have regions with so high soil fertility rates. Other provinces and regions of Uzbekistan have a maximum 57 points (Nerozin, 2005).

Production of silkworm cocoons, cultivation of cereals, gardening, and wine are the most developed spheres of agriculture in the Andijan province due to sufficient water and soil conditions.

Figure 4.4 indicates the area under the different crops in the Markhamat region.

The total agricultural area of the Markhamat region is about 16,750 ha. Strategic crops planted on the major area: cotton planted on 37 percent and wheat planted on 40.5 percent of total agricultural area. Other land is under fruits, vegetables, maize, melons, etc (Markhamat Hokimiyat, 2011).

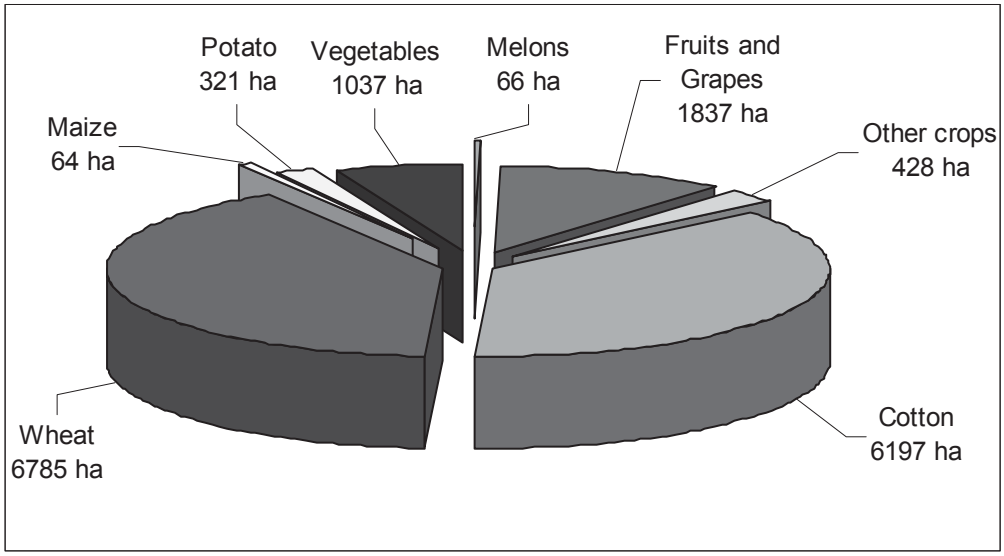

Figure 4.4: Crops area in Markhamat region

Source: Hokimiyat of Markhamat region (2011)

Denau region

Surkhandarya province is the most southern province of Uzbekistan and has the area of 20,800 km². Administrative centre is the city of Termez.

Surkhandarya province has borders with Tajikistan, Turkmenistan, Afghanistan, and the Kashkadarya province of Uzbekistan (see Figure 4.5). According to UzStat (2010) the population is 2,052,100 persons. Surkhandarya is one of the most densely populated in Uzbekistan. Almost ten percent of the total Uzbek population lives here (UzStat, 2010).

Denau region is located in the north-east of Surkhandarya province with a capital in Denau city.

Denau region consists of one city, twelve urban settlements and seventeen rural settlements or “Village Soviets” (Denau Hokimiyat, 2010). The study was conducted in Hazarbog rural settlement joining two villages.

Surkhandarya province is divided into fourteen administrative regions and one out of them is the Denau region.

Figure 4.5: Denau region of Surkhandarya province

Source: Hokimiyat of Denau region (2010)

Note: also available on www.surxondaryo.uz and www.gov.uz

The basis of the provincial economy is represented by agriculture. One of the high quality fine-fibered cotton of Uzbekistan is producing here. This high quality of cotton fiber based on high indicator of soil quality ("bonitet point") which is 60 points out of 100 (Denau Hokimiyat, 2010). Surkhandarya province is also recognized as the leader on the light and the food-processing industries (Denau Hokimiyat, 2010).

Figure 4.6 indicates the different crops area in the Denau region.

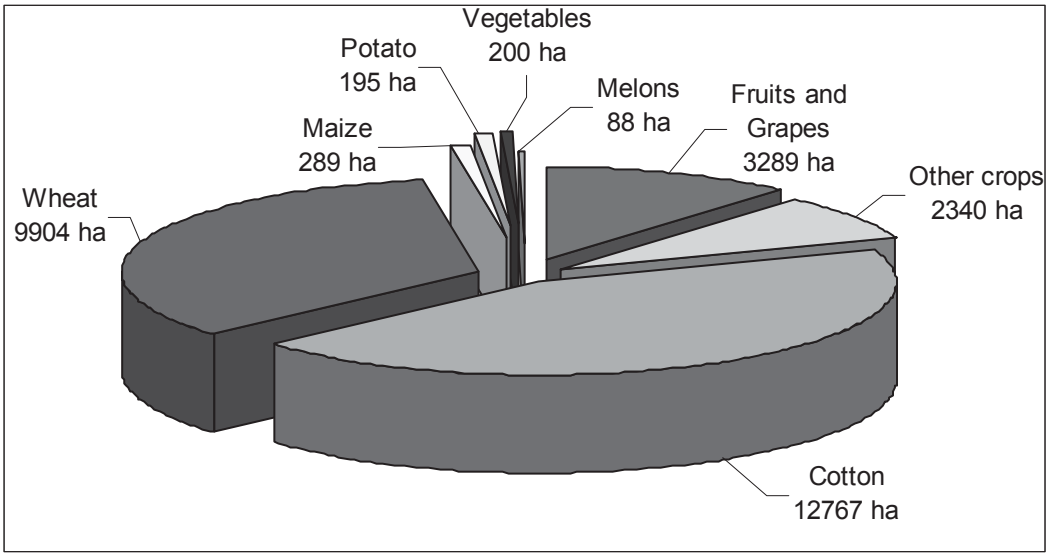

Figure 4.6: Crops area in Denau region

Source: Hokimiyat of Denau region (2011)

The total agricultural area of the Denau region is about 29,000 ha. Strategic crops as anywhere in Uzbekistan cultivated on the major area: cotton planted on 44 percent and wheat planted on 34 percent of total agricultural area. Other land is planted by fruits, vegetables, maize, melons, etc (Denau Hokimiyat, 2011).

4.4.2 Food and nutrition situation in Markhamat and Denau regions

The most recent available data, disaggregated only at the provincial level, do not allow the analysis of the geographic distribution of food poverty at the regional level. The food poverty ranking of the regions can be hardly used for policy targeting purposes. Not only is the ranking of most of the region not robust, but also there are large disparities in food poverty across regions (World Bank, 2007).

One of the major causes of poverty and food insecurity in the context of Uzbekistan as a whole and the Markhamat and Denau regions in particular – is large households with many children.

Poverty is related to demographic characteristics of the households. Poverty and food poverty rates increase significantly with the number of children living in the household. The World Bank's LSA conducted in Uzbekistan in 2003 indicate that the food poverty rate increased from 7.5 percent among households with no children, to 14 percent among households with one child, to 34 percent among households with four children.

Food insecurity is relatively high among the unemployed. Unemployed individuals and their families are clearly at a high risk of living in food poverty. Their food poverty rate is 35 percent, compared to 25 percent of the employed. However, the unemployment rate in Uzbekistan is very low by the standards of transition economies and estimated at 3

percent in 2003 and 4 percent in 2005 (World Bank, 2007). In fact, this rate is based on a narrow definition of unemployment that excludes those people who are in working age and would like to work but are not searching actively for a job because they do not believe that they can find a good and/or well-paid job (WFP, 2008).

Indeed, work does not protect families from food poverty in Uzbekistan. Almost 25 percent of all the employed live in food poverty and as many as half of all the food poor live in households with employed heads. However there are considerable differences in the type of employment between the food poor and non-food poor. Those who are in food poverty are more likely to work in the informal sector, to have an unstable employment and to be self-employed (WFP, 2008).

Low productivity, underemployment and greater informality of employment arrangements in agricultural sector are certainly contributing to the high rate of poverty and food insecurity among farmers' households. However, the major factor that contributes to the very low wages and revenues and to the high rate of food insecurity among farmers and agricultural workers is the implicit taxation of cotton and wheat (WFP, 2008). This taxation takes place through the low state procurement prices and marketing policy in cotton and wheat, and the overvalued exchange rate (SDC, 2011).

Farmers in the Markhamat and Denau region are vulnerable to low levels of income and consequently to food insecurity in fact that the majority of their land cultivated by strategic crops.

In fact farmers receive a fraction of the true value of the cotton and wheat which are acquired by the government via the system of compulsory state procurement. Thus, the low procurement price of wheat allows the government to achieve self-sufficiency and keep wheat and bread at an affordable consumption price for the local population. On the other hand, cotton is exported and the revenues, resulting from the differential between the very low procurement prices paid to farmers and the high tariffs obtained in the international market, are monopolized by the government. Cotton is thus a major source of tax revenue, in addition to its contribution to around 25 percent of foreign exchange revenues (WFP, 2008). According to the World Bank LSA (2003), farms receive one third of the actual value of the cotton they produce. Furthermore even when all kinds of subsidies are taken into account, net transfers from the cotton sector between 2000 and 2004 represented 31 to 66 percent of the gross farmer's income. Other surveys and observations draw an even bleaker outlook. According to a report of International Crisis Group (2004), those who work on the cotton farms usually get far less than their official wages and sometimes receive goods only, such as cotton seeds oil or wheat seeds in kind.

The income of farmers from the cotton and wheat production is clearly insufficient to procure the minimum food necessary to feed their families. However, the farmers are obliged to carry on in this system (WFP, 2008). Sometimes, when the quality of soil or

by other reasons, farmer could get the small plots that are given out by the local authorities for producing other food crops. Significant part of their real income comes from these small plots sometimes of only one or two hectares, where they grow grain or vegetables, and sometime raise cattle. A part of this own food production is consumed and another part is sold at the local markets or exchanged between the neighbors. Thus, in response to the widespread poverty and food insecurity the cultivation of these kinds of plots has been for the rural population, and particularly for the poorest ones, is the most important coping strategy to find an alternative source of income and food consumption (WFP, 2008).

4.5 Summary

This chapter describes the general overview of Uzbekistan. Uzbekistan is a developing country and reforms in all sectors of economy are in progress.

Agricultural and food policy reforms described in this chapter indicates factors influencing food security. This chapter also exposes the general overview of farming in Uzbekistan as a whole and in the Markhamat and Denau regions in particular with own advantages and shortcomings. The main factor influencing farm households' level of income and consequently food security in Uzbekistan is the large part of their land cultivated by cotton and wheat. Producing of such crops is not profitable for farmers, but important for the country's economy. On the other hand, producing of more profitable crops like fruits and vegetables increase the probability of households to be food secure. This chapter includes the secondary data on different aspects of Uzbekistan. The following chapter demonstrates how the primary data was collected in order to obtain own findings of the study.

5. METHODOLOGY, DATA COLLECTION AND PROCESSING

This chapter describes the process of data collection. The first part consists of the study design and sampling design. The second part describes the methods of primary data collection and contains the description of developed questionnaires and procedures of interviewing. Secondary data collection and its sources are indicated in the third section. The overview of data processing steps and techniques is discussed in the last section of this chapter.

5.1 Study design and sampling design

Study area selection

Two regions of Uzbekistan were selected as the study area: Markhamat region of Andijan province and Denau region of Surkhandarya province.

The main selection criteria were that each of these two provinces is one of the most populated in Uzbekistan. In addition to food security problems are typical in overpopulated areas (see Chapter 2.4.2).

Other selection criteria were the intensively and diversity of food and cash crops production in both regions (see Chapter 4.4.1).

One more interesting difference between these regions is a food addiction. The people of the Markhamat region consume more vegetable and farinaceous food (Markhamat Hokimiyat, 2010). In the same time Surkhandarya province is famous by its meat dishes, thereby Denau people often consume meat food (Denau Hokimiyat, 2010).

The last but not least criteria for selection of these regions were the problem to obtain the “special permission” normally needed for conducting such a study. So far both regions are pilot zones of projects of Scientific- Information Centre of Interstate Coordination Water Commission of Central Asia (SIC ICWC). It was therefore unnecessary to obtain the “permission” hence it permitted to economize the time and finances.

Sampling unit and sampling size

The farm household was selected as a sampling unit of the present study so far it corresponds to research objectives.

Household definitions used in multi-topic household surveys vary between surveys, but have potentially significant implications for household composition and household poverty statistics. Standard definitions of the household usually include some intersection of keywords relating to residency requirements, common food consumption and intermingling of income or production decisions. Despite best practices intending to standardize the definition of the household, it is unclear which types of definitions or which intersec-

tion of keywords in a definition reveal different types of individuals listed as the household (Beaman and Dillon, 2009).

In the context of the present study the following definition of household was selected: “A household is composed of the group of people living in the same dwelling space who eat meals together and have at least one common plot together or one income generating activity together and acknowledge the authority of a man or women who is the head of household” (Beaman and Dillon, 2009. p. 8).

Initially 127 households in the Markhamat region and 114 households in the Denau region were interviewed by questionnaires. Later it was found that answers of 17 households from the Markhamat region and 4 households from the Denau region were incomplete, hence not applicable for statistical analyses. Thus, 220 farm households in total were investigated, from those 110 households are located in the Markhamat region and 110 households in the Denau region.

Sample recruitment

The “snowball effect” was selected as an instrument for sample recruitment. This method involves using informants to identify cases that would be useful to include in the study. “Snowball effect” uses insiders’ knowledge to maximize the chance that the households included in the final sample are strong cases to include in research (Lewis-Beck et al., 2004). In the case of the present study, every asked farmer suggested to address the investigator to the following farmer.

Field study steps and procedures

Before starting primary data collection, several meetings with representatives of local authorities on different levels took place in the study regions. Main general data needed for the study was obtained from these sources. Group discussions on coping everyday’s food supply were conducted and moderated by the investigator and his helpers in order to get deep information for conclusions and recommendations.

5.2 Primary data collection – the field study

Primary data collection was conducted by the investigator and his helpers in each study region during the field study from November 2011 to April 2012. This period was chosen non-randomly. Exactly in this period people do not have access to fresh fruits and vegetables and in the same time almost all their reserves (salty, dried, etc.) are finished. Helpers were necessary for translating questions from Russian to Uzbek and vice versa in order to make all questions more understandable. They were selected from the local population and know all specifics of the study regions i.e. local traditions and laws, the

representatives of local authorities and their location, and specific mentality of the local population.

Primary data was collected through the interviewing households by the questionnaires: Structured household questionnaire; Modified household food security survey module (HFSSM); Food list recall combined with Food consumption score (FCS). Each of these methods will be described in detail below.

All kinds of developed questionnaires were pre-tested during the period of January – March 2011 in order to modify and/or abort some questions. It is also necessary for proving the understandability of all questions and tables.

5.2.1 Structured household questionnaire

As it was mentioned above, the household questionnaire was pre-tested before the final survey in order to improve it and for obtaining good results. In a majority of cases the head of the household and his/her spouse were interviewed.

Following Uzbek traditions the man is responsible for earnings and the woman is for cooking the meal, housekeeping and childcare. That is why it was very important to collect the answers of both spouses in the same time. This permits information on how much money a household earns, how much is spent on food, and how much food it consumes.

The term “head of household” is used to cover a number of different concepts referring to the chief economic provider, the chief decision maker, the person designated by other members as the head, etc. Generally, the definition of head of household reflects the stereotype of the man in the household as the person in authority and the bread winner. Sometimes even where the definition is adequate, criteria used by interviewers are often vague and leave room for subjective interpretation (Hedman et al., 1996). The focus changes depending on the specific circumstances of the country.

In Uzbekistan’s context, head of household is the eldest and able-bodied man. In case of his disability, illness or death the eldest son takes his place. In the same time if there are no other men in the household the woman could also take the place of household head. Thereby, the household head is defined only by the opinion and traditions of household members.

The completed household questionnaire consist of the following information: socio-demographic data as household composition, age, sex, education and occupation of household members; dwelling unit data as movable and immovable assets, farmland and homestead plot availability, livestock; and socio-economic data as farm inputs and outputs, farm and non farm income, production of food and cash crops on farmland, land use strategy of homestead plot, livestock production, composition of household

budget, etc. The last part of household questionnaire also consist some general questions on food security and food frequency (see Appendix 1).

The household questionnaires have been developed in English at first. Then it was translated to Russian and Uzbek in order to increase the understandability of all questions and tables for household members. After completing all questionnaires and upon their retrieval, statistical analyses have been made in English. Hence, all questions were translated into English again.

5.2.2 The household food security survey module (HFSSM)

The household food security survey module focuses on self-reports of uncertain, insufficient or inadequate food access, availability and utilization due to limited financial resources, and the compromised eating patterns and food consumption that may result (USDA, 2006).

The HFSSM is not designed to capture other possible reasons for compromised food consumption, such as voluntary dieting or fasting. The HFSSM is a household measure, that is, it assesses the food security situation of adults as a group and children as a group within a household. The HFSSM does not determine the food security status of each individual member residing in the household. It cannot be assumed that all members of a household share the same food security status (USDA, 2012).

The HFSSM contains eighteen questions (see Appendix 2) about the food security situation in the household over the previous twelve months, ranging in severity from worrying about running out of food, to children not eating for a whole day. Ten of the eighteen items are specific to the experiences of adults in the household or the household in general. Others eight are specific to the experiences of children under the age of eighteen years in the household. Each question specifies a lack of money or the ability to afford food as the reason for the condition or behavior (Health Canada, 2004).

Modified version of HFSSM used in the present research contains only eleven questions, because other seven do not correspond to conditions of Uzbekistan. Basically, questions about hunger were deleted from the list because the hunger is not the actual problem in the context of Uzbekistan. As well all questions were concerned only the one month period and not one year period as in original HFSSM (see Appendix 3).

