Climate Change and its Impact on Food and Nutrition Security

Report on an assessment conducted in four regions of the Autonomous Republic of Karakalpakstan, Uzbekistan

June 2011
AUTHORS

Pernille Malberg Dyg – Senior Lecturer, Global Nutrition and Health, Metropolitan University College and PhD Fellow, Research group on Meal Science & Public Health Nutrition at Aalborg University, Copenhagen.

Arustan Joldasov – National consultant, Expert-Fikri, Centre for Socio-economic and marketing research.

Dr. Zulfia Atadjanova - National Professional Officer, Nutrition and Food Safety, WHO Country Office, Uzbekistan.

Dr. Joao Breda, Senior Officer – Nutrition, Physical Activity and Obesity; Non-communicable Diseases and Health Promotion Division, WHO Regional Office for Europe, Copenhagen.
ACKNOWLEDGEMENTS

The work contributed to the WHO/BMU project on protecting health from climate change, coordinated by Dr Bettina Menne and Jo Nurse. The authors are grateful for the financial contribution received from the German Ministry for Environment and Nature Protection

The authors would like to thank the Minister of Health, Karakalpakstan Dr. Atajan Khamraev and Dr. Anatoly Khudaibergenov from the Ministry of Health, Uzbekistan for their support in facilitating the data collection. We would also like to acknowledge the invaluable support provided by the assessment team: interviewers, focus group facilitators and translators as well as the WHO project team on Protecting Health from Climate change’ lead by Dr. Nina Nizamatdinova for her contributions, facilitation of the assessment and provision of data. The team is also grateful for the support from the WHO Representative, Dr Michel Louis Marie Tailhades at the WHO Country Office in Tashkent.

A special thank goes to Dr. Aileen Robertson, Isabel Maria Pereira Figueira-Periquito, Michael Heasman and Alexandr Parlesak (Metropolitan University College, Copenhagen) and Sharon Friel (National Centre for Epidemiology and Population Health Australian National University), who provided significant assistance in the development of the methodology and/ data processing and analysis. Additionally, Philippe Crahay, Project officer ”Food and nutrition security, disaster risk management and climate change“, Action contre la Faim (ACF) provided valuable inputs and permission to use the conceptual framework on food and nutrition security and impacts of climate change.

Our gratitude also goes to the health departments in Takhtakupir, Kanlykol, Ellikala and Khodjeyli districts for their assistance and hospitality in conducting the assessment as well as members of Mahalla committees in the districts, the women and others, who participated in the assessment.

Finally we would also like to thank the staff from Medicines Sans Frontieres, Red Crescent Society and the UN Development Programme and the Ministry of Agriculture and Water Resources in Karakalpakstan for their inputs into the assessment.
**GLOSSARY AND ACRONYMS**

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaemia</td>
<td>Anaemia is a condition in which the number of red blood cells or their oxygen carrying capacity is insufficient to meet physiological needs, which vary by age, sex, altitude, smoking and pregnancy status. Iron deficiency is considered to be the most common cause of anaemia globally.</td>
</tr>
<tr>
<td>Adaptation</td>
<td>Adaptation to climate change refers to adjustments in natural or human systems in response to actual or expected climatic stimuli and their effects which moderates harm or exploits beneficial opportunities.</td>
</tr>
<tr>
<td>Adaptive capacity</td>
<td>The ability of the system to adjust to climate change (including climatic variability and extremes) to moderate potential damages.</td>
</tr>
<tr>
<td>Aul</td>
<td>Village</td>
</tr>
<tr>
<td>Climate</td>
<td>Climate in the narrow sense can be defined as the average weather, or more rigorously as the statistical description of the relevant quantities (Temperature, Precipitation and Wind) over a period of time.</td>
</tr>
<tr>
<td>Climate Change</td>
<td>Climate change refers to the change in the state of climate that can be identified by (statistical tests) through the changes in its properties over a period of time. UNFCC (United Nation Framework Convention on Climate Change) article 1 defines climate change as, “a change of climate which is attributed directly or indirectly to human activity that alters the composition of global atmosphere in additional to natural climate change over a period of time “.</td>
</tr>
<tr>
<td>DF</td>
<td><em>Dehkan</em> farm or rural household farm</td>
</tr>
<tr>
<td>DN</td>
<td>Drainage Networks</td>
</tr>
<tr>
<td>Drought</td>
<td>The phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalance that adversely affect land resource and production system.</td>
</tr>
<tr>
<td>Evaporation</td>
<td>The process by which liquid changes into gas.</td>
</tr>
<tr>
<td>FGD</td>
<td>Focus Group Discussion</td>
</tr>
<tr>
<td>FE</td>
<td>Farming enterprise is a farm that predominantly produces cotton and wheat under government order.</td>
</tr>
<tr>
<td>Food Security</td>
<td>The FAO (Food and agricultural organisation) defines “food security” as a &quot;situation that exists when all the people, at all the times, have physical, social and economic access to sufficient, safe and nutritious foods that meet their dietary needs and food preferences for an active and healthy life “</td>
</tr>
<tr>
<td>Green Vegetables</td>
<td>“kokat” is the term, which the population uses to describe tomatoes, cucumbers, eggplants, bell pepper, cabbage, and other similar vegetables.</td>
</tr>
<tr>
<td>Hokimiyat</td>
<td>Local municipalities representative and executive authority at a district level, who interacts with FEs and DFs on access to land and that of towns and households to housing construction and small land plots, conditions of land use and cropping patterns and receives permits for a non-rural business, construction of houses and buildings.</td>
</tr>
<tr>
<td>Infectious disease</td>
<td>Any disease that can be transmitted from one person to another. This may occur by physical contact, by common handling of the infected objects, through disease carrier or by spread of infected droplets coughed or exhaled in the air.</td>
</tr>
<tr>
<td>Makankenes/mahalla</td>
<td>A village level self-governing body/committee</td>
</tr>
<tr>
<td>Mitigation</td>
<td>Human induced intervention to reduce the sources of greenhouse gases.</td>
</tr>
<tr>
<td>Non-green Vegetables</td>
<td>“palyz” is the term, which the population uses to describe potatoes, carrots, onions, squash, radish, and other similar vegetables.</td>
</tr>
<tr>
<td>Nutrition</td>
<td>Nutrition as defined by World Health Organisation is the “intake of food, considered in relation to the body’s dietary needs.</td>
</tr>
<tr>
<td>Nutritional status</td>
<td>State of body in relation to consumption and utilization of nutrients</td>
</tr>
<tr>
<td>Precipitation</td>
<td>In meteorology precipitation is any product of condensation of atmospheric water vapour that falls under gravity.</td>
</tr>
<tr>
<td>Purchasing power</td>
<td>The value of a particular monetary unit in terms of goods and services that can be purchased with it.</td>
</tr>
<tr>
<td>Rayselvodhoz</td>
<td>District Department of Ministry of Agriculture and Water Resources</td>
</tr>
<tr>
<td>Salinization</td>
<td>Accumulation of salt in soil.</td>
</tr>
<tr>
<td>Soum</td>
<td>National monetary unit. $1 equals 1,630 soums at official exchange rate</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Person or entity holding grants, concession or any other type of value that would be affected by a particular action or policy.</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Stunting</td>
<td>Low length or height for age.</td>
</tr>
<tr>
<td>Weather</td>
<td>Weather may be defined as day to day state of atmosphere and its short term variation. AMC (American meteorological society) defines weather as “The state of atmosphere, mainly with respect to its effect upon life and human activities”.</td>
</tr>
<tr>
<td>WUA</td>
<td>Water Users Association includes all farmers and representatives of dehkan farms</td>
</tr>
</tbody>
</table>
EXECUTIVE SUMMARY

Climate change has been one of the most sought out and debated topic of this decade and is evident to have profound effect on human health, climatic conditions and biodiversity. Though changes in climatic conditions has been referred as natural process but scientific investigation has shown that the recent climatic variation has gone beyond the natural level suggesting the evolution of a process i.e. "global climate change".

The Article 1 of United Nations framework Convention on Climate Change (UNFCCC), defines climate change as “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time period”. Whereas the Intergovernmental Panel on Climate Change (IPCC) defines climate change as “a change in the state of climate that can be identified by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer” (ISDR, 2008). The human induced climate change as defined by UNFCCC has largely been related to greenhouse gas emission particularly due to burning of fossil fuel and changing land use (Deforestation, over cultivation, Urbanisation). Global warming, sea level rise, uneven rainfall and weather patterns and frequent occurrence of extreme events like droughts, flooding, heat waves has been identified as projected impacts of climate change. Apart from this climate change has also been linked with impacts on human health and food and nutritional security.

The climate-health connection has been researched and evidences are there to support the adverse effect of climate change on human health. In its Third Assessment Report IPCC concluded that “overall, climate change is projected to increase threats to human health, particularly in lower income populations predominantly within tropical/sub tropical countries. In 2008 the World Health Organisation reported that “a warmer and more variable climate threatens to lead to higher levels of some air pollutants, increased transmission of disease through unclean water and through contaminated food, to compromise agricultural production in some of the least developed countries and increase the hazards of the extreme weather (WHO, 2008).

Thus there are sound scientific evidences suggesting the adverse effects of climate change on health of the population apart from the health effects, climate change also has been linked with the food and nutrition security. Climate change is evident to have effect on global food production with projections suggesting sharp decline in global food production and consequently an increase in number of food insecure people. According to WFP (world food programme) by 2050, the number of people at risk of hunger as result of climate change is expected to increase by 10% to 20 % more than would be expected without climate change and the number of malnourished children is expected to increase by 24 million i.e. 21% more than without climate change. Sub-Saharan Africa is likely to be the worst affected region (WFP, 2009).

Acknowledging the impact of climate change on human health and food and nutrition security different mitigation and adaptation strategies are being promoted all across the globe. The impact
of climate change in human health has been a topic of interest among policy makers, researchers, scientists and general public whereas impact of climate change in the “food system” has been rather a quiet issue as compared to health welfare issues, although one of the main issues of UN convention on climate change has been to ascertain that food production will not be endangered by climate change indicating the important link between these two factors (Miraglia, et al. 2009). Even when food –climate issues has been studied the main focus has been on the impact of climate change on agricultural production which covers only one part of food security and very limited researches and projects have tried to establish a link between impact of climate change on overall food and nutritional security despite of the fact that harder hit “hotspots” for climatic impact has been indentified as developing countries particularly parts of Asia and Africa which are already food insecure and facing burden of communicable and non communicable diseases.

As such, WHO (World Health Organisation) initiated a project in 2008 on “protecting health from climate change in Uzbekistan “with the objective of developing a National Action Plan for protecting health of the population with one of the specific objectives being the assessment of nutritional status.

Thus this particular baseline assessment on “climate change and its impact on food and nutritional security in Karakalpakstan (Uzbekistan) is the part of the pilot project which was initiated in 2010 to address the impact of climate change in food and nutritional security of Uzbekistan. The main aim of this report is to address the impact of climate change in food and nutrition security based on the finding from the “Karakalpakstan” as well as suggests future challenges and recommendations to mitigate the impacts. Whereas the specific objectives of this baseline assessment are to assess the household food security in terms of availability and distribution, nutritional and food security assessment of household with women of reproductive age and children under 5, to evaluate the impact of climate change on household food security and indentifying vulnerable areas and to address the existing coping strategies and to develop special recommendations based on the findings to improve the food and nutritional security of the population.

The findings of this baseline assessment are based on overall conclusion from the focus group discussion, household surveys and interviews with the local stakeholders from 4 different districts of Karakalpakstan, apart from this review of secondary data was used to provide a baseline of indicators linked to climate change and food security. Existing food and nutrition security frameworks were used to structure the assessment.

The findings from this report and from reviewed publications showed an increasing effect of climate change in food and nutritional security of the people in Uzbekistan particularly due to impact on water quality and water supply hampering the agricultural production especially during droughts and winter season. The household food access was found affected making them vulnerable to anaemia, tuberculosis and under 5 stunting. The climatic impact was more profound on the food production and reduction in soil fertility as well as frequency and severity of droughts. The rise in food prices was also seen which can have an impact on food access. Thus findings of
this report suggested an adverse impact of climate change in food and nutritional security of people of Uzbekistan, and showed the needs of proper mitigation and adaptation strategies in order to reduce the impact of climate change in terms of food and nutrition security in Uzbekistan.

Tailored to the country perspective and based on the findings of the report, the assessment indentified recommendations that could help Uzbekistan to cope with climatic impacts on food and nutritional security. Support to nutrition monitoring, early warning, awareness of climate change and nutrition within the health sector are key recommendations. Use of early warning systems and improved emergency assistance to protect the population from any severe climatic extremes, empowering women and communities in adapting to climate change and improving food access and nutrition, strengthening farmers through insurance against any loss and promoting diversified food production, effective water management and greater support from the international organisations in disaster preparedness and climate mitigation strategies and strengthened health system were identified as strategies that could be undertaken to cope with climatic variation. Strengthening of existing programmes and cross-sectoral collaboration are also crucial for protecting the Karakalpak population from future climate related food and nutrition insecurity.
1. INTRODUCTION

It is widely recognized that climate change is already having a significant impact on human health and will even more so in the future: affecting the basic prerequisites for maintaining good health such as ensuring clean air, water, food security, shelter and freedom from disease (WHO, 2009; FAO, 2008). Climate change is having a profound impact on food security affecting food availability, access, utilization and stability of the food system – thereby impacting nutrition security. It will have a significant impact on food production and distribution channels, livelihood assets and on purchasing power and market flows in the future (FAO, 2008). Ensuring that good quality and nutritious food is available and affordable is also one of the key factors for reducing the growing threat of Non-Communicable Diseases (NCDs), such as heart disease, stroke, cancer, diabetes (WHO, 2008, 2; Beaglehole, Bonita, and Horton et al, 2011). Further, latest scientific research on early development indicates that NCD risks are impacted by the developmental environment, such as mother’s diet in the foetal and postnatal periods (including over- and undernutrition), which shape the development and function of specific organs; increasing risk of developing chronic conditions such as diabetes and cardiovascular diseases in adulthood (Hanson and Gluckman, 2011; Barnes and Ozanne, 2010; Yajnik, 2009)

Thus, the rising threats to food and nutrition security from climate change increase the risk of hunger, undernutrition, obesity and NCDs and challenges future nutrition security and the realization of the right to health and adequate food. Climate change affects nutrition not only through threats to the food supply and food access (increasing poverty and food prices), but also through its impact on water and sanitation, food safety as well as maternal and child health care practices and socio-economic factors. (SCN, 2010; Caesens et al, 2009)

The profound impact, which climate change will have on human nutrition and overall health status, calls for strengthening public health services and building the capacity of the health sector to plan for the future health challenges and implement interventions to adapt to climate change. (WHO, 2009).

Under the WHO Regional Office for Europe/BMU-project “Protecting health from climate change in southeast Europe, central Asia and the Russian north”, WHO initiated a project in 2008 on ‘Protecting Health from Climate change in Uzbekistan’ with the objective of developing national capacity for assessing health impacts of climate change and developing a National Action Plan for protecting health from the negative impacts of climate change. The project was initiated in the Republic of Karakalpakstan as a pilot with the specific objectives of:

a. reducing the burden of respiratory diseases, through early warning and early case detection and management;

b. assessing the nutritional status related to climate change and climate related events and providing the public health authorities with recommendations for action; and

c. assessing the odds of the successful implementation of the National Action Plan at the regional level.

As part of the second and third objectives, a baseline assessment was initiated in October 2010 on the impact of climate change on food and nutrition security in the Republic of Karakalpakstan.
The impact of climate change and on nutrition is increasingly recognised by WHO and the UN Standing Committee on Nutrition (SCN) as an important element in the assessment of climate change impacts and related adaptation and mitigation strategies. During the climate change negotiations at COP16 in Mexico, the UN SCN presented a shared vision for addressing nutrition within the climate change negotiations and strategies, focusing on joint comprehensive short and long-term approaches to preserve and improve nutrition security while addressing climate change. It was stressed that all strategies responding to climate change through adaptation, mitigation, finance, technology, and capacity-building, should take into account the impact of climate change on nutrition security. (SCN, 2010).

Yet, at the moment the nutrition sector is poorly linked to emerging policies and practices in facing climate change (SCN, 2010) and the importance of capacity building, investments and widening the coverage of existing nutrition and public health measures are stressed in order to save lives and adapt to climate change (WHO, 2009). Further, aligning climate change mitigation efforts with nutrition interventions, could have a positive health impact, e.g. by reducing the prevalence of cardiovascular diseases through a reduced intake of saturated fat from animal sources, which also has a positive impact on reduced greenhouse gas emissions (Friel, Dangour and Garnett et al. 2009; WHO, 2003; Hu, Manson and Willett, 2001)

The aims of this report, based on the findings from Karakalpakstan, are to assess how climate change is currently affecting food and nutrition security in this region of Uzbekistan, suggest future challenges and identify recommendations for actions by the health sector, and others, in adapting nutrition interventions to a changing climate.

1.1. PROFILE OF THE REPUBLIC OF KARAKALPKSTAN

Karakalpakstan is a sovereign republic in the Republic of Uzbekistan in Central Asia with its own parliamentary government. The Republic covers 166.6 thousand sq. km and borders Kazakhstan in the north and west, the Navoi region in the east, Khorazm and the Bukhara regions in the southeast of Uzbekistan and with Turkmenistan in the south. The population of Karakalpakstan was approximately 1.5 million in 2004 according to the State Committee on Statistics of the Republic of Uzbekistan, with a high percentage of the population (48.7%) living in urban areas while 51.3% are classified as rural. This is the highest proportion of urban dwellers across all the fourteen administrative districts of Uzbekistan except for Tashkent city, the capital of Uzbekistan. (Government of Uzbekistan, 2004). Four districts were selected for the assessment, which were partly urban/semi-urban and rural settlements: two districts were located close to the capital, Nukus (Khodjeyli and Kanlykol districts) and far from Nukus (Ellikala and Takthakupyr districts) (see map below). Ellikala and Khodjeyli (south and south east of Nukus) are both located close to rivers and irrigation networks, whereas Takthakupyr and Kanlykol districts (north east and north west of Nukus) are facing more challenges in relation to water supply and irrigation.
1.1.1. Socio-economic conditions

As with other regions of Uzbekistan, Karakalpakstan has been adversely affected by the challenges of the social, economic and political transition after the collapse of the Soviet Union in 1991, which has had severe effects on poverty and the health situation. Poverty figures from UNDP from 2005 indicate that Karakalpakstan is the region with the highest percentage distribution in poverty with rates of up to 44% in 2005 (latest figure). The second highest is the region of Kashkadarya with 41% for that year. This is an increase from 2001, when poverty was only 36.4% while Kashkadarya had a percentage of over 62% (UNDP, http://data.statistics.uz/en/mapping). The increasing poverty rates are caused by a combination of problems such as the lack of employment opportunities, outmigration of skilled human resources combined with increasing livelihood challenges resulting from environmental challenges. (MSF, 2003).

1.1.2. Environmental challenges

In addition to the socio-economic challenges, Karakalpakstan faces immense environmental challenges such as land degradation, water scarcity, desertification and increased vulnerability to natural and man-made disasters, largely as a result of the drying up of the Aral Sea and exacerbated by climate change. Karakalpakstan has experienced one of the worst human-induced ecological disaster the world has seen with the shrinking of the Aral Sea. In the 1960s, the Aral Sea was the fourth biggest inland water body in the world with a surface area of 67,000 km2, a depth of 53.4 meters and salinity of about 10 grams per litre. Today, the Aral Sea’s surface is less than half of its 1960 size, its volume has dropped by more than 9 times and its salinity has increased by more than 10 times. The area of the dried-up seabed exceeds 4.0 million ha. (UNDP, 2008)

The major reason for this disaster is the reduced inflow of water to the Aral Sea since the 1960s.
This is a direct consequence of irrational water use during the Soviet era and over-exploitation of water resources from the two main feeder rivers, the Amu-Darya and the Syr-Darya. (UNDP, 2008) The majority of this inefficient water use is by the agricultural sector: agriculture accounts for more than 85% of the total water volume used in Uzbekistan, withdrawing about 57 km3 of water annually but only about 21% is used efficiently due to an inefficient irrigation and drainage system inherited from the Soviet period (UNDP, 2007). This is linked with factors of unsustainable cropping patterns - primarily the cultivation of cotton and rice-, poor land husbandry practices and increasingly hot and dry weather conditions leading to desertification of Karakalpakstan (FAO/WFP, 2001).

The root causes of the challenges facing the Aral region stem from the inadequate legislation regulating the transboundary watershed basin management in the region, according to the Global International Water Assessment (GIWA) (UNEP, 2005). The transboundary nature of the major watersheds in the region makes it impossible to solve the problems of rational water use without inter-state agreements. In spite of regional agreements, they have to date not been implemented or followed by some of the countries of the region. Furthermore, water resources are not being utilized efficiently due to outdated irrigation technology, including irrigation canals that are inefficient and limited technical expertise to renovate or construct a new irrigation system. Economic constraints and the lack of economic incentives for farmers to save water are also preventing the adoption of water saving technologies. (UNEP, 2005).

The socio-economic problems combined with environmental degradation in the region have led to severe health problems in the population of Karakalpakstan. According to MSF, there are two sets of health challenges faced by the population of Karakalpakstan: the first are those diseases and health conditions linked to the deteriorating economic situation and poverty; the other are those linked to environmental destruction which includes a range of complex chronic health problems (MSF, 2003). Related to the first set, Karakalpakstan has the highest newly diagnosed tuberculosis cases in the country per 100,000 population and these have been increasing since 2000. Tuberculosis is caused by overall poor living standards in Karakalpakstan, including low gas pressure in the winter for heating leading many households to live in close quarters – combined with poor nutrition, which is associated with increased risk of tuberculosis (MSF, 2003). From 129 per 100,000 population in 2000 in Karakalpakstan – where other regions of Uzbekistan are only at rates between 50-70 per 100,000 population – the number is up to 137.6 in 2005. The only other region with comparably high rates is Kashkadarya with 95.7 per 100,000 (UNDP, http://data.statistics.uz/en/mapping/). High rates of anaemia, cardiovascular diseases, stunting in children under 3 years, diarrhoea and maternal and child mortality are also critical. The environmental health problems related to the environmental disaster of the Aral Sea - and compounded by changes in climate - include increases in mineralized and salinised water and soil, lack of water in some areas, increases in temperatures and decreased crop production causing a number of health and nutrition problems some of which are not easy to link directly to dissolved salt in drinking water (MSF, 2003) or climate change. The increases in mineralized and salinised, water could have an effect on hypertension and renal diseases. However, there is so far no evidence to support this potential link.

