

Food Security and Climate Change Assessment in Pakistan¹

Final Draft

February 18, 2010

Special Programme on

Food Security and Climate Change, South Asia

South Asia Bureau, Oxfam Novib

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List of acronyms

ADB: Asian Development Bank
AJK: Azad Jammu and Kashmir
APCOM Agricultural Prices Commission
API: Agriculture Prices Institute
AZRI: Arid Zone Research Institute
BISP: Benazir Income Support Programme
CBOs: Community Based Organizations
CLIS: Crop Loan Insurance Scheme
CO₂: Carbon Dioxide
CRED: Centre for Research on Epidemiology of Disaster
DAP: Di-Ammonium Phosphate
DFID: UK Development Cooperation
DRM: Disaster Risk Management
EPA: Environmental Protection Authority
EU: European Union
FAO: Food and Agriculture Organization
FAS: Food Security Survey 2003
FATA: Federally Administered Tribal Area
GDP: Gross Domestic Products
GCISC: Global Change Impact Studies Centre
GLOFs: Glacial Lack Outburst Falls
GMOs: Genetically Modified Organisms
GNP: Gross National Product
GOP: Government of Pakistan
HDR: Human Development Report
ICIMOD: International Centre for Mountain Development
IDP: Internally Displaced Persons
IFPRI: International Food Policy Research Institute
IGP: Indo-Gangetic plain
I/NGOs: International/National Non Governmental Organizations
IPCC: Inter-governmental Panel on Climate Change
IUCN: World Conservation Union
Km: Kilometer
MAF: Million Acre Feet
MDG: Millennium Development Goals
MINFA: Ministry of Food and Agriculture
MT: Million Metric Tons
NAPCC: National Action Plan for Climate Change
NARC: National Agriculture Research Centre
NGO: Non Governmental Organization
NIO: National Institute of Oceanography
NORAD: Norwegian Development Cooperation
NWFP: North West Frontier Province
ODA: Official development assistance
Oxfam GB: Oxfam Great Britain
PASSCO: Pakistan Agricultural Storage and Services Corporation Limited
PIDE: Pakistan Institute of Development Economics
PMD: Pakistan Meteorological Department
ppm: Parts per million
R&D: Research and Development
Rs. Pak Rupee
SDC: Swiss Development Cooperation
SDPI: Sustainable Development Policy Institute
TAP: Technical Advisory Panel on Climate Change
UN: United Nations
UNDP: United Nations Development Programme
UNFCCC: United Nations Convention on Climate Change
UNICEF: United Nations Children Fund
USA: United States of America
USD: US dollar
USDA: United States Development Agency
WB: World Bank
WFP: WFP World Food Programme
WHO: World Health Organization
WMO: World Meteorological Organization

Executive Summary

Poverty and hunger is on the rise World over, especially in developing countries. The number of hungry people in the World has increased to over 1 billion out of which 40% live in South Asia. In Pakistan about 62 million persons are food insecure. Climate change is expected to further increase poverty and food security in the country.

Recognizing the issue, Oxfam Novib is expanding its South Asia Regional programme for Food Security and Climate Change in Afghanistan, Bangladesh, and Pakistan. The overall aim is to reduce poverty and vulnerability of rural households in these countries with regard to food security and climate change/variability. This assessment for Pakistan is part of the series of Oxfam Novib programme development activities in the selected countries.

The results of the assessment suggest that although Pakistan hosts a population of 163 million (64% rural), spread over extensive geographical area (88 million hectares), and has diverse environment and natural resources, yet the country has more than one third of the population that are living below the national poverty line of less than USD 1000 per capita per annum or less than 2350 calories per day. Nearly 80 per cent of these poor are living in the rural areas.

While Pakistan maintained annual GDP growth rate at about 5 – 6 percent, the country's GDP is at a continuous decline since 1990. Being largely agro-livestock based economy, the share of agriculture in the largest in GDP (21.8%) out of which crops accounts for 48% and the remaining is from livestock (50%), and forestry and fishery. Cultivated area is 22.3 million hectares out of which 19.12 million hectares is irrigated and 3.67 million hectares is rainfed. The remaining 3/4th of the total geographic area is not available for cultivation or under range lands and forest. The irrigated areas meet more than 80% of the food and fiber requirement of the country.

Wheat is the main staple, catering for 48% of caloric needs of the population. Wheat production has been fairly stable in the past five years, averaged around 21.5 million metric tons (MT). Rice is the second most important food crop with a total production exceeding 8 MT, about half of which is exported. Livestock supplements the food and cash requirement of the rural poor particularly in marginal areas including the dry western mountain areas of Balochistan and the desert areas of Punjab and Sindh.

The assessment suggests that at the aggregate national level, Pakistan is marginally self sufficient in food production. Total wheat requirement for food and other uses was around 24.65 MT in 2008-09, most part of which was met from domestic production (21.8 MT) and the rest through imports with a fraction drawn from the available stocks. Future demand will however increase to 30 MT by 2020 if the population grows at the same rate.

Strong provincial disparities in food production were observed that pose a major challenge to the food security of the country. The Indus irrigated plains in Punjab and Sindh province are the main food baskets that meet control about 80 percent of the total annual food production. The other provinces including (NWFP, Balochistan, FATA, and Gilgit-Balthishan) are overall deficit in food production.

Household level food availability is more challenging especially for the poor small farmers and landless households. About 40% of the total farm households are small land holders with less than 1 hectare of land and another 30% are landless. Even in the irrigated areas especially the Southern Punjab and lower Sindh that are surplus on aggregate district level, majority of the poor households are landless tenants or bonded wage labour with not enough food from their own production and the food from market is expensive and unaffordable. Land distribution is highly skewed towards large farm holdings in these areas.

The field survey results based on discussion with partner NGOs, key informant group discussions in each village and household level questionnaire reveals that poverty was much higher ranging between 40 to 70% depending upon agro-ecological zones. Land holdings were small (even less than 1 acre), own food was sufficient for only 3-4 months and most households had to work off-farm in low paid jobs/wage labour to supplement their income and food requirement.

While food was easily accessible from other farmers in the village and markets, the poor households could not afford to purchase food from their own income and relied on loans from landlords or middle men to purchase expensive food. In times of high food prices, the poor households had to reduce food consumption and to buy cheaper low quality food on credit. Thus the 2008 food inflation has increased debts and poverty in rural areas all over the country in general and in the selected marginal zones (especially in southern Punjab and lower Sindh) in particular.

A major food security issue therefore was the access to food through out the country but more specifically in marginal areas (NWFP, FATA, Gilgit-Balthishan, Balochistan, southern Punjab and lower Sindh). Agriculture share in the household income in these areas was less than 15% and the income from non-farm labour was more than 40%.

The nutritional status of the poor population in Pakistan has also not improved and the number of malnourished people, mainly children and their mothers, has increased overtime as per UNICEF surveys. The food absorption capacity is low because of lack of health facilities and safe drinking water causing diarrhea, pneumonia, malaria and measles.

The current food security situation of the country is therefore not very encouraging. Since the beginning of 2000's, commodity prices and cost of services have been rising. The inflation rate accelerated at a rapid pace especially during 2007-2008 because of rising food prices (26.6% increase in food price index), a weaker rupee/dollar exchange rate, withdrawal of subsidies, and upward revision of support price for wheat and sugar crops. Domestic shortages also caused high prices of widely consumable items.

The food price policy in Pakistan mainly focuses on price protection measures both for producers and consumers at huge subsidies. To protect the consumers the government ensure wheat flour distribution and other food items at subsidized rates relying mainly on Utility Stores Corporation, the recently introduced cash transfer scheme under the Benazir Income Support Programme (BISP), and Baitul Mal, Zakat and Ushr schemes. These facilities do not sufficiently reach to the rural areas. The UN World Food Programme (WFP) is contributing through school feeding programme for girls in rural areas on limited scale. Some international NGOs are also involved on pilot scale to support the social safety nets in vulnerable areas.

At the same time, to protect the consumers the government has introduced procurement policy since 1980's to purchase food from producers at minimum guaranteed prices. However, only 3 to 5 million tons of wheat is procured every year mainly from large farmers. The Pakistan Agricultural Storage and Services Corporation Limited (PASSCO) has limited storage capacity of less than half a million tons. Provincial food departments also have some storage capacity in which Punjab has the largest storage capacity of 4.221 MT. The involvement of private sector was envisaged under 2005 wheat policy for procurement and storage but it is still to be implemented.

Future prospects for ensuring food security of the rural poor are also not very hopeful in the country if the status quo remains. Major impeding factors are the inequitable land distribution, increasing competition for natural resources due to growing population, poor governance and lack of sufficient investment in agricultural sector. Especially, since 1990's, investment in R&D for agriculture sector has drastically reduced in Pakistan, which has caused stagnation in yields and widened the yield gap. The country has not been able to fully tap into the benefits of green revolution compared to the other countries in the region and the yield gap has been widening between the progressive large farmers and the average farmers. About 40 per cent yield gap or even more has been estimated for wheat in the country.

Political marginalization is further increasing income and food disparities across provinces. Government policies and investments are mainly geared towards well of regions (mainly irrigated areas) and large farmers. Small farmers' and landless household requirements particularly in marginalized zones for their access to alternative livelihoods, food, inputs, markets and credit are limited or non existent. Disparities in poverty and food security may increase cross provincial/regional conflicts within the country.

Agricultural productivity is continuously at a declining trend because of land and water resource degradation, water logging and salinity, and inefficient utilization of water resources. Although the investment in biotechnology is at rise in various countries yet there are uncertainties about the political and economic costs associated with it. Investments in proven technologies already available on the shelf would be more cost effective for Pakistan but these have not been fully tapped. These include for example soil and water conservation technologies, tillage technologies, post harvest handling, precision land leveling, improved irrigation systems like drip and sprinkler methods, waste water treatment, rain water harvesting etc. These technologies have potential particularly in the marginal zones that could help reduce the problem of food security in these areas.

Climate change and variability is expected to further reduce the agricultural productivity, heighten water insecurity, exposure to extreme events, collapse of ecosystems, and increased health risk. The country is highly vulnerable to climate change because of its climatic and geographic diversity, most parts of the country are already in the heat surplus zone, and a large part of the economy is in the vulnerable agriculture sector. Poor will be affected most by climate change because of lack of recourses and capacities to timely adapt to adverse effects. The poor people would also suffer because these communities are being pushed towards marginalized/ less productive lands that are more prone to climatic extreme events. According to recent WFP study about 20% of the households will be added to food insecure group mostly in developing countries by 2050.

The impacts of climate change will vary across the country's diverse agro-ecological regions. Climate change will increase the risk of land and water degradation in the Himalayan mountain zone and heat and moisture stress will reduce crop yields in the country's productive irrigated and rainfed lands that will have implications for food security of the whole nation. Climate change related droughts will increase stress on range lands affecting livestock fodder availability particularly in the dry western mountains of Balochistan and sandy deserts. Monsoon and flash flooding will increase in the hill torrent zone of southern Punjab and NWFP and in plain areas of Punjab and lower Sindh. Rising sea levels and salt water intrusion will affect agricultural land and fishing grounds in coastal areas of Sindh and Balochistan.

While our survey results indicated that some awareness in the villages existed about climate change and its impacts. They informed that temperatures have increased and rainfall has declined in both summers and winters, crop and livestock diseases have increased, and irrigation water resources and crop and livestock yields have declined. The survey respondents directly related these impacts due to climate change- increased in temperature, reduction in rainfall and increased frequency of floods and droughts. The decline in yields was also related to crop and animal diseases, high input cost and shortage of water.

Majority of respondents had started some climate change adaptation practices on a self help basis, in some parts of the country by adjusting to early sowing and using early maturing varieties, and increasing number of irrigations. However, overall there is lack of awareness both at community level as well as policy level to timely adapt to the adverse impacts of climate change/variability.

The main conclusions of the assessment are summarized below.

- At the national level the food security situation is not very encouraging and future prospects for improving food security are also not hopeful. Even though the country has marginally maintained self sufficiency in wheat and surplus in rice, about 62 million people are still poor and food insecure. The food inflation over the last 3 years has further increased poverty.
- The country relies heavily on irrigated agriculture in already well off areas to maintain self sufficiency in food and to keep pace with the growing population. Some of these irrigated areas are now severely degrading due to water logging and salinity and soil fertility loss.
- The potential of the green revolution has not been fully exploited. Crop yields are at a declining trend due to various reasons including policies and inefficient practices and methods as well as perhaps due to climatic stresses.

- The government owned food storage capacity is limited therefore only small quantity of wheat is procured on minimum guaranteed price mainly from large farmers. Small farmers have to sell their wheat in open market at lower price for purchase of inputs and to pay for debts. Private sector involvement in wheat procurement and storage is envisaged but it is still to be adapted. Food storages in marginalized zones are not available for strategic maintenance of food stocks.
- Social protection through social safety initiated by the government e.g., Utility Stores Corporation, BISP, Bait-ul-Mal and Zkata/Usher schemes are still limited to reach to rural poor.
- Climate change and variability is further decreasing yields, reducing water resources and affecting health. The increased frequency of hydro-meteorological hazards associated with climate change has increase land degradation, incidences of crop and animal diseases, and exacerbated the livelihood and food security vulnerabilities of small/ landless tenant farmers.

Recommendations

The government has to continue its struggle to secure the national level food self sufficiency to meet the food requirement of the growing population by adopting incentive based policies (e.g., price support policy, procurement and storage policy etc.), introduce high yielding food crop varieties, and improve efficiencies in the use of agricultural inputs (water, seed, and fertilizers). However for alleviating poverty and achieving wider scale food security, small farmers and landless/tenants should be targeted. Specific attention should be given to the marginalized poor zones including NFWP, FATA, Gilgit-Balhistan, Balochistan, northern and southern Punjab, Sindh coastal and Desert areas. These areas have extreme poverty and are highly prone to climate change impacts including climate related disasters.

Protection measures and social safety nets as introduced by the government such as Utility Stores Corporation, and cash transfers through BISP and Bait ul mall scheme should be expanded to marginalized rural areas.

The country should increase storage facilities through public-private sector partnership for establishing strategic wheat stocks in each province/state. These measures will discourage hoardings, reduce shortages and avoid unnecessary price hikes which mostly affect the poor. At the same time, the government should also ensure regular monitoring and timely planning of food availability through improved information, crop forecasting and assessments of the food commodity situation and where necessary to order imports well in time.

Public investment in R&D for agriculture sector should be increased focusing on small farmers to improve efficiency in use of land and water resources in marginalized areas. Efforts should also be made to rehabilitate degraded lands, introduce rain water harvesting techniques and shifting to cropping patterns that are less water demanding and heat tolerant.

For climate change adaptation, the overarching policy recommendation should be the integration of water and climate change policy as well as integration of climate risk considerations within sectoral policy frameworks. At the same time capacities in disaster preparedness at national, provincial and local levels should be enhanced, including information management, early warning systems, contingency planning, and risk reduction measures in disaster prone areas. The government initiative on crop insurance scheme for small farmers may be encourage and supported. At the same time, micro-finance schemes may be initiated for landless/small farmers.

NGOs should organize themselves to form forums at national, provincial and local levels to advocate for bottom up pro-poor policies. These forums may also increase awareness of the local parliamentarians and assist the local communities in timely adaptation to climate change in rural areas.

Specific recommendation at agro-ecological level for food security, livelihood and climate change

The government and NGOs should initiate specialized programmes in each agro-ecological zone based upon specific issues and comparative advantages. Major recommendations per agro-

ecological zones are listed in the following table. These interventions will improve livelihood and food security on the one hand and adaptation to climate change on the other hand. While these recommendations are targeted for government and NGOs interventions, it is important to mention that these recommendations would require community based people-centred approach as without community involvement the chances of success could be minimal.

Table: Specific recommendations per agro-ecological zone

Main Interventions	Responsibilities
Mountain Zones (Himalayas) and covering Gilgit-Balthishan, northern parts of NWFP	
<ul style="list-style-type: none"> - Promote ecological farming (sustainable agricultural land use practices) such as improved methods of cultivation, land contouring and terracing technologies and practices, introduction of cover crops, organic farming, improved orchard/tree plantation techniques, and off-season vegetable production. 	Agriculture extension department in support of Local NGOs and communities
<ul style="list-style-type: none"> - Establishment of small scale agro-based processing industries to create employment and livelihood opportunities for the landless/small farmers in these areas along with improved/efficient markets, road infrastructure and value addition/cold chains for perishable commodities (fruits and vegetables). 	Government through public-privet partnership.
<ul style="list-style-type: none"> - Introduce varieties of the plain areas as these will perform well in the scenario of increased temperatures caused by climate change. 	Provincial public research & extension departments
<ul style="list-style-type: none"> - Introduce demand side measures to reduce deforestation through the involvement of communities to protect and manage their own forest, e.g., through efficient technologies for fuel wood use (efficient cooking stoves) with women, and to make use of micro-hydro and solar energy technologies. These will also help in climate change adaptation measures. 	Provincial forest department/ National NGOs in support of local NGOs and communities.
Dry western Hindu Kush mountains covering, FATA and Balochistan	
<ul style="list-style-type: none"> - Improvement of rangelands in Balochistan, improved livestock management practices, and health and hygiene of women. 	Livestock department, NGOs and communities
<ul style="list-style-type: none"> - Exploit the un-tapped potentials of fruits and non-timber forest products by improving productivity, value addition and access to marketing. 	Government through public-privet partnership and NGOs
<ul style="list-style-type: none"> - Skill development for non-farm workers based on market demand 	NGOs
Sub- Mountain/ Rainfed plains/ Hill torrent zones (NWFP and Northern and southern Punjab and western Sindh)	
<ul style="list-style-type: none"> - Introduction of heat and moisture resistant varieties as part of climate change adaptation for wheat and pulses production. 	Agriculture department and NGOs and communities.
<ul style="list-style-type: none"> - Exploit the potential to harvest the surface runoff due to heavy bursts of rains upstream to improve moisture conservation and water availability and to reduce soil erosion and losses due to flash floods. This should include building of reservoirs by government and introduction of other rain water harvesting techniques e.g., check dams, diversions and forest plantations. 	Government and NGOs in partnership with communities.
<ul style="list-style-type: none"> - Introduce micro-credit schemes in these areas. The government crop insurance scheme for small farmers should be advocated and supported in these areas in view of the increased frequency of floods in these area. 	Government, NGOs and communities
<ul style="list-style-type: none"> - Introduce water and sanitation, health and hygiene, kitchen gardening, skill development in farm and non-farm income generating activities for women. 	Government, NGOs and communities
<ul style="list-style-type: none"> - Introduce community based biogas plants, solar lighting, water purification etc. 	Government, NGOs and communities (involve private sector)
Coastal zone (central and lower Sindh and Balochistan coastal)	
<ul style="list-style-type: none"> - Shallow water fishing has reduced in coastal areas perhaps due to climate change. Fishing grounds/ mangroves plantations should be initiated along with sustainable fishing techniques. 	NGOs in support of local NGOs and communities.
<ul style="list-style-type: none"> - Techniques for small fish drying for food consumption and marketing, along with awareness to caution them about the consequences of fish exploitation 	NGOs in support of local NGOs and communities.
<ul style="list-style-type: none"> - In lower Sindh and coastal areas salt-tolerant species and varieties should be introduced based on indigenous knowledge in these areas as part of adaptation to climate change. 	Agriculture department, NGOs and communities
<ul style="list-style-type: none"> - Adaptation to climate change should also include interventions such health and sanitation activities with the poor including drinking water purification/ desalinization of water for agriculture using solar energy technology. 	NGOs and communities

Main Interventions	Responsibilities
<ul style="list-style-type: none"> - Mangroves are degrading fast in coastal areas due to cutting for fuel as well as due to pollution and declining flow of fresh water from the Indus delta affecting breeding ground for fishes. Mangroves also provide protection from storm surges. Protection and plantation of these mangroves should be among main priorities for coastal zone as part of climate change adaptation. 	Government and NGOs and communities.
Desert Zone (Tharparkar desert in Sindh Province and Cholistan desert in Punjab province)	
<ul style="list-style-type: none"> - The frequency of monsoon droughts is increasing in these areas perhaps due to climate change. There is a need to introduce improved feed management for livestock, measure for protecting livestock diseases, water harvesting techniques and drinking water and sanitation. 	NGOs and communities
<ul style="list-style-type: none"> - Introduce weather information system for communities, including indigenous knowledge based early warning system. 	PMD, NGOs and communities
<ul style="list-style-type: none"> - Introduce skill development activities for mining and weaving industry and linking them with market for diversifying livelihoods. 	NGOs and communities

1 Background

1.1 Introduction

The number of hungry people in the world are estimated to be about 1 billion by 2009, about two third of these people live in Asia and 50 percent are women (Oxfam International 2009a). In Pakistan conservative estimates suggest that about 62 million persons are consuming less food than the minimum required standard of 2350 calories per capita per day. This includes 11 million persons that were added after the high food inflation in the last three years (GOP 2009). However, the UN joint interagency assessment (UN 2008a) based on field surveys indicates that 84 million people (49% of the total population) are consuming even less than 2,100 kcal/capita/day, and about 28% of the total population are extremely food insecure, consuming less than 1,700 kcal/capita/day. Main factors for food insecurity are high population growth rate, political marginalization, poverty, land degradation, disparities in land holdings, distorted government policies, poor performance on social indicators and climatic stresses (UN 2008a). Rising food prices nationally and internationally are claimed to be also contributing to the recent increased malnutrition. At rural household level, the main factors are: lack of support to small/landless farmers, lack of alternative income opportunities, low yields due to lack of improved seed, non availability or inefficient water use and poor methods and timings, and lack of investment in Research and Development (R&D) including poor agriculture extension services. It is believed that major focus for ensuring food security of the country is through the development of irrigated areas and the potential of the marginal areas for high value agricultural products that would generate income and livelihood opportunities in those areas is not being exploited.

Climate change is expected to further increase vulnerabilities for agriculture sector that could worsen the food security situation of the rural people and affect their livelihoods, land and water resources, agricultural productivity, nutrition and health. The impacts of climate change and variability² will be higher in marginal areas and on rural poor population who lack capacities and resources to cope with the adverse situations. Of more concern is the increased climatic variability that is causing extreme events in the form of hazards such as droughts, floods, cyclones, windstorms and disease epidemics. The research data by Centre for Research on Epidemiology of Disaster (CRED 2007) indicates that these extreme climatic events (hydro-meteorological disasters) have already increased all over the world and since 1990's. In Pakistan the extreme climatic events are already affecting the rural agricultural based livelihood and food systems, bringing losses to crops and livestock, damaging rural infrastructure (houses, roads and public services), and increasing the incidence of diseases. Timely adaptation measures would be needed to increase resilience of the rural poor to cope with the adverse impacts due to climate change.

² Climate change is a long-term phenomenon based on 30 year normal pattern of weather. Climate variability is referred to short-term changes and disturbances that occur over a shorter period of time (e.g., year to year variability in climatic parameters) during the 30 year normal period. The climatic variability brings extreme events (shocks)/hydro-meteorological hazards in the form of heat waves, erratic but intensive rains and cause droughts, floods, land slides, cyclones, windstorms and disease epidemics.

1.2 Definition of food security

The definition of food security adopted by the 1996 World Food Summit³ has been used to assess the food security situation. It includes three key aspects of food security: **availability** (presence or absence of food within a given area), **access** (the ability of individuals or households to make claims on these food supplies) and **utilisation capacity** (ability to use food in a way that promotes their health and well-being) [Oxfam International 2007].

“Food availability” is achieved when sufficient quantities of food are consistently available to all individuals. Sources of food supply could be household’s own production, domestic markets, imports or food assistance. “Access” to food is ensured when a household and all members of the household have enough (economic and physical) resources to acquire the food, meeting the nutritional requirements and dietary needs of the household. Access is thus primarily a function of a household’s income from on-farm and/or off-farm, the price of food and the distribution of income within the household. The physical assets, human capital (literacy) and roads also affect food accessibility. Finally, “Utilization” also referred as the “absorptive capacity” of individuals depends upon the health of the population which itself is affected by quality of the drinking water and sanitation facilities and the surrounding environment.