Four categories were used to describe the food security situation experienced by adults, children, and households overall: (i) High food secure, (ii) Marginal food insecure, (iii) Low food secure and (iv) Very low food secure. These category labels generally correspond with that traditionally used by the United States Department of Agriculture (USDA) in its monitoring reports. The USDA has recently introduced new language to describe ranges of severity of food insecurity in response to the National Research Council's recommendation (Nord et al., 2006). In USDA reporting, the labels "low food

security" and "very low food security" have replaced "food insecure without hunger" and "food insecure with hunger", respectively (Nord et al, 2006).

Hence, investigated households can be divided following the scale:

- Raw score 0: High food security;
- Raw score 1-3: Marginal food security;
- Raw score 4-9: Low food security;
- Raw score more than 9: Very low food security.

The scale of results was also changed taking into account the decreasing of questions number and specific conditions of Uzbekistan (see Appendix 3).

5.2.3 Food list recall

Ideally, detailed food consumption surveys would be used to measure caloric intake. However, the cost and time limitations of surveying an adequate sample are needed meaning that such surveys are rarely conducted. In spite of indicated limitations, this kind of survey was conducted using the “Food list recall” (WFP et al., 2008).

The aim of the food list recall was to collect the data relevant to the quantity of food consumed by household during the specific period of time (WFP et al., 2008). In case of the present study the seven-day period was chosen. During this seven-day period the household member who cooks the food for the whole household completed the table developed by the investigator (see Appendix 4).

For increasing the comfort of using the food list recall table, it was made on the paper of a big size and pencils were bought for completing. It permitted the cooking person to complete the table just during the cooking and indicated the average weight of raw products cooked.

Later, when the seven-day period was finished, all tables were collected from households and obtained data was transferred using the Excel software.

5.2.4 Food consumption score (FCS)

The food consumption indicator generally used by the World Food Program (WFP) is produced by collecting and analyzing dietary diversity and food consumption frequency scores. Thresholds are then applied to the scores to determine poor, borderline and acceptable food consumption patterns. Household scores are then compared with pre-established thresholds that indicate the status of household’s food consumption (WFP et al., 2008).

The food consumption score is a proxy indicator reflecting quantity (calories) and the quality (nutrients) of the affected population's diet. It is based on a seven-day recall of food types and frequency of consumption with data collected at the household level (WFP, 2008).

A limitation of the FCS is that it is only a snapshot of one week's worth of food consumption by the household. It does not capture seasonal changes, quantify the food gap, or show how food consumption has changed as a result of the crisis. In an emergency, then, more analysis is clearly needed to understand changes in household food consumption (WFP et al., 2008).

The food consumption score analysis is based on the frequency of consumption of one or more items from the eight food groups. Some minor changes were made in the list of items taking into account the specific food stuff of Uzbek people.

Table 5.1 below provides a breakdown for each food group and associated weight.

Table 5.1: Food groups and weights

Food items	Food groups	Weight
Rice, maize, bread, pasta, other cereals, etc	Cereals and tubers	2
Potatoes		
Beans, peas, etc	Pulses	3
Meat, fish, poultry, eggs, etc	Meat/fish	4
Milk, yoghurt, cheese, other dairy products	Milk and dairy	4
Vegetables	Vegetables	1
Fruits	Fruits	1
Sugar, sugar products, sweets	Sugar	0,5
Oil, fats, butters	Oil	0,5

Source: WFP (2004)

Households are grouped according to their overall consumption score: "poor food consumption", "borderline food consumption" and "adequate food consumption" (WFP, 2004).

Thresholds for separating these three groups are generated by using a weighted food consumption score. Each food group is given a weight based on its nutrient content and then multiplied by the number of days a household consumed one or more items from that group within a seven-day period.

Food consumption score was combined with the food list recall and was applied simultaneously. It was just one line in the table, but in the same time took deep sense into itself.

An example of FCS calculation

In order to better understand how the calculation of the FCS was conducted an example of how the answers of one household were translated into the FCS and is given below.

Assume that household's members consume rice, bread and potato daily during the investigated seven-day period. Following Table 4.1, these food items have a weight (or score) of 2. Thus, 7 days multiplied by 2 scores gives 14 scores. Further by the analogy, assume that beans which have 3 scores were consumed 4 days out of seven, hence 3*4=12 scores. Suppose that meat and eggs which have 4 scores were consumed only twice a week, consequently 4*2=8 scores. Milk and dairy products also have 4 scores. Hence, the consumption products from this group 3 days a week gives us 4*3=12 scores. Therefore, summarizing of all these scores, e.g. 14+12+8+12 will give the value of 46 scores. According to the FCS scale, the household with 46 scores belongs to the group with adequate food consumption, due to the threshold between borderline and adequate food consumption of 35 scores.

5.3 Data processing

Data input

Before starting any kind of analysis it is necessary to input all data collected through questionnaires into the database in digital form. Therefore, a selection of computer software is required. For these purposes the Microsoft Office Excel for Windows 2003 and IBM Statistical Package for Social Science (SPSS) versions 18 and 19 were used.

Microsoft Office Excel for Windows 2003 was used only to combine the data of the Food consumption score questionnaire and Food list recall. As was mentioned above these tables were in a big format of paper and it was not possible to bring them all from the study regions. Thereby all data was input in digital form and brought to Tashkent and later to Germany.

Final database was created in the IBM SPSS versions 18 and 19 and all subsequent manipulation with data were conducted using this software.

Data checking

Data input is a long and monotonous process demanding the precision of a high degree in order to minimize any errors in typing the data. Nevertheless sometimes errors and

mistakes happened. Options of “Data check”, “Filter” and “Explore” are used to expose these errors and to detect extreme values.

After detecting errors it is necessary to correct the database in order to escape any errors in the following analysis and to get the right results. In the case of the present study, and as started in section 5.1, initially 127 households in the Markhamat region and 114 households in the Denau region were interviewed. Later it was found that answers of 17 households from the Markhamat region and 4 households from the Denau region were incomplete, hence not applicable for statistical analyses. Thus, the answers of 220 farm households in total were analyzed, from which 110 households are located in the Markhamat region and 110 households in the Denau region.

5.4 Empirical data analysis

There are a great number of statistical analyses of the data. Selection of relevant statistical analysis depends on the obtained data, its quality and/or validation, and finally on developing objectives of the study.

Statistical analyses selected for the present study are described below in details.

5.4.1 Univariate and bivariate analyses

Descriptive statistics are used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. Together with simple graphical analysis, they form the basis of virtually every quantitative analysis of data (Bower, 2009).

Descriptive statistics are used to present quantitative descriptions in a manageable form. Research studies may have lots of measures. Descriptive statistics helps to simplify large amounts of data in a sensible way. Each descriptive statistic reduces lots of data into a simpler summary (Madsen, 2011).

The descriptive analysis in the case of the present study was used for getting the main outcome with regard to socio-demographic and socio-economic factors of investigated households, food and cash crops production on farmland and homestead plot, food security and food consumption situation, etc. This step of analysis includes minimum, maximum, mean and standard deviation.

In order to test the study hypotheses and realize empirical results the relationship between variables was later examined.

First, variables were tested for normal distribution using the parametric t-Test and in cases when variables have a not normal distribution non-parametric U-Test or the

Mann-Whitney-Test was applied. These tests were also applied in order to find the statistical significances.

The correlation is one of the most common and most useful statistics. A correlation is a single number that describes the degree of relationship between two variables. First of all it is necessary to examine the statistical significance of correlation in order to reject some of the hypotheses and to accept the alternative (Madsen, 2011).

As was mentioned above IBM SPSS versions 18 and 19 were used for univariate and bivariate analyses.

5.4.2 Multivariate analysis

After univariate and bivariate analyses, logistic regression was used.

Typically, a regression analysis is done for one of two purposes: in order to predict the value of the dependent variable for individuals for whom some information concerning the explanatory variables is available, or in order to estimate the effect of some explanatory variables on the dependent variable (Hosmer and Lemeshow, 2000).

To explore such issues, the investigator assembles data on the underlying variables of interest and employs regression to estimate the quantitative effect of the causal variables upon the variable that they influence. The investigator also typically assesses the “statistical significance” of the estimated relationships, that is, the degree of confidence that the true relationship is close to the estimated relationship (Hosmer and Lemeshow, 2013).

Logistic regression is a statistical method for analyzing a dataset in which there are one or more independent variables that determine an outcome. The outcome is measured with a dichotomous variable, in which there are only two possible outcomes (Hosmer and Lemeshow, 2013).

Wooldridge (2013) asserts that the dependent variable in logistic regression is binary or dichotomous, i.e. it only contains data coded as 1 (in case of the present study: Food secure HH; HH with adequate food consumption) or 0 (in case of the present study: Food insecure HH; HH with borderline food consumption).

The goal of logistic regression is to find the best fitting model to describe the relationship between the dichotomous characteristic of interest (dependent variable = response or outcome variable) and a set of independent (predictor or explanatory) variables. Logistic regression generates the coefficients and its significance levels of a formula to predict a logit transformation of the probability of presence of the characteristic of interest (Webster, 2013):

$$Logit(p) = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + ... + b_kX_k \quad \text{.....(5.1)}$$

where *p* is the probability of presence of the characteristic of interest. The logit transformation is defined as the logged odds:

$$odds = \frac{p}{1-p} = \frac{probability \quad of\ presence \quad of \quad characteristic}{probability \quad of\ absence \quad of \quad characteristic} \quad \text{.....(5.2)}$$

and

$$Logit(p) = \ln\left[\frac{p}{1-p}\right] \quad \text{.....(5.3)}$$

Rather than choosing parameters that minimize the sum of squared errors like in ordinary regression, the estimation in logistic regression chooses parameters that maximize the likelihood of observing the sample values (Webster, 2013).

Following Hosmer and Lemeshow (2013) it is necessary first to identify the dependent variable, which must be binary or dichotomous, and it should only contain data coded as 0 or 1. Cases with values other than 0 or 1 for the dependent variable will be excluded from the analysis. Further, for the independent variables it is necessary to enter the names of variables that expected to influence the dependent variable.

First results of the model is the sample size and the number and proportion of cases with a negative (Y=0) and positive (Y=1) outcome.

If the P-value for the overall model fit statistic is less than the conventional 0.05 then there is evidence that at least one of the independent variables contributes to the prediction of the outcome.

Further, the regression coefficients are the coefficients $b_0, b_1, b_2, \ldots b_k$ of the regression equation (5.1).

Webster (2013) asserts that an independent variable with a regression coefficient not significantly different from 0 (P>0.05) can be removed from the regression model. If *P*<0.05 then the variable contributes significantly to the prediction of the outcome variable.

The logistic regression coefficients show the change (increase when b_i>0, and decrease when b_i<0) in the predicted logged odds of having the characteristic of interest for a one-unit change in the independent variables (Webster, 2013).

By taking the exponential of both sides of the regression equation as given above, the equation can be rewritten as:

$$odds = \frac{p}{1-p} = e^{b_0} \times e^{b_1X_1} \times e^{b_2X_2} \times e^{b_3X_3} \times ... \times e^{b_kX_k} \quad \text{.....(5.4)}$$

Thus, when a variable X_i increases by 1 unit, with all other factors remaining unchanged, then the odds will increase by a factor e^{b_i}.

This factor e^b is the odds ratio (O.R.) for the independent variable X_i and it gives the relative amount by which the odds of the outcome increase (O.R. more than 1) or decrease (O.R. less than 1) when the value of the independent variable is increased by 1 units (Webster, 2013).

5.5 Summary

This chapter described the methodological approaches of the study. The main steps of data collection and data analysis are also included in this chapter. Two regions of Uzbekistan were selected as a study area: Markhamat region and Denau region. Farm households in these two regions were selected using the snow-ball effect. The primary data was collected through the structured household questionnaire, Household Food Security Survey Module questionnaire, Food Consumption Score with the Food list recall. Obtained data was explored and coded. Further, univariate, bivariate and multivariate analyses were conducted in order to achieve the objectives of the present study. The main results obtained using the analytical approaches described by this chapter are presented below.

6. DESCRIPTIVE FINDINGS OF THE FIELD STUDY

This chapter explores the results of descriptive statistics and contains six parts. The first part describes basic socio-demographic characteristics of the farm households. In particular household composition and the level of education of the household head are explained. The second part presents the crops production on homestead plots. Here the size of a homestead plot, number and kind of crops cultivated are presented. The third part exposes the production on the farmland. Here the size of the farmland, cultivated crops and production strategies are discussed. The fourth part covers the livestock keeping in households. The fifth part shows the level of income using different scales as well as the amount of farm and non farm income. This part also describes the amount of income spent for food. The final part exposes the food security and food consumption situation of surveyed households taking into account the Household Food Security Survey Module (HFSSM) and Food Consumption Score (FCS) scales and thresholds.

6.1 Socio-demographic characteristics of farm households

Chapter 3.2 described in detail the major factors which influence household food and nutrition security in developing countries.

In the context of the present study, two major socio-demographic characteristics were taken into account. First is the household composition and description of some of the indicators describing it, and the second is the level of the education of the household head. Due to research hypotheses the second characteristic is more important but could not be examine without the first one.

6.1.1 Household composition

Household composition plays a major role on the well-being of the household itself. On the one hand, the more people in a household then the more labor force the household has. On the other hand, the number of dependent members of the household i.e. eldest persons and especially small children plays a big role on food security and food consumption status of the household (Reimers, 2006).

Table 6.1 shows the summary statistics of socio-demographic characteristics of surveyed households. It provides the mean and standard deviation (the indicator in brackets) of the basic demographic characteristics of the household as number of members, number of children under 7 years old, as well as age and gender of household head.

Table 6.1: Socio-demographic characteristics of households

Items	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)
Number of household members	6.35 (1.87)	6.35 (1.75)	6.34 (1.99)
Number of children under 7 years old	1.59 (0.68)	1.60 (0.67)	1.59 (0.69)
Age of household head	47.26 (11.45)	46.77 (11.26)	47.75 (11.67)
Gender of household head (1= male; 0 = female)	0.85 (0.36)	0.85 (0.36)	0.85 (0.35)

Source: own computation with data of the questionnaire

Traditionally, Uzbek families are large with two and more children. Moreover, the eldest members always live with their children. Hereby, Uzbek household usually consist three or four generations and always more than one family.

Therefore, Table 6.1 shows the average number of household members in both regions is 6.35. Chapter 4.1.2 described the situation on labor migration from Uzbekistan. Here it is necessary to underline again that the labor migration from Uzbekistan to Russia and Kazakhstan is greatly widespread. In this case the household members who live abroad at the moment of investigation were not taken into account.

Table 6.1 also indicates the number of children under seven years old, which on average is 1.59. The seven years threshold was analyzed because in this age children starts their primary education at the school and in the same time they start to help their parents to maintain household keeping. That includes the minor work on homestead plot, drinking water delivery in case of absence of running water in the house or in the garden, etc.

The average age of household head in both regions is 47 years old. The interesting findings were that the minimum for this indicator was 24 and the maximum was 78. As was mentioned above, the majority of international definitions of the “head of household” are not valid in the conditions of Uzbekistan due to its traditions and mentality. In the case of the present study the “head of household” was decided only by the opinion of all members of each investigated household.

The definition of the “head of household” also plays the major role during the descriptive statistics of the household head gender. Table 6.1 shows the distribution of households according to gender. The male-headed households are in the majority and represent 85 percent of households in both regions.

In fact, the woman becomes the head of household due to the absence of the man. The main causes of absence in Uzbek households are the labor migration, divorce or natural death. In those cases women have no choice but to become the household head and to be responsible not only for housekeeping, but also for farming duties. On the one hand, to be responsible for all duties in the same time is very difficult. This fact was confirmed during the interviewing in the Markhamat region. On the other hand, in the Denau region were a lot of women described their experiences as very prosperous in their farm keeping as well as in home keeping.

6.1.2 Level of education of the household head

In Uzbekistan eleven years of education is compulsory and free. The education begins with four years in primary school and is followed by two phases of secondary education taking five and two years respectively. Primary school begins at the age of seven (or incomplete seven) and there is no specific leaving examination after the four years are completed (UNESCO, 2011).

The next five years are spent at general secondary school from ages ten to fifteen. Following that, there is a choice between two to three years of upper education at either general or technical vocational schools. The former provides a certificate of completed secondary education and the opportunity to enter university, the latter a diploma of specialized secondary education through a network of secondary vocational institutions (UNESCO, 2011).

All further stages of education i.e. “Bachelor”, “Master”, “PhD” are considered as a higher education. This classification was used in the context of the present study due to its clarification for all interviewed.

Low education levels could have negative impacts on knowledge, level of income, job placement, and consequently on human well-being, and even low food and nutrition status (Yeudall, 2007). Low education limits an appropriate knowledge in order to understand technologies of crops cultivation, coping strategies for harvest saving and consequently does not permit benefits for farming.

Low education levels among women, who are usually responsible for cooking in Uzbek households, could lead to food and nutrition insecurity of the whole household. Especially it concerns young mothers who do not know which kind of food stuff is necessary for their children (Ramesh et al., 2008).

In the context of the present study, education is considered as one of the main factors of crop production on homestead plots and on farmlands. The household education also could lead to higher levels of income in the study regions. Expecting, the household head level of education has a highly positive statistical significance on each of these

factors. These are hypotheses of the present research and will be proved and described in the following chapters.

Table 6.2 describes the education level of the heads of households.

Table 6.2: Level of education of household head

Level of education	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)
Incomplete secondary	0.02	0.04	0
Secondary	0.39	0.35	0.44
Specialized secondary	0.26	0.23	0.29
Incomplete higher	0.01	0.02	0.01
Higher	0.32	0.37	0.26

Source: own computation with data of the questionnaire

The prevalence of secondary education (44%) over all others levels of education is observed in the Denau region. In the same time the higher level of education (37%) prevails between the heads of households in the Markhamat region. Incomplete secondary and incomplete higher levels of educations are the most insignificant and have in both regions 2% and 1% respectively. Table 6.2 also indicates that the heads of households with the incomplete secondary education were not detected from surveyed household in the Denau region.