In addition, dust storms are spreading dust from a now exposed seabed in the Aral Sea region contributing to high levels of ambient dust and illnesses and deaths from respiratory problems (MSF, 2003).
1.2. FOOD AND NUTRITION SECURITY

In the following sections, the internationally recognized definition of food and nutrition security and its key pillars will be presented as well as the conceptual framework used for understanding and assessing the impact of climate change on food and nutrition security in Karakalpakstan.

1.2.1 Definitions

The international definition of food security as stated in the World Food Summit declaration from 1996 is:

‘Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life’ (WFS, 1996).

Food and nutrition security is based on three key pillars:

Availability: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid) with the focus on national and regional levels.

Access: Food access is about individuals and households having sufficient resources (entitlements) for acquiring appropriate foods for obtaining a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given legal, political, economic and social arrangements of the community in which they live. Food access is closely linked to income and/or food poverty factors.

Utilization: Is about the appropriate use of food based on knowledge of basic nutrition and appropriate care and feeding practices, as well as access to adequate water, sanitation and health care to reach a state of nutritional well being where all physiological needs are met. This brings out the importance of non-food inputs in food security.

A fourth pillar - which affects food availability and food access - is ‘Stability’. This pillar highlights the importance of having food available and being able to access food at all times both throughout the month, year and in the future. A population, household or individual should not risk losing access to food as a consequence of sudden shocks, which is where climatic shocks plays a significant role (as well as other shocks, e.g. economic, political etc.) or cyclical events (e.g. seasonal food insecurity). (FAO, 2006; WFP, 2009; and WHO, http://www.who.int/trade/glossary/story028/en/).

Food and nutrition insecurity is in other words not a constant state, and can be short-term, long-term, cyclical, transitory or chronic. In addition to this, intra-household inequities (e.g. intra-household distribution of food) exist in many households requiring an understanding of household dynamics for assessing household food security. Both of these factors make food and nutrition security assessment complex and multidimensional, requiring the use of multiple indicators and methods for assessing food and nutrition security.
1.2.2. Conceptual framework for understanding the impact of climate change on food and nutrition security

As stressed, climate change will affect the key conditions for good health: clean air, water, food, shelter and the control of disease. In fact, climate change is seen as the biggest global health threat of the 21st century, and is already contributing to the global burden of disease and premature death (Costello et al. 2009). Important future trends for human health include increases in the number of people suffering from death, disease and injury from heat waves, floods, storms, fires and droughts; infectious diseases; diarrhoeal diseases; even impacting mental health of those affected by climatic shocks (Confalonieri et al., 2007; Fritze et al. 2008).

Extreme air temperatures and air pollution associated with climate change are posing a direct hazard to human health by contributing to deaths from cardiovascular (CVDs) and respiratory diseases. High temperatures increase the risk of strokes and raise ozone levels and other air pollutants, thus exacerbating CVDs and respiratory diseases, and increases in pollen and other aeroallergens trigger asthma. (WHO, 2009).

Increases in the frequency and/or severity of floods and droughts will also have a direct impact on public health: higher temperatures decrease water access by increasing the evaporation rate of surface waters and melting glaciers, which provide fresh water for the people of Karakalpakstan and many other populations across the world. In turn, the lack of fresh water increases the risk of diarrhoeal diseases, results in drought and potentially even famines. (WHO, 2009). In the case of Karakalpakstan, the primary problems are related to drought and extreme shifts in temperatures.

Climate change currently affects nutrition security – and even more drastically in the future, - through different causal pathways that impact food security, water, sanitation, food safety, maternal and child health care practices and poverty. Undernutrition could be one of the most significant consequences of climate change due to the sheer number of people that could be affected, many of whom are already poor and vulnerable to food insecurity (Confalonieri et al., 2007).

In relation to the impact of climate change on nutrition, the impact is of a more indirect nature than some of the direct health impacts mentioned earlier. Climate change has a direct impact on agricultural production, through rising temperatures and changing rainfall patterns and seasons, which are projected to decrease crop yields and the productivity of livestock and increase risks of crop failure thus affecting food availability and access. According to FAO, climate impacts will affect all forms of agricultural production and the livelihoods of poor and their access to food more severely. Other processes in the food system are also likely to be affected (e.g. processing, distribution, storage, preparation and consumption) causing greater instability in the food supply and agricultural-based incomes as well as increasing food prices (FAO, 2008). According to IFPRI, climate change could lead to food shortages and up to 130% price rises in staple foods within our lifetime (IFPRI, 2010). The direct impact of climate change on agricultural production and the food system as a whole is in turn expected to translate into increasing prevalence of malnutrition. Thus climate change has an indirect impact on nutrition insecurity and a more direct impact on food availability and access depending on the type of livelihood system people are relying on.

Understanding these linkages between climate change and food and nutrition security conceptually will be explained in more detail in the following sections. The analysis of the impact of climate change on food and nutrition security in Karakalpakstan is based on the conceptual
framework by Crahay, P. et al. (2010). This conceptual framework incorporates frameworks by the WFP food and nutrition security framework (WFP 2009) as well as Black et al. (2008) and the DFID livelihood framework (DFID 1999), the former of which are inspired by the 1990 UNICEF nutrition framework. Identification of context specific impacts will be provided throughout the assessment, as the threats of climate change have differentiated impacts and are context specific.

Figure 2: Conceptual Framework for food and nutrition security and impacts of climate change.

Livelihood strategies and assets
Livelihood strategies, which are determined by capabilities and assets (or capitals) to which a household has access, are basic causes affecting the underlying causes of food and nutrition
insecurity. The underlying causes comprise factors like household food insecurity\(^1\), inadequate care practices and/or poor water, sanitation and health care. A livelihood comprises capabilities including assets (or capital), such as natural, physical, human, social, financial, and activities (referred to as livelihood strategies), e.g. household cultivation, livestock-rearing, employment, remittances, money transfers and social benefits used by a household for its means of living. An important aspect of food security is the household’s livelihood security, which determines the extent to which the livelihood strategies applied can cope with and recover from shocks and stresses affecting livelihoods and food access, and maintain or enhance its capabilities and productive asset base (Crahay, P. et al., 2010).

Strategies used for dealing with a crisis such as food insecurity are referred to as ‘coping strategies’. Some coping strategies or adaptation strategies are successful in the sense that they do not undermine the livelihood assets to which the household have access, especially if those are based on diversification of livelihood assets or adaptation to changing climatic conditions. However, recent crises show that coping strategies of the poor face increasing challenges in withstanding current and future food, economic and climate crises and lack the capacity to adapt to climate change (Crahay, P. et al., 2010). Both livelihood assets and strategies can easily be disrupted by climatic events, e.g. droughts affecting water access, livestock productivity and crop production, which in effect affect nutrition security. Based on the conceptual framework, the livelihood capitals and strategies are affected by local, as well as national, regional and/or global factors of both natural, social, economic, political, institutional and security nature. An analysis should take into consideration this vulnerability context, which is the exposure to shocks and stresses (e.g. drought, rising food prices, seasonality) (Crahay, P. et al., 2010).

**Household food security**

Climate change induces various types of stresses on livelihoods, such as reduced production of food crops and livestock products in affected areas reducing food access and incomes from agricultural production. Increases in food prices compromise affordability and access to food, resulting from less food being produced or less money available to buy more expensive food. (FAO, 2008; Crahay, P. et al., 2010). This in effect will impact what people eat, both in terms of quality and quantity, e.g. affecting dietary diversity. According to International Food Policy Research Institute (IFPRI), the frequency and severity of production shortfalls are projected to increase due to climate change increasing future food prices even further, especially on meat and staples (IFRPI, 2009).

**Shocks, trends, seasonality**

Shocks in relation to seasonality are an important source of stress in the lives and livelihoods of poor communities, and are exacerbated by changes in climate, such as lack of rain, even drought, rapid changes in temperatures from hot to cold, and changes in seasons, which are the main climatic changes reported in Karakalpakstan. Changing seasonality induced by climate change is

---

\(^1\) According to the 3 pillars described earlier, the household food insecurity factor in the context of the conceptual framework is primarily focusing on food availability and household food access, not utilization, which is placed under ‘care practices’ and ‘water, sanitation and health services’.
likely to lead to more livelihood insecurity, seasonal hunger and malnutrition both in the form of under- and/or overnutrition possibly increasing risks of non-communicable diseases (e.g. CVDs).

**Water, sanitation and health services**
Access to safe and clean water and good sanitary conditions are essential for an adequate diet. Water resources are predicted to be strongly impacted by climate change with hundreds of millions of people at risk of being exposed to a growing scarcity of water in the future (Pachauri and Reisinger 2007). In Karakalpakstan, water problems are already occurring.

Health services will in the future be challenged by increases in morbidity and mortality as a result of climate change and its associated health and nutritional impacts. The ability of the health sector and services to tackle these challenges is therefore crucial. In Karakalpakstan and Uzbekistan in general the health system has been restructured to strengthen the quality of medical services in primary healthcare by setting up rural health centres (SVPs) covering basic packages of primary health care services. (IMF, 2008). This is could be viewed as a positive trend in terms of providing basic services to deal with future climate change related morbidity.

**Inadequate care practices (maternal, infant and young child)**
In relation to care practices, climate change is linked indirectly to malnutrition and projections of increased incidences of food and water related diseases due to climate related changes in water availability and access and increasing difficulties in storing food safely. Diets could become less varied and/or less nutritious due to lack of availability, increases in food prices and limitations in household food production, thus affecting maternal, infant and young child nutrition eventually linked with different forms of malnutrition namely under-nutrition, micronutrient deficiencies.

The assessment will be based on these dimensions presented here of climate change and food and nutrition impacts and will be presented in chapter 4.

**2. OBJECTIVES OF THE ASSESSMENT**

General objectives:
To conduct a baseline assessment on the impact of climate change on food and nutrition security in the Republic of Karakalpakstan to be used as a policy and advice tool to government on climate change related nutrition problems and recommendations for further capacity development and responses.

Specific objectives of the baseline assessment:
1. to assess the health profile and availability and distribution of food at household level in 4 sub-regions of Karakalpakstan;
2. to conduct a nutritional and food security assessment of households with women of reproductive age and children under 5;
3. to evaluate the impact of climate change on household food security and identify areas that are most vulnerable;
4. to assess existing coping strategies and identify barriers and opportunities for improving food and nutrition security at household and community level;
5. to develop specific recommendations for the health sector for improving food security and nutritional status of population in Karakalpakstan.

3. METHODOLOGY
The report is based on findings from focus group discussions with women, household surveys, market surveys and interviews with local stakeholders in four districts with different geographical and agricultural conditions over an eight-day period during late November 2010. The qualitative and quantitative data from selected districts have been compared with data for Karakalpakstan as a whole from Ministry of Health and national statistical data when possible. A review of studies, policy documents and statistical data from Government, UN and other international sources have been used to gain insight into the health status and food and nutrition situation as well as recent health data and data on climate change and food production pertaining to the situation in Karakalpakstan.

3.1. DATA COLLECTION
The following methods and approaches were used in the data collection:

3.1.1. Assessment team
The assessment team was divided into two sub-teams (of 5-6 people each) of which one team was responsible for interviews in Ellikala and Khodjeyli and the other of Kanlykol and Takhtakupyr districts. The teams consisted of:

- An international or national consultant
- A representative from the Ministry of Health
- A WHO CO national officer
- A local social scientist for focus group discussions and interviews with local experts
- Two interviewers for household interviews
- One translator
3.1.2. Selection of districts

The selection of districts was based on criteria of selecting different livelihoods zones, for which reason both urban/semi-urban and rural sites and districts were selected, since more than 50% of the population in Karakalpakstan are living in urban or semi-urban areas. Also districts with different agro-climactic patterns were selected, primarily based on different conditions related to access to water (i.e. rivers or irrigation networks) of relevance to food production capacity. To represent areas with better water conditions located close to rivers and irrigation networks were Ellikala and Khodjeyli districts and to represent districts with more water supply challenges and drought risks were Kanlykol and Takhtakupyr districts. In each district, interviews were conducted both in the district centre (to represent an urban/semi-urban setting) and a rural community (to represent the rural setting). An exception was made in the District of Khodjeyli; Khodjeyli district is located very close to the capital Nukus, and for this reason the urban centre of Khodjeyli was omitted and replaced by two villages, which closely resemble a semi-urban setting and are more easily comparable to the other districts. Altogether eight sites were selected (two sites per district in four districts).

3.1.3. Focus group discussions

In each community mothers and grandmothers were called in for a focus group discussion focusing on questions and discussions related to:

- Food access (production and affordability) and difficulties influenced by climatic/weather changes
- Weather conditions/climate conditions and its impact on health in the household focusing on vulnerable groups – primarily children and women
- Health problems in the community
- Coping strategies
- Changes in food consumption and access over the past 5 or 10 years
- Water access challenges
- Food storage practice and food losses
- Future expectations related to accessing food, dealing with water challenges and health problems
- Views on adapting to climate change and coping with food insecurity risks in the future

In each village between 8-15 women participated in the focus group discussion. Different age groups (ranging from young women to mother in-laws\(^2\)) and wealth groups were represented in the focus group discussions.

---

\(^2\) Older women were included to get more information about changes over time and due to the fact that they are often in charge of buying food, know about food storage methods and are heads of household.
3.1.4. Household surveys

In each site, household interviews were conducted to get data on household characteristics, socio-economic data, information about water supply, household food and agricultural production, basic health and food security information, including breastfeeding practices, anaemia detection and treatment and use of health services, as well as self-reporting on weekly food consumption per household – a seven day recall. The food consumption part of the questionnaire was adapted from a questionnaire used in the 2008 WHO/UNICEF assessment on complementary feeding (WHO, 2008) and is adapted to the local population. Women with children under 5 were interviewed, although mother-in laws occasionally sat in. The criteria for selecting households were based on the selection of different wealth (socio-economic) groups within the same community to capture the differences between socio-economic groups: half of the women were selected based on the status of being poor and half were selected based on being within the non-poor category. The households were voluntary sampled/selected by community women leaders and visiting nurses instead of either target sampling (targeting only on poor households) or probability sampling (random sampling). Altogether 8 households were interviewed in each village, providing a total number of 64 household surveys.

In the seven-day (weekly) food recall part of questionnaire, women were asked about average weekly household consumption during the months of March (considered to represent the worst month in terms of food intake and diversity within a year) and September (considered to represent the best month). Due to the short timeframe of the assessment, and inter-seasonal variations, alternative methods for collecting food consumption data was not possible.
Data was processed and correlated using Statistica and further analysis of correlations between questions were subsequently made looking into statistical significant correlations between questions.

3.1.5. Interviews with local and central level experts

Interviews were held in each site with local farmers or representatives from the Rayselvodhoz (i.e. the District Department of Ministry of Agriculture and Water Resources), health staff (rural medical points or district hospitals) and local mayors, or heads and women leaders of rural citizens council (makankeneses) depending on the site. After the interviews in the 8 sites, interviews were held with heads within the Ministry of Health and Ministry of Agriculture and Water Resources as well as with key international organizations operating in Karakalpakstan, such as Medicins Sans Frontieres (MSF), Red Crescent and UN Development Programme related to the findings and for additional information on agriculture, health and food insecurity and current programmes in the republic.

3.1.6. Market survey

In each district a market survey was conducted in the central market (bazaar) and local stores on a selection of food items (see annex 8). The market survey was conducted to estimate approximate prices of key food items, compare prices between districts, check availability and compare the prices and availability to a previous market survey conducted by WHO in 2008 ³ (during the same time of year).

Photo: Market survey in bazaar in Ellikala district

3.1.7. Secondary data collection
To compare and validate findings from the empirical work in the four districts and document overall trends related to climate change, health, food security and nutrition, national and Karakalpak data was collected from Ministry of Health, Republic of Karakalpakstan, Centre of Hydrometeorological Service, UNDP statistics for Uzbekistan, latest MICS (2006) and DHS (2002). Various assessments from WHO, WFP, UNDP, MSF and World Bank were used to analyse the situation pertaining to food and nutrition security, poverty, health conditions and current and future interventions. Finally international reports from WHO, the Standing Committee on Nutrition (SCN), WFP and FAO on climate change and health, nutrition and food security were used to design the methodology and structure and analyze the findings.

3.2. LIMITATIONS
Statements and expectations of women and the key informants/experts (see above) cannot be generalized and represents the situation during a better season less prone to food insecurity (September to November is a better off season) and a year with relative abundance of water, although many questions addresses past experiences with food security and weather/climate related events. In some districts, responses were relatively positive in relation to water challenges (especially in Ellikkala and Khodjeyli) due to the water abundance in 2010. All statements of FGD participants and experts from villages are only pertinent to those villages and towns, where FGDs were carried out and may be extrapolated to other villages and towns only on a provisional basis.

The small sampling size of the household surveys cannot provide any general conclusions, which can be generalized. In the selection of households, there could be a potential bias. Since the households were selected based on voluntary selection, it is likely that the households selected do not represent a general picture of the difference between poor and non-poor households. More non-poor households than poor households seem to have been selected by local authorities to provide a better picture of the situation in the district. On the other hand, respondents could have exaggerated the problems related to food insecurity and the need for food aid to get additional support from government. Analysis of the findings indicates that both types of bias might have occurred. Comparing findings from household surveys to FGDs in especially the Northern districts seem to be contradictory, with interviews with local key informants and FGDs with women revealing a worse food insecurity situation than what came out from the analysis of household survey data on food consumption and food insecurity indicators. A bias in the selection of households for the household survey could be an explanation for this.

In general, the findings from the fieldwork have as far as possible been supported by other data sources, i.e. statistics and other assessments relevant for Karakalpakstan as a whole from Government, UN and other sources. These sources do to some extent give similar assessments of components of the food and nutrition security situation as many of the findings from the fieldwork. However, most of these data sources and assessments are not specifically looking into the link between climate change and food and nutrition security, for which reason these sources also have their limitations in relation to supporting this assessment.
4. FINDINGS - IMPACT OF CLIMATE CHANGE ON FOOD AND NUTRITION SECURITY IN KARAKALPAKSTAN

Based on the dimensions of food and nutrition security from the conceptual framework related to climate change and its impact on food and nutrition security, the situation in the four selected districts in Karakalpakstan was assessed.

4.1. FOOD AVAILABILITY SITUATION IN KARAKALPAKSTAN

Before the collapse of the Soviet block, agriculture in Uzbekistan was mainly oriented towards cotton, fruits and vegetables, and food crops were far from able to satisfy local needs leading the country to be net food deficient relying on imports to meet major parts of the country’s food needs. Since independence, however, the Government has had a food self-sufficiency policy increasing for instance the wheat cropping area to produce sufficient amounts of wheat, the main staple, to meet the food needs of the population. From a dependency on wheat imports, the import-to-production ratio of wheat dropped from 461% in 1992 to 4.69% and the country is self-sufficient in wheat (or 95% self-sufficiency) from 2003. Uzbekistan is virtually self-sufficient in other food groups as well such as meat, milk, potatoes, eggs, fruits and vegetables. (WFP, 2008)

According to a recent policy analysis by the Centre for Economic Research, this self-sufficiency strategy has to a large extent protected the nation’s food security from the volatility of the global economy, including the steep increases in food prices on international markets. However, it is also recognized that the food security situation in the future could be adversely affected by external factors and shocks, including reduced water supply due to hydro energy projects contemplated in neighbouring countries and the effects of long-term climate change, which could aggravate the water shortage problem further. (CER/UNDP, 2010)

The food security model of the past - in combination with external factors mentioned above - however, poses challenges for the future. Agricultural growth rates are declining resulting from agricultural practices of the past: Deterioration of land quality due to water and wind erosion, chemical poisoning, salinization, and soil exhaustion are posing challenges for future food security. Presently wheat and cotton production make up 80% of the country’s arable land, and current land use practices do not allow crop rotation necessary to restore land fertility. To cope with deteriorating soil fertility and future food and nutrition security needs, more sustainable alternatives are legumes and vegetables. (CER/UNDP, 2010). According to the Statistical Review of Uzbekistan for 2010, Karakalpakstan has consistently the lowest output of agricultural products in all food categories of all the regions in Uzbekistan (e.g. grains, vegetables, potato, melons), except for livestock, poultry and egg products.

In Karakalpakstan the main economic activity is agriculture; cotton and rice are the two main agricultural crops. Wheat, fruit, vegetables, potatoes, millet and forage plants are also cultivated in this region. Cultivation is possible in irrigated areas only. Livestock is generally pastoral including karakul sheep, cattle, camels and horses. (interviews at district level; http://mansurovs.com/Umid/Main/Uzbekistan/Regions/Karakalpakstan/karakalpakstan.html)

Whereas Uzbekistan as a whole has had increases in production since independence, Karakalpakstan has experienced a decrease in productivity of basic agricultural crops by 20-30%
compared to 1980s. In fact, 95% of the lands in the lower reaches of Amudarya river (Karakalpakstan) are considered substantially saline. (Centre of Hydrometeorological Service, 2010)

The region is traditionally a deficit area for wheat (but a surplus producer of rice) and annually receives an allocation of about 50 000 tons of wheat flour from the central Government. Production of rice and other cereals in dekhan farms/household sector supplements this allocation. Livestock production in Karakalpakstan is a cause for concern as a result of the shortage of good drinking water, quality feed and veterinary supplies. (FAO/WFP, 2000).