1.3 Objectives of the study

The overall objective of this study is to analyze the food security situation in Pakistan including climate change impacts on food security. The study will provide input to the design of the Regional Programme on Food Security and Climate Change and the Country Level Action Plans. The specific objectives of the assessment are to:

- Analyze food security situation in Pakistan by investigating the different drivers of food insecurity - such as how socio-economic, political and natural drivers including climate change, affect food security of the country.
- Develop understanding on how livelihoods, food security, and climate change are interlinked, assessing the impact of these issues at household level.
- Provide strategic recommendations for future programming on food security and climate change in the country.
- Identify stakeholders and partner NGOs, understand their current and future plans of work for developing long-term strategic partnership on food security and climate change.

The findings of the assessment have been shared in a consultative workshop at the country level inviting partner NGOs working in various agro-ecological zones. Finally, the perception of partner NGOs on food security and climate change issues at local levels and the findings of this assessment will form basis for developing joint action plan of Oxfam Novib and partner NGOs in Pakistan.

1.4 Approach and Methodology

The assessment focuses on all the three dimensions of food security – availability, access and utilization as defined above. The target community is the rural poor in marginalized areas of the country. National and regional factors impacting the food

³ Food security, at the individual, household, national, regional and global levels [is achieved] when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

security dimensions have been analyzed, including the impact of climate variability and change in the country.

The findings are based on literature review and secondary information and field survey in the main agro-ecological regions of Pakistan. The field surveys were conducted in the most vulnerable areas targeting the poor in various selected agro-climatic regions. The survey was completed in three steps: (i) Discussion with a selected partner NGO for selection of the district, understanding broad issues about the selected district and identifying the three most vulnerable villages in the district; (ii) Discussion with key informants in each village to obtain their perception about livelihood and food security vulnerabilities and climate change impacts in the village; and (iii) a pre-coded questionnaire covering 3 villages in each district and 10 households in each village (total of 150 sample household) to assess household level poverty, livelihoods, and food security status. Trained researchers and enumerators conducted the field survey. The survey also tried to understand climate change vulnerabilities at the household level and their current adaptation practices for coping with climate change/variability. The sample frame for the survey is given in Table 1.

Table 1: List of selected districts and sample frame by agro-ecological zones

Sample	Abbottabad	Rajanpur	Jangh	Musakhel	Shadad Kot	All
Agro-ecological zone	Himalayas (NWFP)	Hill torrent (Punjab)	Central irrigated (Punjab)	Dry western mountain (Balochistan)	Sindh	-
No. of sample villages*	3	3	3	3	3	15
Number of sample households (10 per village)	30	30	30	30	30	150

1.5 Structure of the report

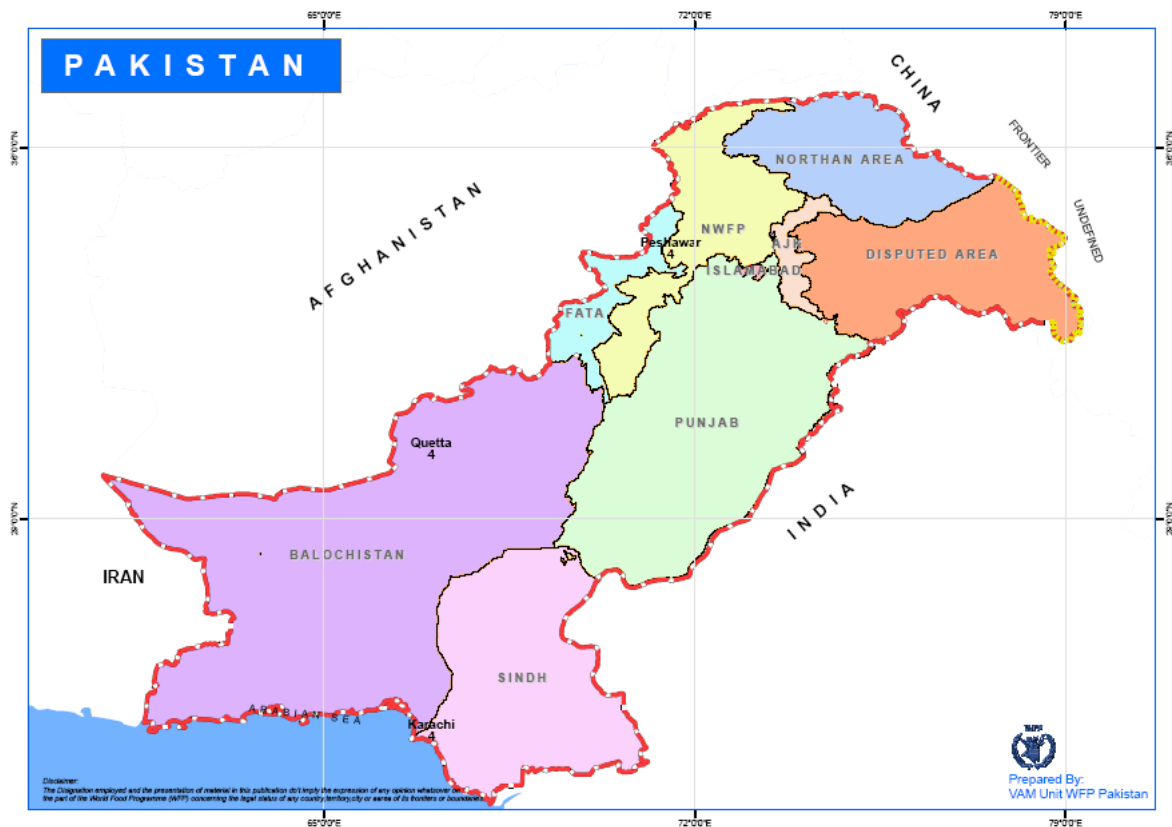
In the next section an overview of the country context has been provided describing the physical environment including climate change, socio-economic environment and government policies. The third section discusses the role of agriculture in the economy and its current status. The fourth section examines the country's food security situation. The fifth section addresses the main causes/drivers including agro-climatic regions that affect food security situation in the country. The sixth section provides summary results of case studies in selected districts covering major agro-climatic zones. The seventh section maps out stakeholders and the actions being undertaken by them to address food security and climate change issues. The 8th section provide summary of main issues and recommendations on the basis of the findings in the report. The last section outlines suggestions for Oxfam Novib Programmes on food security/livelihood and climate change adaptation in Pakistan.

2 Country overview

2.1 Geographic location

Pakistan is situated in South Asia between longitudes 61° & 76° E and latitudes 24° & 37° N. The geographical area of the country is about 88 million hectares. The country is bounded by China in the northeast, India in the southeast, Afghanistan in the northwest and Iran in the southwest. The Arabian Sea is Pakistan's southern boundary with 1,064 Kilometers of coastline (see map in Figure 1).

Figure 1: Map of Pakistan



The country extends about 1,800 kilometers from north to south, administratively divided into four provinces, namely Punjab, Sind, Balochistan and North West Frontier Province (NWFP). In addition, there are three areas under different Administrative structures: Northern Areas (Gilgit-Balthishan), Azad Jammu and Kashmir (AJK), and the Federally Administered Tribal Area (FATA). Each of these provinces/states is further divided into district boundaries, sub-district (Tehsil) boundaries, union councils and large number of revenue villages (Table 2).

Table 2: Number of administrative units in Pakistan

Province/ Administrative Unit	District	City district	Tehsils	Union Councils	Revenue Villages	Urban Areas/ Towns
NWFP	23	1	51	957	7326	54
Punjab	30	5	109	3466	25930	213
Sindh	22	1	103	1080	5872	157
Balochistan	29	1	128	506	6584	46
Islamabad	1	-	1	46	132	1
FATA	7	-	42	-	2603	5
Azad Kashmir (AJK)	8	-	20	-	1653	18
Gilgit-Balhistan	6	-	21	-	566	5
Total	126*	8	475	6055	50666	499

Source: Government of Pakistan, Bureau of Statistics, Planning and Development, Islamabad, Pakistan, 2008.

* In 2009, some new districts have been formed totaling 132 districts

2.2 Physical environment

2.2.1 Weather and Climate

Pakistan has a large variety of climatic types ranging from temperate climate in the north to hot arid sub-tropical in the south. The climate of the country has wide variations in both temperatures and precipitation. Temperatures reach as low as -26°C over the northern mountains in the winter, and as high as 52°C in the lower plains in summer. The hottest months are June-July and the coldest months are December-January. Average annual rainfall in the country ranges between 300 - 500 mm of which more than half falls in the summer (monsoon) season in July-August.

2.2.2 Agro-Ecological Regions

Pakistan is highly diverse because of varying topographical, ecological and climatic conditions. The country has been broadly classified in to seven agro-ecological zones (see Annex 1 for description, along with main characteristics). These are (i) humid and sub-humid Himalayan mountains, (ii) Western dry mountains of Hindu Kush, (iii) Semi-arid sub-mountain rainfed plains, (iv) Semi-arid irrigated plains, (v) Suleman hill torrent plains, (vi) Sandy deserts, and (vii) Coastal zone.

The country is fortunate of having three of the world's famous mountain ranges: Himalayas, Karakorum and Hindu Kush. These mountains not only provide sustenance to more than 15 million people, they also harbor huge resources in the form of minerals, forests and biodiversity, and are the main source of water in our rivers on which depends particularly the entire agriculture system of the country (Mufti, Hussain and Khan 2003). In general, Himalayan mountain region, AJK, Central Punjab and Sindh receive more rainfall in the summer season (called monsoon dominated areas), whereas the Western mountain region (Balochistan, most parts of NWFP, FATA and Gilgit- Balhistan) receive more rainfall in the winter (called winter dominated areas). The desert and coastal areas depend mainly on erratic but intensive monsoon rains in the summer season.

Pakistan also has vast alluvial plains where intensive agriculture is practiced especially in irrigated parts and contributes a major share in GDP. In addition, most large and small scale industrial activities take place in the plain areas. The non-farm private sector for

example provides employment to almost nine-tenth of the workforce of the whole Punjab (World Bank 2005a). In addition, some extensive sandy deserts in the east and a long coastal belt stretching from Baluchistan to Sindh on the south of the country provide unique ecologies where relatively less densely population make their livings from fishing, livestock and agriculture.

2.2.3 Climate Change issues in Pakistan

Climate change is the serious problem of the World both of developed and developing countries. Average global temperature has increased by about 0.7 °C since industrial revolution and the future change in global average temperature in between 2 – 4.5 °C is almost inevitable (IPCC 2007). In South Asia the annual average temperature could rise 3.5 to 5.5 °C by 2100 (IPCC 2007). The increases in temperature are expected to be high in South Asia because of being lying in arid and semi-arid region where the temperatures are already above the tolerance limit.

These changes in temperature will increase climatic variability associated with the frequency and intensity of extreme climatic events (shocks). In particular storms, droughts and floods will increase considerably (IPCC 2007). The climatic variability and change will have considerable impacts (both positive and negative) on various socio-economic sectors e.g., agriculture, water, health, forestry, biodiversity etc. These impacts have important implications for livelihood and food security of the poor countries.

It is believed that the developing countries would be most affected by the adverse impacts of climate change. The change will exacerbate the poor country's food insecurities because of lack of resources and capacities to withstand the adverse impacts due to climate change. Climate change in the form of temperature increases, changing rainfall patterns and sea level rise will impact the Pakistan's water resources, agriculture, livestock, forestry, fishery, biodiversity, and health. Annex 2 lists the potential impacts of climate change along with proposed adaptations in the country, including impacts on women.

A climate change vulnerability index, calculated by a UK based firm, rated Pakistan as the 29th most at risk country in the World from climate change (Maple Croft, 2009). However, the country must be highly vulnerable to climate change because:

- Pakistan has high climatic and geographic diversity and therefore less control over the environment. This diversity is an opportunity for the country but it also poses a number of issues compounded by climate change.
- The country has a warmer climate to begin with because it lies in the arid and semi-arid region which is already surplus in heat.
- A large part of the economy is in the vulnerable sector (i.e., agriculture) which highly depends on irrigation water from glaciers and snow melt in mountain areas. Even these glaciers are believed to be receding.
- The livelihoods of majority of the rural population depend upon small land holdings for subsistence agriculture. They are poor and have less resilience and capacities to withstand shocks and extreme events.

Given that rainfall is already insufficient, shifts in the rainfall pattern might eliminate rainfed agriculture from the country. Climate change may also affect irrigated areas which are the country's main food basket and a source of livelihood for majority of the rural poor. Livestock plays an important role in the livelihoods of the poor communities in

the desert zone and dry mountains of Baluchistan. The increasing temperatures will increase water requirements for livestock and will exert heat stresses that will significantly reduce livestock productivity and increase the incidence of livestock diseases and deaths. Impact of climate change on pastures and grazing lands in Baluchistan will reduce fodder in the already stressed rangelands.

The Himalayan mountain areas, rich of biodiversity will also be affected by climate change and variability. The carbon sinks in the mountain areas are degrading fast as the country has low forest cover (4.5 %) with a high rate of deforestation of about 0.2 - 0.4 % per annum. Thus long-term impacts of climate change are expected to threaten the biodiversity (loss of species and habitats) in the mountain areas, affect agriculture, increase glacial receding, and increase incidence of land slides and flash floods.

Climate change will also affect livelihood and food security in the coastal region. Productive agricultural land in coastal districts of Sindh province has been lost due to salt water intrusion and rises in water tables. According to IUCN study, about 18,000 hectares of land in Sindh coastal has become unproductive mainly due to salt water intrusion (IUCN 2007). The water table in Sindh province has increased from 20-30 meters to 1-2 meters during the last two decades (Oxfam GB, 2009b). This water is brackish and not suitable for drinking and irrigation. The coastal areas are also affected by floods and cyclones destroying the fishing based livelihood of the already poor communities as well as losses of houses, food stores, and standing crops (FAO 2009).

No comprehensive research exists in the county about the impact of climate change on agriculture and food security. According to ADB, climate change- induced heat and water stress if continues may reduce maize yields by 17%, wheat by 12% and rice by 10% in irrigated areas in South Asia until 2050 (ADB 2009). Some research conducted by GCISC suggest that similar declining trend in yields of existing varieties has already been noticed in the sub-mountain and plain areas because of increases in temperatures over the past century, whereas in the high mountain areas above 1500 meters altitude, the wheat yields are showing an increasing trend because these areas are already constrained by cold temperatures (Hussain et. al 2005, Saltana and Nazim, 2006, Hussain and Mudasser, 2007 and Sultana et. al. 2008). The GCISC models further suggest that wheat yield would be improving in high mountain areas till a temperature rise of 4 °C after which it would start decreasing. On the other hand, any increase in temperature would result in loss of wheat and rice yields in sub-mountain and plain areas. The rising CO₂ level in the atmosphere could compensate the yield losses. However, even increasing CO₂ concentration level from 360 to 550 ppm would not be able to sustain current yields beyond a temperature rise of 2 °C in sub-mountain area and plain areas.

Climate change impacts are also expected on human health. According to a recent WHO/WMO/EPA results, in the year 2000 climate change was responsible world wide for 150,000 deaths; 2.4 per cent of all cases of diarrhea and 2 per cent of all case of malaria (Pollution Probe, 2004). Epidemic potential of malaria is anticipated to increase by 12-27 percent and that of dengue by 31-47 percent as a consequence of rising global temperatures (Lead, 2008). No comprehensive research has been however conducted to assess the impacts of these climatic changes on human health in the country.

The above climate change impacts may not be gender neutral (Oxfam GB, 2009a). While all the segments of the society (men, women and children) will be affected by the climate change, it is believed that women will be affected by the climate change due to their poor capacities and a lack of knowledge. They will be particularly faced with

problems such as loss of livelihoods and hardship due to natural resource degradation such as water, fuel wood and land resources. Women's informal rights to resources could decrease as access to land and natural resources could decline due to land degradation caused by climate change. There may be increased difficulty in accessing resources, in particular, fuel wood and water which is their main responsibility, hence creating an increased workload for women. Male out-migration may also happen due to resource shortages, generating increased work load for women both at home as well as on-farm. Women responsibility for family health care (children, sick and old) will increase due to climate change impact on health (see Annex 2a and 2b for details). Mainstreaming of gender in climate change would be necessary, yet capacities of the public and civil society institutions to integrate gender in climate change mitigation and adaptation are lacking in the country.

The major issue associated with climate change is an increase in the climatic variability that is causing extreme climatic events (floods, cyclones, droughts, windstorms and disease epidemics, including water born diseases). The frequency of most hydro-metrological disasters has significantly increased since 1990s world over as well as in Pakistan (CRED, 2007). These disasters are causing land losses, damages to the standing crops and deaths of livestock. These hydro metrological disasters may affect livelihoods and increase the risks of future availability of food in the country.

Timely adaptation measures would be needed for farmers to minimize these damages and losses both at national as well as community level. However, in general, Pakistan lacks capacity and resources to deal with the climate change issue. The country has recently started up the very basic elements of policy development for climate change, though the country has not developed climate change policy and national action plan. The Ministry of Environment is the focal point for climate change. The Global Change Impact Studies has been established to carry-out modeling based research on climate change and its impact on agriculture and water resources. Some UN agencies, donors and I/NGOs are also playing a positive role in bringing climate change awareness, generating climate change related information and project related activities and adaptation measures. Surprisingly, NGOs and other institutions not directly involved in policy (or have less power) in particular have influenced the climate change decision process (Oxfam GB 2009a). Among these, the scientific community (GCISC), intellectuals and some NGOs (like LEAD Pakistan, IUCN, SDPI, Oxfam GB) have been more instrumental in increasing top level awareness through research reports, seminars, workshops and meetings inviting high officials. A Planning Commission Task Force on Climate Change has been recently established to develop climate change policy guidelines. UN agencies (UNDP) and some Bi/Multilateral donors (WB, ADB, DFID, SDC, NORAD) have also played a positive role in bringing climate change related awareness through their diplomatic role, generating climate change related information, and project related activities/funding. DFID has included climate security as one of the 9 strategic priorities in its 5 year plan of work (to be started from January 2009). More recently, a Technical Advisory Panel (TAP) on Climate Change has been set-up under the Ministry of Environment with funding from DFID to support the government in international negotiations, take sound actions towards adaptation to climate change, and increase awareness on climate change in the country. LEAD Pakistan is undertaking an initiative to form a Climate Change Network for awareness raisings and SDPI has initiated a Climate Change Youth Network. These initiatives may bring on board multi-stakeholders (hopefully including media) to influence policy agenda of the government, politicians and increase awareness among civil society including women on climate change (Oxfam GB 2009a).

2.3 Socio-economic environment

2.3.1 Population and poverty

Total population of the country is estimated as 163.76 million in 2008-09, out of which more than half are women. The population may reach to 167 million in 2010 and about 194 million by 2020 if the existing trend continues (GOP 2008-09). The share of rural population is 64%. Punjab has the highest population (55.46%), followed by Sindh (22.92%), NWFP (13.73%) and Baluchistan being the least populous (5.15%). In addition, FATA has 2.37% and Islamabad has 0.7% of the total population.

Approximately 34% of the population lives below the national poverty line of less than USD 1000 per capita per annum or 2350 calories per adult per day using the calorie based approach. Poverty in Pakistan declined rapidly during the 1980's and early 1990's and then showed an increasing trend after 1993/94 (UNDP, 2005). The increase in poverty during these periods coincides with the onset of slow growth in the country (Khan, Ehsan, Shams, 2009).

Various estimates for poverty incidence in recent years have been reported. The Planning Commission Panel reports an increase of 6 percentage points in poverty incidence for the year 2008-09 in comparison to 23.9 percent poverty incidence in 2004-05 (GOP 2008-09). The Planning Commission Task Force on Food Security on the basis of the World Bank estimates indicates that the head count ratio of 29.2 percent in 2004-05 has increased to 33.8 percent in 2007-08 and 36.1 percent in 2008-09. This has resulted about 62 million people in 2008-09 below the poverty line (including about 11 million people due to 2007-08 price inflation).

Nearly two thirds of the population and 80 per cent of the country's poor people are living in rural parts of the country and the incidence of poverty has increased significantly in these areas (UN 2008a). In our recent field survey in the selected villages, more than 40 to 70 percent of the surveyed households was found to be below the national poverty line.

The main factors for the increased incidence of poverty in the country in recent years are slow economic growth, high international energy and food prices for domestic consumers, declining trend in development spending, declining agricultural productivity and more frequent natural and human catastrophes perhaps due to climatic variability/change (UN 2008a). Poverty is also the result of unequal access to land and other natural resource distribution. For example according to the 2000 Agricultural Census, about 60 percent of the households are directly involved in farming. Among the farming households, 78 percent are land owner, 8 percent are owner-cum-tenant and 14 percent are landless tenant. About 61 percent of these land-owning/tenant households own or cultivate fewer than hectares or 15 percent of total land. The 14% landless tenants on average in Pakistan are mainly concentrated in Southern Punjab and Sindh who mainly work as bonded labour for landlords (field survey results confirms this). These inequalities and the resultant poverty have worsened illiteracy rates, employment and livelihoods in rural areas.

Regional disparities in poverty were also observed in the country during the late 1990s (see Table 3). The NWFP and adjoining FATA had the highest incidence of poverty (45 percent), followed by Punjab and Sindh based on 1998-99 HIES survey (ADB 2002). The regional disparity must be worsened in recent years because of food inflation and inaccessibility due to security issues.

Table 3: Incidence of poverty in Pakistan by provinces (1998-99)

Province	Urban	Rural
Punjab	26.5	32.4
Sindh	19.0	29.2
NWFP	31.2	44.3
Balochistan	28.4	24.6
AJK	14.5	15.6
NA (Gilgit-Balhistan)	22.6	36.5
FATA	-	44.5

Source: ADB (2002)

2.3.2 Food inflation trends

Since the beginning of 2000's, commodity prices and cost of services have been rising. The inflation rate has accelerated at a rapid pace in Pakistan during 2008 because of rising food prices (26.6% increase in food price index), a weaker rupee/dollar exchange rate, withdrawal of subsidies, and upward revision of support price for wheat and sugar crops (GOP, 2008-09). Domestic supply shortages due to various reasons (including hoarding and informal export to Afghanistan) also caused high prices of widely consumable items, especially wheat, during 2008-09. Based on the trend of prices of these items, the contribution of food inflation to the overall inflation has increased to 48% and that of non-food at 50.7% (UN 2008a). The surge in world food prices by about 83 percent in the past three years also has contribution in the country's inflation. The food inflation is thus pretty much also a global phenomenon. The world food price index as calculated by the Food and Agriculture Organization of the United Nations (FAO) rose by nearly 40 percent in 2008 compared with nine percent the year before (Oxfam International 2008). More recent figures however indicate that the World food prices on average have come down to the level of 2007, however in some Asia-Pacific countries, food prices are still at an increasing trend. Food inflation has also slowed down in Pakistan (FAO Update 2009).

The inflation in general and the food inflation in particular have eroded the purchasing power of especially the poor small farmers and landless households in rural areas of the country. It has affected both the poor as well as middle income group because a major share (70-80%) of their expenditure budget is composed of food items (field survey). The high food prices has also led to an adverse impact on health and nutrition in various ways (UN 2008a): i) poorer food consumption increases malnutrition, which in turn heightens susceptibility to disease; both may lead to higher mortality rates; ii) greater workload (to earn more income) of both men and women negatively influences care and feeding practices, resulting in poorer health and nutrition status; iii) reduced expenditures on health lead to less adequate treatment of disease and higher morbidity and mortality rates. Our field survey indicates that households are coping with the price crisis by taking children out of school, sending children to work and moving them from private to public schools. It is likely that the price hike has relatively worse impact on girls' education than on boys.