Due to these findings and in order to make furthers analyses more comfortable and for obtaining better results, it was decided to regroup heads of households by another scale of education level. This scale will be described in Chapter 8.

6.2 Production on homestead plot

Plots of land which are large enough to sustain a small garden or even a few trees increase the quantity and quality of food consumption, resulting in better overall family nutrition and health. Homestead plots by providing a supply of diverse fresh fruits and vegetables provide nutrition that is absent from field agriculture crops, which are mainly grains (Hanstad, 2001).

In addition to providing a place for a garden and fruit trees, small pieces of land can be used for livestock keeping and store fodder. Livestock in turn improves a family's supply of protein through eggs, milk and meat. They can also benefit a family by providing them with saleable commodities, manure that can be used on their own land as fertilizer or sold to others (Hanstad, 2001).

6.2.1 Size of homestead plot

As it was described above, the average size of homestead plot in Uzbekistan is about 0.02 ha and is limited by law to 0.04 ha each. However, despite its small size they play a major role in terms of agricultural production and, more importantly, in household food security and food consumption. Homestead plots are vital for the survival of farm households as they provide more than a quarter of the food consumption of rural households (WFP, 2008). The typical homestead normally consists from the 0.04 ha of the land, used for cultivation of fruits and vegetables, and cow house and/or hen house for livestock and poultry keeping.

The descriptive statistics indicates that the average size of homestead plot in both Markhamat and Denau regions is 0.03 ha, with the standard deviation of 0.01.

Sometimes the size of a homestead plot is bigger, but in these cases household members prefer to hide it because it is illegal.

The field study had shown that usually households did not sell any production harvested from homestead plots. In some cases households could exchange with their neighbors and some own production for anything else needed. Thus, the majority of production is used for own consumption and preserved, pickled, dried, and marinated in order to have enough access to food in the winter season when all food crops are not produced (Markhamat and Denau Hokimiyats, 2010).

More detailed information on cultivated crops and harvested areas is discussed in the following section.

6.2.2 Number and kind of crops cultivated on homestead plot

As it was marked above, the homestead plot has a small size limited by 0.04 ha. In the same time it allows partly insure households' food and nutrition security.

Table 6.3 explores the main food crops cultivated by households during the autumn-winter season, i.e. during the period from the end of September to the end of March.

Traditionally, Uzbek households consume a lot of potatoes and onions. Table 6.3 confirm this and shows that the average area of potato and onion occupied almost one third of homestead plot. Potato planted on the area of 0.012 ha in the Markhamat region and of 0.011 ha in the Denau region, with the standard deviation of 0.005 and 0.004 respectively. Almost the same area is planted by onion: 0.010 ha in Markhamat region and 0.011 ha in Denau region.

These high degrees could be explained by two reasons. First, these two crops are very consumable in Uzbek dishes. The same status has a carrot which planted on the area of 0.007 ha in each region. The second is that the cultivation and harvesting of these

food crops are not expensive as for example tomato and cucumbers, production of which needs the special conditions such as green-houses, maintenance of temperature conditions, special expensive fertilizers, etc. Following these reasons tomatoes planted on average area of 0.008 ha in the Markhamat region and on 0.006 ha in the Denau region. Cucumbers have almost the same means of 0.007 ha and 0.006 ha respectively. In the majority of cases tomatoes and cucumbers harvested from the homestead plot during the investigated period are not consumed as fresh. Usually they will be salted or marinated in order to save it for a whole winter season.

Table 6.3: Crops cultivated on homestead plots

Crop	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)
Potato (ha)	0.012 (0.005)	0.012 (0.005)	0.011 (0.004)
Onion (ha)	0.010 (0.003)	0.010 (0.002)	0.011 (0.003)
Tomato (ha)	0.007 (0.003)	0.008 (0.003)	0.006 (0.002)
Cucumber (ha)	0.007 (0.002)	0.007 (0.003)	0.006 (0.002)
Carrot (ha)	0.007 (0.003)	0.007 (0.003)	0.007 (0.003)
Cabbage (ha)	0.008 (0.004)	0.008 (0.004)	0.008 (0.004)
Radish (ha)	0.006 (0.002)	0.006 (0.002)	0.008 (0.003)
Other crops (ha)	0.005 (0.002)	0.005 (0.001)	0.006 (0.002)

Source: own computation with data of the questionnaire

Table 6.3 indicates that households in both regions cultivate cabbage on the area of 0.008 ha. Cabbage is a food crop which has a high yield and does not need big areas. Cabbage is a universal crop and could be consumed in fresh and cooked. In the same time it could be stored as fresh and salted.

Radishes are planted on an average area of 0.006 ha in the Markhamat region and on 0.008 ha in the Denau region and must be consumed immediately due to its perishing.

Other crops indicated in the Table 6.3 means small areas of an average 0.005 ha in both regions and planted by garlic, mushrooms, peanuts, etc. Only five out of all 220 households investigated have such kinds of crops. Production of such crops is prerogative of the household with the highest level of income which explains why it is so rare.

During the field study it was found that some of the households also produce winter apples, but its number and yield was so insignificant that it was not taken into account for the analysis.

The descriptive statistics shows that the minimum number of crops produced on the homestead plot is 1 and the maximum is 8. In the same time, the average number of food crops cultivated on homestead plots of investigated household is 3.10 with the standard deviation of 1.53 in the Markhamat region and 3.51 with the standard deviation of 1.35 in the Denau region.

6.3 Production on farmland

Production on farmland is a major source of income for rural households. The major crops, produced on farms are cotton and wheat. Cotton is economically profitable for the government and wheat is produced for achieving food security. Infrequently farmers could use a small part of their land to produce other crops like fruits and vegetables. Sometimes in cases when the land quality does not satisfy the cotton and/or wheat cultivation requirements, this land is used for producing only other crops which are more profitable for farmers.

6.3.1 Size of farmland

The minimal size of the farmland in Uzbekistan varied from year to year. Some years ago the average size of a typical farm which produced cotton and wheat varied from 25 to 40 ha. In some regions the farm size could reach 1,000 ha and more, especially when farms cultivates only wheat (SDC, 2011). This fact observed in Tashkent province, for example. On the contrary, farms which cultivate only fruits and vegetables could have an area of 3-5 ha only.

Beginning from the year 2008 the process of “optimization” of farmlands started in Uzbekistan. This process implies the joining of small farms into the bigger ones in order to have an area of 60-70 ha each. It was made to simplify the water and land management issues (SDC, 2011).

Descriptive statistics shows the average size of farm in the Markhamat region is 52.56 ha with the standard deviation of 22.47. In the same time the average area occupied by a farm in the Denau region and its standard deviation are 54.12 and 24.05 respectively.

Following the data obtained from the field study and analyzed by descriptive statistics, the minimum size of the farmland in both regions is 7 ha and the maximum is 98 ha. This is a big gap depending on kind of crops produced on farmland.

The main kind of crops produced on farmlands of the Markhamat and Denau regions and its production strategies will be described in the following sections.

6.3.2 Crops cultivated on farmland

Uzbek farmers in the majority of cases produce on their farmland cotton and wheat which are “strategic crops” for the country. Existing system of the state order for the harvest of these two crops make them not too profitable for farmers (Rudenko, 2009). As it was mentioned above, all harvested cotton and the part of harvested wheat must be sold to the state at reduced prices.

In occasional cases fruits, vegetables, potato, melons and other crops could be produced on farmlands. The area under these crops is usually very small. In the same time such small parts of farmland allow farmers to increase their income and/or food security status as well to diversify their food consumption patterns (SDC, 2011).

Table 6.4 executes the areas and main crops cultivated in the study regions.

On the basic part of farmland of investigated households cotton and wheat are cultivated. Thus, in the Markhamat region cotton is produced on the average area of 34.56 ha with a standard deviation of 14.54. Farms of the Denau region have on average 33.15 ha of cotton on their farmland and the standard deviation in this case is 13.91.

In turn, the average cultivated area of wheat in the Markhamat and Denau regions is 30.53 ha and 29.63 ha respectively. The standard deviation in this case is the same in both regions and equal to 11.70.

Table 6.4 also provides the mean and standard deviation of the cultivated area of “other crops”. In the context of the present study “other crops” mean fruits: apple, pomegranate, apricot, etc; vegetables: onion, tomato, cucumber, aubergine, paprika, etc; grains: barley, corn, sunflower; and fodders such as alfalfa and barley. There was no opportunity to analyze all these crops one by one, due to their insignificant planted areas. That is why these crops were joined to the group of “other crops”.

Descriptive statistics provides the average cultivated area of farmland by “other crops” in the Markhamat region is 7.32 ha with standard deviation of 3.57. The same indicator of the Denau region made 7.58 ha with the standard deviation of 3.67.

Table 6.4: Crops cultivation area on farmland

Crop area	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)
Cotton (ha)	33.86 (14.21)	34.56 (14.54)	33.15 (13.91)
Wheat (ha)	30.09 (11.68)	30.53 (11.70)	29.63 (11.70)
Other crops (ha)	7.46 (3.61)	7.32 (3.57)	7.58 (3.67)

Source: own computation with data of the questionnaire

The main part of harvested “other crops” production is sold on the free market and the profit from this production is a main source of income for all farm households in Uzbekistan (Babu and Tashmatov, 2000). Along with the homestead plot it is also the main opportunity to achieve food and nutrition security by households.

6.3.3 Production strategies

“Production strategy” is a term developed during the present study in order to designate the combination of crops cultivated by farmers in their farmland.

Usually, all Uzbek farms can be divided into three groups taking into account the kind of crops produced by them. Thus the first group or production strategy includes farms producing only cotton and wheat (or strategic crops) on their farmland. The descriptive statistics showed that the Markhamat region has 53.6 percent of such kind of farmers and the Denau region has 50 percent.

The second production strategy group includes farmers who produce cotton and/or wheat together with other crops, which was described in the previous section. Table 6.5 indicates the number of farmers in both regions. Thus, cotton and/or wheat and other crops produced by 39.1 percent of Markhamat farms and by 40.9 percent of Denau farms.

Table 6.5: Production strategies of investigated households

Production strategy	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)
Only Cotton and Wheat	51.8	53.6	50
Cotton and/or Wheat and Other crops	40	39.1	40.9
Only Other crops	8.2	7.3	9.1

Source: own computation with data of the questionnaire

Table 6.5 also provides the percentage of farmers who follow the third production strategy. These farmers produce only other crops. There are 7.3 percent of such farmers in the Markhamat region and 9.1 percent in the Denau region.

Hypothetically it is expected that those farmers which belong to the production strategy of “Only cotton and wheat” have a lower level of income than farmers which belong to the other two production strategies. In the same time, the farmers followed the “Only other crops” production strategy are in the best position over all others farmers in the context of income level and consequently of food and nutrition security.

6.4 Livestock keeping

The livestock plays a major role in food and nutrition security of the household. Livestock provides households with meat, milk, dairy products and eggs. Moreover livestock supplies the household with the wool, feathers and down which are used for hand making the clothes, blankets, pillows and many other items used in the household itself or sold on the market. Additionally livestock also produce the organic fertilizer used for nourishing the homestead plot soil (Pomfret and Anderson, 1997).

Traditionally, each Uzbek household keeps in a minimum one cow, one or two sheep, and two or three chickens. Cows are used for producing the milk for own consumption. Moreover, obtained milk is used for getting dairy products such as yoghurt, butter, sour cream, cheese and cottage cheese, etc. Sheep are generally kept for producing of new generations and usually used for slaughter meat in cases of big religious feast days or family celebrations. In turn, chickens are used for supplying the household with eggs and meat (Markhamat and Denau Hokimiyat, 2010).

Figure 6.1 provides the number of investigated households keeping one kind of livestock or other.

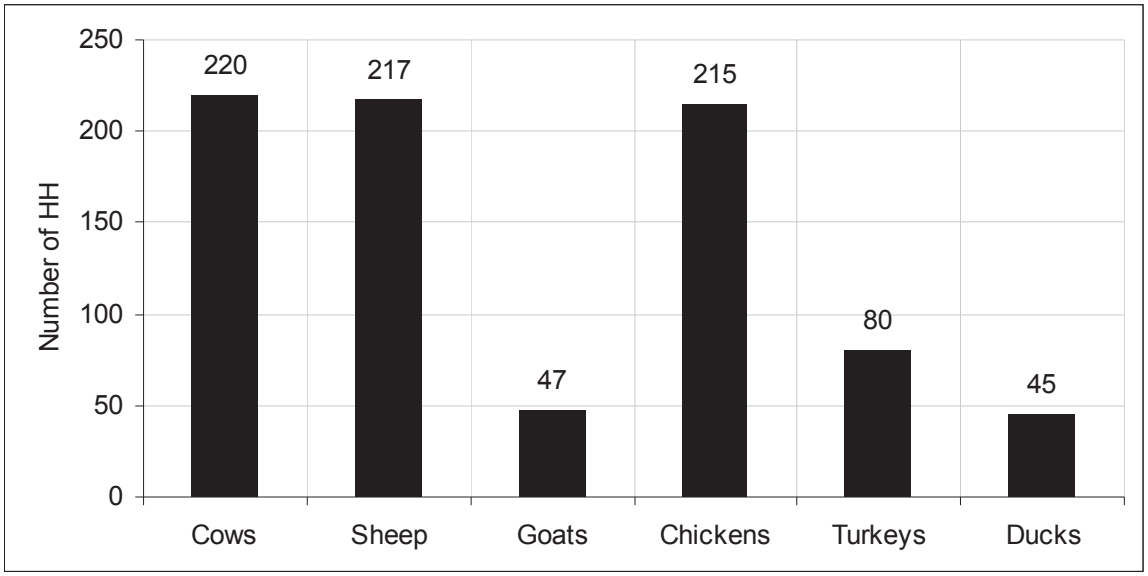

Figure 6.1: Number of households keeping the livestock

Source: own computation with data of the questionnaire

Note: multiple answers possible

Following the descriptive statistics results indicated in Figure 6.1, all of households keep cows (220 out of 220), almost all (217 out of 220) households keep sheep as well as almost all (215 out of 220) keep chickens. These indicators correspond to official information that the majority of Uzbek households keep cows, sheep and chickens.

Additionally, 47 households out of 220 in both regions keep goats, 80 keep turkeys and 45 keep ducks. Goats are used for obtaining milk and wool. Turkeys and ducks are used for meat.

Table 6.6 provides the results of descriptive statistics on the number of livestock kept in investigated households.

Table 6.6: Average number and standard deviations of livestock kept in investigated households

Livestock	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)
Cows	2.18 (1.04)	2.25 (1.19)	2.11 (0.95)
Sheep	3.88 (2.23)	3.31 (1.80)	4.45 (2.47)
Goats	2.83 (1.05)	2.78 (1.09)	2.88 (1.03)
Chickens	10.59 (6.61)	11.90 (7.85)	9.30 (4.81)
Turkeys	4.18 (1.70)	4.43 (1.89)	3.89 (1.45)
Ducks	4.73 (2.43)	4.77 (2.02)	4.70 (2.80)

Source: own computation with data of the questionnaire

Note: multiple answers possible

The average number of cows kept in the Markhamat region is 2.25 and 2.11 in the Denau region with the standard deviation of 1.19 and 0.95 respectively. The average number of sheep is lower in the Markhamat region than in the Denau region and is respectively 3.31 and 4.45 with a minimum of 2 and maximum of 12 sheep in household. On average 2.78 of goats were found in households of the Markhamat region and 2.88 in the Denau region.

Chickens are the most numerous livestock kept by investigated households with the average number in both regions of 10.59 and standard deviation of 6.61. Finally, the average number of turkeys and ducks in both regions is 4.18 and 4.73 respectively.

6.5 Household income

According to the Chapter 3.2 the income is the main indicator which influences food and nutrition security of the household. It is expected that the higher the income is then the higher the level of household food security.

In the context of the present study, investigated households have two sources of income. First is the income received from farm activity and the second is obtained from non-farm activities. Both of these sources of income are described below.

6.5.1 Non-farm income

In the case of rural Uzbekistan non-farm income means the earnings from all other activities excluding farm activity. Such kinds of income in conditions of the Markhamat and Denau regions are represented by: salaries from the secondary occupation; scholarships of those household members who are students and/or lyceum pupils; different kinds of pensions such as disability pensions, old-age pension, service pension etc; and different kinds of state allowances such as sick benefit, temporary disability allowance, child benefit, unemployment benefit, and so on (Markhamat and Denau Hokimiyat, 2010).

Remittance income from household members working abroad is extremely important in the context of rural Uzbekistan. In most cases these remittances have a positive effect on the household income with the average income from a labor migrant up to ten times higher than from other sources of non-farm, and even of farm earnings (WFP, 2008).

Conducted descriptive statistics show the household's average non farm income in both regions is 6,242,580 Uzbek soums[1] (2,601 €) per year with the standard deviation of 13,049,440 UZS (5,437 €). In the same time the household's average yearly income of investigated households in the Markhamat region is 7,005,290 UZS (2,919 €), and in the Denau region is 5,507,600 UZS (2,295 €) with the respectively standard deviations of 17,833,320 UZS (7430 €) and 5,331,170 UZS (2,221 €).

6.5.2 Farm income

The present study aims to analyze the farm households. Thus, the income from the farm activity is an extremely important indicator due to the fact that the farm income is the major source of income for investigated households.

Descriptive statistics of farm income shows the average income from the farm activity. Thereby, the average farm income of households in the Markhamat region is 56,634,640 UZS (23,598 €) per year. The average amount of yearly farm income of households situated in the Denau region is 57,685,000 UZS (24,035 €).

6.5.3 Scales for households' level of income

In order to regroup households by the level of income for further analysis, different approaches are usually used. The wide range of scales for analyzing households' level of income such as OECD equivalence scale; OECD modified scale; square root scale; etc exists. Moreover, almost each country worldwide has an own approach and scale for level of income for the population.