Reoccurring droughts and limitations in water supply put a stress of household and regional food production, although at the time of the assessment water supply was generally reported to be sufficient and improving. However, the most recent drought in 2000-2001 and water shortage in 2007 and 2008 had tremendous effects on the food supply in the Republic. In 2000, grain production was down by 54 percent, the rice and potato production virtually failed while fodder and oilseed crops were down by about half, cotton and vegetable output by 30-40 percent. Additionally, perennial fruit trees and vines were reported to have died. (FAO/WFP, 2000). Another drought is projected for 2011-12 according to the Centre of Hydrometeorological Service.

4.1.1. Characteristics of farms
During the 1990s collective farms established during the Soviet era were re-organized into producer cooperatives (‘Shirkat’), with members receiving a share of the land and other assets. However, more recently the Shirkat were transformed into private farms after a progressive transformation. Private farms are held at up to 50 year leases and have an average size of approximately 27 ha primarily for cotton and wheat production. Dekhan farms - or small household plots - were already prevalent under the Soviet era: allocated for all rural and a limited number of urban households for having a supplementary food source. However, since independence the number of such farms has increased from 2.3 million in 1991 to 4.3 million in 2008 in Uzbekistan as a whole. At national level, 97 % of all rural households have access dekhan or household plots. (WFP, 2008). As illustrated in figure 3, there are also a high percentage of households in the surveyed districts with access to land (67.2%). Although it is lower than the national average more than half of the households interviewed in the survey were located in urban or semi-urban areas, which explains the relatively lower percentage of households with land access.

Figure 3: Distribution of households with access to arable land in the four districts
Even more of the households with arable land grow fruits and/or vegetables (74%).

Figure 4: Percentage of households with arable land to grow fruits and vegetables

Land plots of private farming enterprises on average have an area of 27-30 ha, which are chiefly used to produce cotton, wheat and rice. Upon winter wheat harvest from June through November, the farmers use the fields to grow forage (corn, sorghum) and vegetables.

A dehkan farm (a rural family farm) has a land plot with an area from 0.03 to 0.2 ha and about 5% dekhan farms have “tamorka” (land plots). Dehkan farms grow wheat, vegetables, rice, keep cattle (if they can afford to buy cattle and fodder) as well as sheep, goats, and poultry on their plots. Dehkan farms have become key producers of meat and dairy products. Recent trends in
Karakalpakstan, however, indicate a decline in productivity of DFs due to difficulties in accessing fodder, water, and common pastures, most of which are used by private farming enterprises.

4.2. SOCIO-ECONOMIC DESCRIPTIONS OF THE DISTRICTS

Ellikkala District was established on virgin lands in the 1970s and consisted of large state-run rural industrial enterprises founded on cotton plantations and villages that resembled small urban-type settlements with dehkan farms. Khodjeyli district is located close to the capital of Karakalpakstan, Nukus. Takhtakupyr and Kanlykol districts are both located in the northern (eastern and western) part of Karakalpakstan. The other districts are smaller in population than Ellikala and have existed for hundreds of years consisting of collective farms and dehkan farms with much smaller plots of agricultural land.

Table 1: Population size in the selected districts

<table>
<thead>
<tr>
<th>District</th>
<th>Population size:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellikkala</td>
<td>127,700</td>
</tr>
<tr>
<td>Khodjeyli</td>
<td>143,600</td>
</tr>
<tr>
<td>Takhtakupyr</td>
<td>39,900</td>
</tr>
<tr>
<td>Kanlykol</td>
<td>43,000</td>
</tr>
</tbody>
</table>

Source: Ministry of Health, 2009

All districts are located in an area of extreme continental climate, so they experience climate change threats (primarily as increases in annual temperatures) more explicitly.

Ellikkala and Khodjeyli Districts lie in the south (east and west) of Karakalpakstan and closer to water sources – the Amudarya River and adjacent irrigation network, which enables farmers to mostly cope with water challenges. Kanlykol and Takhtakupyr Districts in the northeast and northwest are faced with water supply risks and risks of sudden cold spells in warm autumn, winter, and spring. Takhtakupyr District is situated at the end of all irrigation networks for which reason it is the most vulnerable of the four districts to the impacts of climate change.

Almost all districts specialize in similar trades. First, this is production of cotton and winter irrigated wheat, then – rice, forage (corn, sorghum), vegetables, and animal husbandry – cattle (cows, oxen) and small cattle (sheep and goats). The south of the Republic is predominated by cattle and sheep. There are fewer cattle and sheep in the north, where goats are more frequent, since they are not picky about forage.

Specific features of specialization in agriculture are a result of the fact that the more south and higher up the Amudarya River the districts are located, the more they specialize in cotton, wheat, and rice production. The more north and lower downstream of the canals the districts are located,
the less they specialize in cotton and rice production and the more they specialize in wheat, corn, and sorghum production. This specialization in crops is related to the limitations in the amount and timeliness of water supply, rather than the geographic location.

Literacy rates for Karakalpakstan is generally high: 99.35 % of the 17-24 year olds are literate in 2007 and for the same year more than 70% of all school graduates in Karakalpakstan enrolled in higher educations (http://data.statistics.uz/en/mapping/) Similar findings are revealed from the household survey where the majority of women interviewed had a college level education or more.

Figure 5: Educational level of the women interviewed in the 4 districts

![Educational level of the women interviewed in the 4 districts](image)

Source: Household surveys in Khodjeyli, Kanlykol, Ellikala and Takthakupyr districts

According to data shown in figure 6 from a public opinion poll with 2000 respondents conducted by the Centre for Social Marketing Research (2010), the educational level of the respondents in the household survey corresponds more or less to their figures related to women's level of education for Karakalpakstan. Some differences are, however, noted: no respondents in the household survey had an education of less than 9 years (for which reason it is not mentioned in figure 5), only 1% had 4 years of education or less in the poll; Slightly less (15%) had 9-11 years of education amongst the respondents (compared to 20% in poll by Centre for Social Marketing Research.). The same goes for the respondents with a university degree: 7% of the respondents (mostly in the North) had a higher degree, whereas 10% had a higher degree when looking at the poll.

---

4 The districts have been grouped into Northern (Kanlykol and Takhtakupyr) and Southern districts (Ellikala and Khodjeyli)
4.3. HOUSEHOLD LIVELIHOOD STRATEGIES AND ASSETS

In the following chapter, the main livelihood strategies and assets of households in the four regions of Karakalpakstan will be analyzed, including poverty trends and how livelihood strategies could be influenced by climate change.

Karakalpakstan has been the poorest region in Uzbekistan for decades and the proportion of poor and vulnerable families is as high as 20-50% of population depending on the district (Centre for Social and Marketing Research; Centre for Economic Research, 2010).

The livelihood strategies of families in Karakalpakstan depend on the availability of certain sources of income and food – cash and in-kind. In the ranking of livelihood assets in the household survey and FGDs priority is given to wages, pensions and social benefits in urban areas and to income or other assets from land and livestock, wages, pensions and social benefits in rural areas.

In Ellikkala, Khodjeyli, and Kanlykol Districts priority is given to income from land and livestock. In Takhtakupyr District priority is given mainly to the pensions of the elderly, allowances to low-income people and childcare allowances, while the third source is small-scale cattle farming (household surveys and FGD). This is directly linked to the limitations in natural assets (soil and water) and limited employment opportunities found in Takhtakupyr compared to the other districts.

Formal employment is ranked low due to the low salary and small share of population that has this source of livelihood. For example, in Ellikkala District the official rate of the unemployed from the employable population totals 35% and about 70% of population live unofficially without permanent employment. In other districts, these proportions are similar at around 25-40%, especially, from autumn until spring.
The ranking of livelihood sources of rural households in Kanlykol District is as follows: own land plots, cattle, and poultry rank first; wages through hired labour rank second; and pensions and social allowances to low-income families rank third.

From focus group discussions and findings from MSF (2003), there is on average one family member in households in all districts – or in almost 80% of families - who is seasonally (autumn-spring) employed outside of the province and sends money home – on average, 150 US Dollars – 2-3 times per season. A participant in a FGD reported these figures, but other interviewees reported that these figures are approximately twice as high. However, in contradiction to this, the household surveys showed that only 9 out of 64 households had a family member working abroad (the majority in Ellikala). Now it is difficult to say whether this was unique for the selected households or a more general trend as a result of the financial crisis, which according to FAO (2009) is decreasing job opportunities abroad and in urban areas and therefore also the ability to send remittances home. Thus, the drive to look for employment abroad could have slowed down in Karakalpakstan as well. According to FAO, globally this has lead to a back migration to rural areas, as a temporary coping strategy.

4.4. HOUSEHOLD FOOD ACCESS

In the following chapter the various dimension of food access in Karakalpakstan will be discussed ranging from household income, access to social safety nets, markets and land, water and other productive resources for food production. Perspectives as to the potential impact of climate change will be considered.

4.4.1. Household income, social safety nets and poverty

According to FGD participants, the following average monthly incomes from various sources were reported:

- Salary of a civil servant (at school, hospital, etc.) amounts to 100,000 to 200,000 soums (USD 61-122).
- Average pension size by age varies from 100,000 to 150,000 soums (USD 61-92).
- Average allowances for low-income families – about 90,000 soums (USD 55)
- Average child allowances for mothers of children under two years of age – about 30,000 soums (USD 18)\(^5\)

These figures are based on information from FGDs and may not be accurate.

When low-income (poor) households are chosen to receive allowances, large families with children aged less than 16 years and women with newborns (children under the age of two years) are preferred. Childcare allowances for children younger than 16 years of age are paid every three months with an opportunity to receive it on a rotational basis.

---

\(^5\) Based on official exchange rate of 1630 soums for USD 1. The black market rate is however approximately 2300 soums for USD1 (January 2011)
This kind of rotation of social allowances between poor households and the low amount of benefits results in periods with lack of income, and with frequent risks of food insecurity in these households. In order to avoid falling into poverty and food insecurity, employment opportunities and a sustainable supply of water for the household farms are critical.

Official criteria for assessing poverty were established at the level of an average monthly income per family member at the average of minimal monthly salary (approximately 50,000 soums or about 30 US Dollars). When a family’s income is calculated, the availability of a land plot is taken into account. Since there are insufficient funds to provide social benefits for all low income households, mahalla committees also use indirect signs of wealth or deprivation, such as availability of carpets, new furniture, a car, cattle, etc. – to grant households the right to monetary allowances (social allowances) or food benefits.

Unofficial criteria of low-income status ascertained by FGD participants themselves are also based on criteria such as quality of housing quarters, clothes, availability of a car, and etc. When asked about the simplest aggregate criteria of affluence, people indicated criteria of consuming a certain amount of meat per week as being an important indicator of poverty: The poorest can only afford to consume less than 1 kg of meat or no meat at all per month, whereas people with average income/resources consume approximately 2 kg meat per week. Only the rich can afford to consume more than 2 kg per week.

The average household size of the households interviewed was 7 persons per household.

4.4.2. Conditions for household food production and access

Private farming enterprises and dehkan farms produce wheat, rice, tubers, vegetables (fruit is predominantly in Ellikkala District), meat and dairy products. If there is excess of some products (mainly in Ellikkala District), they are sold at open markets including those in other districts of the republic. In general, dehkan farms produce foods for their own consumption, but low crop yield and productivity prevents households from ensuring a sustainable and sufficient food supply, even in Ellikkala District where conditions are generally better.

The overall tendency for Karakalpakstan in the recent decades is a reduction in food production output and an increase in food prices (see section 4.4.4).

This reduction is less expressed in Ellikkala District and more expressed in other districts in the North, as they are located farther from the irrigation network. This increasing tendency is coupled with a decline in rural population, movement to towns and migration outside of Karakalpakstan and Uzbekistan.

The main sources of food for the population in the surveyed districts are a combination of own production from land plots and cattle rearing in private farming enterprises or dekhan farms. Of the households with land in Ellikkala district, 50% of households buy part of their food products, whereas about 90% of households with land in other districts buy their food (for example meat, dairy products, vegetables and fruit). Nearly all households irrespective of district buy vegetable oil, tea and sugar.

---

6 The country uses the term “low-income” instead of “poor”
According to participants of FGDs and representatives from local authorities, one rural dehkan farm on average has 0.1 ha of land at their disposal, while urban farms have about 0.03 ha. Approximately 30% of dehkan farms in Ellikkala District and nearly 80% of DFs in Takhtakupyr District produce nothing on their land plots due to poor land or lack of water. Farming enterprises and dehkan farms experience limitations in access to irrigated land because of water shortage. Land is abundant in most districts, however a huge problem is the lack of water, especially in areas of insecure water supply, frequent low water years and risks of droughts. However, at the time of this assessment, key informants at the Mahalla level reported improvements in water supply but primarily in Ellikkala and Khodjeyli districts.

From the FGDs and interviews with local authorities, 30% of dehkan farms in Ellikkala District to 80% DFs in Takhtakupyr District have no cattle. About 50% in Ellikkala District and 30%-5% in other districts – from Khodjeyli to Takhtakupyr – keep poultry, namely, chickens and turkeys. They cannot afford keep cattle, since fodder is expensive and difficult to cultivate.

Approximately 50% of households in Khodjeyli and Kanlykol Districts keep cattle (cows). And the household survey for all the districts confirms that approximately half of the households have livestock. FGD participants pointed out the phenomenon of declining cattle livestock population for the following reason.

“Ten years ago cows would get pregnant every six months. In other words, a cow would calve, at least, twice a year. But right now cows won’t get pregnant. Each month we pair them up with an ox. We asked the vet about this problem. We gave them treatment, but they don’t get pregnant. We don’t know why” FGD, Khodjeyli village.

Whether this is influenced by climate change (lack of water and fodder and/or infections in animals leading to loss of production and fertility), is difficult to determine but could be connected.

Fruit orchards and trees remain only in few villages and towns; they have either dried out in periods of water shortage or in periods of water abundance due to a rise in the level of salty ground water.

Food production and consumption vary depending on districts. As mentioned above, areas of dehkan land plots are too small (in average 0.01 hectare per capita) for self-provision of wheat, rice, vegetables, fruit, meat and dairy products etc. Therefore, DFs combine consumption of self-produced and bought foods. The farther south the district is located, the greater is the share of self-produced foods in dehkan farms, and the farther north, the greater is the share of households, who buy foods. In Ellikkala District, the largest share of foods is produced and consumed from own production. In northern Takhtakupyr District, most foods are bought at markets or stores.

For example, from focus group discussions in Kanlykol District, it was estimated that the following food items were derived from:

- Flour and bread – nearly 100% is bought on the market/at stores;
- Meat and legumes – mainly produced on farms or bought/exchanged for other products with neighbouring households;
- Dairy products – about 30% of households derive dairy products on their own farms/from neighbouring dehkans, while other dehkan farms buy dairy products, since milk yielding capacity and fat content in the milk is low (about 5 litres per cow daily);
- 75% of vegetables is produced by the households themselves and 25% is purchased on the market;
- About 20% of fruit, melons, and watermelons are bought at the market.

The two southern districts, Ellikkala and Khodjeyli had a greater proportion of foods produced from their own land or those that are rented from farmers. Accordingly, the urban population in the southern districts is better provided with local food products, than the population in the northern districts, where agricultural produce come, primarily, from southern districts and where the population has to purchase even agricultural produce – wheat, flour, vegetables, fruit, and others.

Meat, meat products and poultry are entirely produced locally. As stated by participants of FGDs and local agricultural experts, nevertheless, cattle population totals about two cows per dehkan farm and there are 40% of these DFs in Ellikkala District and about 5% in Takhtakupyr District. Therefore, all households, even those who own cattle, still purchase meat fully or partly. Milk yielding capacity is low; and the number of households with no cattle is high, so from 20% (Ellikkala) to 70% (Takhtakupyr) of dehkan farms purchase dairy products on the market. The household survey confirms that many households do not have livestock and many who do only derive 20-50% of their dairy products from own production: Only 21 of the 64 respondents produced their own milk even though nearly half of the households own livestock: of those 21 households who produce milk, 14 of them were 100% self-sufficient.

Vegetables are produced mostly at the private farming enterprises and less in dehkan farms. The most common vegetables are potatoes, carrots, onions, and squash. Fruits, melons and watermelons are primarily grown in Ellikkala District. In Takhtakupyr District fruits are mainly purchased. Previously, watermelons and melons used to be grown widely in all districts. However, after 2006, they were subjected to insect attacks for several years and only in 2009-2010, crop yields and areas under melons and watermelons began to increase, however, has reached approximately 40% of the 2005 level (in accordance to FGD participants' statements).

4.4.3. Market conditions and purchasing power

Food prices, and thereby the purchasing power of households in Karakalpakstan, are to some extent affected by world market prices, although as mentioned earlier not to the extent seen in many other countries, due to the Government’s food self-sufficiency strategy. However, changes in food prices has also occurred in Karakalpakstan but seems to be linked more to local supply and demand. As shown in table 2, the price of wheat was 5 times higher in October 2008 than the average price at district markets in November 2010. Reports from USAID’s Famine Early Warning Systems Network (FEWS NET), who monitors trends in staple food prices, show that wheat flour prices in the neighbouring countries of Tajikistan and Kazakhstan were increasing to almost 2008 levels in November 2010 (http://www.fews.net/docs/Publications/MONTHLY%20PRICE%20WATCH%20November%202010.pdf), thus indicating that prices are on their way up again.
A similar situation was the case for rice, which was 4 times higher in October 2008 than the average price in November 2010. And the cost of bread was double in 2008 compared to 2010 prices.

The high prices of these two main staples greatly affected economic access to these staples; as the majority of households are obtain wheat almost entirely from the market. As mentioned, households in the four districts consume both local and imported flour/bread (from Kazakhstan or Russia). Since the markets surveys did not distinguish between differences in prices of local and imported wheat, the average prices mentioned in Table 2 could be respectively higher or lower depending on where the wheat was produced. But generally, locally produced wheat is cheaper and consumed by poor households. Whether locally produced or imported flour it is consumed throughout the year. Prices vary slightly among regions – within 5%-10% and depending on the remoteness of districts and their settlements from the railroad.

Prices on buckwheat on the other hand have either doubled or tripled - or is not available at all. The same is the case for chickpeas both of which are imported, not traditional to the region and therefore rarely eaten.

Where prices of staples were significantly higher in 2008 than 2010, the prices of locally produced vegetables, fruits, dairy and meat is higher in 2010 compared to 2008 seemingly also with variations from district to district based on local supply and demand. Fruits and vegetables such as apples, grapes, tomatoes and cucumber are nearly double the price (in average) in 2010 compared to prices in 2008. There are also big differences in prices between districts, where prices in Ellikala are generally lower on fruits and vegetables due to the fact that many of the fruits and vegetables are produced here where water access is more stable. Fresh carrots, cabbage, potatoes, onions, and squash are generally cheap although prices almost double in early spring, which leads many households to decrease consumption in early spring.
Table 2: Prices of selected food items in Uzbek soums, November 2010 compared to market survey October 2008.

<table>
<thead>
<tr>
<th>Food items</th>
<th>Khojeyli</th>
<th>Ellikala</th>
<th>Kanlikul</th>
<th>Taktahkupir</th>
<th>Average</th>
<th>Oct '08 Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>2000</td>
<td>1200</td>
<td>1500</td>
<td>1800</td>
<td>1625</td>
<td>790</td>
</tr>
<tr>
<td>Bean</td>
<td>3000</td>
<td>3000</td>
<td>2500</td>
<td>1500</td>
<td>2500</td>
<td>1700</td>
</tr>
<tr>
<td>Bread, lepeska</td>
<td>700</td>
<td>700</td>
<td>400</td>
<td>700</td>
<td>625</td>
<td>1400</td>
</tr>
<tr>
<td>Buckwheat</td>
<td>7000</td>
<td>4000</td>
<td>n/a</td>
<td>n/a</td>
<td>5500</td>
<td>1800</td>
</tr>
<tr>
<td>Butter</td>
<td>16000</td>
<td>15000</td>
<td>3500</td>
<td>8000</td>
<td>10625</td>
<td>8500</td>
</tr>
<tr>
<td>Cabbage</td>
<td>500</td>
<td>400</td>
<td>800</td>
<td>400</td>
<td>525</td>
<td>550</td>
</tr>
<tr>
<td>Carrot</td>
<td>300</td>
<td>200</td>
<td>300</td>
<td>350</td>
<td>287.5</td>
<td>550</td>
</tr>
<tr>
<td>Chickpea</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>1450</td>
<td></td>
</tr>
<tr>
<td>Cucumber</td>
<td>1500</td>
<td>1200</td>
<td>4000</td>
<td>400</td>
<td>1775</td>
<td>900</td>
</tr>
<tr>
<td>Egg</td>
<td>300</td>
<td>250</td>
<td>400</td>
<td>200</td>
<td>287.5</td>
<td>525</td>
</tr>
<tr>
<td>Flour, wheat</td>
<td>900</td>
<td>800</td>
<td>1400</td>
<td>300</td>
<td>850</td>
<td>4500</td>
</tr>
<tr>
<td>Grape</td>
<td>3500</td>
<td>2400</td>
<td>3000</td>
<td>2000</td>
<td>2725</td>
<td>1500</td>
</tr>
<tr>
<td>Kefir</td>
<td>1200</td>
<td>1000</td>
<td>1500</td>
<td>n/a</td>
<td>1233</td>
<td>850</td>
</tr>
<tr>
<td>Lentil</td>
<td>n/a</td>
<td>n/a</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>1250</td>
</tr>
<tr>
<td>Margarine</td>
<td>5000</td>
<td>3600</td>
<td>4000</td>
<td>7000</td>
<td>4900</td>
<td>2300</td>
</tr>
<tr>
<td>Meat, beef</td>
<td>8600</td>
<td>9600</td>
<td>8500</td>
<td>8000</td>
<td>8675</td>
<td>6800</td>
</tr>
<tr>
<td>Meat, mutton</td>
<td>10000</td>
<td>9600</td>
<td>8000</td>
<td>8000</td>
<td>8900</td>
<td>7500</td>
</tr>
<tr>
<td>Milk, fresh</td>
<td>1100</td>
<td>800</td>
<td>1200</td>
<td>1000</td>
<td>1025</td>
<td>800</td>
</tr>
<tr>
<td>Milk, tetra packed</td>
<td>2200</td>
<td>2500</td>
<td>2200</td>
<td>2400</td>
<td>2325</td>
<td>900</td>
</tr>
<tr>
<td>Sorghum flour</td>
<td>800</td>
<td>n/a</td>
<td>600</td>
<td>500</td>
<td>633</td>
<td>1800</td>
</tr>
<tr>
<td>Mineral water</td>
<td>600</td>
<td>400</td>
<td>800</td>
<td>800</td>
<td>650</td>
<td>400</td>
</tr>
<tr>
<td>Onion</td>
<td>700</td>
<td>600</td>
<td>600</td>
<td>500</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>Pear</td>
<td>2000</td>
<td>1200</td>
<td>3000</td>
<td>900</td>
<td>1775</td>
<td>2200</td>
</tr>
<tr>
<td>Pepper, green</td>
<td>800</td>
<td>200</td>
<td>1500</td>
<td>500</td>
<td>750</td>
<td>500</td>
</tr>
<tr>
<td>Pepper, yellow/red</td>
<td>500</td>
<td>200</td>
<td>1000</td>
<td>500</td>
<td>550</td>
<td>650</td>
</tr>
<tr>
<td>Potatoes</td>
<td>700</td>
<td>600</td>
<td>700</td>
<td>600</td>
<td>650</td>
<td>700</td>
</tr>
<tr>
<td>Pumpkin</td>
<td>700</td>
<td>1500</td>
<td>500</td>
<td>700</td>
<td>850</td>
<td>480</td>
</tr>
<tr>
<td>Raisins</td>
<td>4500</td>
<td>3000</td>
<td>3000</td>
<td>4000</td>
<td>3625</td>
<td>4000</td>
</tr>
<tr>
<td>Rice, white</td>
<td>800</td>
<td>650</td>
<td>700</td>
<td>600</td>
<td>687.5</td>
<td>3200</td>
</tr>
<tr>
<td>Salt, iodized</td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>300</td>
<td>262.5</td>
<td>300</td>
</tr>
<tr>
<td>Sugar</td>
<td>3300</td>
<td>3500</td>
<td>3800</td>
<td>3800</td>
<td>3600</td>
<td>1500</td>
</tr>
<tr>
<td>Tomato</td>
<td>3000</td>
<td>500</td>
<td>4000</td>
<td>500</td>
<td>2000</td>
<td>900</td>
</tr>
<tr>
<td>Vegetable oil</td>
<td>4300</td>
<td>4200</td>
<td>4500</td>
<td>3500</td>
<td>4125</td>
<td>3800</td>
</tr>
<tr>
<td>Watermelon</td>
<td>400</td>
<td>250</td>
<td>1500</td>
<td>n/a</td>
<td>4333</td>
<td>1000</td>
</tr>
<tr>
<td><strong>Total sum</strong></td>
<td><strong>87100</strong></td>
<td><strong>101800</strong></td>
<td><strong>72200</strong></td>
<td><strong>62250</strong></td>
<td><strong>66595</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Market survey, last week of November 2010 compared to prices collected in WHO (2008) market survey

Vegetable oil is another key food item bought at stores/on the market. Very limited amounts of cottonseed and sesame oil are produced in the farms.