To deal with the food crises and to keep food prices from further escalating so that it is available at affordable prices, the GOP undertook immediate inclusive policy and trade related measures (GOP 2008-09). These included: i) import of about 2.5 million MT of wheat; ii) vigilance on informal flow of wheat across the borders; iii) removal of import duty on wheat; iv) imposition of minimum export price on rice; v) subsidy on DAP, vi) wider coverage of wheat flour distribution at subsidized rates through Utility Stores

Corporation; and vii) various social protection instruments such as cash transfer schemes, e.g., Benazir card under the Benazir Income Support Programme (BISP), Baitul Mal scheme, and Zakat and Ushr schemes. However, most these protection measures focused urban poor. The poor households in rural areas have not benefited from these measures (field survey findings).

The UN World Food Programme (WFP) contributed through country programme to help improve access to food in order to enable women and girls in poor rural areas taking advantage of development opportunities. The WFP programme is comprised of three components; food assistance to primary education of girls, promoting safe motherhood, and creating livelihood assets for rural women.

2.3.3 Livelihood Systems, Employment and Literacy

Pakistan is an agricultural based economy and the livelihoods of the rural sector generally depend upon crops and livestock production systems.

Livelihood opportunities are generally limited on aggregate scale in Pakistan, which is the main cause of widespread poverty and unemployment mostly in the marginalized rural regions. The current employment status in Pakistan suggests that the country has labour force of 51.78 million people that includes 10.96 million (21%) women labour force. The total number of people employed is 49.09 million and unemployed is estimated at 2.69 million out of which 1.70 million live in rural areas (GOP 2007-8). Among the employed labour force, about two third are self employed or unpaid family helpers (women) mostly in rural areas. Agriculture dominates the distribution of self employed persons (44.65%). Employments opportunities in other sectors are mainly in urban areas on a limited scale e.g., services: 13.66%, manufacturing: 12.99%, construction: 6.29%, transport: 5.46% etc. (GOP 2008-09).

Livelihood patterns however vary from region to region. These are briefly discussed below (also see Annex 1 for more details). The major sources of livelihoods in the **Himalayan mountain region** are from local natural resource base (forestry products and agriculture). Some families supplement their income from off-farm work in cities and abroad. The **dry western mountain** areas of Hindu Kush mainly depend on livestock (sheep and goats), especially in Balochistan. Crop land is limited but used for high value fruits in small pockets. Most families have limited local livelihood sources. The **sub-mountain and dry rainfed plain areas (Southern NWFP, Southern and Northern Punjab, and western Sindh)** mostly depend on income from government services, working in industries and other services but these are at a declining trend. Some farming is practiced under rainfed conditions in this zone but because of climate change agriculture in these areas is becoming less feasible. These factors are leading them towards extreme poverty in rainfed areas. In the **Central Irrigated zone (Punjab and Sindh)**, agriculture is the major source of livelihood. The region is the main food basket for Pakistan because of canal network and is relatively better off in terms of income sources. Agro-based and other industries concentrate in these areas, which also form the main source of livelihood for majority of the population from all over the country. The communities in the **Sandy desert** zone (Cholistan desert in Punjab and Thar desert in Sindh) depend mainly on livestock (cattle) with some crops grown during summer monsoon season. The livelihood in these deserts is highly prone to droughts. In the **Coastal zone covering Balochistan and Sindh** the main livelihood source is fishing especially those living along the coast. Apart from fishing, coastal communities also cultivate some agricultural land but most land is severely affected by salinity.

Education is the key to sustainable socio-economic growth. It helps in broadening livelihood and employment opportunities and reducing poverty, Education also raises productivity and increases women awareness on health, hygiene and child nourishment. Improved child nourishment was observed among those households where women were educated and/or employed (Khasnobis and Hazarika, 2006). The main issues in education system in Pakistan are related to access and quality of education. While the budgetary allocations including foreign funding for improving access to education are at a rising trend (above 11% of GDP) during the current decade, close to 50% of the population is still illiterate who can not read and write. According to the Pakistan Social and Living Measurement Survey (PSLM 2007-08), the overall literacy rate (age 10 years and above) is 56 percent (69% for male and 44% for female). Literacy remains higher in urban areas (71%) than in rural areas (49%). Punjab has the highest literacy rate (59%) followed by Sindh (56%) mainly because of more urban concentration (Lahore and Karachi). The literacy rate in NWFP is 49 percent and in Balochistan 46%.

Gender disparity in literacy and school enrolment is a major issue. While the status of women has improved in recent years but gender inequality still persist keeping the women at disadvantaged situation throughout life. This discrimination is mainly because of social norms (girls are kept deprived of school for household duties), limited women educational institutions, and affordability of the poor to meet educational expenses (Hussain et. al, 2003).

2.3.4 Economic growth and government priorities

The government of Pakistan places highest priority to increase the rate of growth in gross domestic product (GDP). Pakistan maintained an annual GDP growth rate of 5 – 6 percent. In general however the real GDP is at a continuous decline. It was 7.2 percent in 1991-92, followed by 6.6 percent in 1995-96 and 5.1 percent in 2002-03 (GOP 2008-09). While a momentum was seen in real GDP growth rate of 5.4% and 6.8 percent in 2005-06 and 2006-07 respectively however because of global financial crises and domestic environment (war on terror), the real GDP growth rate has come down to less than 2% in 2007-08, out of which about 50% contribution was from the growth in the agriculture sector.

The Economic Survey Report (GOP 2008-09) envisages increasing efforts to protect the poor and preserve social stability through well targeted social safety nets. In this regard, an encouraging step of the government is the introduction of Benazir Income Support Programme (BISP) which has been launched since 2008 by providing cash grants (Rs. 1000 per month per family) through women to help satisfy the most fundamental needs of vulnerable households. Currently reaching 3.5 million poor households (more in urban areas), BISP is expected to expand to 7 million households in 2009 -10⁴. In agriculture, the government also realizes the need to adopt measures by protecting the rural poor through increasing productivity, crop diversification and value addition for agricultural produce (GOP 2008-09). However, these proposed measures in agriculture would be far from reaching to a reality if not expanded to the marginalized zones.

3 Agriculture in the economy

Pakistan is an agricultural based economy. It is the main source of livelihood for about 45 percent of the country's employed labour force in the country and contributes the highest share in foreign exchange earnings. Being arid and semi-arid, of the country

⁴ The field survey results suggest that so-far close to none have received BISP support in the surveyed districts.

total area of about 88 million hectares, only 22.3 million hectares is under cultivation⁵, which includes 19.12 million hectares irrigated area and 3.67 rainfed area. The irrigated areas meet more than 80% of the food and fiber requirement of the country.

The country's GDP largely depends upon the performance of the agricultural sector as it has the highest share in GDP currently amounting to 21.8 percent. Crops account for roughly 48 percent in the agricultural share of GDP, out of which major crops such as wheat, rice, cotton and sugarcane account for about 35% and minor crops such as pulses, oilseeds, fruits and vegetables contribute about 13%. The remaining 50% share of agriculture to GDP is from livestock, and one percent each from forestry and fishery (GOP 2008-09).

The Planning Commission Task Force 2009 (GOP 2009) recognizes that agricultural growth could be at least twice as effective in improving real GDP of the country. However, relatively little investments are made in agriculture compared to its contribution in real GDP. Total development expenditure for agriculture were around 7 percent of GNP during 1980s and 1990's that has fell down to roughly 3-4 percent during the current decade.

Agriculture is also highly dependent on year to year weather variability. Bad year with negative or low growth in agriculture take the country's GDP growth rate down to 1.7 percent and good years to above 7% or more. Climate change and variability has therefore important implications for agricultural growth in general and food security in particular. Significantly negative impacts are expected on agriculture in Pakistan due to the adverse impacts of climate change as discussed in the previous section.

3.1 Performance of crop based food production

Wheat is the main staple in Pakistan, accounts for 13.1% of value added in agriculture, 2.8 percent of GDP and cater 48% of caloric needs of the population. Wheat production has been fairly stable in the past five years, averaged around 21.5 million metric tons (MT). As shown in Table 4, the area under wheat has increased during the current decade but the yields are declining, except 2006-07 in which an increase in both area and yield was observed, perhaps due to good weather. Furthermore, timely policy announcement for the setting-up of support prices (much higher than the previous years) and timely availability of chemical fertilisers may have helped in increasing the wheat production in 2006-07.

Table 4: Area and Production of wheat in Pakistan

Year	Area (000 ha)	Production (000 tones)	Yield (kg/ha)
2004-05	8358	21612	2568
2005-06	8448	21277	2519
2006-07	8578	23295	2716
2007-08	8550	20958	2451
2008-09	9062(P)	23421(P)	2585(P)
2009-10		24,000 (T)	

P: Provisional estimates based on (July –March observations); T: Target set
Source: GOP, 2008-09

⁵ The rest of the area is not available for cultivation but used as rangelands for grazing and a fraction (5%) is under forest.

In general, the decline in wheat yields started since 1990's because of lack of sufficient research and development expenditure in agriculture both by the government and donors. Wheat yields are declining also because of overall degradation of land and water resource, poor quality of seed, non-availability of fertilizers and also due to climate change (Hussain and Mudasser 2007).

Rice is the second most important food crop. It accounts for 5.9% of value added in agriculture and 1.3 percent of GDP. Pakistan produces enough high quality rice to meet both domestic demand and exports. Rice is grown under irrigated condition mainly in Punjab and Sindh, and some in the lower Himalayan region. Overall, the rice yields have shown an increasing trend over the last two decades mainly because of genetic improvements and rising prices. Winter season pulses production is also showing an increasing trend. The pulses production however does not meet the domestic demand and thus are imported.

Pakistan also has high potential in fruits production and some are exported (e.g., mangoes and apples). Lack of efficient markets and cold chains causes substantial losses to perishable fruits before reaching to markets, particularly in marginalized mountain zones where access to markets is poor. Similar pattern is also observed for onion and potatoes, which in most cases is imported and the high prices in shortage period badly affect the food budget of the poor both in urban and rural areas.

3.2 Performance of livestock based food production

Livestock plays an important role in the economy of the country. Its value added to agriculture share of GDP has reached to about 50% in recent years. Main livestock products are milk, meat, poultry and eggs. In addition, livestock hides and wools are produced that meet both the country's domestic demand and exports. Commercial level livestock production and processing has recently got momentum especially in the urban suburb areas due to increasing demand for milk and meat in urban areas.

Traditionally, livestock has remained and is still a major livelihood source in rural areas that supplements the food and cash requirement of most rural households all over the country. Livestock is the major livelihood source particularly of marginal areas including the dry western mountain areas of Baluchistan and FATA, and the Desert areas.

Most landless households and small farmers (including widows) in rural areas keep livestock all over the country that not only supplement their food but also provides cash from its products and livestock sale. Livestock are sold mainly to cope with emergencies, for paying credits and meeting other non-food needs. Women have important role in livestock care for feeding, watering and cleaning. Women are however largely ignored for improving their management practices and raising awareness about health and hygiene.

Livestock are prone to climate change and temperature increases. The increases in temperature could cause heat stresses to livestock and increase their water and nutritional requirements. These may negatively affect milk production, fertility, mortality and morbidity of the livestock. These impacts will have high negative implications for livelihood and food security of the poor communities.

3.3 Government agricultural and food policies

Policy makers are confronted with a dilemma to ensure food security, especially availability and access as on one hand they want to fix high support prices to encourage producers and on the other hand they want low prices to protect the poor section of

society. Thus the food price policy in Pakistan mainly focuses on price protection measures both for producers and consumers at huge cost in the form of subsidies. To reduce the downward pressure on price in the harvesting season when supply increases, the government sets-up minimum guaranteed prices of major food crops such as wheat, rice and pulses in the beginning of the season and also procure some wheat grain at the guaranteed prices from farmers at harvest time. These prices are based on cost of production as estimated by the Agricultural Prices Commission (APCOM), established in early 1980's. While such government measures provide incentives and encourage farmers to grow more wheat, minimum guaranteed price for wheat is usually not announced timely⁶.

Furthermore, only small fraction (3 to 5 million tones) of the total produce is procured at the guaranteed prices mainly from large farmers because of lack of storage facility. The Pakistan Agricultural Storage and Services Corporation Limited (PASSCO) is the only government owned body at federal level, responsible for the procurement of wheat grain but has limited storage capacity of less than half a million tons. Provincial food departments also have some storage capacity in which Punjab has the largest storage capacity of 4.221 MT. Most of the procured wheat is however usually dumped in open space for many months and exposed to monsoon rainfall and floods, which causes substantial losses.

These government interventions for growers, therefore, rather than providing incentives are creating disincentives particularly for small farmers as majority of them are usually not successful to sell their wheat at the guaranteed price. Small farmers therefore depend on in-competitive markets for the sale of their produce and purchase of inputs. They have to sell their wheat to middlemen at lower prices for cash which they need to purchase inputs, to pay debts, and to meet other household needs. Opportunities for small farmer's credit programmes for the timely purchase of inputs are limited and for landless tenants formal credit opportunities are non-existent.

The government wheat policy as developed in 2005 among others stressed the need to increase wheat procurement capacity by involving private sector which is still under consideration. To ensure wheat flour distribution and other food items at subsidized rates to poor consumers the government is relying mainly on Utility Stores Corporation as the only social safety net. Its coverage has been recently extended to limited population in rural areas. Other social protection instruments have been introduced on limited scale such as BISP, Baitul Mal scheme, and Zakat/ Ushr scheme as discussed previously.

The national policy also stressed the free movement of the wheat throughout the country. However, Punjab restricted the free movement of wheat in the past as well as during 2008 shortage period. Only a fixed limited quota was allocated to the marginalized provinces which did not meet their food requirement. This provincial level policy decision of Punjab increased difficulties of the already poor population in all the other regions that are food deficit. While the ban on the free movement of wheat flour has lifted this year, these bans if continued may become a major issue for the future food security of the marginal areas and may increase tensions and cross provincial conflicts.

⁶ Furthermore, these price calculations are usually not based on realistic data (Oxfam International 2008).

The current Economic Survey report of the government of Pakistan has declared agriculture development the priority area for economic growth, food security and poverty alleviation (GOP 2008-09). The different elements of the policy package for agriculture include diversification to high value agriculture, improving yields, provision of inputs, credit and water use efficiency. For livestock sector, the emphasis is on nutritious feeds, control of diseases, establishing chilling and milk powder plants and improving marketing of dairy farm products. A special emphasis is being laid on promotion of high value products like livestock, fisheries, vegetables and fruits. The overall focus is to improve country level self sufficiency, increase employment opportunity, increase exports, and reduce the import bill for oil seed and pulses.

Recognizing the fact that the farming sector especially the poor communities, are highly exposed to natural hazards, the government of Pakistan has initiated a mandatory Crop Loan Insurance Scheme (CLIS) for major crops since 2008-09. The government will bear the cost of premium on account of subsistence farmers up to maximum 2 percent per crop. All the Banks including Microfinance Banks will implement the scheme. The scheme is in the initial stage and still to be implemented but it seems to a positive step forward to protect small farmers.

Past practices however points to the fact that the government priorities are usually implemented in the already prosperous regions which are easily accessible e.g., the plain irrigated areas of Punjab and Sindh. For alleviating poverty and food insecurity the above policy measures would be successful only if the focus is given to marginal zones where poorest of the poor live and the poor households make their livelihoods from subsistence crops and livestock farming, and wage labour. These rural households are already at disadvantage due to political marginalization, inaccessibility and deprived of other development activities. Substantial potential exist in these areas that could be tapped both from the production of traditional food crops but also from high value crops, livestock and horticulture and fishery. Due to lack of knowledge, efficient market infrastructure, and processing and cold chain/storage facilities, a large proportion of the high value perishable commodities are lost or sold to middlemen at throw-away prices.

4 Food Security Situation in Pakistan

4.1 Food availability

Pakistan is marginally self sufficient in wheat food production on an aggregate national level. Total wheat requirement for food and other uses was estimated around 24.65 MT during May 2008 to April 2009. Looking at the wheat balance sheet as shown in Table 5, the domestic availability of wheat was only 21.8 MT during the period. The deficit at around 3 MT was met through imports and some drawn from the available stocks. Pakistan also has exporting about one million ton of wheat to Afghanistan since 2000. However, informal export of wheat flour at around 1 MT or more to Afghanistan through illegal channels is a major concern.

The deficit in wheat supply at the country level could be easily over succeeded through reducing illegal cross-border smuggling and reducing losses that occur in post harvest handling and storages (e.g., wheat grain losses were about 1.4 MT during 2008-09). Yet a major challenge ahead is the increase in overall demand annually because of the growing population in the country. For example, to meet the demand of wheat, the

production has to reach to a target level of 24 MT in 2010. This demand will further increase to about 30 MT in 2020⁷.

Table 5: Wheat Balance Sheet in Pakistan

	Wheat Supply/Demand Balance (000 tones)	
	May 2008 – April 2009	May 2009-April 2010
Domestic Availability	21,900	24,000
Production	21,800	24,000
Stock drawn down	100	
Utilization	24,650	23,949
Food use	20,070	20,672
Feed use	400	400
Seed use	765	819
Losses	1,415	1558
Export (formal and informal)	2,000	500
Surplus (deficit)	(2,750)	51

Source: WFP, 2009

While Pakistan in times imports wheat the current import bill for wheat is minimal. Yet overall trade balance has been negative throughout the past decades and the food also has share in imports. During 2006/07, Pakistan's imports totaled \$27 billion while exports were \$17 billion (USDA 2009). Textiles dominate exports, accounting for 59 percent of export value. Pakistan's other main agricultural exports in 2006/07 included rice (\$1.13 billion), fruits and vegetables (\$234 million), fish and fish preparations (\$191 million), raw cotton (\$76 million), meat and meat preparations (\$55 million), oilseed, nuts and kernels (\$22 million) and spices (\$16 million). On the other hand, Pakistan imported over \$3.0 billion agricultural products, including vegetable oil (\$883 million), cotton yarn (\$647 million), sugar (\$313 million), pulses (\$225 million), tea (\$184 million), milk and milk products (\$62 million), and dry fruits (\$45 million). Petroleum, machinery and chemicals form the major share in the import bill.

Even if at the national level, Pakistan could match the food supply and demand, strong Provincial disparities in food production, poses a major challenge to food security of the country. As can be seen from the following map (Figure 2), the Indus irrigated plains in Punjab and Sindh provinces are the main food basket of Pakistan. The wheat production from these areas accounts for about 80 percent of total annual production.

Punjab province has 60% surplus districts in wheat and rice production (FSA 2003). These surplus districts have the potential not only to cater the needs of food deficit districts of the province e.g., Lahore, Rawalpindi, Jehlum and Gujrat districts⁸ but are also meeting the requirements of other provinces. However, household level food availability is still be a problem in some of these surplus districts even in the Punjab province. For example, even though southern districts of Punjab are surplus in wheat production, it is controlled by only few landlords and majority of the poor households

⁷ However, the country is surplus in paddy production, which could be strategically used to meet the domestic food demand.

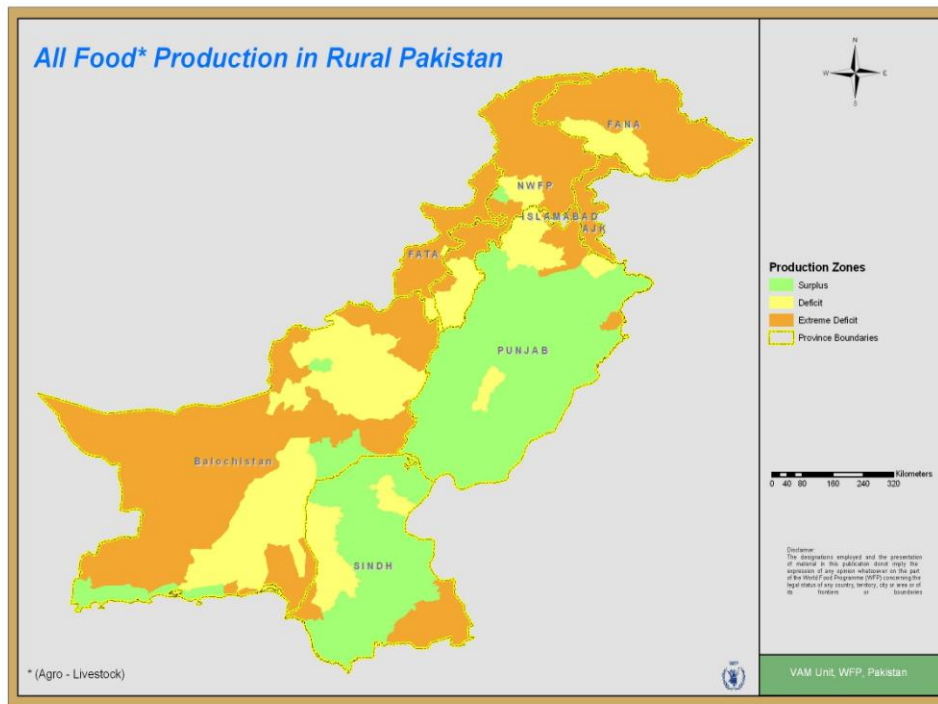
⁸ Lahore is the provincial capital of Punjab province (the second largest city in terms of population). Rawalpindi, Jhelum and Gujrat districts are part of the rainfed belt of sub-mountain/ rainfed zone.

work as tenant and receive only 1/8th share in total production, which is not enough to meet the annual food requirement for their households.

Sindh province is the second largest province in terms of wheat and rice production, yet the province has to import wheat from Punjab, because of high urban demand (Karachi which is the country's largest city). Productive areas are also used for growing Mangoes and Banana by large farmers and for vegetable production that arrive early to markets and fetch higher prices. Mostly the landlords and middle men make high profits from these productions. Tharparkar in Sandy desert zone is extremely deficient in crop-based food (FSA 2003) due to monsoon droughts. The district is however surplus in animal based food production. Again, like southern Punjab district, the household level food vulnerabilities are high in Sindh because of inequalities in land holdings.

The other two provinces: NWFP and Balochistan as well as FATA, AJK and Gilgit-Balhistan that lie in the Himalayan and Western dry mountain zones are extremely food deficit. Most mountain areas are mainly constrained by farm land and/or water availability and the local food production in these areas meets the household food requirements for a maximum of only half a year. For the remaining period of the year, food is accessed from markets. A strong potential in fruits and off-season vegetables production in these zones exist but it has not been fully tapped.

Figure 2: Map of food production zones in Pakistan



Source: FSA 2003, WFP

Annex 3, provide list of net food deficient districts in term of agro-livestock products. Most of the extreme deficit districts are in the mountainous zones (both Himalayan and Western dry mountains) lying in NWFP, all FATA areas, Balochistan, AJK and Northern

Areas (Gilgit-Balthishan). Even in Punjab and Sindh, there are few extreme food deficient districts, especially where irrigation facilities are not available.

It is interesting to note that the districts that are deficient in crop-based food availability rely more on livestock production for their food and livelihoods. The FSA 2003 analysis reveals that out of 120 districts 43 (36%) have surplus livestock-based food production and another 37 (31%) have sufficient production. Most these districts are in the sub-mountain and rainfed districts of Punjab towards the south-west, those districts which are lying in desert areas e.g., Tharparkar in Sindh and most parts of Balochistan province. Balochistan province in the dry western mountain zone has extensive land but dry due to hyper arid climatic conditions. The province has comparative advantage in livestock production because extensive range lands are available. These rangelands need to be properly managed as most rangelands are severely degraded due to being dry and extensively grazed.

4.2 Food Accessibility

Access to food is a multi-dimensional issue and is a function of multitude of factors such as household income, household on-farm food production, geographic location and physical access such as roads and markets. The results of the FSA 2003, using a number of the above access indicators (including per capita income, land holdings, landless labour, adult literacy and road access) suggest that out of the 120 districts of Pakistan, 56 (roughly one-half) are in the extremely low category and 95 (about 80%) are in the low to extremely low category districts. A closer look of these districts indicates that most of these districts are in the mountainous zones, especially those districts in NWFP, FATA, AJK, Gilgit-Balthishan and Balochistan which are also extremely deficit in food production. Access to food is also a problem in some districts in lower Sindh along the coast and in the Tharparkar desert.