[1] According to the web-site www.oanda.de the average yearly currency rate for 2011 was 1 € = 2400 UZS

In the context of the present study two kinds of scales for income level were used: “Uzbek scale” and OECD equivalence scale.

“Uzbek scale” of income level

Uzbekistan has an own approach for detecting levels of income (UzStat, 2010). In the present study it was called “Uzbek scale”. Generally such a scale uses in order to expose the poor people and/or poor households. The concept of the “Uzbek” scale is simple. The person who has an income less than the official minimal monthly wage is considered as a poor. The minimal wage in Uzbekistan in the year 2011 was 63,000 UZS (26.25 €) per person per month (Markhamat and Denau Hokimiyat, 2011).

The same approach is also used in order to detect poor households. Thus, those households which have a monthly income less than 63,000 UZS per person after dividing the total income by the number of household members are considered as poor (Markhamat and Denau Hokimiyat, 2011).

Using the “Uzbek scale”, descriptive statistics in the Table 6.7 were developed. All investigated households were divided into three groups taking into account their levels of income.

Table 6.7: Level of income calculated using “Uzbek scale”

Income level	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)	Description (UZS/person/month)
Low	4 (1.8%)	4 (3.6%)	0 (0%)	≤ 63 000
Middle	178 (80.9%)	86 (78.2%)	92 (83.6%)	from 64 000 to 2 233 000
High	38 (17.3%)	20 (18.2%)	18 (16.4%)	> 2 233 000

Source: own computation with data of the questionnaire

The first group includes households with a “low” level of income and consequently those households which have an income less than 63,000 UZS (26.25 €) per person per month. Descriptive statistics show that 4 household or 1.8 percent between all investigated households belong to this group. Moreover, all 4 households with the “low” level of income are situated in the Markhamat region and represent 3.6 percent of 110 investigated households. In turn, households with a “low” level of income were not exposed in the Denau region.

The second group is the largest between all other groups and combines households with the “middle” level of income. This group includes households which have an amount of income in interval between 63,000 UZS (26.25 €) and 2,233,000 UZS (930 €)

per person per month. This sum was calculated as 'mean + standard deviation' instead of any concrete amount in UZS as a threshold or frontier. In this case the mean is 1,138,000 UZS (474 €), and standard deviation is 1,095,000 UZS (456 €). Table 6.7 indicate that 86 household or 78.2 percent in the Markhamat region have the "middle" level of income. In the same time the Denau region has 92 households with a "middle" level of income that makes 83.6 percent of all households investigated in this region.

The third group is composed of the household having the "high" level of income. Consequently, those households which have an income more than 2,233,000 UZS (930 €) per person per month, or more than 'mean + standard deviation', belong to this group. Table 6.7 shows that 20 households in the Markhamat region or 18.2 percent of all investigated households have the "high" level of income. In turn, 18 households of the Denau regions which represent 16.4 percent of all investigated households in this region have a "high" level of income.

The OECD equivalence scale

The needs of a household grow with each additional member but – due to economies of scale in consumption – not in a proportional way. Needs for housing space, food, drinking water, electricity, etc. will not be three times as high for a household with three members than for a single person. With the help of equivalence scales each household type in the population is assigned a value in proportion to its needs. The factors commonly taken into account to assign these values are the number of household members and their age, whether they are adults or children (Atkinson et al., 1995).

One of the most commonly used scale is the "OECD equivalence scale" also called the "Oxford scale". This assigns a value of 1 to the first household member[2], of 0.7 to each additional adult and of 0.5 to each child. This scale was mentioned by OECD in 1982 for possible use in countries which have not established their own equivalence scale. For this reason, this scale is sometimes labeled the "old OECD scale" (Atkinson et al., 1995).

Concluded all mentioned above, the OECD scale was calculated using the formula 6.1:

$$OECD \quad scale = 1 + (N_{aa} * 0{,}7) + (N_{ac} * 0{,}5) \quad \text{.....(6.1)}$$

Where:

1 - the value for the household head

N_{aa} - the number of additional adults in the household

[2] In the context of present study the head of household was considered as the first household member

0.7 - the value for additional adult in the household

N_{ac} - the number of children in the household

0.5 - the value for children in the household

In order to obtain the income by the OECD equivalent scale it was necessary to divide the total income of the household by the indicator of the "OECD scale".

The results of calculations described above are indicated in the Table 6.8.

Table 6.8: Households' income by the OECD equivalence scale

Income by OECD equivalence scale	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)
UZS per year	13,665,000 (13,144,000)	13,769,000 (12,402,000)	13,560,000 (13,903,000)
UZS per month	1,139,000 (1,095,000)	1,147,000 (1,033,000)	1,130,000 (1,159,000)

Source: own computation with data of the questionnaire

Descriptive statistics on the households' income by the OECD equivalence scale show that the household average yearly income in both regions is 13,665,000 UZS (5,694 €) with the standard deviation of 13,144,000 UZS (5,476 €). In the same time the minimum income by this scale in both regions is 192,980 UZS (80.5 €) and the maximum is 62,592,590 UZS (26,080 €) per year.

The household income by the OECD equivalence scale per month was obtained by simply dividing the yearly income by 12. Thus, the household average monthly income by the OECD equivalence scale in both regions is 1,139,000 UZS (475 €) with the standard deviation of 1,095,000 UZS (456 €).

6.6 Food security and food consumption

6.6.1 Food security status

Food security status was calculated using the primary data obtained by the Households Food Security Survey Module (HFSSM). As it was mentioned above the HFSSM is a household measure which assesses the food security situation of adults as a group and children as a group within a household. The HFSSM does not determine the food security status of each individual member residing in the household (USDA, 2006).

According to Bickel et al. (2000), the set of food security questions included in the HFSSM can be combined into a single overall measure called the food security scale.

This is a continuous, linear scale which measures the degree of severity of food insecurity experienced by a household in terms of a single numerical value. These scale values vary across a wide range that expresses the full range of severity of food insecurity. The statistical procedure that determines a household's scale value depends on the number of increasingly severe indications of food insecurity that the household has experienced, as indicated by affirmative responses to the increasingly severe sequence of questions. A household with a scale value of six, for example, has responded affirmatively to more, and typically to more severe, indicators of food insecurity than a household with a scale value of three. A household that has not experienced any of the conditions of food insecurity covered by the HFSSM questions will be assigned a scale value of zero, while a household that has experienced all of them will have a scale value more than nine.

It is often useful, both for policy and research purposes, to simplify the food security scale into a small set of categories, each one representing a meaningful range of severity on the underlying scale, and to discuss the percentage of the population in each of these categories. For this purpose four categories have been defined (Bickel et al., 2000). The scale of results was adapted by the investigator to specific conditions of Uzbekistan.

Table 6.9 provides the scale and results of descriptive statistics with regard to food security. First of all the scale for food security status was developed in order to join investigated households by groups of HFSSM scores. Secondly, investigated households were divided into groups by their food security status.

The first group of households were decided as "high food secure" because they received a zero HFSSM score. That means these households never face a problem with food supply. There are 39 percent of such households in the Markhamat region and 36 percent in the Denau region.

Table 6.9: Food security status of investigated households

HFSSM status	HFSSM score	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)
High FS	0	0.37	0.39	0.36
Marginal FS	from 1 to 3	0.24	0.18	0.29
Low FS	from 4 to 9	0.34	0.37	0.30
Very low FS	more than 9	0.06	0.06	0.06

Source: own computation with data of the questionnaire

Note: U-Test for statistical significance of HFSSM status between regions is p=0.65

The second group is “marginal food secure” households, which have the HFSSM scores between one and three. These household rarely have a problems of food security. The number of such households in the Markhamat region is much lower than in the Denau region and indicate 18 percent and 29 percent respectively.

The third group is “low food secure” households, which is represented by 37 percent of investigated households in the Markhamat region and by 30 percent in the Denau region. This group has a HFSSM score between four and nine.

The last group according HFSSM represents the households with “very low food security”. Consequently this group contains the households with the maximum of HFSSM scores, i.e. more than nine. These are households which often have difficulties with food supply. The number of “very low food secure” is the same in both regions and made 6 percent of investigated households.

For further analyses investigated households were regrouped from these four groups into two groups. The first group combined those households which have “high” and “marginal” food security and took the name of “food secure households”. This group is represented by 134 of households in both regions. The second group combined “low” and “very low” food secure households by the name of “food insecure households”. In both regions 86 households were found to be “food insecure”.

6.6.2 Food consumption status

The food consumption score analysis is based on the frequency of consumption of one or more items from the eight food groups.

Households are grouped according to their overall consumption score: “poor food consumption”, “borderline food consumption” and “adequate food consumption”. In the context of the present study households with “poor food consumption” have not been found. Consequently all investigated households were joined into two groups.

Thresholds for separating these groups are generated by using a weighted food consumption score. Each food group is given a weight based on its nutrient content and then multiplied by the number of days a household consumed one or more items from that group within a seven-day period (see Chapter 5.2.4).

Table 6.10 provides the number of households with different food consumption statuses divided by groups due to food consumption scores (FCS).

Table 6.10: Food consumption status of investigated households

Food consumption status	FCS	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)
Borderline	from 21.5 to 35	0.04	0.01	0.07
Adequate	more than 35.5	0.96	0.99	0.93

Source: own computation with data of the questionnaire

Note: U-Test for statistical significance of food consumption status between regions is p=0.21

Thus, households with “borderline food consumption” have a FCS from 21.5 to 35. It is low FCS in fact that the minimum for FCS measurement is 0 and the maximum is 112. Households with “borderline food consumption” represent only 4 percent of all investigated households in both regions. In turn, only one household was found in the Markhamat region and eight in the Denau region. Table 6.10 shows that households with “borderline food consumption” represent 1 percent in the Markhamat region and 7 percent in the Denau region.

Despite the big number of households with low food security (see Chapter 6.6.1) the main part of investigated households in both regions belongs to the group with a high FCS or to “adequate food consumption”. Thus, on the average 96 percent of all investigated households have the “adequate food consumption”, from that 99 percent are situated in the Markhamat region and 93 percent are in the Denau region.

This phenomenon could be explained by the fact that usually adult members of households with the low level of income and/or with the low food security status try to supply their children with necessary food by prejudice to their own consumption. For example, some investigated households where the meat was consumed exclusively by children were found. In the same time fresh vegetables and fruits in the winter season (when such a production is extremely expensive) was also supplied for children than for adults.

6.7 Summary

This chapter describes basic socio-demographic characteristics of the farm households’ crops production on homestead plots, production on the farm land and livestock keeping in households. The level of income and the amount of income spent for food is also exposed in this chapter. The main results on food security and food consumption situation of surveyed households taking into account the Household Food Security Survey Module (HFSSM) and Food Consumption Score (FCS) scales and thresholds described by this chapter.

In both regions 4 percent of all households have borderline food consumption thereby 96 percent of households have an adequate food consumption. There is no statistically significance between the regions (U-test: p=0.21).

Further, 37 percent of all households have a high food security status, 24 percent- marginal, 34 percent- low, and 6 percent have a very low food security status. Again, there is no statistically significance between the regions (U-test: p=0.65).

This chapter described univariate analysis or descriptive statistics. Following chapter will expose the findings of the next step of statistical analysis – bivariate.

7. FACTORS INFLUENCING FOOD SECURITY IN RURAL UZBEKISTAN

This chapter describes the basic factors which influence food security of investigated households. Exposed factors were chosen following the study objectives and hypotheses. The main obtained statistic results are included in this chapter and represented in form of figures. One of the main factors influencing household food security is the level of income. Factors influencing level of income are also described here in details. The final section of this chapter explores the proving of study hypotheses.

7.1 Factors influencing food security

According to Chapter 3.2, there are a big number of factors influencing food security status of a household. In context of the present study the main factors influencing food security of investigated households are described in this section. These are: the size of homestead plot; number and kind of crops produced on the homestead plot; level of income; the income spent for food; level of education of the household head; etc. Each of these measures will be described in more detailed below.

7.1.1 Food crops production on the homestead plot

As was mentioned above, the homestead plot is the main source of food for households. There are several factors concerning homestead plots which influence food security of the household.

Size of the household homestead plot

The influence of the size of the households' homestead plot on food security was investigated. Figure 7.1 indicates that food secure households have a homestead plot with the average size of 0.0366 ha. On the other hand the average size of a homestead plot of food insecure households is 0.0302 ha only. This difference is statistically significant (U-test, $p<0.0001$).

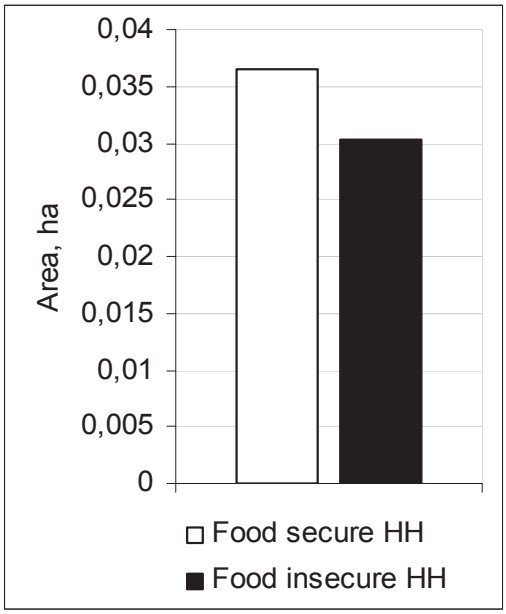

Figure 7.1: Households' homestead plot size

Source: own computation with data of the questionnaire

The bigger size of homestead plot permits the household to produce more food crops and consequently to be more food secure.

Crops cultivated on homestead plot

The size of a homestead plot is not the only factor influencing household food security. The variety of crops produced on it was also analyzed and gave statistically significant results. Figure 7.2 shows the average area of a homestead plot occupied by different food crops.

Thus, potato is planted on the significant part of area in both food secure and food insecure households. Potato is produced in 208 households out of 220 investigated households. Mann-Whitney U-test shows that this difference is statistically significant (U-test, $p<0.01$). Hence, the average area planted with potatoes in food secure households is 0.0111 ha and food insecure households produce potatoes on the average area of 0.0127 ha.

The following crop produced by the majority of investigated households (by 166 out of 220) is onions. The average area planted with onions in food secure and food insecure household does not differ much from each other and respectively makes 0.0101 ha and 0.0104 ha.

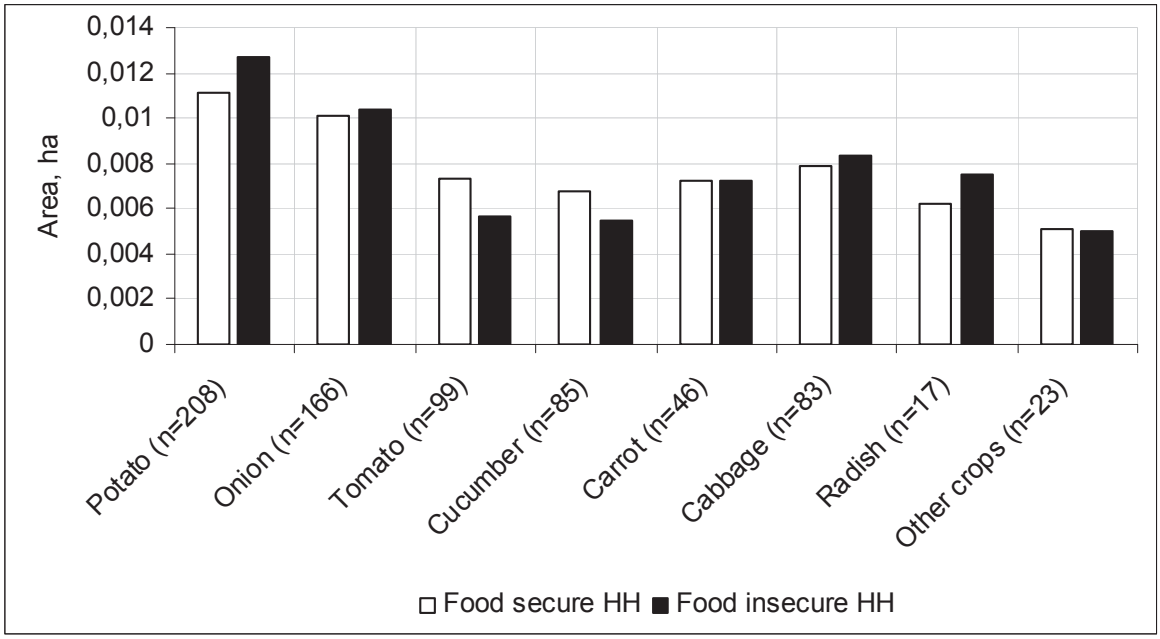

Figure 7.2: Crops cultivated on homestead plot

Source: own computation with data of the questionnaire

Tomatoes are produced by 99 households out of all investigated households in both regions. Tomatoes planted on the average area of 0.0073 ha in the homestead plots of food secure households and 0.0057 ha of food insecure households. Mann-Whitney U-test shows that this difference is statistically significant (U-test, $p<0.05$).

Approximately identical results indicate the area on which households produce cucumbers. Food secure households produce cucumbers on the average area of 0.0068 ha and food insecure households on the area of 0.0055 ha.

Carrots are produced on the same area in both food secure and food insecure households. Carrots are cultivated by 46 households out of 220 on the average area of 0.0072 ha.

The same area is also planted with other crops. These crops produced only by 23 households from 220 and planted on the area of 0.005 ha in both food secure and food insecure households homestead plots.

In turn, radishes are cultivated on the homestead plots of 17 households out of 220. This crop produced on the average area of 0.0062 in food secure households versus 0.0075 ha in food insecure households.

Number of crops cultivated on homestead plot

Following the previous section it is necessary to underline the significance of crops produced on the homestead plot. Hence, the next factor influencing household food security is the number of food crops produced by households on their homestead plot.