---

7 See full market survey ANNEX 3
Based on the findings from the household surveys at least 31% of all the households interviewed do not have access to land and are therefore relying on buying the majority of their foods from local markets.

The mandatory payment of salaries or pensions using debit plastic cards rather than cash, and as mandatory transfer of poverty allowances to stores is posing major problems for many households relying on these various forms of government transfers for economic and food access. The selection of food items in these stores is limited or prices are 10-15% higher. Considering the low incomes of vulnerable families, these circumstances reduce the level of food security. Bazaars/markets, where the main food items at more affordable prices are concentrated (flour, vegetables, and fruit), do not accept debit plastic cards.

“Nowadays, there are state-owned/collective farms, lands were distributed to FEs. Since 1995 salaries have been paid in kind – as cottonseed oil, grain, and combination fodder. This discontinued completely in 1999. All money was remitted via a cheque to a store. In the past, when one worked for a state-owned farm, he/she would buy cottonseed oil at a low price. But now we, for example, deliver cotton, but have to buy oil twice the price than on the market. Stores, where we are to receive our food instead of salaries, buy the cheapest foods on the market and sell them to us at three times the cost. One can only receive flour, tea, sugar, and macaroni at the expense of salaries. But we also have to buy meat for ourselves, cattle fodder and other items. But we have no ready cash at hand. Lack of cash has been a problem for the last five years. Sometimes, it’s even hard to find 500 soums for transportation fare.” FGD, Takhtakupyr

4.5. CLIMATE CHANGE TRENDS IN KARAKALPAKSTAN

Uzbekistan is situated in the Northern band between subtropical and temperate zones with a climate characterized by seasonal and day-to-night fluctuations in the air temperatures, long, dry and hot summers, humid springs and irregular winters. Penetration of radiation heat in wintertime is noticeably decreased. Uzbekistan is situated in the arid part of Asia with minimal precipitation (within the range of 80-200 mm) and occurs during the cold period of the year. The Aral Sea does not affect the quantity of precipitation very much. Extremely high variability of precipitation is characteristic of the country, especially in the warm period of the year. (Centre of Hydrometeorological Service, 2010)

Most parts of the Aral Sea Basin suffer severe anthropogenic impact when low water withdrawal can reach 60-100%. In spite of some reported improvements in water management and access in recent years from interviews with key stakeholders in the four districts of Karakalpakstan and the Ministry of Water and Agriculture in Karakalpakstan, an assessment from the national Centre of Hydrometeorological Service, its Second National Communication under the United Nations Framework Convention on Climate Change indicates an increasingly vulnerable situation in terms of the water resources in the entire Central Asian region. It is stated that the compensation potential of the Aral Sea basin has been exhausted. In the downstream areas and estuaries, water quality is characterized by high mineralization (from 1.070 to 250 mg/l), while areas affected by industrial and municipal sewage the values of nitrite nitrogen, organic substances and heavy metals are several times as high as admissible norms/standards allow. According to the Centre of
Hydrometeorological Service the processes of climate change in the region strengthen the vulnerability to natural disasters such as droughts, and impose a continued threat upon food security. As mentioned the latest drought in 2000-2001 had devastating effects on household food security, and another drought is projected for the coming year due to low precipitation. (Centre of Hydrometeorological Service, 2010).

4.5.1. Impact of climate change on household food production

From the FGDs, it is evident that the population perceives the climate change as persistent trends of increasing seasonal and annual temperatures, more hot and warm days during the year, reduced volume and frequency of precipitation (especially snow). People no longer perceive these trends as usual climatic fluctuations of temperature. There is now a special concern about the reduction in precipitation and an increase in frequency of low-water years, high temperatures in the summer and sudden cold spells (that cause plants to die) during otherwise warm days in autumn, winter, and spring.

Nevertheless, people are not as much concerned about temperature changes, as they are with the risks of frequent and severe droughts and water shortages (the most recent one occurred in 2007-2008), both of which resulted in loss of cattle, deterioration of soil, partial tear down of irrigation and drainage networks between districts, between farming enterprises, especially, between farming enterprises and dehkan farms.

As one woman stated:

“We can cope with the heat, frost, and wind – but what are we to do without snow, rain, and water in the canals during dry and low-water years”. FGD, Takhtakupyr Village

Temperature rise and less extreme continental climate enables farming enterprises and dehkan farms to have up to three harvests from a land plot, and those farms that receive water, especially, on a timely basis have these kinds of harvests. At the same time, temperature rise and summer heat reduced milk product yield (milk yielding capacity and cattle weight gain).


- “In 1965, there was 60% of normal amount of water. And in 2000, 90% of water was lacking. There was no water for about five months.” Mother in-law, FGD Kanlykol
- “In 1973, there was a drought. There was one person standing at each water gate. I watered during the day, and distributed water at night.” Farmer, Khodjei
- “In 1975, we irrigated the land not in April, but in June and there was no water in July and August at all. A district requires 30 cubic meters of water, but back then there were 15 cubic meters of water. Water didn’t reach us.” Farmer, Takhtakupyr
- “In 1986, 1995, 2000, there was little water for irrigation.” Farmer, Khodjei
- “In 1991, there was water shortage, while water consumption was under strict control. Yields declined slightly, by about 10-15%.” Farmer, Ellikkala-aul
- “1993, 1994, and 1995 were the toughest.” Farmer, Kanlykol
• “Droughts occurred in 1996, 1997. In 1996, we received 60% of planned water amount. All the grass turned yellow. We lost the wheat harvest.” Rayselvodhoz, Takhtakupyr.

• “Water shortage began in November 1999 and drought occurred in 2000, so we lost our entire wheat crop. There was almost no water for three years—2000, 2001, and 2002. In 2001, nothing was planted. There was no water at all. Transparent water flowed in the canals. This water was only meant for water for cattle and for household purposes. If somebody used it for irrigation, the water turned black (dirty). So, it was prohibited to irrigate the land. We only had water again in 2003. People wept, when they saw the water. We were preparing ourselves for the worst, we were about to abandon our homes and leave.” Farmer, Kanlykol

Sustainable and sufficient food supply in dehkan farms mainly depends on availability of irrigation water, sustainable supply of which is increasingly at risk in terms of volume and, especially, timeliness. Water, if it is supplied, arrives later than required to achieve yields that would allow the production to recover and provide food.

High risks of harvest loss risks and related expenses result in unwillingness or avoidance of dehkan farmers to produce agricultural goods and maintain their irrigation and drainage networks, despite the fact that after years of drought in 2000-2002 and low-water years of 2007-2008, farming enterprises and dehkan farms in general received sufficient water in 2004-2005 and in 2010.

Efficiency of food production is directly and indirectly related to climate change, water availability in certain months of the year, availability and size of a land plot, soil quality, availability of manpower at a DF and their health. High temperatures and lack of water have a significant effect on wheat yields. This caused a decline in global and local wheat yields in 2008 and increased prices manifold, as mentioned earlier. Also changes in wheat prices between 2009 and 2010 by 45% were reported in focus group discussions.

A rise in average annual temperatures affected quantity and activity of pests and rodents, which reduce crop yield, damage stocks of vegetables/fruit, prevent weight gain and decrease milk yield capacity of cattle. Ten years ago, a cow’s milk yielding capacity was about 20 litres per day, while now it dropped to 5-10 litres daily. In Ellikkala District, milk yielding capacity of cows is at the level of 10 litres per day, while in the northern districts, it amounts to 3-5 litres a day.

“We had water supply in 2010, but the heat lead to multiplication of pests. This year we had to replant tomatoes, carrots, onions, and potatoes three times in our backyard. But we couldn’t harvest anything. In the middle of May, a rain brought a swarm of small black locusts. Locusts never left the field until August. We bought chemicals on the market and treated everything with them. But nothing helped.” FGD, Kanlykol village

The most productive and promising type of grains under existing circumstances of climate, water supply, and soil quality is sorghum, whose grains and stems are good fodder for cattle to increase its productivity. Some FEs and DFs began to expand areas for sorghum production and they require small agricultural machinery for harvesting, since manual harvesting makes sorghum production much more expensive.
Ellikkala and Khodjeyli Districts began to adjust to water shortage and plant crops that are resistant to water stress or soil salinity – sunflower, sorghum, sesame etc. (Interviews with local experts in agriculture at district level).

### 4.6. FOOD CONSUMPTION PATTERNS AND MATERNAL, INFANT AND CHILD CARE PRACTICES

In the following chapter, an assessment of the food consumption patterns and maternal and child care practices will be made based on focus group discussions, household surveys and secondary data to better understand how food consumption and care practices are impacted by food culture, seasonality and climate change, food security and other conditions.

#### 4.6.1. Food consumption patterns

The Karakalpak people use a conventional and laconic saying to describe the structure and seasonality of food consumption: “3 months of ‘kaun’ (melons), 3 months of ‘saun’ (dairy products), 3 months of ‘kabak’ (squash), and 3 months of ‘shabak’ (fish). Consumption of all these types of products has declined considerably in the recent 10 years in all districts according to FGDs.

Melon consumption begins in July and then stops generally by October, since Karakalpakstan has either discontinued or significantly reduced cultivated areas for melon and watermelon varieties that are good for long-term storage. Karakalpakstan mainly produces early-maturing and soft melon varieties. Only in Ellikkala District, there are a limited number of dehkan farmers who know how to grow melon varieties suitable for winter storage. In general, melons are consumed fresh without being processed into preserves suitable for consumption or drying/sun drying, despite the fact that about 20 years ago, this kind of processing was common.

Dairy product consumption increases from spring and continues until early autumn. According to the household survey, kefir is the most common dairy product consumed by the majority of households throughout the year, although some households reduce the consumption during the winter (March). Kefir is a fermented milk product. Other dairy products - such as cream cheese (suzma), sour creme (kaymak) or dried and rounded curd (kurt) - are primarily consumed by better-off families. During the cold season, fresh milk is consumed in the form of “karachay” (strong tea with milk). This kind of tea consumption is common in all districts. Findings from the household survey show that there is a significant positive correlation between educational level and intake of milk.

The main food item consumed throughout the year is wheat flour, which is the main source of calories. Wheat flour (and to a lesser extent sorghum) is used by rural population and some urban residents to bake bread and different types of farinaceous meals – e.g. noodles, dumpling. This is eaten with squash, potatoes and meat.

Findings from the household survey of self-reported weekly consumption (7 day recall) of various food groups in March and September, as illustrated in figures 7 and 8, confirm that the majority of
food is derived from various kinds of bread, especially in the two Northern districts, which for the month of March is more than one kg. per day and even more in September. The consumption of especially pulses and milk is low, but also fruits and vegetables consumption is below the recommended 400 gr. daily recommendations. This is however, primarily a problem in March.

Figure 7: Average consumption of different food categories in March in the two regions in Karakalpakstan expressed as kg or litre/week/adult person.  

Source: Household survey in the four districts

In September on the other hand the weekly consumption of all items, except pulses and milk, is high especially in the Northern districts. So high for a weekly consumption average that it might suggest over-reporting, as the figures are in noticeable contrast to the reports from the same households of skipping meals shown in figure 9 (from the same household survey). A likely explanation, thus, seems to be an over reporting of household consumption, suggesting a difficulty in recalling seven-day average consumption figures.

8 Children under 5 years were presumed to consume 50 % of the amount of adults. Significances are for two-group comparisons (two-sided Student’s t-test: *: p<0.05; **: p<0.01; ***: p<0.001)
Figure 8: Average consumption of different food categories in September in the two regions of Karakalpakstan expressed as kg or litre/week/adult person.

Source: Household survey in the four districts

Looking into the consumption in more details from FGDs (and the household surveys), show that meat is consumed predominantly in autumn and winter, where it is available at affordable prices. In spring and summer, meat consumption is reduced and is substituted with dairy products, green vegetables, and/or vegetable oil. However, the household survey shows that poor households irrespective of district consume very low amounts of meat and dairy products, some only 0.5 kg of meat for a whole week per household, some eat eggs instead but only very limited amounts (less than 10 eggs per household for a whole month). However, only 3 households do not consume any eggs, meat or fish at all. It is more common not to eat cheese and legumes and pulses than meat or milk.

According to the household survey, access to livestock increases the mean caloric intake of meat, but does not contribute significantly to the intake of dairy products. This could be linked to the lower productivity from livestock (impacted by climate change, i.e. droughts and limitations in water access), which is decreasing milk production, or selling the milk to have cash.

Fish is consumed, predominantly from autumn until May although many households do not have access to fish. The consumption of fish was especially low in Khodjeyli where only 2 of the 16 households surveyed consumed fish at all. In recent years, water reservoirs (lakes) were handed over to farmers for lease and this significantly limited access of the population to fishing, since farmers with access rights prefer to sell the fish on the market or beyond the region.

9 The average household size is 7 persons per household including children.
“Non-green” vegetables (carrots, potatoes, onions, and radish) are consumed at equal amounts throughout the year with a slight decline in consumption in April-May. Consumption of fresh “green” vegetables (tomatoes, cucumbers, bell pepper, eggplants, greens, and others) begins in late spring until August. Preserves are made from them at the same time to be consumed in winter and early spring. However, the consumption of vegetables is very low during March compared to September.

Comparing the educational level of the respondents in Takhtakupyr and Kanlikul, 28 had college and university degrees compared to only 21 in Ellikala and Khodjeyli\textsuperscript{10}, which could influence both income levels and food consumption. It is therefore likely that the caloric intake from the various food groups in the northern districts (Takhtakupyr and Kanlikull) might be significantly lower amongst poorer households than the ones interviewed, which might not have been adequately represented in the survey. FGDs in these northern districts do indicate that the problems of poor diets are significant in the North – more severe than revealed in the household survey. Yet, the household survey does show that even with a small sample size, more than half of the households (37 out of 64) experience food insecurity during the year at least once or more during the year and cut food intake to cope with food insecurity. Even though there might be a bias towards better conditions among the households interviewed in the two Northern districts compared to the Southern districts, than the actual situation, 12 households do experience food insecurity here compared with 25 households in the Southern districts (see figure 9).

Figure 9: Number of food insecure households cutting food intake

Source: Household surveys

\textsuperscript{10} 7 had a university degree Takhtakupyr and Kanlikul, compared to only one in Ellikala
During droughts and low-water years, frequency and quality of dietary intake deteriorates significantly, especially in northern districts:

“We ate bread made from barley during water shortage. At that time even bread made from dzhugara (sorghum) was worth its weight in gold. Children cried and didn’t want to eat barley bread – it was awfully bitter. But we had to eat it not to starve to death.” FGD, Takhtakupyr

“All the land was white from salt. There was salt in the air. Salt dust ended up in the mouth and gawed everything inside. Mouths and lips of children and adults were covered with sores. There were 1-2 tuberculosis patients in each house.” FGD, Kanlykol

4.6.2. Women's nutritional status

Dietary patterns of women from poor families show severe risks of poor quality nutrition. From FGDs it was mentioned that they are at greater risk of being malnourished compared to men and children, since women in these families first feed their men and children, especially nutritious and highly valued foods, such as meat, fruit and green vegetables. Figure 9 also shows that women cut their own meals and to a lesser extent cut the meals of their children. In addition, there is a common tradition of male gatherings (“gap”s, “gashtak”s) and mutual food and drink chat parties (“otryspa”) both with and without their family members, these parties help men from poor families to get better diets than women. This intra-household inequality in relation to food distribution and consumption is also manifested in high rates of anaemia among women in Karakalpakstan.

“We see that children grow to be short. Anaemia affects 70-80% of our women and children.” FGD, women in Takhtakupyr District.

The results of a survey by UNICEF and Ministry of Health in 2005 showed the highest rate of anaemia (44%) among women in Karakalpakstan compared to other regions (UNICEF and MOH, 2005). Although it was mentioned by health staff that rates of anaemia are especially high in the spring, when diets are poor due to low consumption of vegetables and meat products, there is a low percentage of women taking any kind of anaemia medication in the households interviewed. According to the household survey of women in the reproductive age, only about 26% received any medication (see figure 10). It is not clear, however, from the survey whether the 55% who did not answer, did not answer because they had not been diagnosed with anaemia or did not have anaemia at all. But with the high estimates of anaemia prevalence mentioned above it is likely that a high percentage of women are anaemic but go undetected and/or untreated.
From the household survey, it was also found that 32 persons out of 64 reported being diagnosed positively for anaemia; 20 from the south (out of 32) and 12 from the north (out of 32). This makes a significant difference calculated with the Chi-square test \((p<0.0455)\) showing that anaemia was more prevalent amongst women interviewed in the south.

**Table 3: Number of women by region having anaemia diagnosed**

<table>
<thead>
<tr>
<th>Region</th>
<th>Anaemia</th>
<th>No anaemia/no anaemia diagnosed</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>12</td>
<td>20</td>
</tr>
<tr>
<td>South</td>
<td>20</td>
<td>12</td>
</tr>
</tbody>
</table>

Source: Household surveys in Khodjejyli, Kanlykol, Ellikala and Takthakupyr districts

Correlating these figures with the frequency of visiting health centres or being visited by health personnel shows that the less frequently they visited a doctor the higher was the prevalence of anaemia diagnosed. This could mean that the real prevalence of anaemia among women surveyed in the southern districts might be higher than reveal in the questionnaire, which was based on women's self-reporting. This in order words limits the reliability of this information.

With these limitations in mind, results from women's self-reporting show that there is a significantly positive correlation between diagnosed anaemia and cutting the size of children's meals: The higher the prevalence of a diagnosed anaemia in women, the more frequently women also had to cut the size of the children’s meals \((p=0.0011)\). Thus, it could indicate that anaemia is linked to food insecurity not only for the women but also for their children; in other words a general lack of food. However, again these figures from the household survey are likely biased in showing a worse situation in the Southern districts compared to the Northern: the situation could be worse in the Northern districts had more women with poorer socio-economic and educational status been interviewed and had the women been tested for anaemia.
Although women do receive nutrition advice from health staff, primarily pregnant women, the cost of anaemia medicine and limitations in nutrition knowledge of health staff (based on interviews with health staff in rural clinics) prevent appropriate treatment and prevention. None of the health staff for instance understood the importance of iron rich foods when introducing semi-solid foods to children after the age of 6 months and beyond. Although iron fortified flour is available in markets, most villagers in the four districts (especially the poor households) eat (and often grow) local wheat, which is not fortified, yet rich in other micronutrients.

Apart from anaemia, overweight and obesity is also an increasing problem amongst women in Uzbekistan. Figures from the 2002 Uzbekistan Health Examination Survey (UHES) show that in Karakalpakstan 22.3% of women have a BMI of over 25 and nearly 16% have a BMI between 25 and 29.9 (UHES, 2002) – ARE THESE BMI FIGURES CORRECT – WHERE IS THE OBESITY FIGURE?. As is the case for other low- to middle income countries, Karakalpakstan - and Uzbekistan in general - is faced with the double burden of disease, whereby infectious disease (tuberculosis) and under-nutrition (e.g. stunting in children, see next chapter) interact with increases in non-communicable disease risk factors such as obesity and overweight, cancer and CVD diseases. It is likely to find under-nutrition and obesity co-existing within the same community and household in Karakalpakstan, although health data and field observations was not able to confirm this. But with stunting in children (see the following chapter) coexisting with exposure to energy-dense, high fat and micronutrient-poor diets, which is characterizing the diets amongst many of the households interviewed (as mentioned in section 4.6.1. on food consumption patterns with data from the household survey), the double burden of malnutrition is likely to be a problem.