These marginal provinces are extremely poor with low per capita income who can not afford to buy expensive food. Land holdings are small (less than 1 hectare) and there are limited alternative income earning opportunities available locally (our survey results reveal this). Agriculture share in the household income in these districts is less than 15% and the income from non-farm labour is more than 40% (FSA 2003). The members of the family migrate to cities, leaving women to take care of farming, children and old members. This also enhances work load on the already overburdened and malnourished women folk in most rural areas.

While in Pakistan food is generally available in the market, affordability is the major issue because according the Planning Commission about 40% rural poor households do not have the capacity to afford the minimum dietary requirement. Undernourished population (including both urban and rural) is at an increasing trend since 1990 (Table 6). More recent price rise and high inflation (2008/09) has further reduced the capacity of the poor to access food at an affordable price.

The most vulnerable must be those small land holders/tenants (about 30% of the total rural households on average according to agriculture census 2000) who make their livings from cropping of small land holdings or work for landlords as wage labour for cash or kind. The landless tenant households exist in all zones but its proportion is more in those areas where the land distribution is skewed towards large farm holdings especially in Sindh province and Southern Punjab. These households have difficulty in accessing sufficient food for their families because of their low incomes. While non-farm households also exist (about 48% in total rural households), only a small proportion (about 20%) stay in the village for non-farm work as wage labour and these also must be

vulnerable. In addition, there are widows, handicapped or very old people who are outside the mainstream of economic activity.

Table 6: Undernourished Population (1989-2006) Millions

Year	Total Population (Millions)	Undernourished population (Millions)	Undernourished population (%)
1989-1991	110.91	26.6	24
1990-1992	113.75	27.8	24
1991-1993	116.54	28.1	24
1992-1994	119.35	26.4	22
1993-1995	122.22	25.4	21
1994-1996	125.22	24.7	20
1995-1997	128.47	24.8	19
1996-1998	131.99	26.1	20
1997-1999	135.45	27.9	20
1998-2000	139.76	28.2	20
1999-2001	142.62	29.4	20
2000-2002	146.30	32.1	22
2001-2003	149.03	35.2	23
2002-2004	151.09	37.5	24
2003-2005	153.96	38.2	25
2004-2006	156.77	39.4	27

Source: FAO (2003)

4.3 Food Utilization/Absorption

Food availability and access to food alone can not ensure food security because if the food is not properly utilized it will go waste or in some cases bring harm. Individuals need sufficient amounts of a variety of quality and safe foods to be healthy and well-nourished. Without sufficient calories and nutrients, the body is unable to carry out doing the work needed to produce food. Without good health, the body is less able to make use of the food that is available. A hungry mother gives birth to an underweight baby, who then faces a future of stunted growth, frequent illness, learning disabilities, and reduced resistance to disease. Contaminated water and food can causes illness, nutrient loss and often death in children.

Food absorption has various dimensions mainly related to social indicators such as literacy, health and sanitation and quality of the food. Nutritional consequences of insufficient food or under nutrition include protein energy malnutrition, anemia, vitamin A deficiency, iodine deficiency, iron deficiency and some other micro-nutrient deficiency. Using the above indicators, the FSA 2003 results revealed that 45 out of 120 districts (38%) of Pakistan has experienced extremely low rate of food absorption in 2002. The access to safe drinking water was considered as the main contributory factor for food absorption. In 112 districts (out of 120 districts) safe drinking water was not available to about 50% of the population. This was also revealed by our survey results in all the five districts.

The nutritional aspect has important implication for infant mortality rates. The World Health Organization and John Hopkins University in Baltimore team blame malnutrition as the main cause for more than half of all the deaths of children around the world -- including deaths caused by diarrhea, pneumonia, malaria and measles (WHO 2009).

The team found that poor nourishment leaves children underweight and weakened and vulnerable to infections. They estimated that feeding all children worldwide an adequate diet would prevent about 1 million deaths a year from pneumonia, 0.8 million from diarrhea, 0.5 million from malaria, and 0.25 million from measles. The UNICEF assessment of Internally Displaced Persons (IDP) in Baluchistan, Pakistan revealed similar facts. Of the total displaced persons (84,000) all faced nutritional deficiency. Among them, 70 per cent were women and children (26,000 women and 33,000 children). The survey also revealed that 80 per cent of deaths among the IDPs were of children under the age of five (Arif 2007).

Nutritional status of the population has generally not improved overtime in Pakistan. The four national nutritional surveys conducted by UNICEF in Pakistan during 1960s, 1977-78, 1987-1988 and 2000-2001 indicates that the number of malnourished people, mainly children and their mothers, has increased. More recent findings are not available country wide but the situation must be worst in recent years especially because of the global and domestic economic and food crises.

A more recent survey conducted by UNICEF in collaboration with department of Health, Punjab in flood affected areas of southern Punjab districts (Rajanpur and DG Khan) indicated that the prevalence of serious (global acute malnutrition) was 13.1% among children. The two common childhood illness, diarrhea and Upper Respiratory Infection were reported to be high and diarrhea had shown strong association with malnutrition during this study. In addition, there was association of unsafe source of water, lack of toilet facility and inappropriate child excreta disposal with diarrhea and this confirm that unsafe sources of water and poor sanitation are among the main underlying causes of malnutrition in the study area (UNICEF 2009).

5 Drivers of livelihoods and food security vulnerabilities in Pakistan

5.1 Population growth and economic development

While Pakistan has marginally maintained self sufficiency in food production since 1980's, this national level self sufficiency can not be guaranteed to be sustained in the future due to the growing population. With the current population growth rate of about 1.87 percent per annum, the population is expected to be 194 million in 2020 that would require wheat production to increase from the current 21 MT of wheat to about 30 MT (GOP 2009). Difficulties may also arise because of increasing demand for food due to economic development and changes in food habits.

On the other hand, competition for natural resources through out the country for land, water and energy both in rural and urban areas is increasing due to the growing population. Due to lack of land use planning, more and more agricultural land is brought under housing, industrial use and more recently under corporate farming. Increasing urbanization is also reducing the agricultural land converted to suburb areas where urban slums are emerging. Demand for the already limited water resources is at a rise. This competition will increase future vulnerabilities for sustainable economic growth and development, achieving poverty reduction goals, and improving livelihoods and food security.

5.2 Poverty and resource inequities

The incidence of poverty is at a rising trend though some improvement was seen in the current first half decade. In recent years poverty in rural areas has almost doubled from 27 percent in 2000-02 to about 40% in 2008-09. Food price inflation had a significant bearing on poverty. The 2007-08 rising price trends indicate that a major portion of price

increase stemmed in food items that are mainly consumed by the poor households such as wheat flour, rice, edible oil, vegetables and pulses (GOP 2008-09). Transmission of international energy prices to domestic consumers is one major reason for the inflation but the food inflation particularly the wheat price rise was artificially caused by black marketers locally taking advantage of the poor policy planning on the part of the government.

Poverty in Pakistan is also the result of inequitable distribution of land and water resources in rural areas. Small and landless/tenant farmers comprise majority of the rural population. For example about 80% of the land is owned by only 20% large and medium farmers. About 60% of the farm households own less than 5 acres of land or 15% of the total farm land. The total farm owner and landless tenants below one acre of land makes about 30 percent of the total rural households. In the surveyed villages most of the interviewed households were in this category and found to be extremely food insecure. While land reforms were attempted in 1972 but could not get success and would not even brought in the near future because feudalism is much powerful and majority of them are involved in politics to safeguard their interest. Furthermore a large area in Punjab and Sindh is state owned land which is lying either barren or cultivated by poor landless. Land use rights are not defined for these lands and the illegal occupation of these lands by the powerful replacing the poor cultivator is at a rise. More recently some such land is being brought under corporate farming. These malpractices in the country could further increase land and income inequalities and increase poverty and food insecurity.

5.3 Public policies

Owing to the limited storage capacity of the government, the procurement of wheat (e.g. roughly 3-5 MT annually) at the minimum guaranteed prices is ensured only to large producers. The recent decision of the government to expand the procurement and storage through involvement of the private sector is an encouraging step but has not been implemented.

Furthermore, public sector investments are targeted in the already well off areas focussing large farmers. Small and landless farmers that make over 80% of the rural population is not targeted despite of the fact that they are the most vulnerable and have poor access to improved inputs because of cash constraints and lack of access to credit. Lack of resources and attention by the government has been increasing the vulnerabilities of the poor households in rural areas.

5.4 Land use and land and water resource degradation

Agricultural productivity is at a declining trend because of land and water resource degradation. The productive mountain areas both in the Himalayan as well as western mountain zones are degrading fast that has major implication for agricultural productivity and food security both in the mountain areas as well as for the plain irrigated areas. The communities in the mountains highly depend on limited natural resources for their livelihoods and as such many unsustainable practices are used by the farmers. These include intensive cultivation, cultivation of steep slopes, deforestation and forest encroachment for agricultural use (Hussain 2003). The above unsustainable practices in the fragile mountain areas are causing erosion of top soils, and increasing surface run offs and silt loads downstream. Climate change is expected to further enhance the land degradation in mountain areas and exacerbate the food security issue. The frequency of flash flooding in mountain and sub-mountain areas has already increased since 1990's.

Thus not only the productivity of land in the mountain area is being negatively affected but also the country's reservoirs capacity is declining. Total reservoirs capacity in Pakistan was 18 Million Acre Feet (MAF) in the late 1980's. This has already reduced to 14 MAF due silt accumulation in the reservoirs and has caused reduction in hydroelectric power generation capacity and irrigation water for the irrigated areas in Punjab and Sindh.

Land degradation is also caused by water logging and salinity which is seriously threatening the sustainability of irrigated lands in the Indus Basin and the coastal areas. About 6.3 million ha (35%) of the irrigated area has been affected by this menace in central irrigated zone. The problem is mainly the result of poor irrigation and drainage management in the country. In spite of huge investments by the government with the assistance of multilateral organizations to combat the problem of water logging and salinity, the results have in general been less encouraging. The problem persists and is increasing, affecting the productivity of land in those areas. Water logging and salinity as well as floods are also increasing health related issues (gastro, malaria and other water born diseases) mainly affecting the food security of the poor, particularly the children.

5.5 Water resources and water use efficiency

The food security could not be sustained given the current status of water availability, and low efficiency in agricultural water use and delivery systems. The current delivery inefficiency in canals and water courses is about 30 percent and the inefficiency in on-farm water use is about 25%. The inefficiencies in water use are causing water shortages and are the main cause of water logging and salinity.

The country mainly relies on the supply based engineering measures to fulfill irrigation water demand to achieve country's self sufficiency in food production. Highly capital intensive investments in civil irrigation works were promoted in 1970's and 1980's by the government with support of the Asian Development Bank and the World Bank. These investments have encouraged the introduction of water intensive crops and practices, enhanced increased inefficiencies in water use and delivery systems, and above all created menace of salinity and water logging of productive lands as mentioned in the previous section.

While the above supply-based engineering measures would be necessary even in the future and especially in the context of climate change/variability to harvest and regulate seasonal water flows, minimize flooding and reduce surface run offs and erosion, these measures would not be sufficient to meet the growing water and food demands of the country, especially keeping in view that the potential water resources in the country are limited, are declining and are already under various external threats including climate change. Equally or even more important measures would be to introduce water efficient methods, practices, cropping systems and technologies.

5.6 Science and Technology Development/ Investment in R&D

The green revolution technologies including the introduction of semi dwarf varieties of wheat and rice in the 1960's and 1970's that accompanied with the introduction of synthetic fertilizers and irrigation were instrumental in increasing the food supply particularly in developing world. Both producers and consumers benefited from this technology development. However the inefficient use of green revolution technologies also increased vulnerabilities as land degradation, food quality and health mainly due to over use of chemicals (Oxfam International, 2008).

Yet the green revolution has helped in increasing the supply of food in many regions to keep pace with the increase in demand caused by population growth and economic progress (Aggarwal et.al, 2004). Within Asia, much of the increase in food production was in the Indo-Gangetic plain (IGP), covering large productive areas of Pakistan, India and Bangladesh (Aggarwal et.al, 2004).

Pakistan has however not fully tapped the benefits of green revolution compared to the other countries in the region. The wheat yields for example in Pakistan Punjab “the main food basket for the country” are two times lower than the Indian Punjab and about three times lower from Egypt (GOP 2008-09). Within Pakistan, about 40 per cent yield gap or even more has been estimated in wheat between the progressive farmers and the average farmer. There are progressive (mainly medium/large) farmers of irrigated areas who are harvesting 6 to 7 tons of wheat yield per hectare, whereas the average farmer wheat yield ranges between 2.5 to 2.8 tons per hectare in irrigated areas and 0.5 to 1.3 tons per hectare under rainfed condition (Arif 2007).

The stagnation in yields and widening yield gap has been mainly caused due to reduction in R&D investment, especially since 1990’s. There is increasing diversion of focus of the government including donors to other social and industrial sectors (education, health industries and services)⁹. Within the sector, major reasons for low productivity and instability are low investment in research and extension and lack of interest/awareness to tap the benefits of emerging science and technology development such as biotechnology that has the potential to increase crop yields by 20 percent or more with no greater use of natural resources, even on small farms (Larson, 1999).

“Biotechnology” has the potential to evolve high yielding hybrid seeds and crop varieties that are resistant to pest thus could help in reducing pesticide use. Other benefits likely to come through biotechnology are the development of varieties with greater tolerance of drought, water logging, heat and cold – important traits given current predictions of climate change. Such technologies hence could help in adaptation to climate change. Value added output traits with consumer-oriented tastes/benefits, such as improved nutritional and other health-related characteristic would also be possible through these technologies (Shimoda, 2004).

Although the investment in biotechnology is at a rise in various countries yet there are uncertainties about the political and economic costs associated with it. There are still unresolved international conflicts over environmental and public health safety. The opponents of Genetically Modified Organisms (GMO) products and environmentalists endeavor resistance due to the perceived environmental and health related risks associated with these products. The EU has imposed stringent regulatory requirements on foods containing or produced from (Meijer and Stewart, 2004). On the other hand, various trade pressures are coming from the GMO exporting countries, like USA and Canada. This is leading to paralysis and/or difficulty in developing countries decision making regarding GMOs (Meijer and Stewart, 2004).

While the GMO issue still has to be resolved internationally, the increase in productivity in Pakistan and most developing countries could come from R&D investments in proven technologies already available on the shelf for soil and water conservation/improvement, and post harvest handling of agricultural products. Technologies like precision land levelling and irrigation systems like drip and sprinkler systems, organic farming, planting

⁹ E.g., Official development assistance (ODA) to agriculture has fallen by some 75 per cent over the past two decades, from a high of approximately \$20bn per year in the mid-1980s to \$4bn per year in recent years (Oxfam International 2009c)

on raised beds or zero/deep tillage, waste water treated and used for irrigation, new crops requiring less water (and/or new improved varieties), efficient crop sequestering and timely planting, and rain water harvesting for small scale supplemental irrigation to increase productivity of rainfed areas are few examples. According to Nobel Laureate, Norman Borlaug - In order to expand food production for a growing population within the parameters of likely water availability, the inevitable conclusion is that humankind in the 21st century will need to bring about a "Blue Revolution" to complement the so called "Green Revolution". In the new Blue Revolution, water use efficiency must be wedded to land use efficiency (Borlaug 2002).

These non-GMO options can be introduced with low costs and will improve the availability of food (wheat and rice) given that Pakistan has vast potential in improving water use efficiency¹⁰, fertilizer use efficiency, and use of quality seed¹¹. Furthermore, post harvest losses of wheat are estimated over 10 percent which is mainly caused by inefficient harvesting and storage practices by farmers due to lack of appropriate practices and awareness.

Most of the above measures may be however more appropriate for increasing agricultural output including food crops (wheat and rice) mainly in the irrigated plains especially those districts which already fall in the food surplus zones. Marginal zones covering NWFP, Baluchistan, FATA, NA and AJK as well as the desert and coastal regions in eastern/southern parts of the country also have the potential in improving food availability and access for small farmers but are largely ignored for R&D. Potential technologies in marginal areas that would be more appropriate under the small/marginal farmers local conditions and carry little inherent risks to the poor farmers.

5.7 Climate Change issues and vulnerabilities

The 2007/8 Human Development Report (HDR) warned that the achievements of a number of MDG targets, most notably in poverty reduction, will be compromised by five climate change induced human development tipping points: reductions in agricultural productivity; heightened water insecurity; exposure to extreme events; collapse of ecosystems; and increased health risks (UNDP, 2007a).

Thus climate change and variability will further increase the food security issues and vulnerabilities. The adverse impacts of climate change with higher glacial melt, shortage of water in rivers and dams and prolonged droughts is expected to further reduce water resources for agricultural crops, livestock, energy and other sectors of the economy. Since 1980's, the country is already facing farm gate water reductions due to sedimentation loads in rivers and dams. Climate change is also expected to increase land degradation and further decrease the agricultural and livestock productivity. Furthermore, there is substantial evidence now that extreme climatic events are found to be closely associated with climate change. The data gathered by CRED indicate that the frequency of hydro-metrological hazards has increased in Pakistan since 1990's (CRED, 2007). Some recent studies conducted by FAO also point towards increasing frequency of these disasters (FAO 2009).

Main attributes of climate change impacts that have implications for agriculture in general, and water and food security in particular are:

¹⁰ The current on-farm and off-farm conveyance losses are in the range of 30-40%.

¹¹ The current improved seed availability of wheat is less than 20% of the total seed requirement (MINFA).

- Both summer and winter temperatures have increased in most parts of the country. Furthermore, nights have become cooler and days have become hotter especially in the mountain regions (GCISC results).
- Winter seasons are becoming shorter and spring seasons are disappearing because of the early onset of summer seasons. For example according to the recent report by Oxfam GB, a resident of Rajanpur district in southern Punjab said that “a decade ago, we used to have six months long winters and six months long summers. Now the summers lasts for nine-months and winters for three-months” (Oxfam GB 2009b)
- Rising temperature in the mountains are affecting the glaciers and snow melting that feeds the country’s large canal network. The faster snow melt in early summer months and the melting of glaciers would have implications for the country’s water resources in the long run and thus food security.
- Rising temperatures are increasing water demand and use for crops and livestock. On the other hand, higher evapo-transpiration and heavy siltation loads have reduced the overall water availability in rivers and canals, especially in lower Sindh lying at the tail end.
- Excessive heat in spring season is causing rapid vegetative growth but less yields throughout the country. For example, since many years the agricultural planners announces wheat a bumper crop by observing the lush green good stand and vegetative growth full of grains in early spring season. However after harvesting, the nation’s wheat production is about one to two million tons lesser than the actual forecasts. The main reason could be that grains become shrunken due to excessive heat before maturity that lowers the overall yields roughly by about 5-10%. It also affects the quality of grains.
- Ground water in Baluchistan and some other parts of the country has reduced mainly because of over-extraction but also because of climate change.
- Late monsoons and winter rains are increasing droughts and affecting crop cultivation in rainfed and desert areas.
- Extreme events (droughts and floods) have increased because of erratic but intensive rains affecting livelihood sources and damaging crops and livestock.
- Excessive heat in summers, low rainfalls in winters and abrupt changes in seasonal patterns during the year have increased crops, livestock and human diseases and changed the lifecycle for insects and pests.
- Sea level has increased by about 1-2 cm during the past century (NIO results), affecting marine fishing; especially the shallow water fishing has decreased, which is the main source of livelihood of the poor community.
- The sea level rise has perhaps increased salt water intrusion that is affecting agricultural lands in the coastal zone. Also water tables have increased in the coastal areas. For example according to Oxfam GB report quoting a resident of Bhugra Memon, in district Badin “30 years ago, the sea was roughly 25 Km away from our village. Over the years it has shifted nearer and nearer and is now only about five Km away (Oxfam BG 2009b).
- Women workload has increased to fetch fuel wood and water in the dry land areas and increased their burden to take care children due to increasing

health issues in children. Male out migration has also increased the workload of women on-farm.

The above climatic changes vary in the country's diverse agro-ecological regions. Major climate change vulnerabilities in various agro-ecological zones are discussed below:

5.7.1 Mountain areas:

Mountain ecology is highly vulnerable to various unsustainable practices and climate change. The fragile **Himalayan mountain zone** is already under pressure due to deforestation, land encroachments and soil erosion. Climate change in the form of increased temperature and changing precipitation patterns are increasing the risk of land and water degradation in these areas. Springs have dried up in most sub-mountain areas, increasing the work load for women to fetch drinking water from long distances. Increased summer rainfall along with melting of snow contributes to soil erosion of the fragile mountains, glacial lake outburst floods (GLOFs) and flash flooding. The May 2005 flash flood was caused by snow and mud sliding in the high mountains in the north. These impacts have high implications for agriculture and livelihoods in the Himalayan mountain zone and sub-mountain areas. While crop yields will increase in the high mountain areas, the overall impact on livelihoods will be negative because of high land and water resource degradation (Hussain, 2003).

In the **dry western mountainous ranges** of Hindu Kush (covering FATA and Baluchistan) agricultural lands are also limited, but where available are used for high value crops and fruits cultivations. On the other hand, the region, especially in Baluchistan parts have extensive range lands that are used by communities for grazing small ruminants (sheep) which is the main source of livelihoods of the people living in those areas. These rangelands are extremely dry with less vegetation and grasses because of limited rains (less than 30 mm/year), especially in Balochistan parts. Climate change related droughts and heat stress is causing shortage of water (both surface and ground water) and is increasing stress on vegetation in the range lands. The area is also affected by torrential rains upstream that are causing flash floods, the incidence of which has increased in recent years.

The traditional irrigation system "Karez system" in Baluchistan is common through which the water from the upper mountains flows in closed tunnels which is used for growing high value fruit crops (apple, apricot, pomegranate and grapes). However, perhaps due to climate change, most Karez water sources have dried up and the community has lost interest in managing this system. In addition, ground water that was available in some pockets in Baluchistan is over used and the water table has gone down making it difficult for the farmers to extract deep water. Partly it is also because of the fixed subsidized electricity rates by the government which has encouraged the farmers to inefficiently use the ground water.

5.7.2 Plain areas

Climate change vulnerabilities vary across the plain areas. The **rainfed sub-mountain areas in NWFP, and northern Punjab** are prone to flash flooding, after heavy rains during the summer. The soils are silt loam and gully erosion is common. Heavy and intensive monsoons due to climatic variability may increase the land erosion in these areas. In the Hill torrent zone (in southern Punjab and NWFP and some western parts of Sindh), flash flooding from the Suleman mountain ranges has significantly increased in

recent years¹², inflicting heavy losses to crops, livestock and houses (including stored food). In the **irrigated zone** (covering central Punjab and Sindh) that is the main food basket for the country, climate change is believed to reduce water resources in the long run. At the same time, intensive monsoons and increased run off in the upstream areas will increase the risk of flooding in the irrigated zone.

Temperature increases will affect crop yields and its quality in all the plain areas. The decline in yields has already been noticed because of increases in temperature in the plain areas. Thus country's productive irrigated lands are under serious threat due to climate change that has implications for food security of the whole nation. Major issues are also the in-efficient use of irrigation practices and over use of chemical inputs (fertilizers and chemicals). Poor people are the one that will suffer most because these communities are pushed towards marginalized/ less productive lands/ hazard prone areas.

5.7.3 Desert Areas

Monsoon droughts are regular phenomena in **sandy deserts and semi desert areas** (covering Tharparkar in Sindh, Cholistan in Punjab, Khirtar semi desert and some southern districts of NWFP). In recent years (1990 onwards), the frequency of monsoon droughts has increased, perhaps because of climate change (FAO 2009). No crops could be cultivated during the frequently occurring monsoon droughts. These droughts are disturbing the livelihood patterns of the communities for the entire year. Lack of food, fodder and water bounds the communities to change their food patterns leading to malnutrition, diseases and animal losses. Wells get dry depriving the communities from the use of drinking water. In Tharparkar the water is already brackish. Most families migrate along with livestock to the neighboring districts. On their way many of their livestock (which is their only source of livelihood) also die during migration. Small ruminants (goats) are sold at a cheaper price to cope with household food and other requirements. Most households are already in debt throughout because of these regularly occurring droughts (about every three years). The relatively better infrastructure developed during the current decade along with the exploration of minerals (Plaster and Coal) has increased some livelihood opportunities for the people in the area. Weaving industry (carpets) and local embroidery is also grooming. Introduction of skill development activities for these industries could help in diversifying livelihoods in these areas and improve their resilience to droughts.