Figure 7.3 indicates that the average number of crops cultivated on the homestead plot of food secure households is 3.79. In turn, the average number of crops produced by food insecure households is 2.55.

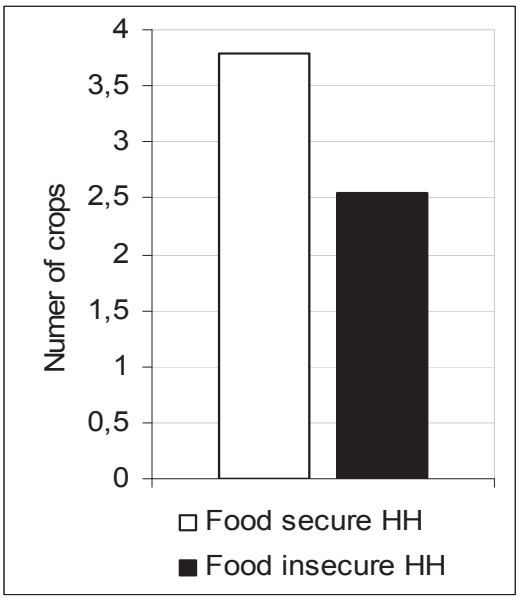

Figure 7.3: Number of crops cultivated on homestead plot

Source: own computation with data of the questionnaire

7.1.2 Education of the household head and food security status

The level of education of the household head might influence the food security status of the whole household (see Chapter 3.2).

Previous analyses described in Chapter 6.1.2 were performed using five levels of education: incomplete secondary; secondary; specialized secondary; incomplete higher; and higher. These five educational levels were joined into three groups. Hence, the first group of education includes those household heads who have ‘incomplete secondary’ education. The second group combined household heads with ‘secondary’ and ‘specialized secondary’ levels of education. The third group joined household heads with ‘incomplete higher’ and ‘higher’ education.

Figure 7.4 combines the data on household head level of education with regard to food security status of his/her household.

Thus, incomplete secondary education prevails between heads of food insecure households. Statistic crosstabs shows that only 0.7 percent of food secure households have the head with secondary education versus 3.5 percent of food insecure household heads.

Household heads of the second group of education i.e. 'secondary' and 'specialized secondary' represented by 49.3 percent of food secure households and by 89.5 percent of food insecure households.

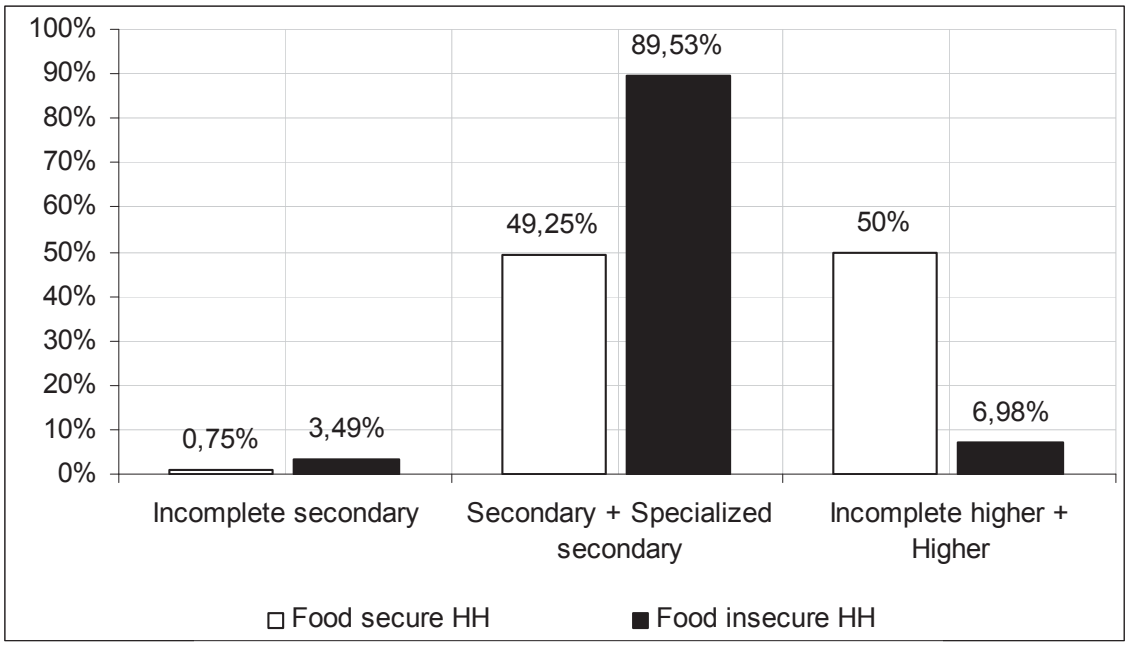

Figure 7.4: Level of education of household head

Source: own computation with data of the questionnaire

The most significant difference was observed between the obtained results on the third group of education, combined 'incomplete higher' and 'higher' levels of education. Thus, 50 percent of food secure households have heads with such a level of education. In the same time, only 7 percent of food insecure households are headed by persons with 'incomplete higher' and 'higher' education. This gap could be explained by the fact that more educated heads of household have more knowledge on agriculture, crop growing, food intake, and other aspects influencing food security status of their household. On the other hand, the lower level of education of the household head and/or its other members does not allow the household to be food secure due to the absence of such kinds of experiences.

7.1.3 Production strategies and food security

Production strategy is one more factor influencing household food security. Following Chapter 3.2, production strategy in the conditions of rural Uzbekistan even could be the major factor for achieving food security.

Figure 7.5 demonstrates how the production strategy influences food security status of investigated households.

Thus, 'cotton and wheat' are produced by 94.2 percent of food insecure households. This production strategy does not permit farm households to earn the money for buying food and in the same time they have no possibilities for growing other crops for own consumption or for selling on the market. The figure shows 5.8 percent of food insecure households produce 'cotton and/or wheat with a small plot of other crops'. Moreover none of the investigated food insecure households produced 'only other crops'.

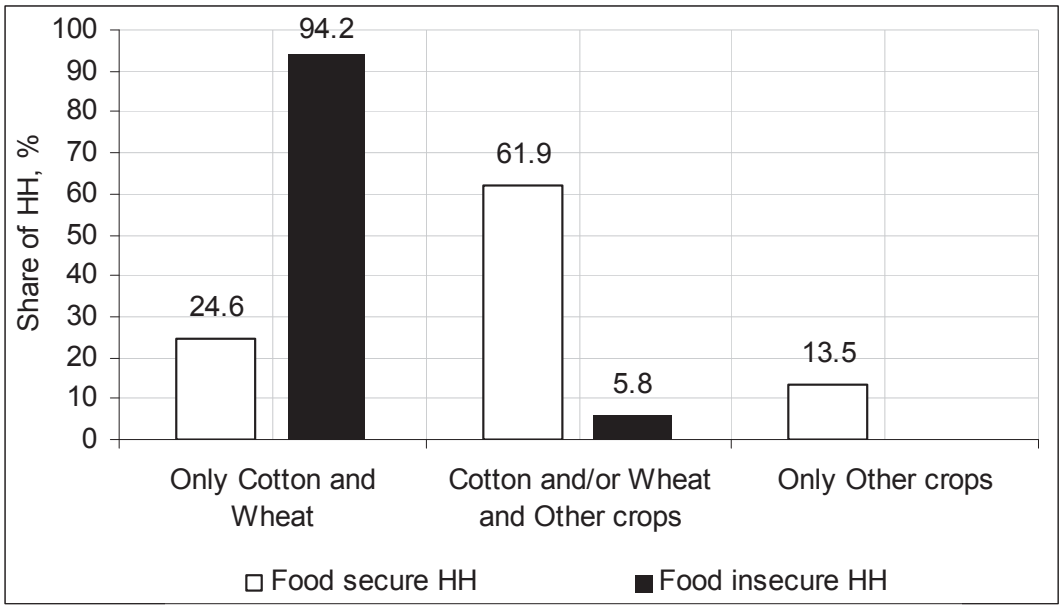

Figure 7.5: Production strategies and food security status

Source: own computation with data of the questionnaire

In the same time, only 24.6 percent of food secure households produce 'only cotton and wheat'. The majority of households having the status of food secure use 'cotton and/or wheat and other crops' production strategy. Sometimes the area of other crops growing occupied approximately the same size of area occupied by cotton and wheat. Finally, 13.5 percent of food secure households produce 'only other crops'.

7.2 Level of income and income influencing factors

One of the expected factors which influence household food security status is the level of household income.

7.2.1 Household level of income and food security status

The main approaches and scales for defining levels of households' income were described in Chapter 6.5.3. In this chapter, the influence of household income on food se-

curity is investigated. Table 6.7 indicated that the majority of investigated households were classified as middle income households.

Therefore, a new approach is used to analyze the influence of income on food security. This approach is based on the Table 6.7, but the minimum wage (or threshold) was multiplied by three in order to get more significant results.

Table 7.1 indicates the level of income of food secure and food insecure households in both study regions.

Thus, the low income households have less than 189,000 UZS (78.75 €) per person per month. Middle income households have an income between 189,000 UZS (78.75 €) and 2,410,000 UZS (1,004 €) per person per month. The threshold of 2,410,000 UZS (1,004 €) was calculated as 'Mean + Standard Deviation'. In this case 'Mean' is 1,231,000 UZS (513 €) and 'Standard Deviation' is 1,179,000 UZS (491 €). Further, households with more than 2,410,000 UZS (1,004 €) per person per month are classified as "high income households".

Table 7.1: Scale of household level of income using for analysis of income influencing on food security

Income level	Both regions (n=220)	Markhamat (n=110)	Denau (n=110)	Description (UZS/person/month)
Low	34 (16%)	24 (21.8%)	10 (9.1%)	< 189 000
Middle	148 (67%)	64 (58.2%)	84 (76.4%)	from 189,000 to 2,410,000
High	38 (17%)	22 (20%)	16 (16.4%)	> 2,410,000

Source: own computation with data of the questionnaire

Further, the analysis of household income level influence on food security status was conducted.

Figure 7.6 exposes the results of cross tabulation of the level of income and food security status of investigated households.

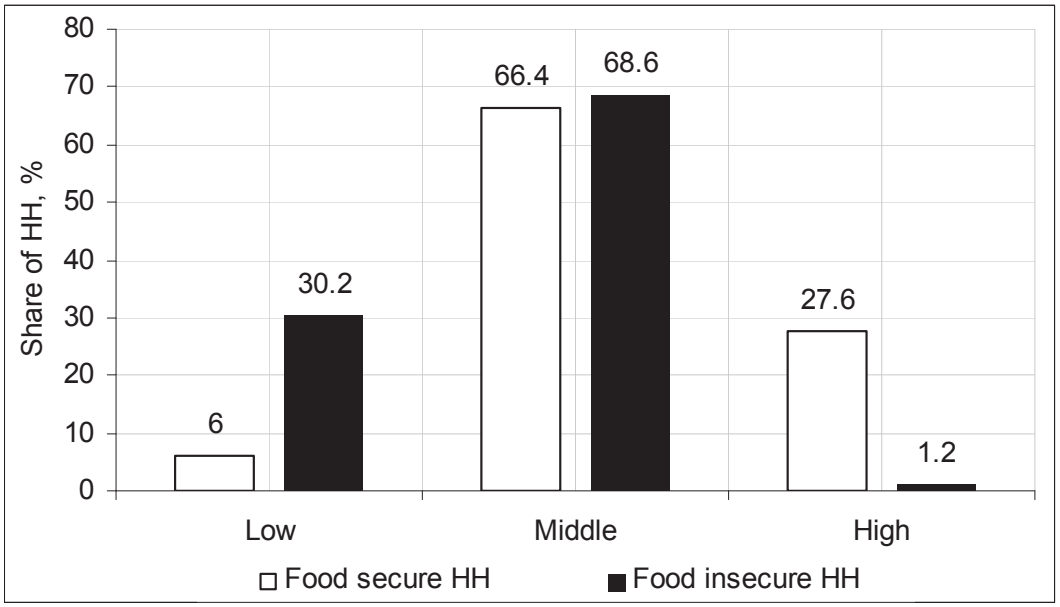

Figure 7.6: Households' level of income and food security status

Source: own computation with data of the questionnaire

Figure 7.6 demonstrates that 30.2 percent of investigated food insecure households have a low level of income and only 1.2 percent has a high level of income. The majority of food insecure households, notable 68.6 percent, have a middle level of income.

In the same time, only 6 percent of investigated food secure households belong to the group with low income level and 27.6 percent have a high level of income. As in the case with food insecure households, the majority of food secure households has a middle level of income and represented by 66.4 percent out of the investigated households with food secure status.

7.2.2 Income influencing factors

In the following section, the influence of production strategies and education level on income is analyzed.

Income and production strategies

Chapter 6 provided the detailed information about production strategies as well as indicated the number of households following each of them.

Figure 7.7 explores the information on income which households achieved from the different production strategies. Income was calculated using the OECD equivalence scale and shown in Uzbek soums and Euro.

Figure 7.7 demonstrates how each production strategy influences the income. Thus, those households which produced 'only cotton and wheat' have the average income of

419,000 UZS (175 €) per month. Households which practiced 'cotton and/or wheat and other crops' production strategy have the average monthly income of 1,696,000 UZS (707 €). The highest income of 2,970,000 UZS (1,238 €) per month was obtained by households which produced 'only other crops'.

In summary, the income of households which produced 'only cotton and wheat' is four times less than the income of households which produced 'cotton and/or wheat and other crop', and seven times less than the income of households which produced 'only other crops'.

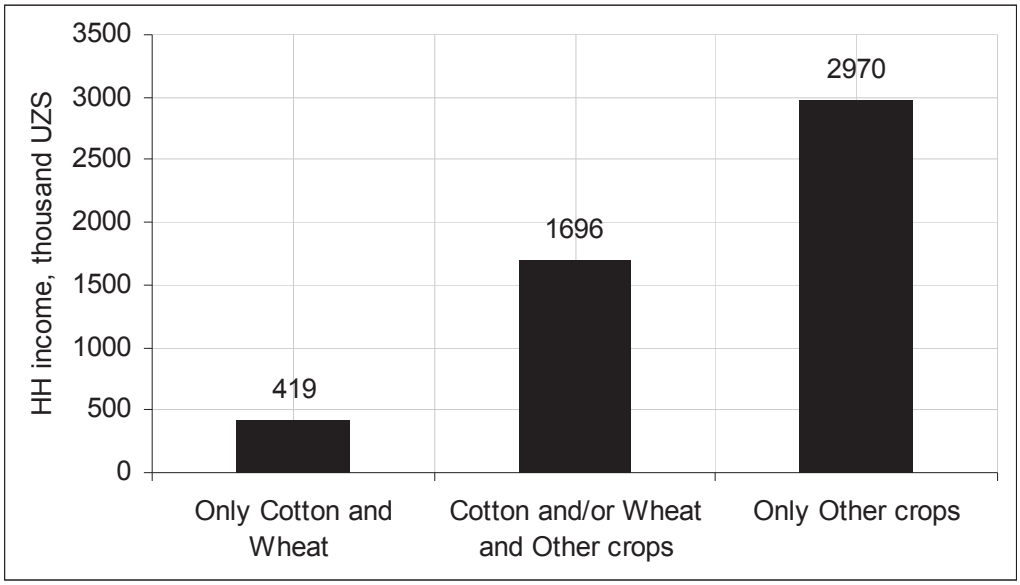

Figure 7.7: The influencing of production strategies on households' income

Source: own computation with data of the questionnaire

Income and household head's education

Figure 7.8 shows the average income with regard to educational group of the household head.

Thus households headed by persons with 'incomplete secondary' education have on average 507,000 UZS (211 €) per month. Households having the head belonging to the group of the 'secondary + specialized secondary' earn monthly on the average 1,015,000 UZS (423 €). The highest monthly income of 2,056,000 UZS (857 €) have households headed by persons with 'incomplete higher and higher' levels of education.

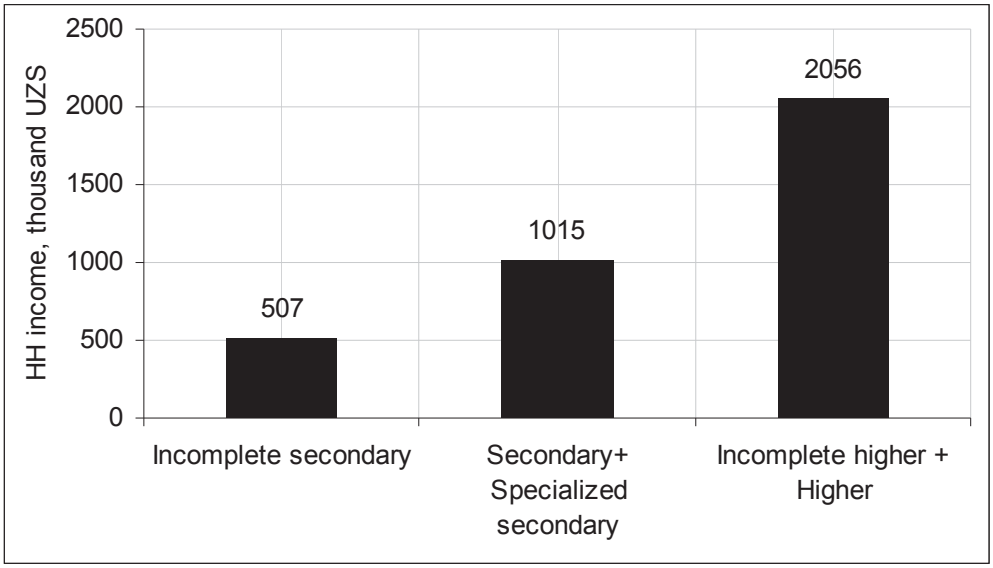

Figure 7.8: The influencing of the household head's education on income

Source: own computation with data of the questionnaire

It can be concluded that households which are headed by persons with 'incomplete higher and higher' education have two times more income than those which are headed by 'secondary and specialized secondary' educated persons, and four times more than those which have a head with an 'incomplete secondary' education.