4.6.3. Infant care and feeding practice - child nutrition

As women themselves claim, health workers from rural health facilities and urban polyclinics inform them of how to follow the nutrition recommendations during pregnancy regardless of their socio-economic status. In fact, the household survey indicates appropriate breastfeeding practices of exclusive breastfeeding for 6 months except in 3 cases out of 64.

At maternity hospitals, health workers inform women about advantages of exclusive breastfeeding until the age of 6 months and further about benefits of breastfeeding until their children reach the age of two years. Nevertheless, according to health staff at out-patient level women that are malnourished or for other reasons produce little breast milk begin to introduce supplementary foods to children aged 2-3 months in the form of liquid (cow or goat milk) and continue to give liquid foods including baby formula or ground food. This indicates that some women are not adequately aware of appropriate and exclusive breastfeeding practices.

The findings from the household survey showed that the majority of women practice exclusive breastfeeding for 6 months, although some do not understand the term ‘exclusive breastfeeding’ and give water as well. Tea and liquid foods are also given to children under 6 months but only 5-10 women. Furthermore, there is a positive correlation between giving children water and frequency of visits to health clinics, which could indicate that women are in fact advised to give children water (perhaps in connection with hot weather). (See ANNEX 4).
Although the majority of women interviewed practice exclusive breastfeeding for 6 months according to WHO recommendations, data from national statistics give reason for some concern:

There is a sharp reduction in exclusive breastfeeding practices for Karakalpakstan as a whole. From a ‘percentage of infants only breastfed at 6 months of age by percent of all children who reach 1 year of age’ of 96.3% in 2000, the percentage for Karakalpakstan has steadily been decreasing in the 2000s to 67.8% in 2006 and most recently down to only 56.7% in 2007. (UNDP, http://data.statistics.uz/en/mapping/). This could again be linked to misinterpretations amongst health staff about the meaning of ‘exclusive’ breastfeeding leading to over-reporting in the past.

According to FGDs in Kanlykol and Tahtakupir districts, the types of nutrition and meals for children in low-income families differ from those for adults mainly in the amount and components of meals if a child is healthy. If a child is ill or weak, he/she is additionally given dairy products, fresh vegetables and fruit; vitamin supplements are purchased. Women reported that they bought “Pikovit” vitamin supplement. Yet, 15% of respondents in the household survey answered that they had had to cut the size of children’s meals, 18% had children skip meals, and almost 8% did not give food for their children for a whole day (see figure 11) due to food insecurity. However, women compromise their children’s meals only in very severe cases and as a last resort. Instead, more than 37% cut the size of adults’ (their own) meals and 42% skipped meals themselves. So the prevalence of adults skipping or reducing meals is in other words more than double that of children skipping or reducing meals. As mentioned earlier, it is likely that it is the women rather than the men who cut down on meals in periods of food insecurity.

Women in the four districts were not asked in detail about feeding practices for infants and young children. However, a recent WHO assessment (2008) 11 shows that complementary feeding is normally initiated at age 6-8 months mainly in the form of cows milk given with water and sugar.

---

11 In which the district of Chimboy, Karakalpakstan was surveyed.
fruits juices, vegetable purees, eggs, soups and porridges from rice, semolina, potatoes, meat and bread. However, most of it is family foods and not given separately. The main food groups for the complementary feeding are dairy products, grains and legumes. The study showed that children are fed first in the family, however, feeding practices are negatively affected by seasonal food insecurity in winter due to lack of availability of a variety of foods and high prices. (WHO, 2009).

Health centres provide nation-wide routine child growth monitoring until 5 years and promotion of breastfeeding, minor treatment of sick children, immunization and supplementation of vitamin A, which was observed during visits to health clinics in the four regions. Yet in spite overall appropriate breastfeeding practices, problems of seasonal food insecurity especially during winter months and limitations in water access and quantity are likely causes of the highest rates of stunting in children in Karakalpakstan at 18.4% (MICS, 2006). See figure 12. Karakalpakstan is under the West region.

Figure 12: Level of child malnutrition by regions: Stunting (height for age <- 2SD)

![Figure 12](image)


The highest proportion of children with moderate and severe anaemia was found in the Republic of Karakalpakstan (29%) according to figures from 2006 (MICS, 2006). Looking at national data on the severity of anaemia by age group (see figure 13), it is mostly mild to moderate anaemia, which is especially a problem in the 12-23 months age group, where moderate anaemia is the highest at almost 45%. Data from the 2002 Uzbekistan Health Examination Survey, also show similar anaemia figures as the 2006 MICS data mentioned above: moderate anaemia in children is the most prevalent in Karakalpakstan at 28.7%, whereas mild anaemia is found in 19.6% of children and 5.4% have severe anaemia. (UHES, 2002). Other national data from 2005 from the Anaemia Prevention and Control Programme Evaluation in Uzbekistan show a prevalence of anaemia in children 6-24 months at 58.35 % (UNICEF/MOH, 2005).
The drought of 2000-2002 had severe effects on young child nutritional status. A WHO Sentinel Surveillance for Nutritional Health (SSNH) in the drought stricken areas of Karakalpakstan and Khorezm (2001) showed the following results:

- **Weight for age (underweight):** 13.3% of children of the whole sample had signs of moderate malnutrition and 3.1% have severe malnutrition signs. However, it was not clear if this was due to acute or chronic malnutrition.

- **Weight for height (wasting):** In the measured sample population only 0.9% showed severe wasting (<-3 z-scores) in comparison with reference. 4.8% of children showed signs of moderate wasting in the whole sample measured.

- **Height for Age (stunting):** 20.7% of population had HfAs below -2 z-scores (moderate stunting) and 6.5% of the whole sample had HfA lower -3 z-scores (severe stunting).


Although stunting in Karakalpakstan has decreased from the 20.7% in 2001 to 18.4% in 2006, the problem is still significant and higher than the national figure of 14.6% (MICS, 2006). With more droughts expected - and perhaps more severe - these figures could increase – as is also the case with anaemia. Thus, the drought of 2001 (in addition to on-going and future water access problems and the increasing likeliness of droughts in the future) is a direct reminder of the severe impacts of climate change on child nutrition.

Child growth and health status monitoring does take place in many hospitals and health clinics in...
Karakalpakstan, where regular records of child health status (growth monitoring) and women’s health are recorded. WHO growth standards are implemented, however the data is still not aggregated at national level. Furthermore, the reporting is still inconsistent between the districts. The following figures show data from the four districts related to anaemia, stunting and obesity in children. Additional data on Iodine Deficiency Disorder, Vitamin A deficiency, Protein Energy Malnutrition, low birth weight, and Intrauterine growth retardation is also recorded but not consistently.

**Figure 14: Total reported cases of anaemia in children in the four districts**

![Figure 14](source)

**Figure 15: Total reported cases of child stunting in the four districts**

![Figure 15](source)

It is however important to stress that it is impossible to compare the data between the districts as the numbers are total numbers and even comparing data from different years in one district is difficult due to the absence of data on the total number of children, which is changing from year to year. Furthermore, under-reporting is also a key problem. Even though the data here might indicate that the food insecurity is worse in Ellikkala and Khodjeyli due to higher reported cases of various nutrition related problems, this is presumably rather due to better reporting in these districts than due to worse conditions. Lower population numbers in Kanlykol and Takhtakupir districts and fewer rural health clinics might also be a reason for the lower total cases in these two districts, rather than a better overall nutrition situation in these districts. Ellikkala according to all
reports from interviews is regarded as one of the better off districts due to better water and soil conditions for food production and better socio-economic conditions affecting both food availability and access to food and health services.

Figure 16: Total reported cases of child obesity in the four districts

Source: Ministry of Health, Karakalpakstan

According to the reported cases, child obesity is very low in the districts, which however could be either due to under-reporting and lack of reporting or due to the fact that the problem is in fact low. More reliable data on all these nutrition indicators are greatly needed.

4.7. HEALTH AND ACCESS TO QUALITY WATER, SANITATION AND HEALTH SERVICES

Access to water, sanitation, food storage and hygiene, and health services all affect health conditions and are parts of the utilization aspect of food security. Climate change could affect food utilization by altering the conditions for food safety, limiting access to water in terms of quantity and quality as well as changing the geographic range and incidence of infectious diseases (Confalonieri et al. 2007). For instance, many regions across the world are experiencing an increase in the number of people exposed to vector-borne and water-borne diseases, reducing their ability to utilize food effectively. This, however, has not yet been documented in Karakalpakstan. An increase in malnutrition due to changes in water access, water quality and/or food storage conditions could be a result, which also makes populations more vulnerable to infectious diseases.

4.7.1. Water and sanitation

People are concerned with drinking water safety, quality of which has been deteriorating lately and somewhat improved only in 2010 because there was sufficient water in the irrigation network. Quality of groundwater used by remote districts (Kanlykol and Takhtakupyr) has also been deteriorating for the past ten years, especially after the droughts in 2000-2001 and low-water years of 2007-2008. During these years, groundwater tables with relatively fresh water (salt content – 1.5 g per litre) were depleted. At present, salt content in most parts of groundwater
sources used for drinking purposes amounts more than to 2 g per litre\textsuperscript{12}. In rare high-water years, fresh water lenses would not usually get fully refilled, and, for example, in the village and town of Takhtakupyr, only 10% of hand pumps can be used for getting drinking water. (See the picture on the cover page of the Report).

Water pipes laid in settlements and villages are unable to withstand aggressiveness of groundwater, so their service life is short, and they deteriorate and let in soil particles and microorganisms.

\begin{quote}
\textit{``Water in our wells has been salty since 1990 and we have to buy drinking water that is trucked in by a tractor. Three tons of water cost 20,000 soums. It is good for a month, but may not last that long.''} FGD, Takhtakupyr, village
\end{quote}

A pipeline will be laid from Tuyamuyun water reservoir, but water quality there is poor, since the water to this reservoir comes from Amudarya River, which is used by upstream regions to dump their drainage waters high in salt, fertilizer, and chemical content.

In the 1990s and before the drought in 2000-2001, equipment for filtration and cleaning artesian well water from salt was installed in some villages and towns. This equipment is out of order or works partly and without filters as regular pumps.

The population of four districts in Karakalpakstan (but most likely also in general) is susceptible to illnesses related to poor and deteriorating water quality – these are urinary tract diseases, joint arthritis in both adults and children, while in the summer time, gastrointestinal tract illnesses are common, as well as conditions, especially, in children related to infections who consume water that was not decontaminated. High salt levels in water also contribute to high blood pressure.

Some schools provide decontaminated water to children, but supplies are short, just as the water that families give schoolchildren to take to school.

\begin{quote}
\textit{``Diarrhoea, severe poisoning is common in children during low-water years because children are weak from malnutrition. Deaths of young children occurred because of this. There were five of them in our village. Health workers went around houses and explained to parents that they should only give boiled water to their children. We gave our children plastic bottles with boiled water to take to school.''} FGD, Khodjeyli
\end{quote}

Diarrhoea seems to be on the rise in the four districts, except for Ellikkala, according to figures from the Ministry of Health (see Table 5).

4.7.2. Cooking, food storage and food safety

According to national statistics, Karakalpakstan has the second highest rates of microbiological food-borne diseases per 100,000 population in Uzbekistan: Latest figures from 2005 show a rate of 50.8 per 100,000 population, only Ferghana province is higher with 61. Comparing figures from

\textsuperscript{12} Mentioned in interviews with officials in Kanlykol and Takthakupir. MSF (2003) mention salt content of up to 3.5 gr./litre
2004 and 2000, where the rates were at 48 and 47 respectively, document that the rates of foodborne diseases are on the increase. (UNDP, http://data.statistics.uz/data_finder/1084/)

Especially in some low-income families, food safety is undermined due to a lack of refrigerators and consumption of meals cooked an evening before or that were stored for a long time.

In general, women bake bread 1-2 times a week. Most wheat varieties contain little gluten, and according to women in FGDs and local doctors, it becomes covered with mould during storage, which may lead to poisoning.

Meat, meat products, poultry, and fish are consumed only fresh or freshly cooked after heat treatment. However, butchers may be at risk of infection, since cattle rarely undergo sanitary and epidemiological expertise before slaughter.

Dairy products are consumed either with hot tea, boiled, or as kefir\(^{13}\), in the form or fresh or dried and highly salted curds, so they are relatively safe. Health risks may be posed due to milk of some cows in urban areas, which forage on garbage dumps, near piles of rubbish.

“Non-green vegetables” are consumed, as a rule, after heat treatment. Green vegetables are used both after heat treatment, and in the form of fresh salads made from washed or peeled vegetables. Surpluses of vegetables or those purchased in a “cheap” season (during and before September) are preserved, as a rule, by means of heat treatment (pasteurization) or vinegar treatment for the lean season (winter, e.g. March). Fresh fruit is consumed after washing or peeling or made into compotes or preserved, and subjected to heat treatment.

As mentioned by FGDs participants, the very poor consume tea including “karachay”, candy, and bread instead of breakfast or even lunch. This inhibits the absorption of the minimum amount of iron that they consume in the evening with hot meals or in the summer with fresh vegetables and fruit. However, this tea is also widely consumed in all households during and after meals.

The poor (about 50%) generally consume the same meals for lunch and dinner, which is fried or boiled food on the basis of vegetable oil, vegetables, farinose meals, preserved vegetables, and again tea, sugar/candy, bread.

Other non-poor population (about 40%) regularly consume meat, butter, fresh vegetables and fruit into their diets in addition to above-mentioned foods.

Food storage is becoming increasingly difficult due to a rise in annual and seasonal temperatures, and it affects storage of vegetables and fruit in autumn and winter period. Some households in Ellikkala and Khodjeyli Districts store foods, which are suitable for storage, effective and keep old traditions. For example, canning food, making cellars and pits with sand for storing carrot, special small dark storage facilities with clay walls for storing potatoes, sheds for hanging grapes, melons, or floors covered with fine sand for storing water melons, pomegranates, apples, pears wrapped in paper or in sawdust in special cases. In the other districts many have lost or are losing the skill of how to store food.

\(^{13}\) A fermented milk drink
In some farming enterprises and dehkan farms production is wasted (or rots) from August to September due to a lack of community (common) silos and granaries as well as lack of manpower for reshuffling/rotating wheat.

A reserve of meat products is stored from spring to autumn (when the cost of these products reaches a maximum, and the consumption reaches a minimum) with difficulties due to unstable supply of electric power or high expenses. Cooking and storage of meat and fish preserves is difficult due to a lack of small-scale processing enterprises and a loss of skills of preserving meat products, especially, poultry.

The storage of dairy products does not require effort, since there are either processing enterprises (Ellikkala and Khodjeyli) or the population easily copes and has skills of processing at home. Vegetables and fruit are stored between seasons and harvest times, as a rule, in districts, where production volumes are sufficient to set them aside for storage (Ellikkala, and, partly, Khodjeyli and Kanlykol Districts). In Takhtakupyr, the least amounts of vegetables and fruit are stored.

Challenges in storage of vegetables and fruit are related both to the lack of common storage facilities and difficulties in building these at farming enterprises and dehkan farms. Storage in cellars and pits is risky due to possible elevation of groundwater and sizeable expenses on hydro and heat insulation, so such storage facilities should be built either above ground or on upland. There are few of them and they are located at a certain distance from FEs and DFs. Still, some FEs and DFs keep carrots in pits interspersed with sand, while they keep other tubers or fruit in special adjacent structures/warehouses, where they suspend bunches of grapes/melons/watermelons from the ceiling, while other fruit and vegetables are kept in crates/boxes inter-layered with straw.

Possibilities for mitigation of climate change implications are abundant, but used insufficiently, since people are only realizing these changes and have not yet adopted a strategy of adaptation. Therefore, there is a need to initiate community investments into construction of community storage facilities or storage facilities for groups of neighbours, relatives.

4.7.3. Health and health services

The basic package of health services is provided free of charge in Karakalpakstan at primary health care facilities (rural health facilities, Central Urban Hospitals, and urban polyclinics) for the population. From having a centralized health care system in Uzbekistan with duplication at regional and district level, a reform was initiated to establish outpatient and rural medical centres. Although this reform could help provide better primary health services to the rural populations, reports from MSF (2003), World Bank (2007) and WHO (2006) show that the health infrastructure and services are declining due to underinvestment and public-private health financing arrangements, which mean that many poor are unable to afford buying medicines and pay out-of-pocket for health care. Resources have been cut and staffing in the primary health care facilities are inadequate and generally difficult to attract or keep skilled staff in rural health centres. In addition, some services are now only available through charges or informal payments, although some remain free of charge in theory but in reality require informal payments (WHO, 2006; MSF, 2003). As mentioned in section 4.6.2 only 26% of respondents in the household survey receive or buy anaemia medicine in spite of the much higher rates of women with anaemia. In spite of these problems, the household surveys showed that of all the surveyed households, only one of the mothers with children under 5 reported not to go to the health clinic or being visited by a nurse or
doctor in the past year. Nurses visit many women with children under 24 months—and the poor—on a regular basis to improve hygiene practices and provide health information.

Tuberculosis is endemic in Karakalpakstan, which is related to poverty, poor quality of nutrition and temperature fluctuations as well as the level of sanitation and hygiene. At national level new cases of tuberculosis was at 89 new cases per 100 000 per year in 2006 (10 Health Questions report). In Khodjeyli it is at 150 per 100 000 per year, 156 in Kanlykol district and up to 242 in Takhtakupir district in 2009. There is unfortunately no data on the nutritional status of the TB cases.

Table 4: Tuberculosis cases per 100 000 per year

<table>
<thead>
<tr>
<th>Tuberculosis cases</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Per 100 000</td>
</tr>
<tr>
<td>Khodjeyli district</td>
<td>217</td>
<td>151.7</td>
</tr>
<tr>
<td>Ellikala district</td>
<td>73</td>
<td>57.7</td>
</tr>
<tr>
<td>Kanlykol district</td>
<td>72</td>
<td>169.0</td>
</tr>
<tr>
<td>Takhtakupir district</td>
<td>87</td>
<td>218.5</td>
</tr>
</tbody>
</table>

Source: Ministry of Health, Karakalpakstan

During droughts and low-water years, frequency and quality of dietary intake deteriorates significantly:

*THIS QUOTE HAS BEEN USED EARLIER* “We ate bread made from barley during water shortage. At that time even bread made from dzhugara (sorghum) was worth its weight in gold. Children cried and didn’t want to eat barley bread—it was awfully bitter. But we had to eat it not to starve to death.” FGD, Takhtakupyr

“All the land was white from salt. There was salt in the air. Salt dust ended up in the mouth and gnawed everything inside. Mouths and lips of children and adults were covered with sores. There were 1-2 tuberculosis patients in each house.” FGD, Kanlykol

Climate change impacts are manifested in Karakalpakstan as threats of drought and increasing frequency of low-water years and cause deterioration of health and nutrition of the population as a result of reduced productivity in agriculture, even failed harvests, loss of livestock, and increasing food prices.

According to interviews with health personnel in the districts, high temperatures in the summer exacerbate hypertension in senior people, pregnant women, while cold and unstable temperatures in the winter cause respiratory and viral infections of upper respiratory illnesses and pneumonia, and others. Worth noting is that hypertension also increases the risk of various cardiovascular problems by two to three times according to most population based studies (Padwal, Straus, and McAlister, 2001). An example of the effects of the heat below is from a woman in one of the FGDs:

*“June and July were unusually hot this year. I am 54 and I can’t recall this kind of heat or sultriness in the past. In July, my husband died from a stroke. We buried 10 people during...”*
these two months, who died from high blood pressure and heart problems. Among these 10 people, there were two young people – a man and a young daughter-in-law from another family. Many women suffer from goitre. The remaining 8 were aged 45-60. We can't recall so many people dying in our community from a heart attack or blood pressure in recent 20 years. A record-setting surge in mortality from hypertensive crisis and infarction/stroke was registered in the district in the summer this year. Usually, we used to register 10-12 deaths from hypertensive crisis or infarction/stroke per year, but this year, 20 deaths for these reasons were registered in only two months. In addition, there has been a surge in mortality of children during their first year of life from Disseminated Intravascular Coagulation (blood coagulation disorder)."

Similar reports on the health impact of increasing temperatures in summer and more extreme changes between hot and cold days were provided by health staff at the rural health facility outside of Khodjeyli.