5.7.4 Coastal areas

The **coastal areas in Sindh and Balochistan** are heavily prone to cyclones and floods, which have the biggest overall impact on lives and livelihoods on people in coastal area, especially those that are living close to the coast. The main source of their livelihood is fishing and some saline agriculture. Rising sea levels associated with climate change is also affecting the coastal region. Productive agricultural land in coastal districts of Sindh province has been lost due to salt water intrusion. Vulnerability of communities for resilience to natural hazards (cyclones/ flooding) in general has also increased due to key man-made factors. Most coastal lands are under heavy pressure of deforestation (including mangroves) for charcoal making and cooking. Some coasts close to Karachi are heavily loaded with industrial affluent and together with over fishing, the marine environment is degrading fast and further increasing the incidence of poverty in the coastal areas. Physical vulnerability of communities at large is compounded by weak

¹² Regular flash floods were received in Rajanpur district in Southern Punjab during the period 2007-2009.

structure and placement of houses that are less resistant to cyclones and floods particularly in the remote low lying areas. Social vulnerabilities include; absence of land rights and fishing rights, lack of employment opportunities, neglect of coastal agriculture, lack of access to local productive resources, lack of social development and capacity building and lack of or non availability of social safety nets. All these has reduced the resilience and coping capacity of communities against hazards (FAO 2009).

6 Case studies

Field survey was conducted to understand ground realities about livelihoods, food security and climate change vulnerabilities of the poor communities in the major agro-ecological regions (see Table 1 for sampling details).

The following districts were selected in various agro-ecological zones for the field survey.

- Abbottabad district in the Himalayan-Sub-mountain zone in NWFP
- Rajanpur district in the hill torrent zone in Punjab province
- Jangh district in irrigated plain area zone in Punjab province
- Musakhel district in hyper arid dry mountain zone in Balochistan province
- Shadadkot district in Sindh province

The above districts were selected based on Partner NGOs advice in each zone and keeping in view the security situation in the country.

The survey results based on (i) perception of partner NGOs in the selected districts, (ii) Key informant discussions in selected villages and (iii) household level questionnaire findings in the selected villages are given the Annex 4. Important findings are summarized below.

6.1 Partner NGOs Perception

Discussions with partner NGOs confirm that agro-livestock farming is the main source of livelihood throughout rural areas of the country. Due to small land holdings, most households also supplement their income by working as wage labour for cash and kind on other farmers' fields or off-farm labour/service. The discussions confirm that the common livelihood issues in the country (including the selected districts) are lack of alternative employment opportunities, lack of safe drinking water and health issues. Livestock diseases and fodder shortages were also mentioned by the NGOs. The NGOs in costal zone confirmed that salt water intrusion has occurred which has caused loss of the productive agricultural land and yields of crops. They also informed that the shallow water fishing has declined in the coastal areas and there is a need for modern fishing tools for deep sea fishing to sustain livelihoods of the fishing community.

In terms of food security, the NGOs confirmed that only the irrigated parts of the districts of Rajanpur and Jangh in Punjab province are food surplus, and the other districts are extremely food deficit. All the districts were however rated as extreme/low in food access and utilization. Major issues mentioned by NGOs were small land holdings, shortage of irrigation water, declining productivity, lack of market access, high input cost and rising food prices. Political marginalization was also mentioned in some districts.

Except for Abbottabad (Himalayan region) where land slides are common, all the other districts receive floods due to heavy rains and droughts caused by shortage of water and/or no rains. The NGOs mentioned that the frequency of all these hazards has increased in recent years.

The partner NGOs also provided valuable suggestions for Oxfam Novib intervention. These are listed in the following table. District specific interventions are shown in Annex 4-B.

Table 7: Suggestions for addressing the livelihood, food security and climate change issues

Livelihoods improvement	Food security improvement	Climate change/ DRR	Other suggestions
<ul style="list-style-type: none"> • Livestock and dairy development. • Extension services for agriculture, livestock and dairy development • Animal health facility • Access to market • Sensitization/capacity building of line departments • Women skill enhancement. • Financial and technical support to vulnerable population. • Livelihood based education/skills development. • Health/education campaign 	<ul style="list-style-type: none"> • Restoration of saline lands • Provision of modern tools to promote fish culture and hatchery development. • Early warning systems • Crop insurance policy • Allotment of common and government land to poor communities for farming. • Community capacity building in agriculture and livestock improvement. • Separate agricultural policy for hilly area. • Promote organic agriculture. • Horticultural development. 	<ul style="list-style-type: none"> • Sensitization of local administration and community awareness • Community preparedness through social mobilization. • Adaptation technologies • District level disaster management plan and capacity building of all stakeholders. • Control of deforestation and land use planning. • Flood protection wall/ checks dams. 	<ul style="list-style-type: none"> • Water storage through dams and water management. • To make link between public health and local population to start adopt participatory approach. • Family planning services according to the social background of the area. • Sensitization of education department about the regular duty of the teacher. • Land reforms

6.2 Key informant discussion group results

Detailed results may be seen in Annex 4-C. The key informants provided useful information about their villages, including issues related to climate change. The results confirmed that the socio-economic facilities vary across the various agro-ecological zones. Shazad Kot district lying in the Sindh lower was found to be most backward area as no facility existed in the survey villages for school, hospital, paved road and drinking water supply scheme. In all the villages, hepatitis and malaria and in some villages gastro diseases were reported. Abbottabad district lying in the foothills of Himalayan zone was found to be slightly better off in most facilities (school, hospital and drinking water supply schemes) compared to the other districts. The improved facilities in Abbottabad are mainly because the district has better access to Abbottabad city which has become the hub for high quality education (including Universities) due to huge army infrastructure and the cooler weather attracts tourism in summer season from all over Pakistan. These facilities have also created substantial employment opportunities for villages in the district. However, it is important to mention that the Himalayan zone, especially in the upper parts has limited such facilities because of poor accessibility and depend only on limited natural resources for livelihoods.

The key informants in all the villages reported that the villages are not self sufficient in food production mainly because of small land holdings as is generally the case throughout Pakistan. Whatever food crops (wheat, maize or rice) are grown, these are sufficient for only few months. Even Rajanpur and Jangh districts that produce surplus food on aggregate level were reported to be deficient in food production mainly because most land is owned by only few large farmers and the other households living in the village work for these large farmers as in-kind labour (some time bonded labour) and receive only a small proportion (14th - 1/8th share) in return that does not sufficiently meet the household food requirements.

Agriculture and livestock farming was considered as the main source of livelihood in all the zones, supplemented by service of-farm and/or work as daily wage labour. Fruits and tourism were mentioned as a source of income in the mountain zones. While Musakhel district, lying in the dry western mountain zone also produce high value fruits but these have not been reported by the informants perhaps, these are mainly owned by rich farmers. However, these high value fruits provide livelihood opportunities for small/landless farmers in the area to work as wage labour for harvesting and marketing. Modern marketing facilities could further improve livelihood opportunities for the poor people living in the dry mountain areas. Substantial opportunities also exist for livestock improvement in this zone, as majority of households keep large number of small ruminants.

The key informant's in each district also provided suggestions for improving livelihood opportunities. As expected, natural resource improvement was major priority in Abbottabad district obviously because the communities in this area depend on these natural resources, especially forest. They also mentioned to improve vegetable production and introduction of improved fruit seedlings. Natural resources, and fruits and vegetables are the major niche of Himalayan mountain areas. Agricultural development for irrigated areas and livestock and skill development for rainfed areas in Rajanpur and Jangh districts were the main priorities. Livestock improvement was the main priority in Musakhel district in Balochistan, and livestock development, agriculture and fishing improvement were main priorities in the Shadadkot district in Sindh.

The 2008 food inflation shock in terms of rising food prices and high input costs has also affected the poor households throughout in the surveyed villages. Wheat flour was available all over the surveyed districts but unaffordable by the poor households. Other shocks were related to natural hazards such as Earthquake and land sliding in Abbottabad, drought in Musakhel, and floods and crop diseases in rest of the districts. Like the other parts of Pakistan, hydro-metrological shocks have increased in all the surveyed villages in recent years. These shocks have increased their indebtedness and most households had to send male members to cities for work or temporary migrate to other areas. During the rising prices in 2007-08, the communities had to increase labour, their debit increased and the households relied on eating less.

Interestingly, changes in some climatic parameters were felt in all the districts as shown in Table 8.

- In all zones, temperatures have increased and rainfall has declined in both summer and winters¹³.
- Crop diseases have increased in all zones as well as crop yields. The key informants relate these both due to climatic factors (temperatures, rainfall, water availability, droughts and floods) as well as due to economic factors, especially high input costs.
- Abbottabad district shows no change in irrigation water availability because it lies in the foothills of Himalayan zone which is fed by water from glaciers in the high mountains. While snow fall has declined as reported by the key informants in the district, the increases in temperatures in the high mountains (GCISC studies) may be causing increased snow and glacial meting with more water flows

¹³ Abbottabad district also shows a decline in overall precipitation (including snowfall) which has also been reported by the GCISC studies for Himalayan zone. Higher temperatures also cause early melting of the snow that disappears quickly before the onset of summer season.

downstream at least in the short-run. However in the long-run, glacial depletion and early snow melting due to rising temperatures, along with reduced precipitation could well affect the availability of water in the plain irrigated areas affecting overall food security of the country. The various studies by ICIMOD suggest that mountain people are equally being affected by these climatic changes. The drying-up of springs, dehydration of soil, reduced flow of local streams, and lack of winter snowfall are increasingly affecting the mountain region water and food security. These studies stress the need for tapping indigenous local knowledge as well as regional strategy to adapt to these changes (ICIMOD, 2009).

- Perhaps because of the above climatic changes (both rising temperatures and decline in rainfall and water availability), all the zones have noticed negative impact on livestock in the form of low productivity, decreased fodder availability and increased animal diseases/ deaths.

Table 8: Perception of key informants in the villages about climate change and its impacts over the last ten years

Indicators	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
Summer temperature	+	+	+	+	+
Winter temperature	+	+	+	+	+
Summer rain	-	+	-	-	-
Winter rain	-	-	-	-	-
Spring rain	-	NC	-	-	-
Snow fall	-				
Irrigation water availability	NC	-	-	-	-
Crop yields	-	-	-	-	-
Crop diseases	+	+	+	+	+
Impact on livestock					
Re-production	-	-	-	-	-
Milk production	-	-	-	-	-
Fodder in grazing lands	-	-	-	-	-
Diseases and deaths	+	+	+	+	+
Adaptation practices by communities					
Crop sowing	NC	E	E	E	L
Crop harvesting	NC	E	NC	E	E
Change in number of irrigations	NC	+	+	+	+

+ = Increased; - = Decreased; E = Early; L= Late; NC= No change;

Realizing the above climatic changes, the communities in all zones have reported adaptation practices to adjust their sowing and harvesting times and to increase number of irrigations. These adaptation practices have not been reported in Abbottabad district for genuine reasons. Temperatures in Himalayan regions are still in the acceptable range for the available varieties, rather increases in temperature are beneficial for crop yields in the high mountain areas. Recent study by Hussain and Mudasser (2007) indicates that wheat yields in the high Himalayan mountains (above 1500 meters) are showing increasing trend because of temperature increases. On the other hand, wheat yields for the available varieties in the sub-Himalayan mountain have already reached to optimum level and any further increase in temperatures would affect these yields. In the lower plain areas crop yields have already declined due to rising temperatures (Malik et.,

al, 2005). Thus it is now the right time that the available varieties of the plain areas should be introduced in the Himalayan zone so that to take advantage of rising temperatures in the region (Hussain e. al. 2005 & Malik et. al. 2005). For the plain areas, introduction of short-duration varieties, adjustments in sowing timings and rational use of water could be more appropriate adaptation strategies as already reported by the respondents.

Water shortages were observed in most zones. This not only affects the crop productivity but also has implications for livestock productivity because the water shortages would reduce the fodder availability. Thus the overall food security and livelihoods are at threat due to climate change in all zones.

6.3 Household level questionnaire results

For understanding of the issues at household level, interviews were held with household respondents in three selected villages in each district. Due to the small sample and the fact that proper random sampling was not done, in-depth statistical analysis in the selected districts were not possible. The results should therefore be quoted with caution. The socio-economic conditions, livelihoods, food security of the households, and climate change impacts and adaptations by the households in each district are given in Annex 4D. Comparison of these results in the selected districts provides some interesting patterns for the various agro-ecological zones. This are briefly explained below.

Socio-economic conditions

Summary of socio-economic conditions of the households are given in Table 9. The Shadadkot district in Sindh is highest in poverty ranking followed by the southern Punjab districts (Rajapur and Jangh). Most households (more than 50%) fall in the category of very poor in these districts. The poverty in these districts is caused by various reasons but mainly because of in-equal distribution of agricultural lands. Productive agricultural lands are owned by only few absentee landlords and majority of the population (both men and women) living in these areas work for them as in-kind wage labour. Furthermore, the poor households in these areas are pushed towards less productive marginal lands e.g., along the Indus river bed or those lands which are saline or depend only on rainfall. All these marginal lands are at greatest threat to monsoon flooding caused by hill torrents in southern Punjab and monsoon flooding in Sindh. The frequency of these floods has increased in recent years affecting their standing crops, non-durable houses (made of mud or thatch material) and household productive assets. These poor households are also less resilient to economic and climatic shocks due to lack of alternative livelihood opportunities and the households members including both men and women work as wage labour.

As mentioned earlier, less poverty in Abbottabad district was observed because of proximity to improved facilities for education and job opportunities in the city. In the upper Himalayan and dry mountains (including NWFP, FATA and Gilgit-Balthishan) the incidence of poverty must be much higher because of limited land, difficult accessibility and lack of alternative livelihood opportunities (Table 4 reveals this). These high mountain areas could not be surveyed because of security issues and time constraint.

Table 9: District-wise socio-economic conditions of sample households

Indicators (% households)	Abbottabad	Rajapur	Jangh	Musakhel	Shadadkot
Poverty Ranking	40	70	64	58	78
Wealth Groups					

Indicators (% households)	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
Very poor	32	60	52	50	58
Poor	8	10	12	8	10
Average	18	18	8	22	20
Well off /rich	42	12	28	20	12
Occupation					
Service (govt./private)	23	13	20	33	10
Agriculture/livestock/fishing	3	20	10	53	73
Labour	17	43	37	3	13
Self employed/shopkeeper	3	6	14	3	0
Pension/retired	37	3	0	3	0
House wife/no occupation	17	15	19	5	4
Women involvement in work					
Involve women	3	50	30	3	50
Literacy (above 10 years age)	83.1	46.5	27.5	67.5	8.6
Type of housing					
Mud house	57	33	73	73	27
Huts- (non-durable material)	0	20	3	0	67
Durable/semi-durable house (bricks + muds)	43	47	23	27	6
Rooms in the house					
Single room house	13	67	47	13	93
Two rooms house	53	20	40	30	7
3-4 rooms house	34	13	13	57	-
Other facilities reported by hh					
Safe drinking water	53	63	86	93	40
Flush latrine/dry pit covered	90	20	7	53	3
Television	63	40	33	63	50
Refrigerator	5	30	1	33	23
Washing machine	43	30	-	13	23
Household reporting hepatitis	10	-	3	-	10
School facility < ½ Km	73	87	33	7	20

The poverty ranking reflects in other socio-economic characteristics, occupation, literacy rates, and housing that vary across the various agro-ecological zones. These factors determine the livelihood opportunities and resilience to economic and climatic shocks. For example the communities in Shadadkot district of Sindh are extremely poor due to which they have lowest literacy rate, highest indebtedness, and live in single room non-durable huts with poor sanitation facilities. These houses are highly prone to floods that are frequently affecting the communities making them poorer. The households in southern districts of Punjab (Rajanpur and Jangh) are also relatively poor and thus have lower literacy rates and most people live in one-two room houses with poor sanitation. These houses are made of mud material that are prone to floods. Most mud houses were damaged by 2008 flash flood in Rajanpur district in southern Punjab.

Human diseases were reported to be not a serious problem in all districts, perhaps because these are not diagnosed or seriously taken by the poor households.

Abbottabad district is relatively well off in all socio-economic characteristics and food consumption because most households have higher incomes mainly from off-farm service (including government and private service and tourism). Similarly Musakhel district in Balochistan relies both on service as well as on agriculture (with fruits as the

dominant source but not recorded by the enumerators). High number of animals especially sheep and goats are kept by households in the district as is generally the case all over Balochistan province and other mountain areas because of extensive range lands.

Most household in the mountains zones own land. In southern Punjab and Sindh, the results confirm that most household work as tenant for land lords but also own some land perhaps those state lands along the Indus river for which land rights are not fully defined. In all zones, all the households cultivate less than one acre of land. Thus the proportion of small/landless tenants in these villages is far higher than the national average where 61% farmers were found to be cultivating less than 5 acres. This emphasizes the fact that the proportion of poor small/landless farmers is much higher in the marginal zones covered under the survey.

Livestock is kept by most households: only one cattle/buffalo and 1-2 goats in all the districts, except in Musakhel district of Balochistan where in addition to cattle, a herd of sheep/goats (46 per household) is kept due to the availability of extensive grazing lands. More than 60% households especially in Abbottabad and Musakhel districts (mountain zones) depend on one person earning with major source of income coming from service or livestock. However in other surveyed districts that are found to be poorer have two or more persons who are engaged in earning for their households. Southern Punjab and Sindh also involve women to earn income for households from in kind wage labour (during harvesting)¹⁴. These findings suggest that poorer households tend to have more diversified livelihoods strategies than better off households. For example, majority of households in Abbottabad district (74%) depend upon off-farm-service only. In Musakhel, agriculture and obviously livestock are the main sources of income. In southern Punjab districts (Rajapur and Jangh) and Shadadkot district in Sindh being poorer depend upon multiple sources of income, e.g., agriculture, labour off-farm service and fishing.

Food Security

Food security situation in each district reveal that the sample households are not self sufficient in food production/ availability. Their yields are low (below the national average) and their own food production last for only few months (1-3 months) as is generally the case for about 80% small/landless households throughout Pakistan. For the remaining period, they depend on markets. Even though the southern Punjab districts (Rajapur and Jangh) and Sindh (Shadadkot district) were rated as self sufficient/surplus in food on aggregate scale (section 4), most poor households are deficient in own food availability. These results therefore point to the fact that food self sufficiency at aggregate district level could not be a guarantee, especially if land distribution is skewed. The large landlords own more than 80 percent of land in the southern districts of Punjab province and many districts in Sindh province. The earnings of the poor households are not sufficient to meet their household food and other cash requirements. Other reasons could be that the sample households were selected in only hot spot villages in the surveyed districts and the sample was not large enough to sufficiently represent these districts.

While the survey results reveal that majority of households (80% in Rajapur, 50% in Jangh and 30% in Shadadkot) produce or earn own rice, but it is perhaps mainly used as cash crop and only some proportion of their produce is eaten at home. Wheat being

¹⁴ Women are however usually over burdened because they also have to take care of children, livestock management, fetching drinking water and fuel wood.

the main staple for all the districts has a negligible share in households own production. In addition, some 17% households in Abbottabad mentioned maize crop from own sources and used as staple for few months during the year. Some maize grain must be sold in the district because it fetches high price in the market. Corn processing industries mostly buy maize from farmers in these areas. In irrigated zones, maize is only produced as green fodder for own livestock and some green fodder is sold in the market to meet the demand of livestock producers in suburb areas.

Majority of the households (about 80 – 90% in all other zones, but only 30% in Shadadkot in Sindh reported that the food was easily accessible (mainly on loan) from other farmers, from nearby town or from shopkeepers in the village. These loans are returned soon after harvest. However, during the 2007-08 food inflation, wheat flour shortages were severely felt all over the country (UN 2008a) and the rural households had to pay three times higher prices. Food being expensive and unaffordable during that period, the surveyed households coped with the high food prices by reducing their household food consumption and by buying cheaper low quality food on credit from local shopkeepers or near by town markets. Thus the 2008 food inflation has increased debts and poverty in rural areas all over the country in general and in the surveyed villages in particular.

It was discouraging to note that only few respondents in Abbottabad district (which is already generally well off) received external support e.g., from Bait-ul-Mal scheme (10% households) and from the recently introduced BISP (13% households). The BISP support was also received by only 3 percent households in Shadadkot district of Sindh. The southern Punjab districts did not receive any external support. This implies that the districts which were found to be the poorest are largely ignored for this kind of external support.

The survey results indicate that majority of the households have monthly income below Rs. 10,000 (less than Rs. 5,000 was reported in Shadadkot), whereas the average monthly expenditure ranges between Rs. 6,000 – 9,000 of which about 70 – 80 is spent on food items especially in southern Punjab and Sindh. Thus the households had deficient income in these areas to meet their food and other cash requirements. Majority of the households especially in Shadadkot district of Sindh were highly indebted (about 90%). They needed cash to pay for health expenditure and to buy food and agricultural inputs. Main source of credit is from landlords or middle men that mostly make all members of the household as bonded labour throughout the year for paying their debt.

While the sample households in all other districts reported that meal was eaten three times a day, in Shadadkot district meal was eaten only two times a day. These meals only include wheat or rice with curry and tea. Other nutritious items (fruits, milk and meat) are not eaten by majority of poor households in Sindh as well as in southern Punjab. Milk and milk products are daily diets of households only in Balochistan because more number of livestock is kept by the households. These results indicate that the southern districts and Sindh perhaps are not meeting the daily diet requirements.

The above results suggest that the poor households in all zones in general, and Sindh and southern Punjab areas in particular are overall food insecure. They have less food of their own and food from market is beyond their affordability due to low incomes. Less nutritious, low quality food is consumed that may be leading to malnutrition and decreased resilience to diseases and shocks. The above results however can not be generalized for other zones and within the sample districts because the survey sample was small and the households/villages were not randomly selected. Furthermore, some

zones were not covered including FATA, Gilgit-Balthishan, Desert areas and communities along the coast where extreme poverty exist.

Shocks

As expected the 2008 high food price was the major shock reported by households in all agro-ecological zones. Other shocks were area specific hydro-meteorological hazards. Flood due to intensive monsoon rains is common in both southern Punjab and Sindh. Rajanpur in Southern Punjab and Musakhel in hyper arid dry mountains also reported droughts (a common feature of the hyper arid dry mountain zone). Southern Punjab also reported windstorms that damage their standing crops. The Himalayan mountain areas are frequently affected by land slides. The main strategy used by the sample respondents to cope with the shocks was to do extra labour and temporary migration, especially in case of floods.

While all the zones mentioned the need to improve agriculture and water resources obviously because these form the main livelihood source for the households in these zones, some area specific measures for improvement were also indicated by the respondents. These included improvement of drainage and sanitation in southern Punjab and Sindh, and forestry plantations in the mountain zone.

Climate change impacts

Respondents in Himalayan mountain zone and southern Punjab zones were aware about climate change. This awareness was relatively low in dry mountain zone and Sindh. However in all the zones, majority of the households reported that crop yields, water resources and milk production have declined (Table 10) but reasons for these declines could not be directly related to climate change. For decline in yields, the respondents mentioned crop diseases, high input cost and shortage of water. Floods and droughts were also reported in flood/drought prone areas. The decline in milk production was mainly related to animal diseases, and some related to shortage of water, droughts and lack of fodder. While water shortage seems to be the key issue, majority of respondents could not understand reason behind these shortages. These results emphasize the need to raise awareness of the communities about climate change impacts.

It was interesting to note that the majority of respondents have started adaptation practices in most zones (Table 11). Almost all households in southern Punjab and Balochistan reported early sowing and early varieties. Most respondents in Southern Punjab relate this to climate change and/or increases in temperature. Abbottabad district lying in the foot hills of Himalaya logically speaking needs not to adapt early maturing varieties because of cooler temperatures, where increase in temperature is expected to have a positive impact on yields (Hussain and Mudasser, 2007). In all zones, number of irrigations has been reduced because of water shortages. Increases in temperature are expected to increase crop water requirement and therefore the number of irrigations should have been increased for reducing the heat stresses on crops but this would was not done because of overall water shortages.