7.2.3 Income spent on food

The most important indicator of well-being for a country's population is the measure and share of income spent on food (Yakhshilikov, 2006). In context of the present study this indicator was analyzed in order to compare it with official data of Uzbekistan (see Chapter 3.2).

Figure 7.9 indicates that food insecure households spend 68.6 percent of their total income on food. This is explained by the fact that about one-third of food insecure households have a low level of income and about two-thirds have a middle level.

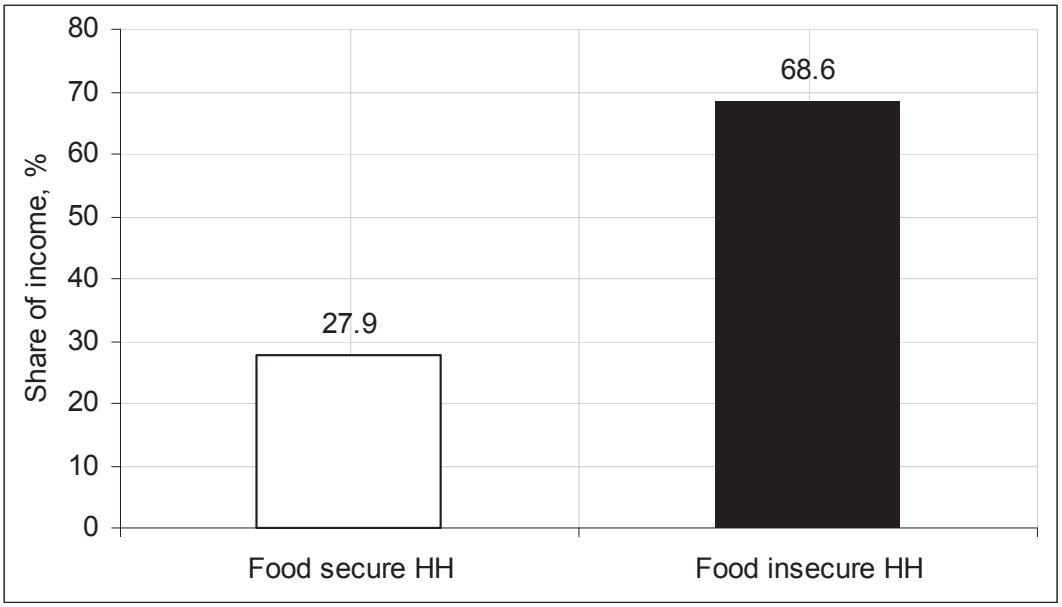

Figure 7.9: Income spent on food

Source: own computation with data of the questionnaire

In the same time, food secure households spend only 27.87 percent of their total income on food. But in this case one-third of investigated food secure households have a high level of income. This is the best explanation for the gap detecting between food secure and food insecure households with regard to income spent on food.

7.3 Food consumption and food preservation

Food preservation plays a major role for seasonal food insecurity prevention in the context of rural households of Uzbekistan.

Uzbek people use a lot of methods for preserving food for winter seasons. Thus, vegetables as tomato, cucumber, paprika, and cabbage could be salted and marinated. Some vegetables as tomato, aubergine, paprika and so on are dried during the summer-autumn period. In the same time all mentioned vegetables could be marinated in types of salads.

Moreover, such vegetables as potato, onion, carrot, pumpkin, etc could be stored in special rooms or cellars which are included in all Uzbek households. By the same method grains and beans like wheat, rice, bean, pea, and corn are also preserved.

Fruits such as apples, grapes, prunes, and apricots are preserved by drying. Moreover the making of different kinds of jams and compotes is much developed in all households of all former USSR countries including Uzbekistan.

Different kinds of nuts as walnuts, peanuts, and almonds are also preserved by drying.

All these processing techniques allow households to consume such kinds of food during the winter season when these products are expensive on local markets. Food preservation increases the chances of households to be food secure through the winter period.

Figure 7.10 provides the obtained results on food preservation by food secure and food insecure households.

Thus, food secure households preserve 47 percent of their harvested potatoes. In the same time food insecure preserve only 28 percent of their potatoes. About 49 percent of the harvested onions are preserved by food secure households versus 32 percent of onions in food insecure households. As was mentioned before, potatoes and onions are the basic products consumed by households in a winter season. Thereby, the preservation of potatoes and onions plays the major role in prevention of seasonal food insecurity.

Chapter 6 described in detail crops produced on the household homestead plot. It was mentioned that cultivation and harvesting of tomatoes and cucumbers need the special conditions as green-houses, maintenance of temperature conditions, special fertilizers, etc which are very expensive. Hence, households with low levels of income have no possibility to produce these crops in satisfying quantity, and thus they could not preserve it adequately as households with higher levels of income and/or higher food security status.

Figure 7.10 shows that 59 percent of tomatoes are preserved by food secure households and only 43 percent are preserved by food insecure households. Food secure households preserve about 63 percent of their cucumbers, but in the same time only 41 percent of cucumbers are preserved by food insecure households.

Figure 7.10 indicates the interesting tendency concerning the preservation of carrots. In this case food preservation is similar between food secure and food insecure households and makes around 48 percent.

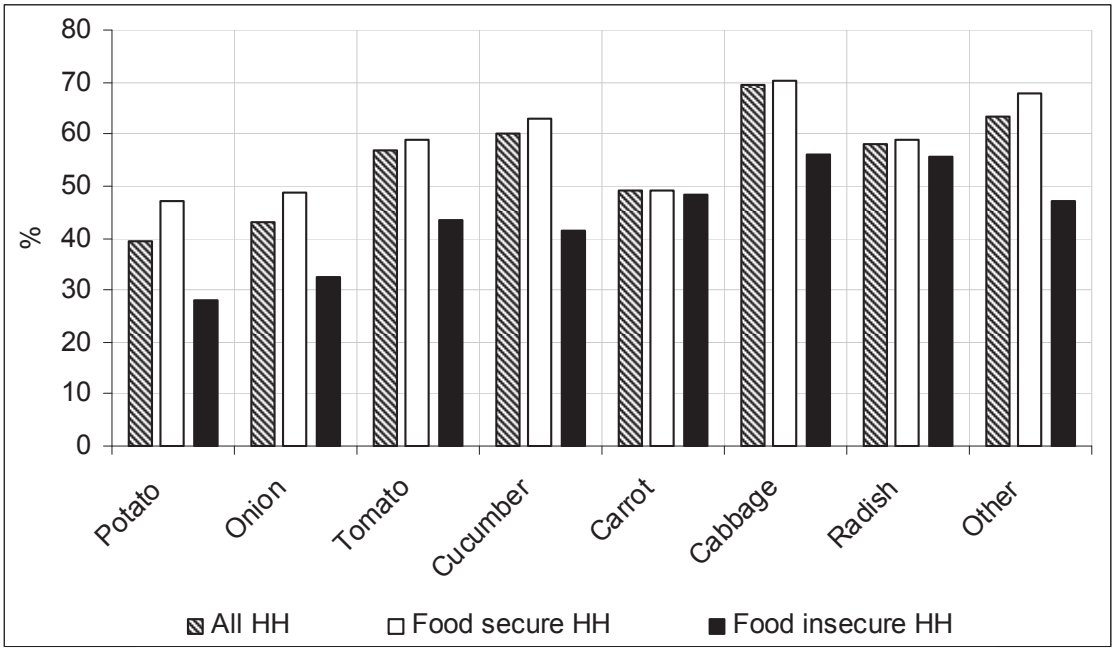

Figure 7.10: Share of preserved food in all produced food

Source: own computation with data of the questionnaire

Cabbage has a percentage of preservation of 70 percent in food secure households and of 56 percent in food insecure households. It is not a significant gap due to a huge yield of cabbage, and even if households preserve half of the harvested cabbage for the winter season it could be enough.

In case of radish preservation the indicators between food secure households and food insecure households do not differ much from each other and respectively make 58 percent and 56 percent.

A big gap was observed on the preservation of other crops. Thus, 68 percent of such production is preserved by food secure households and only 47 percent is preserved by food insecure households. This situation could be explained by the fact that food insecure households produce much less other crops than food secure households. As was described above, the cultivation of other crops in most cases is extremely expensive and food insecure households could not be able to produce such crops.

7.4 Summary

The bivariate analysis described in this chapter shows that food secure households have 0.036 ha of a homestead plot, and food insecure households have 0.03 ha. Furthermore, potatoes and onions are produced more by food insecure households while food secure households produced more tomatoes and cucumbers. Thereby the production on homestead plots also has influence on household's food consumption.

The analyses of factors which influence the income reveal several interesting facts. Hereby, those farm households which produced only cotton and wheat have an average 419,000 UZS (175 €) per month; those who produce cotton and/or wheat and other food crops have 1,696,000 UZS (707 €) per month; and those who produced only other crops on farm land have 2,970,000 UZS (1,238 €) per month. In order to better understand these results it is necessary to note that the minimum wage (or poverty line) in Uzbekistan in 2011 was 63,000 UZS (26.25 €) per person per month.

This chapter described obtained results of bivariate analysis. In order to analyze the set of factors influencing food security and food consumption of investigated households, multivariate analysis was conducted. The results of this analysis described in detail in the following chapter.

7.5 Validation of hypotheses

In order to verify the study hypotheses, the t-test was used. The U-test was also conducted in case of the inability of conducting the t-test, particularly in case of abnormal data distribution.

Hypothesis 1

The first hypothesis of the present study is: “The more the head of household is educated, the more his/her household is food secure”.

Chapter 7.1.2 contains the results proving this hypothesis. Thus, incomplete secondary education prevails among heads of both food insecure and food secure households. This indicator respectively makes 0.7 percent and 3.5 percent. On the other hand, household heads with the higher education level in most cases were observed in food secure households and represented 50 percent of investigated food secure households. In the same time, food insecure households headed by individuals with the higher education represented only 7 percent of cases.

Obtained results prove the high significance of the household head level of education influencing household food security. Moreover, hypothetically, the higher educated heads of households have more knowledge on agriculture, crop growing, water management, fertilization, and other aspects that allow them to be food secure.

Hypothesis 2

The second hypothesis of the study is: “The more the head of household is educated, the more income his/her farm and household have”.

This hypothesis was proven by the results described in the Chapter 7.2.2. Information provided by this section clearly illustrates that the level of education has a positive impact on household income.

Hence, those households which are headed by persons with 'incomplete higher and higher' education have an income two times more than those which are headed by a 'secondary and specialized secondary' educated person, and four times more than those which have a head with the 'incomplete secondary' education.

Hypothesis 3

The third hypothesis of the present study is: "The more kinds of food crops household produces on its homestead plot, the more this household is food secure and the less it is dependent on the seasonal food market".

Obtained results described in Chapter 7.1.1 demonstrate that the number of crops produced on the homestead plot is a highly significant factor which influences household food security. Conducted tests show that food secure households produce on the average 3.79 crops on their homestead plot. In turn, the average number of crops produced by food insecure households is 2.55.

This outcome proves that the higher number of kinds of crops produced on the homestead plot have a positive effect on household food security status. Thus each household wants to produce more kinds of crops in their homestead plot in order to be more food secure and in order to be independent on the market. On the other hand cultivation of more kinds of crops needs more inputs such as seeds, fertilizers etc, but households with low level of income could not afford it.

Hypothesis 4

The fourth hypothesis of the present study is: "If household cultivates a plot of farmland for producing food crops as cash crops, than it wants to earn income instead of using it for own food supply". This hypothesis could be also interpreted as: the production strategies influence on the household level of income.

Chapter 7.2.2 indicates that income of households which produced 'only cotton and wheat' is four times less than the income of households which produced 'cotton and/or wheat and other crop', and seven times less than the income of households which produced 'only other crops'.

Thus, obtained results indicated in Chapter 7.2.2 confirm the production strategies positive impacts on the household income. Moreover, following the third hypothesis this factor also has influence on household food security status.

Hypothesis 5

The last hypothesis of the present study is: “The more household stores/preserves foodstuff for the winter season the more possibilities to prevent seasonal food insecurity”.

Chapter 7.3 provides the results on food preservation by food secure and food insecure households. It is also proven the food preservation positive influences on food security of the household.

Thus, the higher percentages of food preservation characterize the food secure households. In the same time, food insecure households preserve on 20 percent less of their production for the winter season. Moreover, those households which preserved more food could be food secure for a longer time than those which preserved less food.

8. FOOD SECURITY AND FOOD CONSUMPTION MODELLING

Fitting a series of univariate models rarely provides an adequate analysis of the data since the independent variables are usually associated with one another and may have different distributions within levels of the outcome variables. Hence, in order to obtain a more comprehensive modeling of the data, multivariable analysis is normally needed (Bower, 2009).

One goal of such analysis is to statistically adjust the estimated effect of each variable in the model for differences in the distribution of and associations among the other independent variables. Applying this concept to a multivariable logistic regression model, it is possible to surmise that each estimated coefficient provides an estimate of the log odds adjusting for all others variables in the model (Hosmer and Lemeshow, 2013).

Regression methods have become an integral component of any data analysis concerning the relationship between a response variable and one or more explanatory variables.

The goal of analysis using this method is the same as that of any model-building technique used in statistics, i.e. to find the best fitting and most parsimonious model to describe the relationship between an outcome variable and a set of independent variables (Hosmer and Lemeshow, 2000).

In the context of the present study two logistic regression models were developed. Both models are described in details below.

8.1 Logistic regression model for food security

The first model was developed for food security. In this case food security plays the role of the outcome variable and the relationship with the set of independent variables was analyzed.

Following the literature review described in Chapter 3.2, there are a lot of factors positively or negatively influencing household food security. Initially a wide set of explanatory variables were included in the model.

Logistic analysis has been run for households' food security. The explanatory variables provided in Table 8.1 derive from the previous consideration based on socio-demographic characteristics of households, level of income, and land use strategies.

The higher household head level of education and the higher household level of income are expected to increase the probability of household's food security. An increasing number of kinds of crops produced on the homestead plot hypothetically can also have a food security increasing effect. An increasing number of household members as well as increasing of number of children under 14 years old are expected to decrease the

probability of the household to be food secure with regard to a high dependency ratio. In turn, an increasing of 'other crops' production on farmland is expected to increase household probability to be food secure.

Table 8.1: Definition of variables used in the regression model for food security

Variables	Description	Definition	Exp. Sign
Dependent variable			
Food security	Food security according HFSSM scale	Food secure = 1, food insecure = 0	
Explanatory variables			
HH_Education_group	Education of household head	Incomplete secondary (1)	-
		Secondary+Specialized secondary (2)	-
		Incomplete higher+Higher (ref.cat.)	
Number_HHmembers	Number of household members	Number of members	-
No_Children_under_fourteen	Number of children under the age of 14	Number of children under 14	-
Crops_Homestead	Number of kind of crops produced on the homestead plot	Number of different kind of crops	+
Level_income	Household income level	< 189 000 UZS (1)	-
		189 000 UZS - 2 410 000 UZS (2)	-
		> 2 410 000 UZS (ref.cat.)	
Production_strategy	Production strategy	Only cotton and wheat (1)	-
		Cotton and/or wheat and other crop (2)	-
		Only other crop (ref.cat.)	

Source: own computation with data of the questionnaire

Including the categorical variable 'production strategy', e.g. crops producing on farmland, had made almost all other variables not statistically significant, except 'education (1)' is statistically significant at the 90 percent level (see Appendix 5). Hence, in comparison to household produced 'only other crop', being a household produced 'cotton and/or wheat and other crop' decreases the probability that the household is food se-

cure. The coefficient has a negative sign with 99.9 percent statistical significance level. In turn, in comparison to household produced 'only other crop', being a household produced 'only cotton and wheat' decreases the probability that the household is food secure. In this case the coefficient also has a negative sign with statistical significance on 99 percent level.

The regression analysis indicates that household food security status depends on the kind of crop produced on the farmland. The coefficients of 'production strategy' indicate that the more household produces 'other crops' on farmland, the higher the household's probability to be food secure.

Thereby, it was decided to delete this variable from the model. The bivariate analysis in Chapter 7.2.2 clearly indicates that the production strategy affects income of households. Deleting of 'production strategy' might help to gain a deeper understanding how socio-demographic characteristics of the household and production on homestead plots influence food security. Deleting 'production strategy' as independent variables led to the second, reduced model (see Table 8.2).

Table 8.2 summarizes the coefficients and significant impacts of different variables on households' food security situation.

Table 8.2 shows that in comparison to household headed by person with high level of education, being a household headed by person with middle level of education decreases the probability that the household is food secure. The coefficient has a negative sign with 95 percent statistical significance level. In turn, in comparison to household headed by person with high level of education, being a household headed by person with low level of education decreases the probability that the household is food secure. In this case the coefficient also has a negative sign with statistical significance on 99 percent level.

This means that the more the household head is educated, or the higher the level of education of the head of household, the higher the probability that the household is food secure. More education the household head has the more knowledge, more experience and more ideas on how to manage his/her farm, how to earn more money, and how to efficiently use available resources.

Next indicator which has an impact on household food security is the number of crops produced on the homestead plot. This indicator has a positive sign and is highly statistically significant on 99 percent level. Evidently, the more kinds of crops a household produces on its homestead plot, the higher the probability being food secure.

The household size or the number of household members plays an important role in food security of the household. The coefficient of household members has a negative sign with statistical significance on the 95 percent level. Thus, with the rising of number of household members, the probability decreases that the household is food secure.

The number of children under 14 years old also has an impact on food security in the household. This factor has a negative sign, but is not statistically significant. Thus, increasing the number of children under the age of 14 in a household decreases the probability to be food secure.