As figure 17 shows, some of these health problems could be linked to climate change such as cardiovascular diseases including stroke, malnutrition, respiratory diseases and malaria. A figure adapted from Hughes et al (2010) and McMichael et al (2004) is presented below with a list of health problems potentially influenced by climate change in Karakalpakstan based on the findings from this existing assessment and other analyses from the Republic.
Although climate change could have a negative impact on the following health problems (see table 5), it is not possible at this point at least to see any direct linkages between climate change and these health problems. However, further studies and monitoring of changes and developments related to these health problems need to be made on an on-going basis. Additionally, an important topic for further research is to study, if increased water salinity and prevailing shortages of water in drought stricken areas, (due to climate change) has an impact on increasing hypertension in affected communities, which could be the case in Karakalpakistan. At present, there are no studies investigating this potential link.
Table 5: Health problems potentially affected by climate change

<table>
<thead>
<tr>
<th>Diseases</th>
<th>Karakalpakstan</th>
<th>Uzbekistan</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cardiovascular Diseases</strong></td>
<td>Tak: 25.5 per 100,000 (2008)</td>
<td>56% of total deaths (UHES, 2002)</td>
</tr>
<tr>
<td></td>
<td>29.7 per 100,000 (2009)</td>
<td>18% DALys (WHO, 2003)</td>
</tr>
<tr>
<td></td>
<td>Kan: 10.2 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.4 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ellk: 0.8 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.1 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Khod: 16.8 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14.6 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(MOH data)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>56% of total deaths (UHES, 2002)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18% DALys (WHO, 2003)</td>
</tr>
<tr>
<td><strong>Stunting</strong></td>
<td>Stunting: 18.4% (MICS, 2006)</td>
<td>Stunting: 14.6% (MICS, 2006)</td>
</tr>
<tr>
<td>(Also IDD, Vitamin A deficiency, joint arthritis)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Stroke</strong></td>
<td>n/a</td>
<td>Cerebrovascular disease: 178 deaths per 100,000 (2005), in 2002 it was only: 23 per 100,000 (14%)</td>
</tr>
<tr>
<td><strong>Hypertensive heart disease</strong></td>
<td>Tak: 4.4 per 100,000 (2008)</td>
<td>9 per 100 000 deaths (5%) in 2002</td>
</tr>
<tr>
<td></td>
<td>6.1 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kan: 4.6 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.9 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ellk: 2.9 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.8 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Khod: 7.3 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7.7 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(MOH data)</td>
<td></td>
</tr>
<tr>
<td><strong>Asthma</strong></td>
<td>Tak: 0.1 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.2 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kan: 0 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ellk: 2.9 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.4 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Khod: 0.3 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.2 per 100,000 (2009)</td>
<td>(MOH data)</td>
</tr>
<tr>
<td><strong>Allergies (allergic rhinitis)</strong></td>
<td>Tak: 0.5 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4.3 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kan: 0.07 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ellk: 0.7 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Khod: 0.3 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.4 per 100,000 (2009)</td>
<td>(MOH data)</td>
</tr>
<tr>
<td><strong>Heat related mortality</strong></td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td><strong>Mental health (including depression, suicides and alcoholism)</strong></td>
<td>Tak: 30.1 per 100,000 (2008)</td>
<td>New cases of mental disorders (2005): 130 per 100 000 population per year CIS8: 100</td>
</tr>
<tr>
<td></td>
<td>43.2 per 100,000 (2009)</td>
<td>Suicides or deaths from self-inflicted injuries (2005): 6 per 100 000 population per year</td>
</tr>
<tr>
<td></td>
<td>Kan: 32.8 per 100,000 (2008)</td>
<td>EU27: 11, EU15: 10, CIS8: 8</td>
</tr>
<tr>
<td></td>
<td>105 per 100,000 (2009)</td>
<td>New cases of alcoholic psychosis (2005): 2 per 100 000 population per year CIS8: 43</td>
</tr>
<tr>
<td></td>
<td>Ellk: 94.8 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>113.8 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Khod: 58.7 per 100,000 (2008)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>66.8 per 100,000 (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(MOH data)</td>
<td></td>
</tr>
<tr>
<td><strong>Urinary tract diseases, Acute intestinal diseases</strong></td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
### Gastrointestinal tract illnesses, acute intestinal diseases

<table>
<thead>
<tr>
<th>Country</th>
<th>Rate 2008</th>
<th>Rate 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tak</td>
<td>137.3</td>
<td>84.9</td>
</tr>
<tr>
<td>Kan</td>
<td>197.7</td>
<td>152.6</td>
</tr>
<tr>
<td>Ellk</td>
<td>35.7</td>
<td>64.1</td>
</tr>
<tr>
<td>Khod</td>
<td>98.5</td>
<td>177.3</td>
</tr>
</tbody>
</table>

(MOH data)

- **Food borne diseases**

<table>
<thead>
<tr>
<th>Country</th>
<th>Dysentry bacillus</th>
<th>Rate 2008</th>
<th>Rate 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tak</td>
<td></td>
<td>7.5</td>
<td>5</td>
</tr>
<tr>
<td>Kan</td>
<td></td>
<td>12.5</td>
<td>15</td>
</tr>
<tr>
<td>Ellk</td>
<td></td>
<td>8.1</td>
<td>5.7</td>
</tr>
<tr>
<td>Khod</td>
<td></td>
<td>2.1</td>
<td>1.4</td>
</tr>
</tbody>
</table>

(UNDP http://data.statistics.uz/data_finder/1296/)

- **Respiratory diseases**

<table>
<thead>
<tr>
<th>Country</th>
<th>Rate 2008</th>
<th>Rate 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tak</td>
<td>68.1</td>
<td>79.8</td>
</tr>
<tr>
<td>Kan</td>
<td>152.2</td>
<td>126</td>
</tr>
<tr>
<td>Ellk</td>
<td>2.9</td>
<td>4.4</td>
</tr>
<tr>
<td>Khod</td>
<td>60.1</td>
<td>75.7</td>
</tr>
</tbody>
</table>

(MOH data)

- **Diarrhoeal diseases**

<table>
<thead>
<tr>
<th>Country</th>
<th>Rate 2008</th>
<th>Rate 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ellk</td>
<td>34.7</td>
<td>152.0</td>
</tr>
<tr>
<td>Khod</td>
<td>98.6</td>
<td>78.8</td>
</tr>
<tr>
<td>Kan</td>
<td>185.4</td>
<td>170.7</td>
</tr>
<tr>
<td>Tak</td>
<td>138.2</td>
<td>85.1</td>
</tr>
</tbody>
</table>

(MOH data)

- **Vector borne diseases and Zoonotic diseases**

<table>
<thead>
<tr>
<th>Country</th>
<th>Brucellosis:</th>
<th>Rate 2008</th>
<th>Rate 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tak</td>
<td>5 per 100,000</td>
<td>7.5</td>
<td>5</td>
</tr>
<tr>
<td>Kan</td>
<td>2.5 per 100,000</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Ellk</td>
<td>0.8 per 100,000</td>
<td>1.6</td>
<td>0</td>
</tr>
<tr>
<td>Khod</td>
<td>0 per 100,000</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

(MOH data)

- **Infectious (tuberculosis)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Rate 2008</th>
<th>Rate 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tak</td>
<td>218.5</td>
<td>242.4</td>
</tr>
<tr>
<td>Kan</td>
<td>169</td>
<td>156.7</td>
</tr>
<tr>
<td>Ellk</td>
<td>57.7</td>
<td>49.7</td>
</tr>
</tbody>
</table>

(MOH data)

- **Microbiological food borne diseases**

<table>
<thead>
<tr>
<th>Year</th>
<th>Rate per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>40.6</td>
</tr>
<tr>
<td>2004</td>
<td>28.2</td>
</tr>
<tr>
<td>2005</td>
<td>30.1</td>
</tr>
</tbody>
</table>

(Source: UNDP http://data.statistics.uz/data_finder/1296/)

- **Lower respiratory infections**: 10 per 100,000 deaths (6%) in 2002


- **Parasitic diseases**: 200,000 patients with parasitic diseases (predominantly helminthisms, zoonotic cutaneous leishmaniasis) are annually notified in Uzbekistan (Abdiev FT, Shamgunova GSh. Med Parazitol (Mosk). 2001 Jul-Sep;(3): 60-1. Russian

- **Infectious (tuberculosis)**

<table>
<thead>
<tr>
<th>Country</th>
<th>Rate 2008</th>
<th>Rate 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tak</td>
<td>218.5</td>
<td>242.4</td>
</tr>
<tr>
<td>Kan</td>
<td>169</td>
<td>156.7</td>
</tr>
<tr>
<td>Ellk</td>
<td>57.7</td>
<td>49.7</td>
</tr>
</tbody>
</table>

(MOH data)

- **Infectious (tuberculosis)**

89 new cases per 100,000
4.8. FOOD INSECURITY AND COPING STRATEGIES

Annual challenges of food security begin and are most acute in the period from February to April - what people refer to as “uzilish vakti” (translated as a gap in well-being). During this period money saved up during employment in the spring and summer among entrepreneurs and farmers run out - both within the country and from remittances from abroad. Foods produced locally become available at dehkan farms and on the market from May and reach a peak in August-October. During February-April people run out of their saved money and/or remittances from labour migrants abroad. This is also the time, when farmers run out of their stockpiles of fresh and preserved vegetables and fruits. Moreover, stocks of tubers begin to spoil due to increasing temperature and inadequate storage conditions – they rot or begin to germinate. It is also evident from the results of the food frequency questions in the household survey that during March 14, the consumption of dairy and meat products, fresh vegetables and fruit is significantly lower than in September 15 (see chapter 4.6.1).

During this time the population (approximately 10%) employed by farmers and entrepreneurs faces severe risks, if their income depends on profitability of these enterprises and remuneration is primarily available from May to November. Monthly risks depend on timeliness of salary, pension, allowance payments as well as their amount and the skills of distributing these until next payment. Since salaries in state-run and budgetary organizations in paid twice a month, food security risks arise twice a month in about 20% of families, whose members are employed in these organizations. During this period and before the next payment, there is a reduction in the consumption of meat, dairy products, sugar/candy, vegetables, flour, and vegetable oil.

There is rarely a complete absence of foods in families, except for meat, since families are able to obtain some staple foods – flour, vegetable oil, milk/kefir, and “non-green” vegetables – on credit at stores, from vendors, neighbouring families, relatives, whom they then pay in cash or other foods of equal value. Families can ask vendors to sell them foods on credit, on average, once before they return the debt. People can access other food sources multiple times and reciprocally. However, accessing food on credit, especially from vendors or stores is often considered a very risky coping strategy, in case they cannot repay their debt or the vendors and stores charge interests.

14 In the food frequency questionnaire respondents were specifically asked about the month of March and the amount of food consumed during this month

15 September was identified to be the best month in terms of food access and consumption
Social support from relatives is an important safety net and coping strategy. Rural residents help their urban relatives and those rural relatives, who have limited access to food sources due to a lack of land/cattle, absence of irrigation water, unemployment, illnesses, disabilities and old age. An important source of food consumption - and for some individuals and households coping strategy - is “toy-mereke” (when guests are treated with meals on the occasion of family festivities) – weddings, funerals, birth of a son, circumcision, admission to higher educational institutions, return from the army service, anniversaries of the elders, etc. Since these occasions are quite frequent and entail invitation of neighbours and many close and distant relatives, friends, colleagues regardless of their wellbeing, these “toy-merekes” greatly reduce risks of long-term malnutrition.

The food security questions in the households survey also showed that an important coping strategy and consequence of food insecurity, is for adults (most likely women) to cut meal size or skip meals, some for whole days. In extreme cases the households also cut the meals sizes of their children or have them skip meals (see figure 10 in chapter 4.6.1). From the UHES (2002) a total of nearly 12% of the surveyed women in Karakalpakstan went one or more days without eating during a 6 months period. This is nearly double the percentage estimated for the whole country, which is only 6.4% (UHES, 2002)

From the FGDs with women it was estimated that approximately 80% of population of Takhtakupyr District are exposed to food security risks, where the smallest amount of foods is produced, and mainly relies on imported foods from other districts such as Ellikkala. The population in Ellikkala District is estimated to be least food insecurity (only about 20% of the population). The extent of food insecurity risks experienced in Khodjeyli and Kanlykol Districts is estimated to be between the two districts aforementioned district (nearly 50% of population).

Yet the results from the household survey show that the most food insecure households are found in Khodjeyli, and not Takhtakupyr. However as mentioned earlier this could be due to a bias in the selection of respondents (see section 4.6.1.). Also when looking at a question about the need for food assistance/aid in the households, 11 out of 16 households in Takhtakupyr answered there was no need for any assistance, although more than 62% of all households in all the four districts answered there was a need for food assistance. This could support the conclusion that the respondents in this district were not among the most food insecure and not representative of the situation in Takhtakupyr at large.

Results from a t-test correlating sources of income with the need for food aid, indicate that it is especially those relying on government transfers, self-employment and thirdly employment, that are in need of food aid. Those households relying on their own production feel less of a need for food aid. Yet another t-test correlating access to arable land with calorie intake shows that there is no statistical significance between the access to arable land and increased caloric intake. This suggests that land access does not significantly improve food access and caloric intake. Educational level, however, does, which might be linked to higher incomes. This could be linked to the limitations in water supply and productive soil resulting in low yields.

4.8.1. Climate change risks and coping strategies

Climate change impacts are experienced by the population through the manifestation of threats of droughts and increasing frequency of water shortages. Some cope with these risks by abandoning
field cultivation after droughts and water stress, selling off assets, and/or migrating from districts in search of jobs abroad (about 50% of men) or completely emigrating from the country (about 20%), as stated by participants of FGDs and local experts. For instance, in Takhtakupyr District, whole villages emigrate, while the rest of the population is migrating to towns and districts that lie in upper reaches of the irrigation network and the river. People who permanently migrate from northern districts are referred to as "environmental refugees" by some researchers and NGOs in Karakalpakstan and Kazakhstan, the latter of who are progressively addressing international organizations to introduce this kind of status.

As mentioned in section 4.7.3, mental disorders are quite high in some of the districts especially Ellikkala and Kanlykol (see also table 5). According to local medical staff, depression and other mental disorders in the districts are linked to poverty and inability to raise income levels, and have led to suicides in the 1990s and the early 2000s. During these years, suicides were most frequent in northern districts of the republic. Although this might be linked primarily to social problems, the destruction of natural and physical assets associated with droughts and climate change and related livelihood insecurity, could according to WHO (2009) be triggering or exacerbating mental disorders - even suicides. Some of the stories mentioned during FGDs were:

“A man had two young children. They were starving. This was in the early 2000s. So, he decided to go to earn some money in Kazakhstan. But he needed money for that. He sent his wife and children to her parents’ place and sold everything he had at home – a TV set, carpets, rugs, and etc. He was robbed a day before departure. They took all his money. He hung himself at night at home.” FGD, Takhtakupyr

“A young guy’s wife threw a tantrum – she and her children had nothing to eat and that he was doing nothing to find a piece of bread. Then she left to her parents’ place in another district. In the morning, a neighbour came by and saw him having hung himself in cowshed.” FGD, Takhtakupyr

“During low-water years, children from many families were walking around half-starved. I had two young grandchildren – aged 3 and 1.5 years. We tried to feed them first of all. We still remember how young children jumped for joy, when their parents managed to find and bring home a little bit of white wheat flour.” FGD, Kanlykol

In recent years, especially, during water stress, conflicts between neighbouring families and farmers have increased.

“People had frequent scandals because of water. Water arrived, but never reached the end. Residents living upstream watered their fields without waiting for their turn.” FGD, Khodjeyli

In the 1990s and the early 2000s, poverty and inability to overcome it lead to an increase in prostitution out of need, including that among adolescents as well as to violence in families.

5. DISCUSSION OF FINDINGS AND RECOMMENDATIONS

In addition to document the current situation related to the impact of climate change on nutrition and food security and suggest future challenges, an important part of the assessment has been to
evaluate coping - and risk mitigation strategies and identify recommendations: which coping and mitigation strategies to encourage and support and identify negative or unsustainable coping strategies to discourage by finding positive alternatives. In the following sections recommendations will be made based on the interviews with local stakeholders identifying what can be done to reduce the risks and support adaptive capacities. The recommendations are also inspired by the UN twin-tracked approach to food and nutrition security focusing both on direct and immediate nutrition interventions and safety nets - primarily by the health sector and WHO - and also on broader multisectoral and long-term approaches involving sustainable and climate resilient agricultural production and rural development, health and social protection schemes addressing the needs of the most vulnerable. (SCN, 2010; FAO, 2008 2). Thus, current interventions to build on and recommendations for the future will be suggested, including specific recommendations to the health sector and WHO in adapting to and mitigating health and nutrition problems related to climate change.

5.1. GENERAL RECOMMENDATIONS FOR VARIOUS SECTORS

Findings from interviews and focus group discussions show a wealth of knowledge amongst many interviewees and a determination to handle future climate challenges, which can be built on, supported and disseminated.

At the same time, a cross-cutting problem is, that there is a general need for the population at large and authorities at all levels to increase their awareness and understanding of the seriousness of the problems related to future climate change impacts, such as water shortages - and in this connection take adaptive measures at all levels. In order to protect food and nutrition security of the vulnerable population of Karakalpakstan, there is a need to take a number of steps with regards to water management and supply and local food production ensuring that households have access to nutritious foods throughout the year. It is also key to ensure that the adaptive capacity is developed to handle limitations in water supply and salinized soil. The following recommendations are suggested:

- **Improving forecasting and early warning on climate change and building awareness and adaptive capacity**

Interviews with government representatives, local stakeholders and women in the selected districts revealed a concern about the inadequacy or absence of information about climate change, notably water shortages and droughts, and adaptive measures to minimize the consequences of climate change including:

The following statements were made:

“Drought and water shortage is reported by mass media and authorities, when they are over.”

FGD, Takhtakupyr-town

“The drought began in 2000, but the mass media reported about a drought in the north of Uzbekistan only in 2001. But no one said anything about how long it would last. There were rumours that there would be no water for 5 years, then, that it would last for 10 years.”

Farmer, Kanlykol
None of community representatives, except from some from farming enterprises producing cotton and wheat for government, mentioned receiving forecasts and information from irrigation/melioration specialists and agronomists from rayselvodhoz, and local authorities as sources of adaptive or preventative information about climate change or forthcoming droughts and water shortages as well as for selection of adaptive crops, fertilizers, chemicals, storage. Most respondents claimed that they were not warned beforehand or informed too late about water shortage. People reported that the reason for lack of information was that authorities were worried about provoking panic.

"Who would say to you in spring not to plant anything because there won’t be any water? They (authorities) are afraid that people will abandon land plots and leave from the district. If the government announced that there would be no water and not to plant anything, then panic would rise in public. This is not what the government wants. So, they said there would be water, but little of it. And they placed the order for cotton. They knew that farmers wouldn’t be able to turn in 100% of harvest. So they settled to 30-40% of harvest, this is better than nothing. Farmer, Khodjeyli

According to the respondents, rayselvodhoz employees appearing at irrigation sites and strictly controlling water consumption is one of signs of coming water stress or drought.

"People from rayzelvodhoz showed up at the canals and sat there all the time, so we realized that there would be little water. Then, rumours spread among people that there will be no water. They said there wouldn’t be water for 5-6 years." Farmer, Karakol-Karauziak

Absence or insufficiency of information from specialists and authorities impels people to use “folk” signs of climate change, forthcoming drought or water stress:

“Old men say that if leaves fall late from the trees, there are sure to be hardships. This is also a sign of dry summer.” FGD, Khodjeyli-aul

“Our old men used to say that if crows are flying high, then food prices would go up. If crows are flying low, then there will be no high prices.” FGD, Takhtakupyr-aul

“Water shortage or abundance depends of a horoscope sign of the year. There will be little water in the year of the Rabbit16.” FGD, Khodjeyli-aul

After the drought of 2000-2002, local authorities and subdivisions of the Ministry of Agriculture and Water Resources began to conduct seminars and trainings for farmers on using water during water shortage. Agricultural experts in the districts claimed that there is a system of communication and information on agriculture for farming enterprises, but not for informing the general population about climate change, water shortage threats, and emergency situations, which is a duty of the Ministry of Emergency Situations. Rayselvodhoz employees claimed that they knew beforehand about water shortage threats and took measures to save water.

“They (authorities in Tashkent) advise us about water shortage. We receive a telephoned message. But we are mainly regulated by the district hokimiyat. Hokimiyat informs us about

---

16 2011 is the Year of the Rabbit
forthcoming emergency situations, and we deliver this information to the population.”
Expert, hokimiyat-Kanlykol

Nevertheless, farmers report rumours and listen more to preventative information from elders, which they tend to trust more than information from official information channels.

After lessons learned with droughts and water shortages, the authorities consider reports and briefings from rayselvodhoz, mahalla employees, and health facilities as main sources of information about the situation in the districts. After data collection and decision-making, hokimiyats communicated their decisions “downward”.

“Every evening, hokimiyat summoned the management of rayselvodhoz, chairmen, and foremen of collective farms, chairmen and secretaries of village community assemblies, chief physicians of rural health facilities and collected all reports about the progress of farming operations, water level, its regulation, population health status, number of diseases. Those who collected and received it only knew the data. People were desperate and didn’t know where to run. People set on selling their houses for pennies. No one needed the land. People from other regions bought houses and took them apart to bricks and wood boards. We were hardly able to suppress the panic. We went around houses calming down people.” Person from khokimiat, Khodjeili

“No seminars were conducted where we live to mitigate the impacts of the drought for specialists from district water management bodies, population or schoolchildren neither during the drought, nor afterwards. I haven’t heard about anything like that.” Farmer, Takhtakupyr

Some of these statements also indicate that there is a need for local authorities (Ministry of Water Resources and Agriculture and District Departments of Agriculture and Water Resources, i.e. Rayselvodhoz) and their agricultural, water management and land use experts to improve their capacity to provide advice to farmers (both farming enterprises and Dehkan farms) on how to adapt their normal production and the production in years with water shortages to diversified crops and crops that are drought resistant. There is a great need to develop early warning and future forecasts system to inform farmers and households (including Water User Associations) in general about droughts and other weather events through for instance mobile phone messages or local news media. But also to provide advice to farmers - private and dehkan farmers - on how to adapt their production to a changing and more drought prone climate in the long run.

- **Improve emergency assistance measures to minimize negative impacts and consequences of droughts**

It is important that emergency preparedness plans includes responses to droughts, and technical and food assistance ensured to farmers and the general population. As women in Takhtakupyr complained:

“We received food assistance and wells for drinking water only a year after the onset of the drought.” FGD, village in Takhtakupyr


- **Strengthening the role and capacity of local organizations (mahalla committees), women's organizations and community leaders in adapting communities to climate change and improving food access and nutrition**

  "Knowledge will help us cope with risks." Stated by a woman in Kanlykol village.

Local experts and the population put forward suggestions that a wide range of knowledge about climate change and relevant risks of food production was a priority. But local experts and older women also offered to train the population in both traditional methods (those forgotten) and modern methods of production with limited water and storage of foods (both of vegetable and animal origin). Besides these methods, people need to be taught how to ensure healthy and balanced nutrition using local products.

Health staff and women are generally unaware of recommended nutrition standards for different ages – animal and vegetable proteins, vitamins, fats and their content in certain fresh or process foods.