In summary most of the above survey results supports the desk review findings. Poverty is high in the selected districts and the households have limited livelihood sources. Farm sizes are small and most work off-farm to supplement their income and food requirement. Generally speaking, farmers have started feeling the adverse impacts of climate change and have initiated some adaptation practices for agriculture. However,

external support would be needed to enhance their knowledge and capacities for timely adaptation to climate change and variability.

The following main conclusions can be drawn from the field survey results:

- Southern Punjab and Sindh have highest poverty ranking and most households (more than 50%) fall in the category of very poor in these districts who must be extremely food insecure, perhaps consuming less than 17,00 kcal/ capita/ day.
- Most poor households in southern Punjab and Sindh are deficient in own food availability because they work as in-kind wage labour for large absentee land lords (some time as bonded labour due to debts). They have access to only less productive marginal lands e.g., along the Indus river bed or those lands which are saline or heavily depend only on rainfall. These marginal lands depending upon location are at greatest threat to various hazards such as flooding, hill torrents, windstorms and storm surges. The frequency of these floods has increased in recent years that has further increased poverty, deteriorated socio-economic conditions and reduced resilience of the households to cope with these hazards.
- Because of being poor, they have lowest literacy rate, highest indebtedness, and live in non-durable houses (made of thatch material or mud) with poor sanitation facilities and highly vulnerable to hazards.
- The poor tend to have more diversified livelihoods strategies than better off households. Yet their access is mainly to low paid sources of income for livelihoods, e.g., labour in agriculture, off-farm labour and low-paid service.
- While food is easily accessible from other farmers and market but it can not be purchased from own income sources. Thus majority obtain loan from landlord or middle men to purchase the expensive food. In times of high food prices, these households had to reduce food consumption and to buy cheaper low quality food on credit. Thus the 2008 food inflation must have increased debts and poverty in rural areas all over the country.
- All the zones mentioned the need to improve agriculture and water resources obviously because these form the main livelihood sources for agricultural based rural households. Some area specific issues were also mentioned by the respondents, e.g., improvement of drainage and sanitation in Sindh and southern Punjab (especially in Rajanpur) and Forestry plantations in mountain areas.
- While majority of the households have observed the decline in crop yields, milk production and shortage of water resources reason for these impacts are not well understood. There is a need to raise awareness of the communities about climate change.
- Where needed, the rural households have started climate change adaptation practices by adjusting their sowing time and use of early maturing varieties.

Table 10: Climate change related impacts

Indicators (% households reported)	Abbottabad	Rajanpur	Jangh	Musakhel	Shadad- kot
Crop yields					
Declined	57	50	67	33	53
Reasons for decline					
High input cost	40	33	0	30	27
Shortage of water	50	17	13	40	7
Crops diseases	10	23	27	10	30
Flood	0	27	0	0	37
Drought	0	0	60	20	0
Irrigation water					
Declined	80	47	70	63	97
Reasons for decline					
Don't know	77	57	90	100	90
Increase in temperature	0	0	10	0	0
Low rain	23	0	0	0	0
Poor irrigation system	0	43	0	0	0
Political interference in water distribution	0	0	0	0	10
Milk production					
Decreased	70	63	83	73	80
Reasons for milk decrease					
Animal diseases	30	97	67	40	43
Crop diseases	17	0	0	30	7
Droughts	0	0	0	23	0
Lack of fodder	13	0	27	7	10
Shortage of water	40	3	7	0	40

Table 11: Climate change adaptation practices by households

Indicators (% households reported)	Abbottabad	Rajanpur	Jangh	Musakhel	Shadad- kot
Wheat sowing time (% hh reporting)					
Early sowing	0	97	100	100	37
Late sowing	30	0	0	0	60
No change	70	3	0	0	3
Reasons					
Climatic changes	22	0	7	0	7
High temperature	0	93	67	50	27
Lack of irrigation water	22	7	0	0	63
Low rainfall	56	0	0	40	3
Drought	0	0	20	10	0
Other crops sowing time					
Early sowing	0	93	67	100	37
Late sowing	30	0	3	0	60
No change	70	7	30	0	3
Reasons					
Climatic changes	44	93	97	0	0
Crop diseases	0	0	3	0	90
Heavy rains	0	0	0	70	0
Lack of water	0	7	0	0	10
Low rain	56	0	0	30	0
Change in crop varieties					
Early maturing varieties	8	100	95	100	16
Same varieties	92	0	5	0	84
Reasons					
Arid area	0	0	0	100	0
Early varieties introduced by	0	100	0	0	0

agriculture extension					
Lack of water	0	0	100	0	100
Low rainfall	100	0	0	0	0
Change in number of irrigations					
Reduced irrigation	25	100	5	69	100
No change	58	0	95	19	0
Increased irrigation	17	0	0	13	0
Reasons					
Arid area	0	0	20	100	0
Low rain	67	0	0	0	0
Political interruption in water supply	0	0	0	0	100
Tail canal area	0	100	0	0	0

7 Mapping of stakeholders and their interventions

List of stakeholders for food security and climate change is given in Annex 5. The Ministry of Food and Agriculture (MINFA) is the main focal ministry to develop and implement policies for food, agriculture, and livestock. The Agricultural Prices Commission (APCOM) now reformed to Agricultural Prices Institute (API) advises the ministry on food prices and the PASSCO helps in the procurement and storage of wheat, rice and pulses to help regulate food prices and distribution. These market interventions have not been very effective in resolving the food security of the country and particularly of the small farmers. Only a few large farmers and urban consumers benefit from these policies.

The Pakistan Agriculture Research Council (PARC) has some established institutes such as National Agriculture Research Centre (NARC) based in Islamabad and Arid Zone Research Institute (AZRI) based in Quetta generates some research knowledge on agriculture and livestock. Climate change adaptation research has not been mainstreamed so far in their research agenda.

Agriculture being the provincial subject, each province has large set-up of agriculture research and extension departments as well as livestock department. Yet the objective of improving agricultural and livestock productivity and to reach to the small farming community has not been achieved. Agriculture research is not farmer oriented and the recommended technologies and packages are not according to the farmer needs to improve their livelihoods and food security. Research and extension linkages are poor due to which the research knowledge does not reach to farmers. Market research for value addition is non-existent in the provinces. The Fruits and Vegetable Development Board that was established in 1980s in NWFP through Swiss support was abolished in 1990's. More recently Horticultural and Export Development Board has been established in Lahore, Punjab to focus on value addition and increase fruits exports.

Food security until recently was considered up to the level of self-sufficiency in food at the national level. The government research and extension services had been active only in increasing productivity of farmers in food crops with particular focus on wheat and rice. The UN Food and Agriculture Organization has remained short of capacities and resources. The WFP and NGOs had been proactive in the distribution of food items in case of emergencies. More recently the new concept of food security-availability, access and utilization has been realized by the government and NGOs. Realizing its importance, the government of Pakistan has included food security as a separate

chapter in its five year plan. A centre of excellence for food security is in the process of establishment at the Pakistan Institute of Development Economics (PIDE). WFP has initiated school feeding programme since 2005 and some livelihood activities to improve resilience of the communities to shocks. The UN agencies under the One UN programme have initiated programmatic approach for five thematic areas covering poverty, rural development, agriculture, environment, health, education and DRM (including climate change). Safety nets are being targeted through various government schemes such as BISP and utility stores corporation. Most national and local NGOs are expanding their mandate and capacities to participate in addressing the issues of poverty, livelihood, food security and climate change adaptation in rural areas. However, capacities at national as well as at the local level are limited and the interventions are still insufficient to solve the food security, livelihood and climate change issues of the country's growing population of more than 160 million out of which about one third are poor and malnourished more than half are living in rural areas.

Climate change is an additional challenge as it has high future consequences for food security. While Pakistan has started up to take climate change on the development agenda, it still lacks capacities and resources to deal with the issue. The country has so far not developed climate change policy and action plan. Ministry of Environment is the focal ministry for climate change. Global Change Impact Studies Centre (GCISC) has been established to carry-out modeling based research on climate change and its impact on water resources and agriculture. Yet climate change issue has not been mainstreamed in the development sectors to systematically assess climate change impacts and devise adaptation measures for the main sectors such as agriculture, water and health.

I/NGOs, UN agencies, local NGOs and donors who are not directly involved in the policy decision process are the one who are driving the climate change agenda and influencing the policy decisions on climate change (Oxfam GB 2009a). While some awareness about climate change has come at government level but a lot more need to be done to enhance capacities of the government departments to understand the issue and its impacts and mainstream climate change in research and development agenda in the relevant sectors. Especially, the local NGOs capacities have to be enhanced to assist the local communities for timely adaptation to climate change in rural areas to avoid negative consequences on livelihoods and food security of the largely rural population who are expected to be affected most by climate change.

8 Lessons learned, conclusions and recommendations

8.1 Broad Issues

- At the national level the food security situation for the future is not very encouraging. Even though the country has marginally maintained self sufficiency in wheat and surplus in rice, about 62 million people are still poor and food insecure.
- With the recent food crises and inflation, the country faced difficulty to ensure the accessibility of food and especially to the lowest 20% of the extremely poor segment of the society who has no purchasing power to buy the ever rising expensive food of a sufficient quantity to meet the minimum dietary requirements of the households.
- In a struggle to maintain self sufficiency in food and to keep pace with the growing population the country has been exploiting the potential in irrigated areas. Some of these irrigated areas have now been severely degraded due to water logging and salinity and soil fertility loss due to inefficient methods and practices.

- Crop yields are less than the potential and at a declining trend due to various reasons including policies and inefficient practices and methods as well as perhaps due to climatic stresses. Even the potential of the green revolution has not been exploited if we compare the agricultural productivity of Pakistan Punjab with Indian Punjab. Within the country, there are high yield gaps (more than 50%) between the progressive farmers (large/medium farmers) and the average farmers.
- Policies and investments if any are geared towards large farmers in the already well off regions. Small farmers' and landless household requirements particularly in marginalized zones for their access to alternative livelihoods, food, inputs, markets and credit are limited or non-existent. Disparities in poverty and food security have alarmingly increased across the provinces and regions that may increase cross provincial/regional conflicts within the country.
- Government owned food storage capacity is limited due to which only small quantity of wheat is procured on minimum guaranteed price mainly from large farmers. Private sector involvement in wheat procurement and storage is under consideration but not implemented. Food storages in marginalized zones are not available for strategic maintenance of food stocks.
- The government lack monitoring and forecasting systems to assess food situation and stock in the country and to timely take actions for imports. This has encouraged back marketers hoarding that creates artificial food shortages and food inflation. This increases vulnerabilities of the poor to access food at an affordable price.
- Poor farmers and landless households own food is only sufficient for 3-4 months. For the remaining period the food is purchased from market through loans from landlords and middlemen that has been increasing indebtedness of the poor households.
- Social protection through social safety have been initiated e.g., Utility Stores Corporation, BISP, Bait-ul-Mal and Zakat/Usher schemes, but these are still far from reaching to the vulnerable rural poor in marginalized zones.
- The health of the population, especially children is deteriorating fast due to malnutrition and water born diseases that reduces the absorptive capacity of the children and leading to high mortality.
- Climate change and variability may further lower down yields. Declining trend in wheat yields from existing varieties in the sub-mountain and plain irrigated areas have already been noticed. Future impacts will be much higher if genetic improvement is not made. Land degradation both in mountain areas as well as irrigated areas is on the rise because of deforestation, inefficient use of water resources and other inputs, and also because of hydro-metrological hazards (drought and floods). The increased frequency of hydro-meteorological hazard associated with climate change will increase land degradation and exacerbate the livelihood and food security vulnerabilities of the small/landless tenant farmers because of their limited capability and resource availability to cope with the shocks.

The above issues require long-term commitment and therefore Pakistan will not be able to reduce the number of malnourished people to half by 2015 as committed during the World Food Summit 1996 and to achieve the targets set by the Millennium Development Goals (MDG) of 2000. The status quo in food security will remain in the country and may further increase, unless there is political will to change - a need for a rights-based approach for just distribution, people-centred development activity, protection to subsistence, landless farmers and farm workers, and improving social security nets.

While addressing the above issues by the country, the government, NGOs and civil society have to look solutions focusing on most vulnerable agro-ecological zones where majority of the poor are living who have limited livelihood resources and opportunities, prone to economic and climatic shocks and who have less resilience to cope with and adapt to these shocks.

Specific issues related to livelihoods, food security and climate change per agro-ecological zones are listed in Table 12. Detailed list of issues along with recommendations for improvement by various stakeholders involving communities is given in Annex 6. For Oxfam Novib interventions and partner NGOs, two agro-ecological zones are recommended. Southern Punjab zone and the Coastal zone in lower Sindh. These two zones are the most vulnerable agro-ecological zones because of extreme poverty, food insecurity, poor socio-economic conditions, and income and resource inequalities. Furthermore, these two zones prone to climate change and frequently hit by hydro-meteorological hazards (floods and storms). The mountain zones (both Himalayan and Dry western mountains) also need special attention because of high poverty and food security due to inaccessibility and limited livelihood opportunities from the available natural resources. These natural resources including water resources upon which depends the food security of the whole nation are degrading fast due to various economic and climatic pressures. Oxfam Novib may consider the mountain zones for interventions after security risks prevailing in those areas improve.

Table 14: List of Livelihood/food security issues in various agro-ecological zones.

Zone	Issues
Himalayan Mountain Zone (AJK, Gilgit-Balthishan and eastern parts of NWFP)	<ul style="list-style-type: none"> • Largely deficit in food production due to small land holdings and single season cropping (in high mountains). Large population is malnourished (especially women and children). • Double cropping (wheat-maize), fruits and off-season vegetables are practiced at lower altitudes and in the valley bottom. Lack of market information, access, cold chains and processing cause losses. Middle men exploit the small farmers. • Local livelihood opportunities are limited. As a result most male members migrate for off-farm work leaving women children and old men to work on farm. • High rate of deforestation due to heavy dependence of the growing local population for fuel, timber and clearing of land for agricultural use. • Intensive cultivation on fragile and deforested sloppy lands is causing erosion of top soil. Land degradation is also the result of rising temperatures and changes in rainfall patterns that are causing rapid snow melting, glacial receding and land sliding. • Rising temperatures tend to increase crop yields and double cropping at high altitudes will be possible in the future. The genetic varieties developed for plain areas may perform well.
Dry Western Mountain Zone (FATA, northern parts of NWFP, and Baluchistan)	<ul style="list-style-type: none"> • Extremely deficit in food production and low access to food because of being dry, small land holdings, lack of economic opportunities and market access. • Though low population density, majority is backward and illiterate (more among women) throughout the dry western zone. Local livelihood opportunities are limited, therefore most male members of the family work off-farm, in transport sector or as unskilled wage labour. • There is high potential for high value fruits production throughout the zone but this potential has not been fully exploited. • Livestock is the main livelihood source, especially in Balochistan. There are extensive range lands but these are highly depleted due to over grazing and perhaps because of droughts. • The zone has been receiving heavy flash floods in recent years (e.g., 2005 flood in NWFP, 2007 flash floods in Balochistan and 2008 flash flood in Peshawar are unique examples). • Water tables are deep and further declining (Balochistan part) due to excessive use for cropping and high value fruits cultivation in pockets.

Zone	Issues
	<ul style="list-style-type: none"> The traditional irrigation system (Karez system) in Baluchistan is under high threat and being abandoned due to water depletion in the mountains. Perhaps because of its backwardness, this zone is under high security threat, which has been increasing livelihood vulnerabilities, poverty and food insecurity.
Sub-mountain and plain rainfed zone (Eastern NWFP & Northern Punjab)	<ul style="list-style-type: none"> Deficit in food production but food is easily accessible from the surplus districts of Punjab province. Extensive rainfed lands are grown under wheat, rapeseed, groundnuts, fodder and pulses. Yields are low due to low fertility and less rains. Climate change may further lower the yields. Off-farm work and services is common in the area to supplement income for households.
Central Irrigated Zone (Punjab and Sindh):	<ul style="list-style-type: none"> Surplus in food production and main food basket for the nation. However, because of inefficient storage and distribution system, the other zones in general and the mountains and dry western region in particular have difficulties in accessing sufficient quantities of wheat from the market. Crop yields are declining due to inefficient irrigation and other input use. Climate change in the form of increasing temperatures is also causing decline in yields for the currently available varieties. Water logging and salinity is a major problem in this zone which is also causing health and diseases such as malaria, gastro and other water born diseases.
Hill torrent zone (Sothern NWFP and Southern Punjab districts)	<ul style="list-style-type: none"> This zone is generally not food deficit but food insecurity largely stems from land inequalities (especially southern Punjab). There are few landlords occupying extensive irrigated lands that are cultivated through landless poor for 1/8th – 1/4th share basis. The rainfed areas in the bottom of Suleman ranges depend upon rainfall and the hill torrent rainfall is used for flash irrigation growing wheat, pulses, chickpeas and rapeseed. The frequency of flash floods has increased especially in southern districts of Punjab. The flash floods in Rajanpur in 2008 and 2009 that caused heavy losses to houses (mostly made of muds), stored food, crops and livelihoods, making them more poor.
Desert zone (Cholistan and Tharparkar, Sindh)	<ul style="list-style-type: none"> Extremely deficit in crop-based food but self sufficient in livestock based food. Overall, net-food deficit. Monsoon rains is the only hope for cropping of Guar as fodder and some pulses for food. These meet their food requirement only for three to four months. Some families migrate to irrigated districts every year for in kind earning from wheat and sugarcane harvesting that supplements their food and fodder. Majority of the households are in debit for the whole life. The areas are prone to monsoon season droughts, the frequency of which has increased. Droughts affect the livelihoods, animals die, most families migrate to irrigated areas and sell small ruminates at cheap prices. Main source of drinking water is from wells. The water table is deep and brackish. Water born diseases are common, especially among children. Literacy rate is extremely low. Children work in carpet weaving industry and are highly low paid (work for paying debit to the industry owner). Improved road facilities and opportunities in mining of Plaster of Paris and coal in Tharparkar are opining up alternative livelihood opportunities in the area.
Coastal Zone (Sindh and Balochistan):	<ul style="list-style-type: none"> The coastal communities are extremely food deficit. Fishing is the main source of livelihood only for communities living along the coast. Most these households are poor and work as labour for fishing. Away from the coast, the household depend mainly on agriculture. Charcoal making from bushes in saline lands and cutting of mangroves is an alternative livelihood for the poor community. Salt water intrusion has affected their lands and crops can not be grown on saline lands which they were using two to three decades ago. Ground water tables have increased which is mainly salty and not fit for drinking water. Communities have high incidence of diseases (malaria and water born diseases). Floods due to intensive rains upstream (especially in Sindh part) as well as storm surges affect the poor communities destroying their houses, food stocks and fishing

Zone	Issues
	equipment. Shallow water fishing has reduced due to sea level rise and insufficient fresh water reaching to Indus delta.

8.2 Recommendations

While the country has to continue its struggle to secure the national level food self sufficiency focusing on irrigated zone to meet the food requirement of the growing population by adopting incentive based policies (e.g., price support policy, procurement and storage policy etc.), introduce high yielding food crop varieties, and improve efficiencies in the use of agricultural inputs (water, seed, and fertilizers) in those areas.

Yet for alleviating poverty and achieving wider scale food security, small farmers and landless/tenants have to be targeted all over the country. Specific attention has to be given to the marginal agro-ecological zones (dry western zone including Gilgit-Balthistan, NWFP, FATA and Balochistan; hill torrent zone, coastal belt and desert zone) where poorest of the poor live who have limited livelihood opportunities, poor access to markets, difficulty in accessing food at an affordable price, and where women and children are malnourished, deprived of education that are adding to the already less productive human capital of the country. These areas are politically marginalized for development. These marginalized areas are also more prone to climatic variability in the form of droughts, floods, storms and disease epidemic. Because of poverty, the communities have weak resilience to cope with and adapt to the adverse effects of climate change and variability.

The following general recommendations for addressing livelihood and food security issues at the national level and specific recommendations of each agro-ecological zone have emerged.

8.2.1 Interventions at National Level

- Pakistan needs to increase focus in marginalized rural areas on social protection measures through social safety nets as introduced by the government such as Utility Stores Corporation, and cash transfers through BISP and Bait-UI-Mall scheme etc.
- The government should ensure monitoring and timely planning of food availability and access through improved information, crop forecasting and assessments of the food commodity situation and where necessary to order imports well in time. The country should also increase storage facilities through public-private sector partnership for wheat stock and other necessary food items. The private sector involvement in procurement and storage of food items should be encouraged as envisaged in 2008-09 economic survey report. These measures will discourage hoarding, reduce shortages and avoid unnecessary price hicks which mostly affect the poor that further increase their vulnerabilities and food insecurity.
- Land use planning is lacking in Pakistan. The country government should develop and implement resource-specific land use that could reduce the pressure on land, water and energy resources. Specific measures both by government and NGOs should be targeted to improve efficiency in use of land and water resources, improve productivity, and stop the process of land degradation. The government and NGOs should also make efforts to increase crop area through rehabilitation of degraded lands, improved water harvesting techniques and where possible bring more area under irrigation.

- Specific measures for irrigation water improvement should include: Introduction of crop based progressive water changes; introduction of less water consuming crops; and introduction of farm level water efficient technologies and practices such as land leveling, improved methods (drip irrigation) and changes in cropping patterns. The government needs to facilitate NGOs to take-up this responsibility.
- For irrigated areas, while the civil work activities should continue by the government, the NGOs need to increase the focus on improved irrigation management methods and techniques as outlined above.
- NGOs need to organize themselves to form forums at national, provincial and local level. These forums together with local NGOs should influence government for bottom livelihood and food security policies and assist the local communities in timely adaptation to climate change in rural areas.

8.2.2 Interventions at agro-ecological level

Small farmers in general and the marginal areas in particular should be the focus of intervention both by provincial governments and local NGOs to generate livelihood opportunities (both agro-based as well as non-farm). The country has highly diverse socio-economic environment and agro-climatic conditions. Each agro-ecological zone has own issues and niche that require specialized approach. The Government and NGOs should therefore initiate specialized programme of intervention per agro-ecological zone based upon comparative advantages. For example, potential exist for high value crops, fruits and vegetables in the Himalayan and dry western mountain zones (NWFP, FATA, Gilgit Balthistan and parts of Balochistan), sustainable fish production in coastal parts (Sindh and Balochistan), improvement of livestock in range lands of Balochistan and desert zones etc. Some specific recommendations per agro-ecological zones are listed in Table 13 (Also see annex 6). While most recommendations are targeted to government and NGOs interventions, it is important to mention that these recommendations would require community based people-centred approach as without their involvement, the chances of success could be minimal.