Table 8.2: Logistic regression model for food security

Variables	Coefficient
HH_Education_group(1)	- 1.883**
HH_Education_group(2)	- 1.548*
Number_HHmembers	- 0.346*
No_of_children_under_fourteen	- 0.204
Crops_homestead	+ 0.421**
Level_income(1)	- 2.218[a)]
Level_income(2)	- 1.750

Source: own computation with data of the questionnaire

Note: Number of observations=220; Nagelkerke's R-Square= 0.485;

Significance level: ***-99.9%, **-99%, *-95%, [a)] -90%

The number of children under 14 years old also has an impact on food security in the household. This factor has a negative sign, but is not statistically significant. Thus, increasing the number of children under the age of 14 in a household decreases the probability to be food secure.

Another significant factor which influences household food security is the level of income. In case of logistic regression modeling, household level of income was calculated according to Table 7.1 (see Chapter 7.2.1). Hence, in comparison to households with high income, being a household with low income decreases the probability that the household is food secure. This variable is statistically significant on 90 percent level and has a negative sign. In turn, in comparison to households with high income, being a household with middle income decreases the probability that the household is food secure. In this case, the variable is not statistically significant with a negative sign.

Finally, the higher the household income is, the more such household has an opportunity to buy food for its members, and thus the higher is probability to be food secure. Moreover, households which have a high level of income have more opportunities to buy the food they exactly need and thus could have a higher nutrition status.

8.2 Logistic regression model for food consumption

The second logistic analysis has been run for households' food consumption. Thus, the regression model was developed for food consumption. In this case food consumption acts as an outcome variable and its relationship with the set of independent variables was analyzed.

The main approach and scale for defining levels of households' food consumption were described in Chapter 6.6.2. Table 6.10 indicated that the majority (96%) of investigated households were classified as households with adequate food consumption. Only 4 percent (9 households) were classified as households with borderline food consumption.

Therefore, a new approach was used. This approach is based on the Table 6.10, but the threshold between adequate and borderline food consumption was defined according to description statistics as a median, i.e. equal 91 score. This led to a more equal distribution of households into both groups. Table 8.3 indicates that using the new approach 108 households are classified to have a borderline food consumption. Subsequently 112 households achieve adequate food consumption.

Table 8.3: Food consumption status of investigated households for logistic regression modelling

Food consumption status	FCS	Both regions (n=220)
Borderline	from 21.5 to 91	108
Adequate	more than 91	112

Source: own computation with data of the questionnaire

Table 8.4 provides the explanatory variables for logistic regression model for food consumption.

The higher the household head's level of education and the higher household level of income are hypothetically expected to increase the probability of a household to have higher food consumption status. An increasing number of kinds of crops produced on the homestead plot can also have a food consumption level increasing effect. An increasing number of household members and increasing numbers of children under 14 years old are also hypothetically expected to decrease the probability of a household to have a high food consumption level with regard to high dependency ratios. In turn, an increasing of 'other crops' production on farmland is expected an increasing of household probability to have an adequate food consumption.

Table 8.4: Definition of variables used in the regression model for food consumption

Variables	Description	Definition	Exp. Sign
Dependent variable			
Food consumption	Food consumption according FCS	Adequate food consumption = 1, borderline food consumption = 0	
Explanatory variables			
HH_Education_group	Education of household head	Incomplete secondary (1)	-
		Secondary+Specialized secondary (2)	-
		Incomplete higher+Higher (ref.cat.)	
Number_HHmembers	Number of household members	Number of members	-
No_Children_under_Fourteen	Number of children under the age of 14	Number of children under 14	-
Crops_Homestead	Number of kind of crops produced on the homestead plot	Number of different kind of crops	+
Level_income	Household income level	< 189 000 UZS (1)	-
		189 000 UZS - 2 410 000 UZS (2)	-
		> 2 410 000 UZS (ref.cat.)	
Production_strategy	Production strategy	Only cotton and wheat (1)	-
		Cotton and/or wheat and other crop (2)	-
		Only other crop (ref.cat.)	

Source: own computation with data of the questionnaire

By the analogy with logistic regression model for food security initially a wide set of explanatory variables were included in the model.

Including the categorical variable ‘production strategy’, e.g. crops producing on farmland, had made all other variables not statistically significant (see Appendix 6). Hence, in comparison to household produced ‘only other crop’, being a household produced ‘cotton and/or wheat and other crop’ decreases the probability that the household has adequate food consumption. The coefficient has a negative sign with 99.9 percent statistical significance level. In turn, in comparison to household produced ‘only other crop’, being a household produced ‘only cotton and wheat’ decreases the probability that the

household has adequate food consumption. In this case the coefficient also has a negative sign with statistical significance on 95 percent level.

Thereby, it was decided to delete this variable from the model. Deleting 'production strategy' as independent variables led to the second, reduced model (see Table 8.5).

Table 8.5: Logistic regression model for food consumption

Variables	Coefficient
Education_group(1)	- 2.294**
Education_group(2)	- 2.146**
Number_HHmembers	- 0.754***
No_of_children_under_fourteen	- 0.945**
Crops_homestead	+ 0.578**
Level_income(1)	- 3.816**
Level_income(2)	- 2.508*

Source: own computation with data of the questionnaire

Note: Number of observations=220; Nagelkerke's R-Square= 0.698;

Significance level: ***-99.9%, **-99%, *-95%, [a)] -90%

As well as in the case with the logistic regression modeling for food security, the education of the household head influences food consumption. Table 8.5 shows that in comparison to household headed by person with high level of education, being a household headed by person with middle level of education decreases the probability for adequate food consumption. The coefficient has a negative sign with 99 percent statistical significance level. In turn, in comparison to a household headed by a person with high level of education, being a household headed by a person with low level of education decreases the probability of adequate food consumption. In this case the coefficient also has a negative sign with statistical significance on 99 percent level. This means that the higher the level of education of the head of household, the higher the probability that the household has adequate food consumption. More educated household heads have more knowledge on different aspects of food consumption, such as: what kind of food is necessary for his/her household members and what kind of food crops need to be growing up in the household homestead plot.

The number of household members has a negative sign for food consumption with the highest statistical significance on the 99.9 percent level. Hence, the more members the household has, the lower the probability for adequate food consumption.

The number of children under 14 years old also has an impact on food consumption in the household. This factor has a negative sign with the high statistical significance on

the level of 99 percent. Thus, increasing of number of children under the age of 14 in a household decreases the probability for adequate food consumption.

The number of crops produced on the homestead plot also positively influences food consumption. This indicator is highly statistically significant on the level of 99 percent. That means that the more kinds of food crops produced on household homestead plots, the higher the probability to have high adequate food consumption.

Another significant factor which influences household food consumption is the level of income. Table 8.5 shows that in comparison to households with high income, being a household with middle income decreases the probability of adequate food consumption in the household. This variable is statistically significant on 95 percent level and has a negative sign. In turn, in comparison to households with high income, being a household with low income decreases the probability of adequate food consumption in the household. This variable is statistically significant on 99 percent level and has a negative sign.

8.3 Summary

In order to analyze the influence of education, household composition, level of income as well as production on homestead plots and farmland on food consumption status and food security status, logistic regressions were used.

Two different kinds of models were analyzed. First, in the full model, a wide set of independent variables were included. The regression analysis indicates that household food security and food consumption status clearly depends on the kinds of crops produced on the farmland. In these models, almost all other variables are not statistically significant. Deleting kinds of crop produced as independent variables led to the second, reduced models for food security and food consumption. Here, the influence of education, household composition as well as income on household food security status is confirmed. Further, an increasing number of crops produced on the homestead plot increases the probability that the household is food secure and has adequate food consumption.

These results indicate that land use strategies, especially the state order system, clearly influences farm household food security in Uzbekistan. Diminishing the state order system as well as supporting production on homestead plots (in size as well as variety of crops) seems to be relevant strategies to reduce food and nutrition insecurity.

9. DISCUSSION

This chapter discusses the obtained results with the national and international scientific literature. Due to the lack of national data on food and nutrition security in Uzbekistan, this chapter also discusses the results with the research in other countries with comparatively similar conditions to Uzbekistan. The chapter is finalized by the main limitation of the study.

9.1 Discussion of results with local and international research in Uzbekistan

One of the most significant factors influencing food security is the level of household income. Yakhshilikov (2006) in his report “Uzbekistan’s road to food security” in the frame of IFPRI indicates that the poorest population of Uzbekistan spends more than 60 percent of their income for food.

UNDP report of “Food security in Uzbekistan” based on World Bank’s living standards assessment (2007) indicates that the discrepancy between expenditures among the income quintiles is striking. The ratio in per capita food consumption between the poorest and the richest groups is 1:3.7. They investigated 3,000 households in three provinces of Uzbekistan: Tashkent, Andijan and Kashkadarya.

UNDP found that the poorest population spends 61.34 percent of their income for food. This indicator in the frame of the present study shows the result of 68.55 percent.

On the other side, households with the highest level of income following the UNDP spend 31.28 percent of their total income for food. The own statistic analysis shows that high income households spend only 27.87 percent for food.

The differences of these measures could be explained by the outdated data used by UNDP, obtained from number of research in 2001-2007. In the same time, data of the present study was obtained during the field study in 2011-2012 in two regions.

According to UNDP (2010) the diet of poorest households is mostly comprised of cereals, which is an inexpensive source of nutrients. Items in other food groups are consumed in lower amounts than in households with higher level of income. Therefore, as households become wealthier, they consume fewer cereals and more of the expensive food items: fruits and vegetables, meat and meat products, milk and dairy products.

Yakhshilikov (2006) also asserts that almost 30 percent of Uzbek people live below the food poverty line. The present study confirms this fact by the obtained results that 39 percent of investigated households in both regions are food insecure. Moreover, 6 percent out of the 39 percent have very low food security.

Further, the results of UNDP (2010) and Yakhshilikov (2006) indicate that the poorest households consumed the diet dominated by cereals and large nutritional disparities exist among income groups.

One more indicator influencing food and nutrition security following the regression models is the number of household members or household composition. Developed regression models show that the number of household members has a negative impact on food security and food consumption. The UNDP did not analyze it statistically, but the average number of food insecure households is 6.4, versus 4.8 members in food secure household (UNDP, 2010).

Poor households contain more people on average, which is common in many countries, for obvious reasons. First, poor people cannot afford more land plots and housing. On the other hand, it is more secure for every household member to share a household. Finally, poor households tend to have more children. In UNDP sample, poor households have more than two children on average, while households above the poverty line have less than two (UNDP, 2010).

The number of children under the age of 14 years old is also negatively influencing food consumption. Thus the household probability to have a higher level of food consumption is reduced with increasing of the presence of children under the age of 14. Developed regression model in the present study indicates the high statistical significance of this variable. Using the binomial probit regression modeling UNDP also found that this factor has high statistical significance. They found that the number of children under 14 years old has a high marginal effect (UNDP, 2010).

The regression model developed in the present study indicates that the level of household head education is a significant factor which influences food security and food consumption. The results show that the probability increases significantly that the household is food secure and shows a better food consumption with an increase of household head education level. UNDP (2010) found that the head of a poor household has on average 10 years of education, which makes for complete secondary education in Uzbekistan. Heads of households above the poverty line have on average 11.7 years of education, indicating that at least one-third of those household heads have attended higher educational institutions.

9.2 Discussion of results with international research

The logistic regression model developed in the present study shows the high statistical significance of variables such as household composition, level of income, and the level of education on food and nutrition status of the household. Sharafkhani et al. (2011) in the frame of research of food security in Iran also used the same kind of analysis. Their univariate logistic regression shows that the family size, education level and household

level of income had significant relation with food security status. For example, family size following their logistic regression has a negative impact on food security.

Results from their multivariate logistic also show that severity of household food insecurity increased with increasing distance from the city while it decreased with increasing number of centers that provides food, residential infrastructure, family size and the presence of both parents in comparison to the presence of a single parent at home.

Moreover, Sharafkhani et al. confirm that food insecurity has a significant relation with socioeconomic conditions and having children under the age of 18. Further, Sharafkhani et al. discuss their results with research of AliHosseini (2005), who studied demographic and social factors that explain the severity of food insecurity. She shows that the household head level of education and family size are also identified as the most important variables, which explain the severity of food insecurity. According to AliHosseini the presence of patient at home, ratio of working people in family, supervisor education, family support network and supervisor activity status are identified as the most important variables, which explain the severity of food insecurity in Iran.

Adekoya (2009) investigates the food insecurity and coping strategies among rural households in Nigeria. The food security of poor households is dynamic and influenced by a range of factors. The poor live in a changing world to which they must constantly adapt and are often unprepared for the changes. They have a constant struggle to meet basic daily needs. Furthermore, their daily needs consist of more than food; vital non-food needs such as shelter, clothing and health compete with food needs in terms of a household's resource allocation (Frankenberger, 1996).

Adekoya (2009) indicates the household size as one of the major factor influencing demand for food and when it is large, members are forced to seek alternative means of meeting food needs. Adekoya also confirms that household level of income and education of the members are also significant factors influencing food security.

Khatri-Chhetri and Maharjan (2006) in the context of research on coping strategies and food security among farm household in Nepal also confirm the relationship between household food security status and variables such as the number of children, household composition, and education of household members in particularly of household head. They also found the relation of food security and the level of income with the positive sign. Food crops producing on the homestead plot also was defined as one of the coping strategies against food insecurity.

They found that both depth and severity of food insecurity is higher in small landholders and livestock holders, laborers, and households having fewer expenses. It was found that same and higher level of incidence of food insecurity is not directly related to higher depth and severity of food insecurity. Their analysis also indicates that distribution of resources have influence on the household's food security status. Large land and live-

stock holders, business and service jobholders, and households with high-income level (proxy of household's expenses) are more food secure.

Household food security was significantly associated with the level of income and primary caregiver's education in the context of research of "Food and nutritional security of children of urban farmers in Uganda" conducted by Yeudall et al. in 2007. They also indicate the high statistical significances of these factors. Household food security was significantly associated with assets, primary caregiver's education, and area of the land farmed. Moreover, in their overall model, the relationships between asset, land size, and their interaction, along with education of the primary caregiver, remained significant in relation to household food security as did the impact of household food security on dietary intake variables.

The binary logistic regression of Abdalla (2012) shows that the socioeconomic factors consisting of total household income, household size, and education are important factors that shape the food and nutrition security among the farm households in Sudan.

Results indicated by Abdalla were expected because an increase in household income means an increase in access to food. She discussed her results with research on food security of Babatunde et al. (2007) in rural Nigeria. They also found that the higher the household income, the higher the probability that the household would be food secure.

Abdalla found that the household size negatively and significantly impacts the food security and food consumption status of farm households. According to Abdalla the negative impact of household size on the adequate food consumption is mainly due to the higher number of dependent members. The large number of not fully employed household members creates a dependence on the few income earners within the household; as a consequence, a reduction of food consumption for the household occurs.

The research of Abdalla confirms as well that the education of the household head is significant and positive with regard to food and nutrition security. She also affirms that the households with an educated head are more likely to be food secure than those with an uneducated one.

Significant and negative impacts of education on food security status were found from the study of Migotto et al. (2006) in the context of Albania and Madagascar.

The size of the households was slightly associated with food insecurity, with smaller families more likely to be severely food insecure than large families. This concluded the food security research in Tajikistan, conducted by WFP, FAO, UNICEF, and the government of Tajikistan in 2008. Following their hypotheses this may be explained by the fact that it is the absence of working-able and income-earning members which is the main determinant of food insecurity, rather than just the size of the households. As such, large families including one or two income-earning members and/or receiving remittances regularly and in large amounts may be better-off than small families with an

under-employed adult member. Thus, the significance of income level was also discussed. Such kind of explanation could also be valid for Uzbekistan. These Tajik research also indicate that large families and/or families with many young children reflects a perception of heightened vulnerability of these households as food, clothing and schooling expenditures are felt to contribute to food and economic insecurity (WFP et al., 2008).

Interesting fact was found during this research: food expenditures in Tajikistan represented 81 percent of all basic expenditures for the majority of households. This means that a low share of the income is left for other essential expenditures including health, education, energy and transportation, and even less for clothing, housing etc. (WFP et al., 2008). In the same time the present study in Uzbekistan indicates the food expenditures of 68.55 percent among the poorest households.

WFP assessed the food security of Kyrgyzstan in 2012 and found that irregular and low incomes, limited access to land, and dependency on the purchase of food from markets are the main factors of household food insecurity. In addition to income activity, the number of income earners and labor migrants were also determining factors for household food security.

Food security assessment on Kyrgyzstan in 2012 also found that households with a larger family size are more likely to be food insecure. Household sizes were larger in rural than in urban areas. The difference was statistically significant. Kyrgyz food insecure households spent 61 percent of their budget on food, indicating high dependency on food purchases, leaving them vulnerable to market developments, such as the recent price hikes. Wheat, wheat flour and its products accounted for 22 percent of their budget (WFP, 2012).

9.3 Limitation of the study

The present study had an aim to empirically analyze food and nutrition security among rural households in Uzbekistan and has some limitations.

First, the field study was conducted during the winter season, when the food and particularly nutrition status of households were worse than during spring, summer and autumn seasons.

Secondly, the analysis of food consumption was based on only seven days food list recall. That might not give the correct information on usual food consumption by the members of households. Thus, the seasonality of food security and food consumption were not considered in the frame of the present study.

It is recommended that further research will conduct during the whole year period in order to assess the food availability, food access and food supply during each season.

HFSSM used in the present study was modified with regard to number of questions, i.e. all questions concerning the hunger were aborted. In further researches it is recommended to modify the HFSSM with regard to reasons of lack of food in a household (and not only financial difficulties) in order to deeper understand the reasons of low food security on a household level.

Moreover, food items in FCS questionnaire did not always adapted to Uzbek conditions. There are some food items which are not produced and/or not consumed in rural Uzbekistan. Thus, for further researches it is necessary to modify the food items in order to get more significant results of household food consumption status.

Further, the present study was conducted in two out of twelve regions of Uzbekistan. Certainly, Uzbekistan has “more poor” and “more rich” regions in which the food and nutrition status of a household is lower or higher respectively. Thus, the obtained results and recommendations could not be applicable for each of the Uzbek regions. It is necessary to conduct similar research in other regions taking into account the specific conditions of each region and/or even the village.