Various types of broadcasts on television were also identified as important sources of information and means of increasing the awareness of the public. Especially those programmes they watch on foreign TV channels are important sources of this kind of knowledge such as programmes with conventional names like: “My Home Garden”, “My Garden” and “Healthy and Economical Cuisine”. The current local TV broadcasts on agriculture, health, and nutrition were considered unappealing in presentation and content.

Besides TV channels, experts and the women interviewed suggested to publish books, brochures, and manuals on production, storage, processing, and cooking locally grown foods that are translated and adapted to local conditions and could meet the dietary needs of the population.

The respondents believed that the role of local organizations is insufficient or fails to match their objectives in the area of preventive information and minimizing climate change impacts, low precipitation, and water shortage. Experts, farmers and women gave examples of what local organizations, e.g. the hokimiyat, rayaselvodhoz, and WUAs, TV and radio, Mahalla committee leaders, should do:

“There should be measures available beforehand to prevent and mitigate consequences of water shortage. People need to be taught what and where to plant, how to save water, and how to distribute it equitably. Hokimiyat employees should be in charge of this. This information should be delivered as early as possible via TV, radio, and at meeting at Mahalla committees, gatherings of FEs and DFs.” FGD, Kanlykol

People consider timeliness of information and training as the most important condition for minimizing damage to effectively distribute and use their resources.

“If we were informed about a drought on time, then we would repair deteriorated boreholes and wells. We would try to find and prepare pumps.” Expert, Ellikkala

“If the specialists informed people would change cropping patterns and crop types; they would choose and plant crops that are resistant to high temperatures and tolerable to amount and variations in timeliness of irrigation. Of course, some people would be
frightened; there even may be panic. On the other hand, though, they can take precautions and train people how to act during the coming drought.” FGD, Khodjeyli

Some of these findings in other words show that with the right kind of timely information and using already existing knowledge on food storage for instance, people are eager and prepared to take on the adaptive measures and other precautions to enable them to better withstand future climate risks and shocks. However, it is also likely that some households with less livelihood assets would chose to give up and migrate. Yet this is often the very last resort, as the conditions in the new setting are not necessarily better than where they came from. Nevertheless some households or individuals will inevitably chose to migrate and many have already, although the findings from MSF’s report from 2003 on the Karakalpak population and the Aral Sea Disaster suggest that many people are unwilling to giving up their homes. (MSF, 2003).

Measures to adapt and mitigate risks for farming productivity:

- Training and strengthening local communities and their leaders in organizing dehkan farmers for improving irrigation networks between different dehkan farms;
- Training and strengthening local communities and their leaders in influencing WUAs to ensure timely irrigation water supply;
- Training dehkan farmers in choosing drought resistant varieties of vegetables, fruits, cereals and nuts (requiring limited water), diverse in variety and meet the dietary needs of the population.
- Training in methods of tending crop production, increasing yield and processing and storing crops;
- Training dehkan farmers and community leaders in setting up community funds for vegetable and fruit production to provide food support to the most vulnerable households.
- Training in pest control methods and soil improvement methods and supply relevant products on the market.  

- Expansion of existing projects on adaptation for climate change and information sharing

At the moment, there is a lack of institutions and NGOs for educating and training dehkan farmers (or what is in place is insufficient) in achieving higher productivity, diversity and adapting to climate change. However, UNDP’s project on Area Based Development has worked in this area; training 90 extension workers in practices of climate change adaptation and seeds have been improved. Through this programme 90 demonstration plots have been established where practices of improved planting and water efficiency are applied. This is a programme, which should be built on by other stakeholders adding a nutrition education dimension (see chapter 5.3).

---

17 Through Training of Trainers
• **Strengthening farmers’ knowledge and skills to adapt production to climate change focusing on diversified food production**

Farmers and agricultural experts suggested that their capacity to change cropping patterns and crop types in accordance with expected risks should be strengthened. A similar suggestion was proposed in relation to meat and dairy production, as there has been a reduction in meat and dairy production because it has become harder to grow fodder crops due to lack of water. Experts suggest reducing cropland areas for cotton in districts, where crop losses are high, and allot those areas for fodder crop cultivations – primarily, sorghum and corn, and alfalfa (the latest in good years with water). Farmers say that after alfalfa, the soil increases its productivity. Alfalfa was a traditional crop in Karakalpakstan. Other drought resistant crops should also be promoted. Therefore, emphasis should be put on increasing farmers’ skills in soil management and crop diversification, thus improving soil fertility and reducing risk of crop loss. Diversified production will have a positive impact on nutrition and food security.

• **Supporting measures to provide insurance for farmers against crop or cattle loss**

At the moment there is lack of insurance available against crop or cattle loss as a result of climatic and other associated threats. Many farmers could produce agricultural goods for food, but hesitate because of the high risks of loss in relation to the financial and labour investments required.

> “The government rendered assistance 25-30 years ago, when strong winds broke and damaged many of our fruit trees. The authorities calculated everything and they issued an order and compensated the incurred damage. They reduced taxes during the years of drought.” Expert, Kanlykol

However, some experts pointed out that the expectation of compensations could discourage people from making their own active efforts to take precautionary measures to reduce consequences of water shortage or emergency situations. It was therefore suggested that authorities should take charge of actions that farmers and the population at large are unable to carry out using their own expense and resources. For example, drilling boreholes to reach groundwater and reserve these for cases of water shortage and drinking, ensuring reserve electric and diesel pumps to elevate water in case its level drops in canals and water reservoirs, and strict control over the water distribution procedure.

• **Strengthening maintenance of irrigation networks and effectiveness of water management**

Experts, especially, leaders of dehkan farms consider it important to prepare irrigation networks and keep them in adequate conditions for improved effectiveness in water management within dehkan farms. This would require creation of worker groups, who would be paid out of the fund for public works at *hokimiyats* and Mahalla Committee funds.
“We need to bring irrigation networks both between villages and within villages and towns into working order. Not only for cases of water shortage. The irrigation network has not been cleaned since the 1980s. Last time, the canals were cleaned was 1981. If they were better working conditions, maybe during water shortage, water would reach us better.” FGD, Takhtakupyr

Improvements in the interventions related to water supply were suggested by some of the interviewees. The water pumps supplied by international organization should be supplied well in advance in all places, where the risk of water shortages is high. These pumps should be removed from operation and protected by Mahalla committees for periods with water shortage.

- **Improving efficiency of water use through the promotion of basic unsophisticated and affordable equipment for drip and trickle irrigation**

The country has all kinds and sizes of materials for this equipment – plastic and polyethylene pipes and hoses.

“Trickle irrigation could economize water, for example, when land is irrigated sparingly for 20 days rather than 10 days abundantly. Water should be supplied evenly for this purpose. But we don’t always have water in our irrigation canals and if there is water, it just flows without any use.” Expert, Khodjeyli

“There is an Israeli drip irrigation technology. Canal irrigation requires 100 cubic meters of water a year, but drip irrigation only uses 10 cubic meters of water.” Farmer, Kanlykol

Some DFs are already using primitive water-efficient irrigation methods. They take 1.5 litre plastic drinking water bottles and install them under plants. This is usually done on tamorka and in orchards for seedlings.

“They use plastic bottles in Ellikkala. They turn them upside down and water trickles down and irrigates the plants. This can be used in home gardens on an area of 10-15 one hundred square metres.” Expert, Khodjeyli

- **Enhancing resilience to price fluctuations and reducing food waste and losses**

Food access difficulties and resilience to food price fluctuations could be overcome, if:

- Food producers were taught to produce foods in home-based greenhouses under polyethylene film (to protect from cold spells) and women were trained in storage of vegetables for longer periods, for example, in cellars and to sell them year-round;
- Vendors had refrigerated warehouses to store perishable meat and dairy products, vegetables and fruit properly
- Farmers were trained in methods of animal breeding and increasing milk yielding capacity and weight gain;
Micro-credit organizations and banks issued credits for food producers to build greenhouses, warehouses, purchase fertilizers, and pest and rodent control chemicals.

**Enhancing Social Protection and Safety nets**

The importance of providing government salaries and social benefits in a timely manner was highlighted in various focus group discussions:

“In emergency situations, the government should provide for wage mark-ups\(^{18}\), so that we can buy, at least, staple foods, which are sold at higher prices during that time. Instead, salaries are delayed or never paid. We couldn’t get anything from land or receive salaries.”

FGD, Takhtakupyr

The authorities have provided and continue to provide beneficent aid to those in need, but it is insufficient to cover everyone in need. As a rule, these are monetary allowances and food purchase privileges.

“Not only the poor starved. Those who had something to sell – sold whatever they had left. The poor had nothing to sell. So, the assistance of the authorities helped people. The authorities provided flour to the poor – a whole bag – and a lot of vegetable oil. Those who were a little richer than the poor and those who didn’t receive the help even envied them. We saw on TV that because of the drought, train cars of humanitarian aid was received from abroad.”

FGD, Takhtakupyr

Community level funds, food reserves and medication storage were also mentioned as a community level safety net. Increasing the role of micro-credit and insurance organization for granting credits on food production, purchase of cattle, insurance and compensation for lost crops and orchards of general population and farmers is also advisable as well as decreasing or cancelling taxes under condition of water shortage and drought.

**Support from international organizations in disaster preparedness and climate change adaptation**

A number of international organizations have supported various sectors and interventions in Karakalpakstan already, primarily UNDP, Medicins Sans Frontieres and the GTZ. In 2008, UNDP did a review of international assistance to Karakalpakstan and the Aral Sea region, showing that this assistance has covered many sectors, ranging from short-term activities such as addressing urgent needs of the population affected by drought, to mid-term ones such as water supply and infrastructure maintenance and/or improvement. Also more long-term goals and involvement have been put in place such as assisting in the reform of the health care system, agricultural and other socio-economic sectors in the region. Most of these projects were found to work across sectors aiming at impacts on several aspects of the social, economic and environmental systems in the region. (UNDP, 2008).

\(^{18}\) In the 80s, the Karakalpak population was paid allowances to wages and pensions as the population residing in an ecological disaster zone. The population remembers about these allowances and would like to be paid them again
Projects aimed at improving people’s health and supply of irrigation and drinking water accounted for the largest proportion of total assistance, respectively 36.6% and 30.3%. Sustainable natural resource use and management was also receiving a relatively high percentage of assistance at 17%. It is clear when comparing the findings of the UNDP report to the needs and recommendations in this chapter, that there is still a need for enhancing assistance to especially sustainable agricultural development, drought mitigation, improvements of hydro-meteorological services and social protection of vulnerable groups to match the future needs impacted by climate change, while continuing and adapting existing efforts in the areas of health, sustainable natural resource use and management and supply of irrigation and drinking water to climate change.

In addition to the support needed from government and international organization, there should also be a focus on drawing on and strengthening community work, as people have some important resources and skills to provide (knowledge and labour) and are ready to work for nominal salaries or even for food in the times of unemployment. As these findings show, there is a wealth of knowledge amongst many interviewees and a determination to handle future climate and food and nutrition security challenges, which can be built on, supported and disseminated across districts.

5.2. RECOMMENDATIONS FOR THE HEALTH SECTOR

It is evident from the findings that climate change is having a significant impact on nutrition and food security, although some of the impacts on the nutrition situation are (not insufficiently)-NOT SURE WHAT IS MEANT HERE monitored locally and difficult to attribute only to climate change. Other factors are also at play here, such as social factors, inefficient water management, land issues and agricultural policy and last but not least the man-made Aral Sea disaster caused by mismanagement of water resources. However, the nutrition situation can only be expected to deteriorate even further in the future due to current and projected changes in water supply and weather conditions linked to climate change, impacting food availability and access directly, in addition to having negative impacts on food safety (storage, refrigeration and water quality) and a worsening health situation.

Meetings with local health staff at rural health clinics revealed that some of the health staff are already starting to see connections between seasonal variations in health problems and climatic impacts: e.g. that there are increases in cases of high blood pressure, strokes, skin rashes in summer in connection with droughts and salinization. Yet, the connections between health, nutritional status and dietary intake and how it is impacted by climate change are not well understood by the health staff on the ground.

As a general recommendation, there is a need on the one hand to increase awareness amongst health staff at all levels about nutrition in general and about the impact of climate change on health and nutrition; and on the other hand to initiate and expand nutrition interventions.

The specific recommendations are as follows:

- Public health, nutrition and sanitation training for health staff
Interviews with health staff in the 4 districts and the household surveys revealed generally appropriate breastfeeding knowledge and practices among health staff and women. However, numbers mentioned earlier for Karakalpakstan on percentage of children exclusively breastfeed for the first 6 months went from almost full exclusive breastfeeding for the first 6 months to a percentage of only 56.7% in 2007 (UNDP, http://data.statistics.uz/en/mapping/). An explanation for this could be that the term ‘exclusive breastfeeding’ was not well understood even by doctors, for which reason the prevalence was overestimated. Findings from the household survey show that some women do supplement breastfeeding with water and other liquids for which reason continued efforts to promote proper breastfeeding practices are still crucial. Incorrect advice from health staff or limited knowledge amongst mothers e.g. for malnourished women to discontinue exclusive breastfeeding to supplement breast milk with water, needs to be addressed through in-service training.

Thus, a continued focus on starting appropriate and exclusive breastfeeding practices is needed to ensure that infants get the right kind of nutrients from breast milk and to avoid supplementing breast milk with other fluids such as water and tea to infants. As mentioned, water is regularly found to have unusual high amounts of salt of levels of between 2. gr./litre and up to 3.5 gr./litre (interviews and MSF, 2003)\(^\text{19}\). In addition, training and awareness raising on adequate and safe complementary feeding should be part of future efforts, especially focusing on local sources of food and hygienic practices for preparing complementary foods to minimize the risk of contamination with pathogens.

There is a tremendous need to strengthen the awareness of health staff of more general nutrition to prevent nutrition related problems which are likely to increase in the future as a result of climate change, and related limitations in food access and dietary diversity due to increasing food prices, food production problems and food safety issues. Some of the biggest problems from a health sector perspective seem to be an overestimation of protein recommendations\(^\text{20}\), insufficient anaemia detection and intervention, inconsistent child growth monitoring and reporting, and limited knowledge of appropriate complimentary feeding for children under the age of \(2\)\(^\text{21}\). In addition, the focus on promoting more fruits and vegetables in the diet is limited and important for keeping the immune system healthy, enhance iron absorption and reduce cardiovascular diseases, which is the main cause of death (premature mortality) in Karakalpakstan and Uzbekistan as a whole. Yet, it is important to highlight that the primary problem here is not

\(^{19}\) Interviews with local experts only mentioned rates of 2,0 gr. of salt/litre water.

\(^{20}\) Interviews with health staff showed that the general protein recommendation was 100 gr. per day for adults whereas WHO recommends only 50 gr. per day.

\(^{21}\) Women and health staff were not asked in depth about complimentary feeding practices and knowledge. But a WHO assessment on feeding practices from 2009, including a case site in Karakalpakstan, suggests that this knowledge is weak and based on former Soviet standards where complimentary foods e.g. included additional fluids (tea and water with sugar) and introduction of vegetables and jam with water at one month of age; introduction of un-modified cow’s milk at 4 months; and other foods with added sugar and salt such as porridges at four months, and fruits at 2 months.
only limited awareness, but also limited availability of and access to healthy foods during winter months.

WHO is recommending early detection of anaemia and TB and strengthening primary health care programmes. In some of the districts such as Khojeyli, the health staffs is already giving nutrition, sanitation and food safety advice targeting especially poor households. However, the quality of this could be improved and should be further strengthened in the health services across the Republic. Nutrition and sanitation education for existing health staff should be strengthened through in-service training and Training of Trainers, to expand nutrition awareness and food-based approaches amongst primary health care staff throughout the Republic. Integrating more nutrition into curriculum at medical colleges is also important. At the moment, there are no degrees in nutrition in Uzbekistan and there are only limited nutritional sciences and health promotion in the medical curricula, although nutrition and diet is taught as a part of the general medicine curriculum. Strengthening programmes in community nutrition for health staff (nurses and doctors) based on local sources of iron and other essential micronutrients are important to build into health and nutrition promotion. In addition, information to the public either through the media or primary health care staff on minimum subsistence food items, or recommended quantities of foods to eat per person a day to meet dietary needs including their cost is recommended.

- Integrating climate change considerations into primary health care systems and the Integrated Management of Childhood Illness (IMCI) programme in Karakalpakstan

In addition to more general nutrition and sanitation awareness, there is a need to focus specifically on the health of children under 5 years in the primary health care system, e.g. through IMCI programmes integrating climate change awareness and adaption of climate change considerations into current programmes and trainings. IMCI is an integrated approach to child health that focuses on an integrated strategy, which takes into account the variety of factors that put children at risk. It promotes improved child nutrition and includes both preventative and curative elements that are implemented by families and communities as well as health services. IMCI programmes have already been implemented by ZdravPlus and UNICEF in Karakalpakstan, but could be expanded to have a strong nutrition and food safety/hygiene component, to handle potentially increasing problems of lack of water and poor drinking water quality, diarrhoea, heat related problems and local sources of nutritious foods. Integrating climate change considerations into primary health care system at large is also recommended.

- Setting up a nutrition early warning and surveillance system and a comprehensive analyses of the multiple climate change-related threats to food, nutrition and NCDs

Presently there is a lack of regular monitoring of the nutrition situation in Karakalpakstan (using such nutrition indicators as e.g. stunting, wasting, overweight, low birth weight and anaemia).
Most of the nutrition data available at the moment is outdated and based on MICS and DHS surveys or irregular data from district health departments. However, many hospitals and health clinics in Karakalpakstan do keep records of child health status (growth monitoring) and women’s health but reporting is inconsistent. UNICEF has conducted trainings on growth monitoring and infant feeding in different regions of Karakalpakstan based on the new WHO Growth Standards, which are available and used. Although these have been adopted at national level, the knowledge and skills of medical personnel need improvement. Nutrition surveillance is also part of the existing IMCI programmes and training programmes developed by WHO and UNICEF. Developing a nutrition surveillance and early warning system based on existing data collection (with additional training in improved anthropometric measurements and in data reporting and processing at various levels) would enable better data access and monitoring of nutrition and climate change correlations, in addition to improving health sector responses and emergency assistance. A sentinel site surveillance system was already developed and used in 2001 by WHO during the drought, as an effective tool of monitoring nutritional status of the population in the drought stricken areas. This could be used on an on-going basis to detect changes in health and nutritional status.

- **Food-based interventions related to anaemia and other nutrition related problems**

The widespread problem of anaemia in women and children calls for interventions, including increase iron in the diet. While iron fortification of wheat might be a suitable option for older children and women, infants and young children, however, do not consume enough flour to benefit from this. Here home fortification - in the form of micronutrient powder - could be an option, but would require that households can afford to buy this powder. Promoting local food sources of iron such as liver (liquefied or minced) and iron rich green leafy vegetables, legumes, pulses etc. would be a more sustainable option.

Studies from other countries show that food-based approaches in communities with anaemia can positively contribute to improved intake of food containing iron as well as providing a sustainable and relevant prevention strategy (Verrall and Gray-Donald, 2004; Thompson, B., 2006). Especially within poor families that cannot afford to buy supplements and/or buy the flour fortified, nutrition promotion on available iron-rich food sources and introduction of techniques to improve the iron bioavailability of existing food sources, could be a more sustainable way of reducing the anaemia problem. At the same time, promoting general nutrition improvements of dietary diversity could also target cardiovascular diseases, TB and other nutrition related problems. Educational and communication strategies that accompany food-based approaches are important because they can increase women’s understanding of improving food intake and health status of herself and her children. Nutrition promotion strategies need to go hand in hand with improving the access to iron rich foods (and other micronutrient rich foods) such as meats, poultry, and fish, and plant foods such as cereals, pulses, legumes, grains, nuts, and vegetables through various community-based interventions related to water supply and agriculture mentioned in the previous chapters. A collaboration between UNDP’s Area Based Development programme in the area of food production adapted to climatic changes on the one side and a WHO and UNICEF collaboration focusing on nutrition knowledge and promotion of local sources of nutritious foods rich in

---

22 This is based on the WHO (2009) assessment. Whether this is the case in all districts of Karakalpakstan is not clear.
micronutrients could be an idea for a future joint UN programme.

- *Introduce programmes on Community-based Management of Acute Malnutrition (CMAM).*

As mentioned earlier, the WHO Sentinel Surveillance for Nutritional Health (SSNH) in drought stricken areas of Northern Uzbekistan from 2001 showed increasing levels of acute malnutrition in children of drought stricken areas of Karakalpakstan (see table 6).

**Table 6: Nutritional indices from the WHO Sentinel Surveillance for Nutritional Health (SSNH) in drought stricken areas of Northern Uzbekistan**

<table>
<thead>
<tr>
<th>Index</th>
<th>Merged data of Khorezm and RK</th>
<th>Confidence limits</th>
<th>RK</th>
<th>Confidence limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>WfH &lt;2Z-scores</td>
<td>4.8%</td>
<td>3.9-5.9</td>
<td>5.7%</td>
<td>4.5-7.3</td>
</tr>
<tr>
<td>WfH &lt;3Z-scores</td>
<td>0.9%</td>
<td>0.5-1.4</td>
<td>1.3%</td>
<td>0.7-2.2</td>
</tr>
</tbody>
</table>

WfH <-2Z scores 3.4% (28) in Khorezm and 5.7% (62) in Karakalpakstan (RK) (p<0.05, \(\chi^2 = 5.41\)).

Source: WHO, 2001

In order to prepare for future and maybe more severe droughts, a pilot programme on Community-based Management of Acute Malnutrition (CMAM) should be set in place in drought prone areas of Karakalpakstan. The community-based approach involves timely detection of severe acute malnutrition in the community and provision of treatment for those without medical complications with ready-to-use therapeutic foods (RUTF) or other nutrient-dense foods at home.

Training at local level in the production of RUTF could help prepare communities for future food insecurity and drought situations and provide the necessary proteins, energy and micronutrients for children. This could help ensure a timely supply for children under five with signs of malnutrition with effective treatment. It is important here to ensure training and collaboration of local health staff, women and farmers in producing RUFT and coordinating appropriate monitoring and interventions. This should be linked to some of the interventions on strengthening community-based food security and livelihoods interventions already mentioned, which could help expand nutrition interventions that successfully and sustainably address the immediate and underlying causes of malnutrition and develop the population’s resilience to the growing impacts of climate change, e.g. small-scale agricultural development, income generation, water and sanitation, nutrition education and hunger safety nets.