Table 13: Proposed interventions in selected agro-ecological zones

Zones	Main Interventions
Mountain Zones (Himalayas) and covering Gilgit-Balthistan, northern parts of NWFP	<p>The mountain areas have high potential in high value fruits and off-season vegetables. Specific interventions should include:</p> <ul style="list-style-type: none"> - Investment in R&D in the Himalayan Mountains should be increased to tap the potential in producing food crops (wheat, maize, rice, potatoes and beans). Farmers use their own low quality seed from traditional varieties which are low yielding. The varieties of the plain areas may be introduced as these varieties may perform better under the scenario of climate change (Public research and extension departments). - Establishment of small scale agro-based processing industries to create employment and livelihood opportunities for the landless/small farmers in those areas (government and private sector). - Establishment of improved/efficient markets, road infrastructure and cold chains for perishable commodities for easy access to markets. These measures would help in value addition and would not only improve incomes and livelihoods but would also help solve the country's food security situation. It would also provide a major source of foreign exchange through exports of these high value products (Government in support of NGOs). - Deforestation has to be stopped in the mountain areas. This may not

Zones	Main Interventions
	<p>be possible without the involvement of communities to protect and manage their own forest. At the same time the demand side measures should also be introduced including efficient technologies for fuel wood use (e.g., efficient cooking stoves) and/or alternative fuel resources/ technologies for cooking and heating such as liquid gas (LPG) and solar energy technologies. These interventions would also help in climate change mitigation efforts on the part of Pakistan (National NGOs in support of local NGOs, communities).</p> <ul style="list-style-type: none"> - Simultaneously, sustainable agricultural land use practices have to be promoted to reduce land degradation in the mountain areas. These should include introduction of improved methods of cultivation, land contouring and terracing technologies and practices, introduction of cover crops, mulching, organic farming, and improved orchard/tree plantation techniques (Local NGOs, communities).
<p>Dry western Hindu Kush mountains covering, FATA and Baluchistan</p>	<ul style="list-style-type: none"> - The FATA areas have high potential in fruits production and non-timber forest products. These un-tapped potentials should be the main focus to improve productivity, value addition and access to marketing (Government, National NGOs). - In the dry western mountain areas (especially Balochistan) there is high potential in improving livestock production. Introduction of high yielding cross breeds suiting to the local conditions to increasing productivity of livestock, working with communities to increase their awareness about artificial insemination crossing local breeds with improved breeds, improved management practices, including fodder management, and health and hygiene (Government in support of NGOs). - Balochistan province has vast rangelands which are used by communities for livestock grazing, where livestock is the major source of income of the poor in the area. R&D investment is needed to establish improved pasture management system and engaging the communities in sustainable range land management. Targeted interventions with women need to be carried-out to introduce improved livestock management practices, practices for health and hygiene, improved poultry production and vegetable gardening, and non-farm productive activities, including linkage them to markets for their products (Local NGOs and communities).
<p>Sub- Mountain/ Rainfed plains/ Hill torrent zones (NWFP and Northern parts of Punjab and south Punjab)</p>	<ul style="list-style-type: none"> - These areas have high potential in food crops including wheat, maize, potatoes, beans, pulses. Improvement of these crops through introduction of heat and moisture resistant varieties should be the target of intervention in these areas (Government and NGOs). - These areas also have high potential to harvest the surface runoff due to heavy bursts of rains upstream. These are also the major cause of flash floods that inflict heavy losses to people and their livelihoods in these areas. Owing to the increased frequency and intensity of these flash floods in the current year perhaps because of climate change, the government should increase investments in reservoirs and other rain water harvesting techniques e., check dams, diversions and forest plantations. These investments could help in improving the food security and livelihoods of the poor people living in these marginal areas. - Focus should be given to introduce cost effective technologies for small farmers along with micro-finance schemes in these areas. The crop insurance scheme for small farmers should be supported in these areas in view of the increased frequency of hydro-metrological hazards

Zones	Main Interventions
	<p>(NGOs and communities).</p> <ul style="list-style-type: none"> - A need for improved livestock fodder and grazing management systems (Government, NGOs and Communities) - A need to improve access to markets for fruits (Government, NGOs).
Coastal zone (lower Sindh)	<ul style="list-style-type: none"> - Fishing in the coastal areas is at threat due to overexploitation by the middlemen but also due to climate change related sea level rise. Given that the livelihood of coastal communities depends upon fishing, the local communities should be equipped and their capacities enhanced for sustainable fishing through providing small nets and boats and train them in local processing techniques for their own food consumption and markets (Local NGOs in support of National NGOs) - In lower Sindh and coastal areas activities at community level should be introduced including introduction of salt tolerant species and varieties on the basis of community experience in these areas and to initiate health and sanitation activities with the poor including drinking water purification through solar energy, health awareness and establishment of health facilities etc (Local NGOs, communities). - Mangroves are degrading fast in coastal areas due to cutting for fuel as well as due to pollution and declining flow of fresh water from the Indus delta. As such the breeding ground for fishes is disappearing. Mangroves also provide protection from storm surges. Protection and plantation of these mangroves should be among main priorities for coastal zone (government and NGOs).
Desert Zone (Tharparkar desert in Sindh Province)	<ul style="list-style-type: none"> - Livestock is a major source of livelihood of the desert communities e.g. Tharparkar area. These areas are frequently hit by monsoon droughts. There is a need for government supported R&D to introduce improved feed management practices for enhancing livestock productivity and measure for protecting them from diseases and natural disasters (government and NGOs). - Improved weather information systems for farmers including indigenous knowledge based early warning system for communities may be introduced (Government and NGOs). - In addition, introduction of moisture conservation techniques could help in improving crop and livestock productivity (NGOs and communities). - The relatively better infrastructure developed during the current decade along with the exploration of minerals (Plaster and Coal) has increased some livelihood opportunities for the people in the area. Weaving industry (carpets) and local embroidery is also grooming. Introduction of skill development activities for these industries could help in diversifying livelihoods in these areas and improve their resilience to droughts (NGOs and communities).

8.3 Recommendations for adaptations to climate change

Pakistan is highly vulnerable to climate change. It will affect agriculture, water resources and health. The poor will be affected most by the climate change and variability. Adaptation to climate change is urgently needed to help people secure their lives and livelihoods. This will require developing and adapting sustainable pro-poor agricultural systems that focus on genetic research, improved cropping practices and patterns, horticulture and value addition, improved livestock management, efficient technologies for water and land management, and adaptation techniques for improved fishing and

processing. Adaptation to climate change would also be required in the health and sanitation by developing technologies for water recycling, clean drinking water facilities and disease control. Climate change and variability would also require timely interventions for addressing vulnerabilities of the poor to hydro-meteorological hazard and risk reduction programs. Furthermore, adaptation in agriculture for climate has huge potential to cost-effectively mitigate GHGs through changes in agricultural technologies and management practices (Nelson, 2009a).

Successful adaptation strategies to climate change require action at different levels: community, national, regional and/or international. There is growing scientific, economic, political and social consensus that these adaptation measures will require long-term thinking and explicit consideration of climate change risks at the regional (cross-national), national, sub-national, and local levels, including women and men (Oxfam GB 2009a).

Unfortunately, Pakistan has no clear policy guidelines for climate change and no climate change policy or action plan exist. However, it is generally agreed that while adaptation to climate change should be the first priority, attention should also be given to climate change mitigation in view of the post-Kyoto scenario. At national level, Pakistan needs to prepare National Action Plan for Climate Change (NAPCC). The objective should be to take appropriate actions for climate change mitigation and adaptation that best contribute to the sustainable development objectives of the country. Furthermore such actions should focus on most vulnerable segments of the society – women, men, children, disabled and poor in marginalized areas so that to increase their resilience to the adverse impacts of climate variability and change through capacity enhancement, knowledge generation, awareness raising, and provision of improved technologies and resources. The country need to prepare itself to effectively participate in the international commitments in the post-Kyoto agreement without compromising the country's sustainable development objectives, rather to turn it into an opportunity and to take timely actions for identifying and coping with the adverse impacts of climate change in the country.

For mitigation to climate change, the country needs to strengthen the existing research and develop institutions for the development and introduction of climate friendly technologies with particular emphasis on alternate/renewable energy production technologies, improved energy efficiency methods for reducing emissions from industries, transport, housing, forestry, agriculture (crops and livestock). These initiatives may provide a window of opportunity for financing. A national level capacity building and awareness raising campaigns for the private sector and NGOs would help them for effectively taking part in the climate change mitigation.

For adaptation to climate change, specific recommendations listed below:

National level:

- For climate change adaptation, the country needs to develop national action plan for adaptation to climate change. This may include the following actions:
 - Establishment of research institute for coordinating adaptation research in the country, especially for water management, agricultural technologies and practices and forest management and conservation.
 - Redefining climatic regions/boundaries based on global climate variability and change in the country.
 - Assessment of vulnerabilities and risks including detailed mapping of the climate change impacts in various climatic zones, with a particular attention to the most

vulnerable and the poor in these areas including women, children and poor. The potential impact of climate change on agriculture/rural livelihood and water related sectors needs to be particularly studied in the vulnerable areas.

- Development of sectoral policies to integrate climate change in research and development, including development and introduction of improved technologies, best practices based on indigenous knowledge.
 - Introduction of a mechanism to document adaptation best practices and community coping mechanisms.
 - Local initiatives for capacity building and awareness raisings, development of local NGOs/CBOs network.
 - Development of disaster preparedness and early warning systems for minimizing the impacts of natural disasters, including weather information systems, development of disaster relief and resilience strategies, including compensation systems (e.g., insurance schemes etc.), and introduction of risk reduction technologies and practices to minimize the risk of disasters.
- The overarching policy recommendation is also a need for integration of water and climate change policy as well as integration of climate risk considerations within sectoral policy frameworks. These should specifically focus on climate risk management to identify anticipatory strategies for managing both short-term climate variability and longer-term climate change in sensitive areas covering various agro-ecological zones.
 - There is also a need to increase awareness of policy makers, planners, politicians and government institutions about the consequences of climate change and to mainstream climate change in development planning focusing on pro-poor in vulnerable rural areas.
 - Public research should focus on genetic improvement to develop and introduce heat resistant and salt tolerant varieties.
 - Public research and development should also be focused on introducing and facilitating water efficient technologies. Such technologies are available (e.g., drip irrigation, raised seed bed, laser leveling) but there is lack of awareness and incentive to use these technologies.
 - Government and NGOs/UN efforts are needed to enhance capacities in disaster preparedness at national, provincial and local levels, including information management and early warning systems, contingency planning and stocking and risk reduction techniques in disaster prone areas.

At community level, major adaptation measures to reduce impacts and risks of climate change/variability are given in Annex 2 (Oxfam GB 2009a). Most these measures coincide with the food security and livelihood interventions as listed in the previous section. Specific adaptations in general and at agro-ecological are given in Table 14.

Local community level (general)

- Rehabilitation of degraded land by initiating community based afforestation and forest conservation programmes and introducing technologies and practices for reducing water logging and salinity.
- Building of reservoirs and check dams to slow down surface run off and siltation loads downstream,
- Land use planning to introduce crops and cropping patterns that are less water demanding,
- Improved cropping practices by adjusting methods and timings (early sowing, raised beds, mulching etc.),
- Introduction of organic farming and other ecologically sustainable practices (such as soil mulching, introduction of leguminous crops etc) that could enhance the water holding capacity of the soils, improve top-soil fertility and reduce overall land degradation.
- Techniques for management of grazing lands through controlled grazing systems,
- Methods for efficient utilization of food and fodder and improve feeding practices.
- Construction of raised food storages in the house
- Water recycling including desalinization and introduction of clean drinking water techniques

- Introduction of technologies for women such as fuel efficient stoves, clean drinking water techniques, household garbage management (organic and inorganic), health and hygiene practices, methods for protection of children from heat strokes etc.

The following table provides recommendations for climate change adaptation per agro-ecological zone

Table 14: Proposed recommendations for climate change adaptation per agro-ecological zone

Zones	Main Interventions
Mountain Zones (Himalayas) and covering Gilgit-Balthishan, northern parts of NWFP	<ul style="list-style-type: none"> - Decrease in snowfall will reduce water resources. Introduce water conservation and harvesting methods would be needed (Local NGOs/communities) - Intensive monsoon rains leads to land degradation and flash floods (silt accumulation in dams). A need to initiate forest plantation, forest conservation, check dams, sustainable agriculture practices on sloppy lands, terracing, mulching to slow down flash floods and soil erosion (Forest department, NGOs, communities) - Rising temperature/intensive rains tend to rapid/early snow melting and enhanced glacial receding/ GLOFs/land sliding. Intervention needs area: in addition to stopping the land degradation, water harvesting, diversions, risk assessments, risk mitigations through regular discussions with communities (Forest department, NGOs, communities) - Rising temperatures tend to increase crop yields and double cropping, fruits and off-season vegetables at high altitudes will be possible. The genetic varieties developed for plain areas may perform well and should be tested and introduced. Introduce fruit nurseries and vegetable farming (Agriculture research and extension departments, Local NGOs and communities).
Dry western Hindu Kush mountains covering, FATA and Baluchistan	<ul style="list-style-type: none"> - Decrease in snowfall will reduce water resources. A need to introduce efficient water harvesting techniques (Local NGOs/communities) - Flash floods have increased and reduction in water from mountains is expected to occur because of reduced ground water recharge caused by deforestation and water runoff. A need to initiate interventions for forest plantation, check dams etc (Forest Department, NGOs/communities) - Karezes (traditional system of irrigation) are drying and not maintained in Balochistan Organizing the communities to revitalize the Karez system (NGOs, communities) - Range lands fodder reduced are depleting due to less rainfall/droughts. A community based range land management systems may be revitalized (Forest/rangeland management department, Livestock department, NGOs and communities) - Coastal areas of Balochistan have not fully been studied for potential climate change impacts. An assessment study for climate change impacts and to identify adaptation practices for the coastal areas of Balochistan may be needed (NGOs and communities)
Sub- Mountain/ Rainfed plains/ Hill torrent zones (NWFP and Northern parts of Punjab and south Punjab)	<ul style="list-style-type: none"> - Rising temperature is making the available varieties for wheat and other food crops less suitable Introduce short duration varieties. Adaptations to adjust sowing windows have already been initiated by communities. Need to further identify best adaptation practices and develop adaptation package of recommendations (Agriculture department, NGOs and communities) - Erratic but intensive rainfall is causing flash floods, erosion of top soil and gully erosion, and destroys peter engines used in shallow tub wells. Interventions are needed such as forest plantation (hill side), check dams, agro-forestry, diversions etc to reduce risks, raising bunds, water harvesting techniques (Government departments, NGOs, communities). - Early warning systems for floods and enhancing capacities of the line departments and communities to timely cope with the floods would be needed (Government and NGOs) - Irrigation water has reduced in rivers and canals due to inefficiencies and silting of dams, canals). Need to introduce water efficient technologies, moisture resistant varieties/cropping, on-farm water management, forest plantation upstream etc (Government, NGOs, communities).

Zones	Main Interventions
Coastal zone (lower Sindh)	<ul style="list-style-type: none"> - Salt water intrusion perhaps due to storm surges and rising sea levels Introduce salt tolerant crops, species and varieties. Introduce technologies to reduce salinity and introduce methods to stop seas water inundation (Agriculture department, NGOs and communities) - Shallow water fishing has reduced in coastal areas perhaps due to climate change. The communities should be equipped and trained for deep water fishing (Government and NGOs) - Storm surges have increased affecting land, houses and other assets. Need to develop community based system linked to for early warning system for cyclones by PMD and capacity of line departments and communities to cope with the hazard. Mangroves conservation and plantation should also be encouraged (Government, NGOs, communities) - Upstream floods have increased in coastal areas. A need to work with communities in construction of bunds, diversions, change cropping patterns and methods - Rising temperature is making the available varieties for wheat and other food crops less suitable. Need to introduce short duration varieties, adaptations to adjust sowing windows (already initiated by some communities). Further identify best adaptation practices and develop adaptation package of recommendations (Agriculture department, NGOs and communities).
Desert Zone (Tharparkar desert in Sindh Province)	<ul style="list-style-type: none"> - Livestock is a major source of livelihood of the desert communities e.g. Tharparkar area. These areas are frequently hit by monsoon droughts. There is a need to introduce improved feed management practices for enhancing livestock productivity and measure for protecting them from diseases and natural disasters (government and NGOs). - Improved weather information systems for farmers including indigenous knowledge based early warning system for communities may be introduced (Government and NGOs). - In addition, introduction of moisture conservation techniques could help in improving crop and livestock productivity (NGOs and communities) - The relatively better infrastructure developed during the current decade along with the exploration of minerals (Plaster and Coal) has increased some livelihood opportunities for the people in the area. Weaving industry (carpets) and local embroidery is also grooming. Introduction of skill development activities for these industries could help in diversifying livelihoods in these areas and improve their resilience to droughts (NGOs and communities).

9 Proposed Interventions for Oxfam Novib

The overall purpose of Oxfam Novib interventions and partner NGOs should be to build the poor communities resilience, broaden their livelihood and natural resource base, and prepare them to adapt to the adverse situations arising from climate change and climatic variability.

To secure 'win-win' outcomes instead of adverse outcomes, investment in marginal communities would be necessary particularly to build people-centred resilience based on the following five principles (Oxfam International, 2009c):

- Responsive institutions grounded in local context.
- Farmer-driven decisions.
- Expanded and improved sustainable livelihood options.
- Restored and diversified natural resources for sustainability.
- Sound gender dynamics and gender equality.

An agro-ecological based approach should be adopted for food security, livelihood improvement and climate change adaptation, focusing on politically and economically marginalized zones where majority of the poor communities are living. This is necessary because the country has diverse agro-ecological regions, and each region has different socio-economic and climatic conditions and niche that require specialized interventions.

The programmes may cover the following marginalized zones:

- i. Northern mountains (Gilgit-Balthishan) and districts of NWFP (Malakand and Chithral) for Agriculture and horticulture development; Himalayan sub-mountains (Hazara districts of NWFP): agriculture, horticulture and forestry development.
- ii. Hill torrent and rainfed zone (Northern Punjab, Southern Punjab, and Southern NWFP for sustainable agricultural development, flash flood protection/management, rain water harvesting and land improvement.
- iii. Coastal Zone, including central and lower Sindh and coastal parts of Balochistan focusing on fishing and sustainable agro-livestock development, sline land improvement and floods protection/management (lower Sindh).
- iv. Desert zone (Tharparkar, Sindh) focusing on agro-livestock development, non-farm skill development and drought protection
- v. Dry western Hindu Kush mountains (Baluchistan and some areas of FATA): Agro-livestock and horticulture development, and flash flood protection.

The climate change focus should be particularly for adaptation in agriculture sector that is main source of livelihood in rural areas. This is important because climate change in Pakistan will affect agro-livestock based production and utilization systems and will thus increase vulnerabilities in food security of the rural poor. Hence any activity (including policy development) that supports agricultural adaptation also enhances food security. Conversely any thing that results in increased food security will provide the rural poor with the resources that will help them adapt to climate change (IFPRI, 2009). In addition, the programme may also include win-win activities that help mitigate climate change (e.g., fuel efficient cooking stoves, micro-hydro, and other alternate energy – wind, solar, bio gas etc, which at the same time provide opportunities to improve livelihood resources, enhance productivity, and improve environment.

Further consultation through a workshop will be done with partner NGOs to share the findings of the assessment and devise a joint action plan of Oxfam Novib and partner NGOs on food security and climate change for the country.

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Annexure

Annex 1: Agro-Ecological Zones in Pakistan

Agro-ecological zones	Geographical coverage	Physical/Climatic conditions	Livelihoods
(i) Himalayan humid and sub-humid mountains	<ul style="list-style-type: none"> - NA (Gilgit Balthistan) - AJK (Kashmir) - Eastern parts of NWFP (Hazara areas and some Malakand areas) 	<ul style="list-style-type: none"> - Fragile Himalayan mountains - Humid and sub-humid - Cool winter and mild summer - Rainfall in both summer monsoon and winter(1700 mm/ year) - Peaks covered by Glaciers - Snow fall also in valley bottoms 	<ul style="list-style-type: none"> - Mainly depend on natural resources (forest and non-timber forest products) - Small land holdings with intensive cultivation - Main crops: Maize, rice, wheat, onion, tomatoes in lower areas; maize and potatoes in upper areas along with off-season vegetables; - Fruits (apple, peach and apricot in valley bottom). - Livestock: both small and large ruminants - Few off-farm income opportunities
(ii) Western dry mountains of Hindu Kush	<ul style="list-style-type: none"> - Hindu Kush rugged mountains bordering Afghanistan stretching from Gilgit-Balthistan, some districts of NWFP (Chitral Upper Dir), FATA and Western parts of Balochistan 	<ul style="list-style-type: none"> - Temperate/arid/hyper arid - Mostly dry with meager rainfall only in the winter season (as low as 30 mm/year in Baluchistan part) - Poor vegetation, wild olives and bushes - Snow fall in winter only at peaks 	<ul style="list-style-type: none"> - Mainly depend on natural resources (forest and non-timber forest products) - Small land holdings; main crops: maize and red beans, tomatoes, potatoes, onions); High value fruits (apple, grapes etc) - Livestock: Goats and sheep - Few off-farm income opportunities
(iii) Semi-arid sub-mountain rainfed plains	<ul style="list-style-type: none"> - Sub-mountain areas of NWFP in the south and east and Northern and southern Punjab - Include Pothwar and salt range 	<ul style="list-style-type: none"> - Semi-arid - Hot in summer and cold in winter - Rainfall both monsoon and winter rains 	<ul style="list-style-type: none"> - Mainly depend on off-farm sources (services and wage labour) - Crops: wheat and rapeseed in winter and some summer season fodder crops (sorghum) - Ground water suitable for irrigation (in patches)
(iv) Semi-arid central irrigated plains	<ul style="list-style-type: none"> - Central Punjab and Sindh - Some districts of Southern Punjab and Sindh (on the eastern part of Indus river), and eastern districts of Baluchistan (Nasirabad etc.) 	<ul style="list-style-type: none"> - Semi-arid - Hot in summer and cold in winter - Rainfall both summer monsoon and winter - Large canal irrigation network 	<ul style="list-style-type: none"> - Agriculture is the main source of livelihood- food basket of Pakistan - All farm sizes but mainly medium farms; Tenants on 50% share basis; Crops: Wheat, sugarcane, rice, cotton; oranges in Punjab and mangoes in southern districts of Punjab, and Central districts of Sindh - Livestock: Large concentration of stall fed buffaloes
(v) Suleman hill torrent plains	<ul style="list-style-type: none"> - Along the western side of Indus river, stretching from north to south, includes southern districts of NWFP; southern districts of Punjab; southern districts of Sindh and eastern districts of Baluchistan 	<ul style="list-style-type: none"> - Semi-arid - Hot in summer and cold in winter - Rainfall mainly in winter but some monsoon rains - Canal irrigation network close to Indus river on both sides 	<ul style="list-style-type: none"> - Agriculture is the main source of livelihood based on "Rodh Kohi" systems of hill torrents water harvesting from Suleman mountains - Some land is canal irrigated with other land along the side of Indus basin "Katcha Area" - Large land holdings with tenants on 1/8th share basis. - Irrigated crops: Wheat, sugarcane, rice, cotton, oranges and mangoes - Rodh Kohi rainfed crops: Wheat, rapeseed, pulses and summer fodder (sorghum) - Livestock: Mainly stall fed buffaloes in irrigated part, goats in rainfed parts - The rainfed households also work off-farm in cities
(vi) Sandy deserts	<ul style="list-style-type: none"> - Eastern border of India (Cholistan desert in Punjab and Thar abd Khirthar deserts in Sindh 	<ul style="list-style-type: none"> - Semi-arid, very hot in summer and mild in winter - Meager rainfall mainly in summer (monsoon) - Sandy lands with low organic matter and low moisture absorption capacity 	<ul style="list-style-type: none"> - Mainly livestock based farming (mostly Cows and some goats). - Crops depend on monsoon rains. Main crops are millets, pulses and guar (fodder)
(vii) Coastal area	<ul style="list-style-type: none"> - Stretching from Baluchistan Gwader all along Sindh coastal till Badin district 	<ul style="list-style-type: none"> - Semi-arid, sub-tropical - Hot in summer and mild in winter - Meager rains (mainly monsoon) - Soils are saline - Ground water table is high but brackish 	<ul style="list-style-type: none"> - Fishing based livelihood for households along the coast. - Farming is practiced on saline land but less productive (crops: Rice and sugarcane) - Far from the coast: mainly agriculture with land holdings (Crops: Wheat, rice, sugarcane, tomatoes, chillies, and new crop sunflower - Few households work off-farm in cities/towns.