Finally, Uzbekistan is an agrarian country and around 60 percent of its population resides in rural areas. The well-being of Uzbek population strictly depends on agriculture. In the same time Uzbekistan is limited by land and water recourses. Thus, in further research food and nutrition security could be linked with the land and water availability, access and use.

Furthermore, the limitation of time and finances gave not the opportunity for a more detailed study with a bigger number of households. The sample of 220 households also could not describe the complete food and nutrition situation among rural households.

10. CONCLUSIONS AND RECOMMENDATIONS

This chapter shortly concludes the study. Main recommendations for different levels of stakeholders will be described in the second section of this chapter.

10.1 Conclusions of the study

Achieving long-term sustainable food security in Uzbekistan depends on resolving of macroeconomic, agricultural, political, and social problems. The development and implementation of multidimensional policies concerning agriculture, human welfare, equitable and sustainable economic growth, and poverty reduction is a pre-requisite for attaining food security (UNDP, 2010).

The present study analyzed the food and nutrition status of farm households in the rural areas of two regions of Uzbekistan. Moreover, food and nutrition insecurity, low level of income and education, high share of land under the crops of the state order, and small sizes of homestead plots are the most significant descriptions of rural regions. Recently, Uzbekistan's rural areas suffer from inefficient agricultural production, especially the cultivation of those crops which are produced for the state order. Low income and high inputs for the growing of cotton and wheat involve the low motivation among farmers to produce them. In this context, the present study had an aim to analyze the determinants of food and nutrition security with regard to socioeconomic, demographic and farming indicators.

Obtained results of logistic regression modeling indicate that land use strategies, especially the state order system, clearly influence food and nutrition security among rural farm households in Uzbekistan. Diminishing the state order system as well as supporting production on homestead plots in size as well as variety of crops seems to be relevant strategies to reduce food and nutrition insecurity.

The current food and nutrition instability in Uzbekistan requires modern approaches, better performance of the farming system, and the modern economic and policy mechanisms to improve this situation. Thus, the findings of the present study could be a basis of recommendation for different levels of agricultural, economic, and policy stakeholders.

10.2 Recommendations

The main obtained results of the present study gave the opportunity to develop some recommendations for improving the food and nutrition situation in Uzbekistan, as well as for increasing the well-being of rural population and level of income of farm households.

10.2.1 Physical availability of food at the national level

Trade policy components geared towards self-sufficiency and protectionism will have a profound influence upon agricultural policies in Uzbekistan. As noted above, wheat is the predominant food crop in Uzbekistan. In 2005, wheat was cultivated on 1.4 million ha out of total of 3.6 million ha, hence on 39.5 percent of all sown area. Moreover, together with cotton, wheat planted on 79.9 percent of sown area in 2005 (WFP, 2008). Trade policy towards self-sufficiency and protectionism has influence on food and agricultural policy in Uzbekistan.

It is necessary to develop new approaches to the policy of wheat self-sufficiency and protectionism. Farmers are not interested in cotton and wheat cultivation due to the state control over the area sown as well as its procurement prices, which are three times lower than on the world and/or on the open market.

Uzbekistan's population must be provided with access to balanced food. This goal could not be achieved due to predominance of wheat and cotton within agricultural production. Hence, changes in agricultural production and trade are required (UNDP, 2010).

Currently through the authorized bodies the state defines for farmers both the volume of production for the state order and areas of land under the strategic crops (SDC, 2011). Defining the production only by volume than by land sown will allow reaching the necessary volume of strategic crops production even from smaller areas. This could be gained due to the following:

- using the modern kind of irrigation (especially for cotton) as drop irrigation
- using the modern fertilizers
- using the selection of new varieties of cotton and wheat
- crops rotation

All mentioned above will give the opportunity to farmers to get the higher yield of strategic crops and to produce the necessary volume of harvest for the state order. On the liberated areas from cotton and wheat the growing of food crops and fodder crops could be organized. This, in turn, could lead to the higher availability of fruits, vegetables, meat and meat products.

Following stage should be the decreasing of the state order volumes. Decreasing of the state order for cotton in the condition of Uzbekistan will not mean the decreasing of the volumes of its production. The infrastructure for cotton growing and its processing is developed enough, in comparison with other crops, and the basic part of farmers at the first stages will not be interested in crop change. Introduction of the offered recommendation could lead to the conditions for a crop choice. Thus, the economic freedom for farmers will be provided and in turn is extremely important for market mechanism introduction and functioning.

Diversification of crop production will help to diversified supply of foodstuffs, which in turn, could lead to a more varied diet of the population. Crop diversification could also increase the efficiency of agricultural production and reduce the risk in cases of drought. It is particularly important in terms of the current climate change (UNDP, 2010).

Obtaining results with regard to food consumption and food preservation indicate the significant influence of food crops produced on the household homestead plot on food security. Thus, the more households produce food crops on their homestead plot, the more these households are food secure during the winter season and the less the dependency on seasonal food market. Hence, it is recommended to support the production of food crops on the homestead plots by the local authorities. The support could be in the form of increasing homestead plots from current 0.04 ha to 0.08 ha, and even to 0.1 ha. This approach could lead to the food security of the households themselves and the reducing of prices on food production on the local markets. The land from the state land reserve could be taken for these purposes. Moreover it is necessary to support households by micro-crediting in order to use limited land and water resources efficiently.

Finally, the increasing of production and trade of meat and dairy products is necessary. The consumption of livestock product is an issue more closely related to economic growth than production.

The fodder crops area in Uzbekistan is small due to predominance of wheat and cotton within agricultural production. Thus the expansion of fodder area is needed. This could lead to the rising of livestock population, and thus to increasing of livestock products. Consequently, the price which made a livestock products inaccessible for the majority of the population will decrease.

According to UNDP (2010), agricultural production is interlinked with trade and wider macroeconomic policies. The adjustment of agricultural production is of paramount importance for Uzbekistan.

“The justifications for the current structure of agricultural production in Uzbekistan are long outdated and have outlived their use and sharply have to be changed” (UNDP, 2010. p. 57).

10.2.2 Economic and physical access to food at the household level

Based on the conducted analyses, food availability, food consumption, level of income appears to be the most pressing economic challenge for Uzbekistan. Obtained results show that almost 30 percent of the Uzbek rural population in research regions does not have economic access to a sufficient quantity of food. Most of the literature shows that economic growth is an essential prerequisite of poverty reduction, which enhances living standards and improves consumption and economic access to food (UNDP, 2010).

Own logistic regression analysis confirms that the educational level of head of household influences food security and food consumption. The higher the level of education of the head of household is, the higher the probability is that the household is food secure and in the same time has adequate food consumption. A more educated head of household seems to have more knowledge, more experience and more ideas how to manage his/her farm, how to earn more money, and how to efficiently use the available resources (land, water, finances, human, etc). Further on, a more educated head of household seems to have more knowledge on different aspects of food consumption. Hence, what kind of food is necessary for his/her household members and what kind of food crops is needed to be cultivated in the household homestead plot. Therefore, in order to guarantee economic and physical accessibility of food at the household level, the knowledge of farmers has to be improved. This might include trainings in crop production on homestead plots, direct marketing of food by farmers as well as on preservation strategies. All achievements might help households with lower level of education to make the most out of their land (Gojenko et al., 2014).

In contrast to the long-term effects of an improved knowledge and better education, it seems necessary to ensure urgent interventions for vulnerable households and persons. In the study region, 6 percent of households face a very low food security and 4 percent of households were classified with borderline food consumption (see Chapter 6.6). Facing similar problems, other Central Asian Republics like Tajikistan or Kyrgyzstan have discussed several options, including among others cash transfers, school feeding, targeted food rations, or food-for-work programs (WFP et al., 2008). It seems necessary that Uzbekistan should discuss such options, too.

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APPENDICES

Appendix 1.

Structured household questionnaire

№ of household / HHH Name	
District	
Province	

1. Information about the head of household

Gender	Age	Education	Occupation	
1=male 2=female		1=elementary 2=incomplete secondary 3=secondary 4=specialized secondary 5=incomplete higher 6=higher	Primary	Secondary

2. Household composition

	Gender	Age	Education	Occupation	
	1=male 2=female		1=elementary 2=incomplete secondary 3=secondary 4=specialized secondary 5=incomplete higher 6=higher	Primary	Secondary
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

3. Crop production and area **(Farmland)**

Crop	Area (ha)	Harvest area (ha)	Total production (kg)	Quantity sold (kg)	Price (UZS/kg)	Gross benefit (UZS)
Cotton						
Wheat						
…						
…						
…						

4. Crop production and area **(Homestead plot)**

Crop	Area (ha)	Production (kg)	Consumed production (kg)	Marinated, salted, dried, stored production (kg)	Production sold (kg)	Price (UZS /kilo)	Gross benefit (UZS)
…							
…							
…							
…							
…							
…							
…							
…							

5. Livestock

Name	Quantity	Quantity sold	Price
Cows			
Sheep			
Goats			
Chickens			
Turkeys			
Ducks			

6. Production of livestock

Description	Quantity sold	Price	Profit
Eggs			
Milk			
Meat			
…			
…			
…			
…			

7. Assets (Immovable)

	Quantity	Area	Price
House			
Cow-house			
Shed			
Hen coop			
…			
…			

8. Assets (Movable)

	Quantity	Price
Car		
Tractor		
…		
…		
…		
…		

9. Households' source of income (thous. UZS/month)

Income category	Husband	Wife	Children (years)			Elderly family members	Others family members	Total
			Under 7	From 7 to 18	Older than 18			
Labor activity in principal place of business or journey-work members								
Benefit from the Homestead plot								
Pensions, allowances and grants (dependency allowances and grants, pensions, income tested transfers)								
Secondary occupation								
Moneyed remittances from relatives in abroad								

Are you satisfied with current family budget? *(Y/N)*							

10. Composition of households´ expenditures

Category	*UZS*	*%*
Food		
Non-food		
Household expenditures		
Health care		
Public utilities		
Education		
Other		
Savings		

11. Food security / Food frequency

a. During the last week, how many meals your family daily eat at household at the average? ☐

1=1
2=2
3=3
4=More than 3

b. How do you think, is the quantity of food eating in your household:

1=More than sufficient
2=Sufficient
3=Insufficient

☐

c. By your opinion, do you have enough money for buying necessary quantity of food?

1=More than sufficient
2=Sufficient
3=Insufficient

☐

d. In the last months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

1=Yes
2=No

☐

(If yes) How often did this happen?

1=Almost every week
2=Some days but not every week

☐

e. In the last months, did you ever eat less than you felt you should because there wasn't enough money for food?

1=Yes
2=No

☐

(If yes) How often did this happen?

1=Almost every week
2=Some days but not every week

☐

f. In the last months, did you ever not eat for a whole day because there wasn't enough money for food? ☐

1=Yes
2=No

(If yes) How often did this happen? ☐

1=Almost every week
2=Some days but not every week

g. In the last months, did you lose weight because there wasn't enough money for food? ☐

1=Yes
2=No

Appendix 2.

HFSSM questionnaire (Full/Original version)

1. Which of these statements best describes the food eaten in your household in the last 12 months?

[0] Enough of the kinds of food we want to eat

[1] Enough but not always the kinds of food we want

[2] Sometimes not enough to eat

[3] Often not enough to eat

2. Do you worried whether that your food would run out before you got money to buy more?

[0] Never

[1] Sometimes

[2] Often

3. The food that you bought just didn’t last, and you didn’t have money to get more?

[0] Never

[1] Sometimes

[2] Often

4. Couldn’t you afford to eat balanced meals?

[0] Often

[1] Sometimes

[2] Never

5. In the last 12 months did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

[0] No

[1] Yes

5.a. IF YES. How often did this happen?

[2] Almost every month

[1] Some months but not every month

[0] Only 1 or 2 month

6. In the last 12 month, did you ever eat less than you felt you should because there wasn't enough money for food?

[0] No

[1] Yes

7. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

[0] No

[1] Yes

8. In the last 12 months, did you lose weight because there wasn't enough money for food?

[0] No

[1] Yes

9. In the last 12 months, did you ever not eat for a whole day because there wasn't enough money for food?

[0] No

[1] Yes

9.a. IF YES. How often did this happen?

[2] Almost every month

[1] Some months but not every month

[0] Only 1 or 2 month

10. How often you relied on only a few kinds of low-cost food to feed your children because you were running out of money to buy food?

[0] Never

[1] Sometimes

[2] Often

11. How often you couldn’t feed your children a balanced meal, because you couldn’t afford that.

[0] Never

[1] Sometimes

[2] Often

12. The children were not eating enough because we just couldn't afford enough food.

[0] Never

[1] Sometimes

[2] Often

13. In the last 12 months did you ever cut the size of your children's meals because there wasn't enough money for food?

[0] No

[1] Yes

14. In the last 12 months did the children ever skip meals because there wasn't enough money for food?

[0] No

[1] Yes

14.a. IF YES. How often did this happen?

[2] Almost every month

[1] Some months but not every month

[0] Only 1 or 2 month

15. In the last 12 months, were your children ever hungry but you just couldn't afford more food?

[0] No

[1] Yes

16. In the last 12 months, did your children ever not eat for a whole day because there wasn't enough money for food?

[0] No

[1] Yes

Scale for calculation:

- Raw score 0: High food security
- Raw score 1-2: Marginal food security
- Raw score 3-7: Low food security
- Raw score 8-18: Very low food security

Source: USDA (2006)

Appendix 3.

HFSSM questionnaire (Modified version, used in present study)

1. Which of these statements best describes the food eaten in your household in the last month?

[0] Enough of the kinds of food we want to eat

[1] Enough but not always the kinds of food we want

[2] Sometimes not enough to eat

[3] Often not enough to eat

2. Do you worried whether that your food would run out before you got money to buy more?

[0] Never

[1] Sometimes

[2] Often

3. The food that you bought just didn't last, and you didn't have money to get more?

[0] Never

[1] Sometimes

[2] Often

4. Could you afford to eat balanced meals?

[0] Often

[1] Sometimes

[2] Never

5. In the last month did you ever cut the size of your meals or skip meals?

[0] No

[1] Only 1 or 2 days

[2] Some days but not every day

[3] Almost every day

6. In the last month, did you ever eat less than you felt you should?

[0] No

[1] Yes

7. In the last month were you ever hungry but didn't eat because you couldn't afford enough food?

[0] No

[1] Yes

8. In the last month, did you lose weight because you didn’t eat?

[0] No

[1] Yes

9. In the last month, did you ever not eat for a whole day?

[0] No

[1] Only 1 or 2 days

[2] Some days but not every day

[3] Almost every day

10. How often you relied on only a few kinds of low-cost food to feed your children?

[0] Never

[1] Sometimes

[2] Often

11. How often you could feed your children a balanced meal?

[0] Often

[1] Sometimes

[2] Never

Scale for calculation:

- Raw score 0: High food security
- Raw score 1-3: Marginal food security
- Raw score 4-9: Low food security
- Raw score more than 9: Very low food security

Appendix 4.

Food list recall

		Day 1			Day 2			Day 3			Day 4			Day 5			Day 6			Day 7		
Group 1 * 2 (Cereals and Tubers)	Bread (buhanka)																					
	Bread (lepeshka)																					
	Macaroni products																					
	Flour																					
	Wheat																					
	Rice																					
	Maize																					
	Potato																					
Group 2 * 3 (pulses)	Bean																					
	Green pea																					
	Turkish pea (Nohat)																					
Group 3 * 4 (Meat & Fish)	Beef																					
	Lamb																					
	Chicken																					
	Turkey																					
	Fish																					
	Eggs (pieces)																					
	Sausages																					
Group 4 * 4 (Milk & Dairy products)	Milk																					
	Qaimaq																					
	Smetana																					
	Cheese																					
	Yoghurt																					
	Tvorog																					
	Kefir																					

Group 5 * 1 (Vegetables)	Onion																					
	Cabbage																					
	Carrote																					
	Tomato																					
	Cucumber																					
	Radish																					
	Pumpkin																					
	Salted/Dry Vegetables																					
Group 6 * 1 (Fruits)	Grape																					
	Perssimon																					
	Apple																					
	Pear																					
	Peach																					
	Banana																					
	Citrus																					
	Dry/Preserved Fruits																					
Group 7 * 0,5 (Sugar)	Sugar																					
	Novot																					
	Sweets																					
	Chocolate																					
Group 8 * 0,5 (Oil)	Cotton seeds oil																					
	Sunflower oil																					
	Lamb fat																					
	Beef fat																					
	Butter																					
	Melted butter																					

Appendix 5.

Full logistic regression model for food security (with the presence of “Production strategy” variable)

Variables	Coefficient
HH_Education_group(1)	- 1.878[a)]
HH_Education_group(2)	- 1.056
Number_HHmembers	- 0.080
Number_of_children_under_fourteen	- 0.424
Crops_homestead	+ 0.171
Level_income(1)	- 2.011
Level_income(2)	- 1.536
Production_strategy(1)	- 2.881**
Production_strategy(2)	- 3.089***

Source: own computation with data of the questionnaire

Note: Number of observations=220; Nagelkerke’s R-Square= 0.626;

Significance level: ***-99.9%, **-99%, *-95%, [a)] -90%

Appendix 6.

Full logistic regression model for food consumption (with the presence of “Production strategy” variable)

Variables	Coefficient
HH_Education_group(1)	- 1.286
HH_Education_group(2)	- 1.308
Number_HHmembers	- 0.215
Number_of_children_under_fourteen	- 0.155
Crops_homestead	+ 0.201
Level_income(1)	- 0.342
Level_income(2)	- 2.196
Production_strategy(1)	- 2.608*
Production_strategy(2)	- 2.987***

Source: own computation with data of the questionnaire

Note: Number of observations=220; Nagelkerke’s R-Square= 0.673;

Significance level: ***-99.9%, **-99%, *-95%, [a)] -90%