- *Mainstream the climate dimension into existing health initiatives and nutrition programs and upscale best practices and lessons learnt in the area of primary health care and nutrition*

Based on the review of donor assistance in the Aral Sea region 1995-2005 by UNDP (2008), a number of improvements in public health services were introduced during this period in Karakalpakstan, such as surveillance, training in public health and control of communicable disease. Village health committees have been established and pilot community-based
organizations, such as breastfeeding support groups and health courses for mothers; child survival co-ordinating committees have been set up to; and a network of health professionals was established in outlying clinics to effectively promote breastfeeding and manage serious diarrhoea and acute respiratory illness cases. Using some of these existing initiatives and institutions to integrate climate dimensions into these primary health care initiatives would make an important contribution in preparing communities and the health sector for impacts of climate change on health and nutrition in Karakalpakstan. Priority should be on actions for the most vulnerable households and individuals (particularly nursing and pregnant women, infants and children under 5), and priority should be given also to non-communicable diseases, which are more prevalent that communicable diseases in Karakalpakstan.

- **Recommendations for WHO and other international stakeholders**

Based on these recommendations the specific areas of support, which WHO and other international stakeholders could support, e.g. through joint UN programs or other cross agency collaboration, should be the following:

- Scaling up existing and additional nutrition interventions (e.g. IMCI, CMAM and other programmes) that successfully address the growing impacts of and threats from climate change

- Provide support for research to build further evidence on the impact of climate on nutrition and required responses, including support for the establishment of a nutrition early warning and surveillance systems integrating climate dimensions

- Assist the country in developing capacity within the primary health care sector to adapt to climate challenges and strengthening the capacity to prevent and manage non-communicable diseases – promoting healthy diets but also improving mental health interventions

- Provide sufficient and additional resources to support climate change adaptation

- Support integrated food and nutrition programmes which link nutrition awareness amongst health staff and mothers with the production of micronutrient rich foods and proper processing and storage e.g. through a joint UN Programme (between UNDP, WHO and UNICEF) or joint programmes with NGOs in community food and nutrition interventions (such as Helen Keller International or RUAF – Resource Centre on Urban Agriculture and Food Security)

**6. CONCLUDING REMARKS**

The findings are showing that there are increasing threats to food and nutrition insecurity in Karakalpakstan due to climate change. This is affecting the water supply and water quality in the Republic putting strains on food production, which is affecting household food insecurity especially during increasing drought periods and during the winter season. Although recent improvements in water supply and management was reported in some districts and linked to
improved food production in general, there are households in all districts who lack access to food and dietary diversity, many of whom reported skipping meals, running out of food, lacking dietary diversity, especially protein but also micronutrients. This is manifested in high rates of anaemia, tuberculosis, under 5 stunting and especially cardiovascular diseases. Diarrheal problems are also widespread and problems of proper storage of food were also reported. These problems are exacerbated during drought periods, when important assets are lost including livestock and the sale of assets becomes an important coping strategy in addition to outmigration. However, a number of other problems are also influencing food and nutrition security in Karakalpakstan, which are not linked to climate change: primarily mismanagement of water resources and general poverty trends. For this reason it is difficult to link general food and nutrition security directly to climate change, although reports from focus group discussions did show that people experience increasing problems with health and food access as being linked to changes in climate.

The assessment was structured based on the Conceptual Framework for food and nutrition security and impacts of climate change by Crahay et al (2010). Findings show that the impacts of climate change and the threats are very much context-specific and differentiated for which reason figure 18 has been developed to illustrate and sum-up the context-specific impacts and pathways relevant for the Karakalpak context.

Figure 18: Climate change: Impacts and pathways on food security, nutrition and health in Karakalpakstan
Worth stressing is the fact that under ‘immediate effects’, some of the main categories are affecting each other internally and are not directly caused by climatic shocks: For instance, inadequate care practices and the lack of dietary diversity is influenced by problems of food availability and seasonal instability, which is affected by climatic shocks and trends. Additionally, problems of poor water quality and quantity is as stressed, not only affected by climate change, but also by mismanagement of water resources in the past.

The baseline assessment is based on a small sample size of districts and households and only gives a current picture, with improvements to be made in terms of assessing seasonal variations in food consumption. There is a need for follow-up monitoring and larger assessment, as well as monitoring the nutrition and food security situation on a continuous basis. This should be combined with establishing food and nutrition programmes focusing on building adaptive capacity to climate change, food-based approaches, and nutrition awareness as well as monitoring and improving the early warning system related to climatic shocks.

With more droughts expected - and eventually more severe – increasing health and nutritional problems can be expected in the future – in addition to annual heat, food and water related problems affecting health too. For this reason, the urgency of the health sector preparing to adapt to and mitigate climate related health problems is critical. Cross-sectoral collaboration and support to the primary health care system is essential. Although the restructuring of the health care system has shifted towards primary health care, it will be very difficult for the existing health care system to cope with increases in health and nutrition related morbidity associated with climate change and strengthen the adaptive capacity of the population: This is primarily due to the fact that primary health care clinics are under-resourced and many low-income households do not have economic access to medicines and medical support. In addition, awareness initiatives related to nutrition and climate change and monitoring of the nutrition situation are limited. Support to monitoring, early warning, awareness of climate change and nutrition and the strengthening of existing programmes and collaboration across sectors are key to protecting the population of Karakalpakstan from future food and nutrition insecurity linked to climate change.
BIBLIOGRAPHY


UHES (2002): Uzbekistan Health Examination Survey (UHES)


UN Standing Committee on Nutrition (SCN) (2010): Climate change and nutrition. Message to the UNFCCC negotiators. 16th United Nations Conference of the Parties (COP16) Cancun, November 29th - December 10th, 2010


ANNEX I. CAUSES AND CONSEQUENCES TREE OF CLIMATE CHANGE IN KARAKALPKISTAN

- Increased average annual, summer and winter season temperatures
- Change in water shortage and climate warming
- Reduced precipitation volumes and frequency

- Inadequate preventive measures of information and minimization of consequence

- Insect attacks
- Difficulties in storing foods
- Reduction in glacier areas, water in rivers and IN

- Shortage of irrigation water for plants, cattle fodder; reduction of irrigated land area and increased salinization
- New FEs limited access of DFs to irrigation water, waterholes, community rangelands, cropland, and machinery

- Reduced volume and poorer quality of drinking water

- Losses/reduction in productivity - foods of vegetative and animal origin

- Increased number of poor DFs (income - less than $1 per capita a day - 20%, less than $2 - 30%)
- Reduced employment in own DFs in agricultural production

- Reduced volumes and poorer quality of foods in DFs

- Social implications - mass migration of men (60%) outside the country; limited, but increasing alcoholism, depression, stress, a decrease in previously higher level of drug abuse, adolescent prostitution, poor sanitation

- Weaker bodies/immune systems - increase in illnesses - tuberculosis, common colds, GIT diseases, mucopolysaccharidosis, arthritis

- Higher prices of fertilizers, fodder, young cattle and chickens (for fattening)

- DFs avoid producing agricultural goods due to high risk of investment losses - labor and resources

- Higher food prices

- Increased role of DFs who are losing skills of producing and storing foods
## ANNEX 2: Main health problems in Takhtakupir, Kanlikul, Ellikala and Khodjeyli

<table>
<thead>
<tr>
<th>#</th>
<th>Takhtakupir rayon</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Per 100 000</td>
<td>Number</td>
</tr>
<tr>
<td>1</td>
<td>Cardiovascular diseases</td>
<td>1005</td>
<td>25.2</td>
</tr>
<tr>
<td>2</td>
<td>Hypertensive disease</td>
<td>161</td>
<td>4.4</td>
</tr>
<tr>
<td>3</td>
<td>Respiratory diseases</td>
<td>2712</td>
<td>68.1</td>
</tr>
<tr>
<td>4</td>
<td>Asthma</td>
<td>6</td>
<td>0.1</td>
</tr>
<tr>
<td>5</td>
<td>Allergic rhinitis</td>
<td>20</td>
<td>0.5</td>
</tr>
<tr>
<td>6</td>
<td>Mental disorders</td>
<td>12</td>
<td>30.1</td>
</tr>
<tr>
<td>7</td>
<td>Communicable diseases</td>
<td>175</td>
<td>439.7</td>
</tr>
<tr>
<td>8</td>
<td>Acute intestinal diseases</td>
<td>55</td>
<td>137.3</td>
</tr>
<tr>
<td>9</td>
<td>Dysentery bacillus</td>
<td>3</td>
<td>7.5</td>
</tr>
<tr>
<td>10</td>
<td>Tuberculosis</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#</th>
<th>Kanlikul rayon</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Per 100 000</td>
<td>Number</td>
</tr>
<tr>
<td>1</td>
<td>Cardiovascular diseases</td>
<td>436</td>
<td>10.2</td>
</tr>
<tr>
<td>2</td>
<td>Hypertensive disease</td>
<td>195</td>
<td>4.6</td>
</tr>
<tr>
<td>3</td>
<td>Respiratory diseases</td>
<td>6485</td>
<td>152.2</td>
</tr>
<tr>
<td>4</td>
<td>Asthma</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Allergic rhinitis</td>
<td>3</td>
<td>0.07</td>
</tr>
<tr>
<td>6</td>
<td>Mental disorders</td>
<td>14</td>
<td>32.8</td>
</tr>
<tr>
<td>7</td>
<td>Communicable diseases</td>
<td>654</td>
<td>15.3</td>
</tr>
<tr>
<td>8</td>
<td>Acute intestinal diseases</td>
<td>79</td>
<td>197.7</td>
</tr>
<tr>
<td>9</td>
<td>Dysentery bacillus</td>
<td>5</td>
<td>12.5</td>
</tr>
<tr>
<td>10</td>
<td>Tuberculosis</td>
<td>1</td>
<td>2.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#</th>
<th>Ellikkala rayon</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Per 100 000</td>
<td>Number</td>
</tr>
<tr>
<td>1</td>
<td>Cardiovascular diseases</td>
<td>104</td>
<td>0.8</td>
</tr>
<tr>
<td>2</td>
<td>Hypertensive disease</td>
<td>12</td>
<td>0.09</td>
</tr>
<tr>
<td>3</td>
<td>Respiratory diseases</td>
<td>371</td>
<td>2.9</td>
</tr>
<tr>
<td>4</td>
<td>Asthma</td>
<td>44</td>
<td>0.3</td>
</tr>
<tr>
<td>5</td>
<td>Allergic rhinitis</td>
<td>87</td>
<td>0.7</td>
</tr>
<tr>
<td>6</td>
<td>Mental disorders</td>
<td>120</td>
<td>94.8</td>
</tr>
<tr>
<td>7</td>
<td>Communicable diseases</td>
<td>961</td>
<td>759.1</td>
</tr>
<tr>
<td>8</td>
<td>Acute intestinal diseases</td>
<td>44</td>
<td>35.7</td>
</tr>
<tr>
<td>9</td>
<td>Dysentery bacillus</td>
<td>10</td>
<td>8.1</td>
</tr>
<tr>
<td>10</td>
<td>Tuberculosis</td>
<td>1</td>
<td>0.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#</th>
<th>Khodjeyli rayon</th>
<th>2008</th>
<th>2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Per 100 000</td>
<td>Number</td>
</tr>
<tr>
<td>1</td>
<td>Cardiovascular diseases</td>
<td>2409</td>
<td>16.8</td>
</tr>
<tr>
<td>2</td>
<td>Hypertensive disease</td>
<td>1042</td>
<td>7.3</td>
</tr>
<tr>
<td>3</td>
<td>Respiratory diseases</td>
<td>8596</td>
<td>60.1</td>
</tr>
<tr>
<td>4</td>
<td>Asthma</td>
<td>42</td>
<td>0.3</td>
</tr>
<tr>
<td>5</td>
<td>Allergic rhinitis</td>
<td>40</td>
<td>0.3</td>
</tr>
<tr>
<td>6</td>
<td>Mental disorders</td>
<td>84</td>
<td>58.7</td>
</tr>
<tr>
<td>7</td>
<td>Communicable diseases</td>
<td>2120</td>
<td>1482.5</td>
</tr>
<tr>
<td></td>
<td>Acute intestinal diseases</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-------------------------</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>140</td>
<td>98.5</td>
</tr>
<tr>
<td>9</td>
<td>Dysentery bacillus</td>
<td>3</td>
<td>2.1</td>
</tr>
<tr>
<td>10</td>
<td>Brucellosis</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>Tuberculosis</td>
<td>217</td>
<td>151.7</td>
</tr>
</tbody>
</table>
ANNEX 3: Market survey conducted in district central markets and local stores November 2010

<table>
<thead>
<tr>
<th>Food items</th>
<th>Khojeyli</th>
<th>Ellikala</th>
<th>Kanlikul</th>
<th>Taktahkupir</th>
<th>Average</th>
<th>Oct '08 Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>apple</td>
<td>2000</td>
<td>1200</td>
<td>1500</td>
<td>1800</td>
<td>1625</td>
<td>790</td>
</tr>
<tr>
<td>aubergine</td>
<td>700</td>
<td>200</td>
<td>500</td>
<td>400</td>
<td>450</td>
<td>360</td>
</tr>
<tr>
<td>bean</td>
<td>3000</td>
<td>3000</td>
<td>2500</td>
<td>1500</td>
<td>2500</td>
<td>1700</td>
</tr>
<tr>
<td>bisquit</td>
<td>4000</td>
<td>2400</td>
<td>3600</td>
<td>4000</td>
<td>3500</td>
<td>2700</td>
</tr>
<tr>
<td>bread, lepeska</td>
<td>700</td>
<td>700</td>
<td>400</td>
<td>700</td>
<td>625</td>
<td>1400</td>
</tr>
<tr>
<td>buckwheat</td>
<td>7000</td>
<td>4000</td>
<td>n/a</td>
<td>n/a</td>
<td>5500</td>
<td>1800</td>
</tr>
<tr>
<td>butter</td>
<td>16000</td>
<td>15000</td>
<td>3500</td>
<td>8000</td>
<td>10625</td>
<td>8500</td>
</tr>
<tr>
<td>cabbage</td>
<td>500</td>
<td>400</td>
<td>800</td>
<td>400</td>
<td>525</td>
<td>550</td>
</tr>
<tr>
<td>carrot</td>
<td>300</td>
<td>200</td>
<td>300</td>
<td>350</td>
<td>287.5</td>
<td>550</td>
</tr>
<tr>
<td>chickpea</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>1450</td>
<td></td>
</tr>
<tr>
<td>cotton oil</td>
<td>3800</td>
<td>4000</td>
<td>3800</td>
<td>1300</td>
<td>3225</td>
<td>4000</td>
</tr>
<tr>
<td>cucumber</td>
<td>1500</td>
<td>1200</td>
<td>4000</td>
<td>400</td>
<td>1775</td>
<td>900</td>
</tr>
<tr>
<td>curt</td>
<td>5500</td>
<td>1000</td>
<td>500</td>
<td>n/a</td>
<td>3833</td>
<td>3000</td>
</tr>
<tr>
<td>egg</td>
<td>300</td>
<td>250</td>
<td>400</td>
<td>200</td>
<td>287.5</td>
<td>525</td>
</tr>
<tr>
<td>flour, wheat</td>
<td>900</td>
<td>800</td>
<td>1400</td>
<td>300</td>
<td>850</td>
<td>4500</td>
</tr>
<tr>
<td>fruit juice</td>
<td>1700</td>
<td>1700</td>
<td>3000</td>
<td>1500</td>
<td>1975</td>
<td>1800</td>
</tr>
<tr>
<td>grape</td>
<td>3500</td>
<td>2400</td>
<td>3000</td>
<td>2000</td>
<td>2725</td>
<td>1500</td>
</tr>
<tr>
<td>kaymak</td>
<td>7100</td>
<td>6000</td>
<td>3000</td>
<td>3500</td>
<td>4900</td>
<td>5000</td>
</tr>
<tr>
<td>kefir</td>
<td>1200</td>
<td>1000</td>
<td>1500</td>
<td>n/a</td>
<td>1233</td>
<td>850</td>
</tr>
<tr>
<td>lentil</td>
<td>n/a</td>
<td>n/a</td>
<td>2500</td>
<td>2500</td>
<td>2500</td>
<td>1250</td>
</tr>
<tr>
<td>liver</td>
<td>7000</td>
<td>3000</td>
<td>5500</td>
<td>8000</td>
<td>5875</td>
<td>7250</td>
</tr>
<tr>
<td>margarine</td>
<td>5000</td>
<td>3600</td>
<td>4000</td>
<td>7000</td>
<td>4900</td>
<td>2300</td>
</tr>
<tr>
<td>meat, beef</td>
<td>8600</td>
<td>9600</td>
<td>8500</td>
<td>8000</td>
<td>8675</td>
<td>6800</td>
</tr>
<tr>
<td>meat, mutton</td>
<td>10000</td>
<td>9600</td>
<td>8000</td>
<td>8000</td>
<td>8900</td>
<td>7500</td>
</tr>
<tr>
<td>beef fillet</td>
<td>12000</td>
<td>n/a</td>
<td>8500</td>
<td>13000</td>
<td>11166</td>
<td>7000</td>
</tr>
<tr>
<td>milk, fresh</td>
<td>1100</td>
<td>800</td>
<td>1200</td>
<td>1000</td>
<td>1025</td>
<td>800</td>
</tr>
<tr>
<td>milk, tetra</td>
<td>2200</td>
<td>2500</td>
<td>2200</td>
<td>2400</td>
<td>2325</td>
<td>900</td>
</tr>
<tr>
<td>packed</td>
<td>800</td>
<td>n/a</td>
<td>600</td>
<td>500</td>
<td>633</td>
<td>1800</td>
</tr>
<tr>
<td>sorghum flour</td>
<td>600</td>
<td>400</td>
<td>800</td>
<td>800</td>
<td>650</td>
<td>400</td>
</tr>
<tr>
<td>mineral water</td>
<td>700</td>
<td>600</td>
<td>600</td>
<td>500</td>
<td>600</td>
<td>600</td>
</tr>
<tr>
<td>onion</td>
<td>2000</td>
<td>1200</td>
<td>3000</td>
<td>900</td>
<td>1775</td>
<td>2200</td>
</tr>
<tr>
<td>peach</td>
<td>800</td>
<td>200</td>
<td>1500</td>
<td>500</td>
<td>750</td>
<td>500</td>
</tr>
<tr>
<td>pear</td>
<td>500</td>
<td>200</td>
<td>1000</td>
<td>500</td>
<td>550</td>
<td>650</td>
</tr>
<tr>
<td>pepper, green</td>
<td>n/a</td>
<td>1200</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>2000</td>
</tr>
<tr>
<td>yellow/red</td>
<td>700</td>
<td>600</td>
<td>700</td>
<td>600</td>
<td>650</td>
<td>700</td>
</tr>
<tr>
<td>plum</td>
<td>700</td>
<td>1500</td>
<td>500</td>
<td>700</td>
<td>850</td>
<td>480</td>
</tr>
<tr>
<td>potatoe</td>
<td>4500</td>
<td>3000</td>
<td>3000</td>
<td>4000</td>
<td>3625</td>
<td>4000</td>
</tr>
<tr>
<td>pumpkin</td>
<td>800</td>
<td>650</td>
<td>700</td>
<td>600</td>
<td>687.5</td>
<td>3200</td>
</tr>
<tr>
<td>raisins</td>
<td>200</td>
<td>250</td>
<td>300</td>
<td>300</td>
<td>262.5</td>
<td>300</td>
</tr>
</tbody>
</table>

---

23 From the WHO (2008): Report on “Feeding practices of Infants between 6 and 24 months in Uzbekistan”, which included a market survey of the same food items listed here.
<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Unit 1</th>
<th>Unit 2</th>
<th>Unit 3</th>
<th>Unit 4</th>
<th>Unit 5</th>
<th>Unit 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>salt, non-iodized</td>
<td>1000</td>
<td>n/a</td>
<td>100</td>
<td>n/a</td>
<td>550</td>
<td>280</td>
</tr>
<tr>
<td>semolina</td>
<td>3500</td>
<td>4000</td>
<td>2800</td>
<td>10000</td>
<td>5075</td>
<td>2000</td>
</tr>
<tr>
<td>smetana</td>
<td>n/a</td>
<td>3000</td>
<td>3000</td>
<td>n/a</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td>sugar</td>
<td>3300</td>
<td>3500</td>
<td>3800</td>
<td>3800</td>
<td>3600</td>
<td>1500</td>
</tr>
<tr>
<td>suzma</td>
<td>1500</td>
<td>1000</td>
<td>2000</td>
<td>700</td>
<td>1300</td>
<td>1100</td>
</tr>
<tr>
<td>tomtato</td>
<td>3000</td>
<td>500</td>
<td>4000</td>
<td>500</td>
<td>2000</td>
<td>900</td>
</tr>
<tr>
<td>vegetable oil</td>
<td>4300</td>
<td>4200</td>
<td>4500</td>
<td>3500</td>
<td>4125</td>
<td>3800</td>
</tr>
<tr>
<td>watermelon</td>
<td>400</td>
<td>250</td>
<td>1500</td>
<td>n/a</td>
<td>4333</td>
<td>1000</td>
</tr>
<tr>
<td><strong>total sum</strong></td>
<td><strong>134900</strong></td>
<td><strong>101800</strong></td>
<td><strong>115000</strong></td>
<td><strong>106650</strong></td>
<td><strong>107485</strong></td>
<td></td>
</tr>
</tbody>
</table>
ANNEX 4: Question interaction map

Looking at questions and answers related to question 14 (“what else except breast milk did you give to your child during the first 6 months?”) shows a positive correlation between giving children water (Q14b) and frequency of visits to health clinics (Q20), which might indicate that women are advised to give children water (perhaps in connection with hot weather).