Annex 2: Potential Impacts of Climate Change

Annex 2a: Potential effects and impacts of climate change on various sectors

Climate change	Sector	Immediate effects	Medium/long-term Impacts	Proposed adaptations
Increase in temperature	Agriculture	<ul style="list-style-type: none"> - Long summers, short winters - shorten the growing periods of the crops - alter scheduling of cropping seasons - increase evapo-transpiration - increase irrigation water requirements - altering soil characteristics, and - increase the risk of pests and diseases 	<ul style="list-style-type: none"> - in the sub-mountain and plain areas crop yields are expected to decline - in the mountain areas crop yields and area may increase - Cropping patterns may change (e.g., oil seed crops and pulses replacing wheat, cotton crop shifts towards north) 	<ul style="list-style-type: none"> - research to develop and introduce short duration varieties - research to develop heat/moisture resistant varieties - research on methods and timings (research on sowing windows, e.g., early plantation of wheat, change irrigation methods. - introduce new crops (e.g., oil seed crops and pulses)
	Livestock	<ul style="list-style-type: none"> - increase heat stress - increase water requirements - increase diseases 	<ul style="list-style-type: none"> - decline in livestock productivity - increase in animals deaths 	<ul style="list-style-type: none"> - introduce heat and water resistant breeds - methods to avoid heat strokes - heat resistant animal sheds
	Forestry and biodiversity	<ul style="list-style-type: none"> - increase vegetative growth - increase evapo-transpiration 	<ul style="list-style-type: none"> - shift of conifers to higher altitudes - replace conifers by broadleaf species - increase productivity of pasture lands (grasses) - replace forest land for agriculture 	<ul style="list-style-type: none"> - introduce conifer species for lower altitudes - introduce useful broadleaf species - ensure to retain minimum level of forest.
	Human health	<ul style="list-style-type: none"> - increase heat strokes - increase malaria, dysentery and other diseases 	<ul style="list-style-type: none"> - increase human deaths - increase health cost - decline in productivity 	<ul style="list-style-type: none"> - introduce methods to avoid heat strokes - introduce methods to avoid incidence of diseases.
	Water	<ul style="list-style-type: none"> - increase in glacial melt - increase snow melt - increase in water requirements - formation of glacial lakes 	<ul style="list-style-type: none"> - river flows may increase in the short/medium terms (more water in summers) - river flows may decrease in the long-term - high incidence of glacial lake outburst floods (GLOFs) 	<ul style="list-style-type: none"> - introduce methods for water storages with less evapo-transpiration - water conservation methods - monitoring/early warning system for GLOFs
	Soil	<ul style="list-style-type: none"> - rapid decomposition of soil organic matter - Reduction in useful soil micro-organisms - increase soil moisture evaporation 	<ul style="list-style-type: none"> - decline in soil productivity - increase salinity - land degradation 	<ul style="list-style-type: none"> - introduce mulching methods to regulate soil temperatures and reduce soil moisture evaporation
	Changes in rainfall patterns	Water	<ul style="list-style-type: none"> - shift in monsoon season (late monsoons) - erratic/intensive rains (no rains or heavy rains) 	<ul style="list-style-type: none"> - change in cropping patterns - eliminate rainfed agriculture - increased incidence of floods/droughts - increased run-off/soil erosion/land degradation - reduced water recharge (decline in underground water)
Sea level rise/ocean pressures	Coastal livelihoods/resources	<ul style="list-style-type: none"> - increase in sea water intrusion - inundate mangroves - reduction in shallow water fishing - increase cyclones/flooding 	<ul style="list-style-type: none"> - loss of land to sea and salt water intrusion (affect agriculture) - loss of mangroves - increase incidence of cyclones/flooding - negative impact on livelihoods of coastal/fishing communities 	<ul style="list-style-type: none"> - introduce salt tolerant crops/species - introduce alternative livelihood systems - introduce monitoring/early warning systems for cyclones

Source: Oxfam GB, 2009a

Annex 2b: Potential impacts of climate change on women and proposed adaptation measures¹⁵

Effects/Impacts	Proposed adaptations
<ul style="list-style-type: none"> - Women's informal rights to resources could decrease or disappear as access to land natural resources dwindle due to climate change; - Crop and livestock production changes could affect the gendered division of labour and possibly have negative effects on incomes (especially women's); - Male out-migration may happen due to resource shortages, generating increased work for women (though the effects on women's autonomy can be complex, and female out-migration can also occur.); - There may be increased difficulty in accessing resources, in particular, fuelwood and water, hence, creating an increased workload for women; - Women responsibility for family health care (children, sick and old) will increase; - Women vulnerabilities to climatic hazards will increase due to their poor capacities and a lack of knowledge. 	<ul style="list-style-type: none"> - Interventions that create greater awareness and understanding of the complex links between gender equality and the environment can help to build the capacity of the poor, especially poor women, to adapt to the impacts of, and take action on, climate change. Policy and programming considerations include: <ul style="list-style-type: none"> ▪ promoting cleaner-burning fuel for household use, which will also help to reduce air pollution and harmful emissions, and will benefit women by cutting their annual cooking costs by 25 percent; ▪ incorporating both women and men into the decision-making framework on climate change mitigation and adaptation initiatives; ▪ supporting vulnerability-reduction measures that target women's needs; ▪ making use of gender sensitive technologies that are accessible, beneficial, and acceptable to both male and female stakeholders; ▪ facilitating extension studies, particularly for women, to improve the accessibility and use of new technology; ▪ supporting the provision of tools, including vulnerability assessments, that build on local and indigenous knowledge, held by women and men, of measures to adapt to, or mitigate the impacts of, climate change; and ▪ integrating gender analysis and gender equality indicators into programs and projects to identify where specific vulnerabilities to climate change lie, and where opportunities for mitigating and adapting to climate change can be found.

Source: Oxfam GB, 2009a

¹⁵ These impacts and effects on women and proposed adaptations have been summarized from the UNDP, India paper (see UNDP, 2007b). A number of papers/studies on climate change and gender are available on the internet. Some are listed below:

- ISSUES PAPER, 52nd session of the Commission on the Status of Women Interactive expert pane, Emerging issues, trends and new approaches to issues affecting the situation of women or equality between women and men "Gender perspectives on climate change" 28 February 2008
- Gender and climate change: mapping the linkages, A scoping study on knowledge and gaps, Prepared for DFID by Alyson Brody, Justina Demetriades and Emily Esplen, BRIDGE, Institute of Development Studies (IDS), UK. March 2008
- G Gender Perspectives: Integrating Disaster Risk Reduction into Climate Change Adaptation Good Practices and Lessons Learned, International Strategy for Disaster Reduction (ISDR), UN, 2008.
- Gender and Climate Change, Swedish University of Agricultural Science Society, Nature and Change by Hanna Jämting, October 2008
- Declaration on Climate Change and Gender Equality, Women's Environment and Development Organization (WEDO), Council of Women World Leaders (CWWL), on the occasion of the UN Secretary General's High-Level Climate Change Event and the High-Level Roundtable "How a Changing Climate Impacts Women" organized by the partners above, September 2007
- Gender and climate change - Women as agents of change, IUCN December 2007
- Equity and Gender in Climate Change, NOVAFRICA, Canadian International Development Agency, 2005

Annex 3: List of net agro-livestock deficit districts by province in Pakistan

Province	Zones						
	Himalayan sub-humid	Western dry mountain	Sub-mountain/rainfed plain	Suleman Hill Torrent	Sandy Desert	Coastal district	Provincial Head quarters
Punjab (34)*			Rawalpindi(1) Jehlum(1) Gujrat(2)				Lahore(1) Urban
Sindh (17)*					Tharparkar(1) Dadu(2)	Karachi	Karachi(1)
NWFP (24)*	Lower Dir(1) Malakand(1) Battagram(1) Shangla(1) Swat(1) Nowshera(1) Kohistan(1) Mansehra(1) Abbottabad(1) Haripur(1)	Chitral(1) Upper Dir(1) Hangu(1) Karak(1) Kohat(1) Lakki(2)	Swabi(2)	Tank(1)			Peshawar(1)
Baluchistan (26)*		Musa Khel(1) Dera Bugti(1) Killa(1) Abdullah(1) Bolan(1) Chaghi(1) Zhub(1) Kalat(1) Kharan(1) Kohlu(2) Sibi(2) Loralai(2) Pashin(2)				Gawader(1) Turbat(1) Lasbela(1) Awaran(2)	Quetta(1)
AJK (7)*	Rawalakot(1) Mir pur(1) Sudhnoti(1) Bagh(1) Kotli(1)						Muzaffarabad(1)
NA (Gilgit-Balthishan) (5*)	Bhimber(1) Ghizer(1) Ghanche(1) Skardu(1)						Gilgit(1)
FATA (7)*		Khyber(1) Ourakzai(1) Bajour(1) N.Waziristan(1) S.Waziristan(1) Mohmand(1) Kurram(1)					-

Source: Compiled form FSA 2003.

1. Extreme deficit; 2: High deficit

* The figures in parentheses are total districts in the province. The number of districts has increased in recent years to 132, separated from some old districts.

Annex 4: Survey Results in selected districts

A: List of sample villages

	Selected village	Zone	Major livelihood group	Reasons for selecting these village and groups
Abbottabad	Kathwal	Livestock	Livestock	Remote area and willingness
	Mohar Kalan	Horticultural	Vegetable and fruits	Community willingness
	Kokaryala	Eco-truism	Truism and out migration	Remote area and home of forest
Jhang	Kamra	Agricultural	Agricultural	Flood vulnerable
	Kot Nawal	Riverian	Livestock	Flood vulnerable
	Vasu astna	Desert	Labors + Livestock	Drought affected area
Musakhel	Drug	Drug – UC	Agricultural	Poverty
	Sham	Gharyasa - UC	Livestock	Willingness in livestock development
	Musakhel	Saddar - UC	Livestock + Agricultural	Willingness of the community
Rajanpur	Check Jindoo shah	Jahanpur -UC	Livestock and agricultural	Vulnerable of flash flood
	Raham shah	Kot Mithan - UC	Business, Agri, labor and Jobs	Food security access issues
	Basti Ranjhy khamr	Kot Mithan - UC	Agricultural & livestock	Vulnerable of flash flood
Shadadkot	Shahbazi	Agricultural	Farming	RBOD canal drawn point and more than 80% agricultural land
	Kachhari	Fishing	Fishing	Willingness and need of community
	Alighowar chanduo	Livestock & labors	Livestock & labors	Most affected area due to 2007-08 flood

B: Perception of partner NGOs in the selected districts

	Abbottabad	Jhang	Musakhel	Rajanpur	Shadadkot
Partner NGO	Sungi	DOABA Foundation	BEEJ	Help Foundation	LHDP+PFF
Agro-eco zone	Himalayan	Central Punjab	Dry Mountain	Hill torrent	Coastal
District Profile					
No. of tehsils	2	3	2	3	7
District Population (million)	1.8	6.7	0.15	1.6	0.68
Number	56	127	10	44	40
Number of villages	112	948	66	850	1561
No. of Households (million)	0.28	1.0	0.024	0.15	0.12
Av. Size of Households	6.4	6.5	6.3	10.3	5.8
Livelihoods					
Main source	Agriculture/fruits/forestry/livestock	Agriculture/Livestock	Livestock/Agriculture	Agriculture/Livestock	Fishing (coastal) Agriculture/Livestock
Second source	Jobs/Tourism	Jobs/Labour	Jobs/labour	Labour/jobs/business	Labour/trading
Livelihood issues	<ul style="list-style-type: none"> • Shortage of fodder • Animal diseases • Unemployment • Lack of prototype fruits • Illegal cutting of forest • Garbage disposal • Unavailability of safe drinking water. • Poor infrastructure • Traditional way of Hotel industry 	<ul style="list-style-type: none"> • Drought • Communication • Health • Lack of fodder • Animal diseases/deaths • Flash flood • Animal deaths • Community awareness • Access to market • Inappropriate seed • Unemployment 	<ul style="list-style-type: none"> • Access to market • Lack of infrastructure • Lack of health facility • Livestock & human diseases • High animal mortality rate • High human mortality rate • Lack of awareness & skill • Gender issues • Shortage of water • Low literacy rate • Lack of services 	<ul style="list-style-type: none"> • Shortage of water • Lack of services • Over population • Lack of capital resources • High growth rate • Mono cropped area due to flood (on riverside) 	<ul style="list-style-type: none"> • The cultivated land reduced due to changing of soil chemistry • Frequent use of pesticides and fertilizer • Lack of safe drinking water • High out migration • Lack of modern tools in fishing • Exploitation • Population pressure • Lack of veterinary facility • Animal diseases & PPR • Decrease in rice production
Food security					
Availability	Extreme deficit	Sufficient in irrigated	Low deficit	Surplus in irrigated	Extreme deficit

	Abbottabad	Jhang	Musakhel	Rajanpur	Shadadkot
		areas/ Extreme deficit in riverside and rainfed areas		areas/ Deficit in hill torrent rainfed areas	
Access	Extreme low	Extreme low in riverside and rainfed areas	Low	Low	Extreme low
Utilization	Extreme low	Extreme low in riverside and rainfed areas	Low	Low	Extreme low
Major issues/ vulnerabilities	<ul style="list-style-type: none"> Lack of interest in farming due to high input cost Political marginalization Gender Changing rainfall pattern Shortage of water Access to market Rising prices/high poverty 	<ul style="list-style-type: none"> Political marginalization Feudalism Flash flood Lack of coping mechanism/poverty High prices Market access 	<ul style="list-style-type: none"> Lack of cultivated land Climate change/ Drought less fodder/ changing pattern of rain Shortage of water/poor water management Poor land management Lack of animal health facility Lack of economic opportunities High poverty High prices of food commodities Illiteracy Access to market High mortality rate Lack of awareness 	<ul style="list-style-type: none"> Access to market and involvement of middle man Prices hick poverty Flash flooding Non-availability of agricultural-input 	<ul style="list-style-type: none"> Cultivated Land reduces due to land degradation Shortage of irrigation water Due to low agricultural production and high input cost the purchasing power of local population reduced Low quality of food. Fish production reduced due to salinity and reduction in oxygen layer The hunting of fish also create problems Accessibility to market Lack of modern tools in fish hunting Low fish utilization, high prices due to marketing Lack of local breads Increase in PPR diseases Low access due to low purchasing power and high cost Lack of foddors High prices
Hazards					
Name of recent hazards	<ul style="list-style-type: none"> 2005 Earthquake 2005 Intensive rains 2008 Landslide 	<ul style="list-style-type: none"> 2001-2004 drought 2007 flood 2009 Disease epidemic 	<ul style="list-style-type: none"> 2001-2004 drought 2008-2009 Flash floods 2008-09 Hail storm and torrential rains 	<ul style="list-style-type: none"> 2006 drought 2008, 2009 flash floods 2008-09 River flood 	<ul style="list-style-type: none"> 2007-08 flood due to intensive rains
Frequency	All increased	Drought increased due to change in rain pattern	All increased	All Increased	Frequency and magnitude increased
Village selection in each district					
Name of village (reasons for selection)	<ul style="list-style-type: none"> Kathwal (Agro-livestock) Mohar Kalan (agro-fruits/veg) 	<ul style="list-style-type: none"> Kamra (agro) Kot Nawal Riverain/agro-livestock 	<ul style="list-style-type: none"> Drug (agro) Sham (livestock) Musakhel (agro-livetsock) 	<ul style="list-style-type: none"> Check Jindoo shah (agro-livestock) Raham shah (labour, jobs, business) 	<ul style="list-style-type: none"> Shahbazi (agro/RBOD point) Kachhari Fishing) Alighowar chanduo

	Abbottabad	Jhang	Musakhel	Rajanpur	Shadadkot
	<ul style="list-style-type: none"> • Kokaryala (forest tourism) 	<ul style="list-style-type: none"> • Vasu astna (rainfed agro-livestock, labour) 		<ul style="list-style-type: none"> • Basti Ranjhy khamr (agro-livestock) 	<ul style="list-style-type: none"> (agro-livestock/labour)
Suggestions for Oxfam Interventions					
Livelihoods improvement	<ul style="list-style-type: none"> • Access to market • Livestock and dairy development program. • Awareness and advocacy campaign on CC. 	<ul style="list-style-type: none"> • Financial and technical support to vulnerable population • Awareness and advocacy campaign on climate change. 	<ul style="list-style-type: none"> • Copying mechanism against climate change and awareness of the community • Integrated approach for disaster risk reduction 	<ul style="list-style-type: none"> • Livestock and dairy development program. • Sensitization of line department and their capacity building. • Access to market 	<ul style="list-style-type: none"> • Awareness and advocacy campaign on climate change and copying mechanism for community. • Livestock and dairy development programme.
Food security	<ul style="list-style-type: none"> • Horticultural development • Separate agricultural policy for hilly area. • Support organic agricultural. 	<ul style="list-style-type: none"> • To increase cultivable land. • Demo plots of crops. • Capacity building of agricultural and livestock department. • Enhance woman capacity in kitchen, vegetable, fruits growing skills. 	<ul style="list-style-type: none"> • Agriculture and livestock developments. • Diversification of livelihood/services. 	<ul style="list-style-type: none"> • To increase cultivable land, demo plots of corps. • Capacity building of livestock departments to introduce new technology. • Women skill, particularly in kitchen grading. • Fruits and vegetables processing skill. 	<ul style="list-style-type: none"> • Restoration of saline land. • Provision of modern tools and promotes fish cultural and hatchery development. • Activation early warning system
Climate Change	<ul style="list-style-type: none"> • Forest management. • Garbage disposal arrangement • Land used planning 	<ul style="list-style-type: none"> • District disaster management plane. • Capacity building of all stakeholders for implementation of disaster plan. 	<ul style="list-style-type: none"> • Advocacy based on research and policy from adaptation to mitigation, on grass root, local and national levels. 	<ul style="list-style-type: none"> • Awareness, preparedness. • To activate district disaster management. 	<ul style="list-style-type: none"> • Revising of agriculture. • Construction of salinity land. • Provision of modern tool and promote fish cultured and prevision of landing development. • Early warning system installation and awareness of the community about the climate change.
Other suggestion	<ul style="list-style-type: none"> • Water management. 	<ul style="list-style-type: none"> • Education • Land reformers. 	<ul style="list-style-type: none"> • To link public health with adaptation. • Advocacy on these issues based on the participation approach. • Livelihood based education. 	<ul style="list-style-type: none"> • Protection walls for houses protection. • Construct check dams. 	<ul style="list-style-type: none"> • Land reform program • To make link between public health and local population to start adopt participatory approach.

C: Results of key informant discussions in villages

Indicators	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
Socio-economic					
% villages with health facility (%)	67	100	33	67	0
% villages with paved road	67	33	33	33	0
School in the village (Boys)	yes	yes	yes	yes	No
School in the village (girls)	yes	yes	yes	yes	No
% villages with drinking water supply scheme	100	33	0	33	0
Common water born diseases	Kidney, Diarrhea, Malaria	Hepatitis, Malaria	Hepatitis, Malaria	Hepatitis, Malaria	Hepatitis, Gastro, Malaria
Food security					
Food availability	Overall deficit	Sufficient for few months	Overall deficit	Sufficient for few months	Overall deficit
Food access	Available but expensive	Available but expensive	Available but expensive	Available but expensive	Available but expensive
Livelihoods					
Livelihood groups	Agriculture, Service	Agriculture & Labour (irrigated) Livestock (rainfed) Jobs (riverside)	Agriculture, Livestock, Jobs, Labour	Agriculture and labour (irrigated), Livestock (mountain side)	Fishing (coastal side), Agriculture/ Labour
Livelihood constraints	<ul style="list-style-type: none"> High inflation/prices Employment opportunities Infrastructure Natural resource management Water shortages Access to market 	<ul style="list-style-type: none"> High inflation/prices Unemployment Illiteracy Shortage of water 	<ul style="list-style-type: none"> High inflation/prices High input cost Illiteracy Unemployment Over population 	<ul style="list-style-type: none"> High inflation/prices High input cost Less income sources Migration High Debt 	<ul style="list-style-type: none"> High input and food cost Unemployment Illiteracy Shortage of water Flood
Suggestions for alternative income opportunities	<ul style="list-style-type: none"> Natural resources Technical skills Vegetables production New seedlings for fruits 	<ul style="list-style-type: none"> Agriculture development Distribution of goods Micro credit Small industries 	<ul style="list-style-type: none"> Agriculture development Technical skills Livestock and dairy development 	<ul style="list-style-type: none"> Livestock and dairy development Agriculture and water sources development Agriculture enhancement 	<ul style="list-style-type: none"> Cattle raising Fish farming Provision for fish input Poultry farming Financial Support
Shocks in the village					
Shocks in the village experienced over the last five years	<ul style="list-style-type: none"> Earthquake 2005 High food prices 2008 Land Sliding due to heavy rains 2009 	<ul style="list-style-type: none"> Flash flood 2008 Crop diseases 2008 Heavy rains 2009 	<ul style="list-style-type: none"> Flood 2008 Crop diseases 2008 Windstorm 2009 	<ul style="list-style-type: none"> Drought 2006 Bird flue Crop diseases 	<ul style="list-style-type: none"> Flood 2004-07 High food prices 2007-09
Coping mechanisms	Nothing	<ul style="list-style-type: none"> Temporary migration Sent male to cities for work 	<ul style="list-style-type: none"> Temporary migration 	<ul style="list-style-type: none"> Migration to other areas 	<ul style="list-style-type: none"> Migration to other areas
Coping mechanism for the rising food prices 200-7-09	<ul style="list-style-type: none"> Labour and agriculture group were most affected More labour work in the village 	<ul style="list-style-type: none"> All groups were affected Eating less Got loans (increased debts) 	<ul style="list-style-type: none"> All groups were affected Sent male members to other cities for work Increase labor 	<ul style="list-style-type: none"> All groups were affected Increase labor Increased debts 	<ul style="list-style-type: none"> All groups were affected Eating less Increase labor Increased debts
Climate change over the last ten years					
Summer temperature	Increased	Increased	Increased	Increased	Increased

Indicators	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
Winter temperature	Increased	Increased	Increased	Increased	Increased
Summer rain	Declined	Increased	Declined	Declined	Declined
Winter rain	Declined	Declined	Declined	Declined	Declined
Spring rain	Declined	No Change	Declined	Declined	Declined
Snow fall	Declined	Not applicable	Not applicable	Not applicable	Not applicable
Climate change impacts and adaptation					
Change in crop sowing time	No change	Early sowing	Early sowing	Early sowing	Late sowing
Change in crop harvesting time	No change	Early harvesting	No change	Early harvesting	Early harvesting
Crop diseases	Increased	Increased	Increased	Increased	Increased
Irrigation water availability	No response	Decreased	Deceased	Increased	Decreased
Number irrigations to minimize impact of increased temperature	No response	Increased	Increased	Increased	Increased
Impact on crop yields	Deceased	Deceased	Deceased	Deceased	Deceased
Factors affecting crop yields					
Wheat	<ul style="list-style-type: none"> • Low rainfall • Old agricultural methods • High input cost 	<ul style="list-style-type: none"> • Heavy rainfall • Lack of water and fertilizer • High input cost 	<ul style="list-style-type: none"> • Drought • High input cost • flood 	<ul style="list-style-type: none"> • Heavy rainfall • High input cost • Shortage of water 	<ul style="list-style-type: none"> • Change in rain pattern • Shortage of water • High input cost • Flood • Lack fertilizer
Rice	Not reported	<ul style="list-style-type: none"> • Shortage of water • Flash Flood 	<ul style="list-style-type: none"> • Crop diseases • Wind storm • Shortage of water • Drought 	Not reported	<ul style="list-style-type: none"> • Shortage of water • Salinity • Flash Flood • High input cost • Low demand at harvest
Maize	<ul style="list-style-type: none"> • High input cost • Low rain fall • Old seed • Water shortage 	Not reported	Not reported	Not reported	Not reported
Impact on livestock	<ul style="list-style-type: none"> • Decrease re-production due to shortage of fodder • Decreased milk production • Decrease in grazing lands • Increased livestock diseases and deaths due to water stress 	<ul style="list-style-type: none"> • Decrease re-production due to more diseases • Decreased milk production due to more diseases • Decrease in grazing lands due to heat & moisture stress • Increased livestock diseases and deaths due to heat and water stress/less fodder 	<ul style="list-style-type: none"> • Decrease re-production due to more diseases • Decreased milk production due to more disease • Decreased grazing lands due to moisture stress • Increased livestock diseases and deaths due to heat stress and more diseases 	<ul style="list-style-type: none"> • Decrease re-production due to more diseases • Decreased milk production due to more disease • Decreased grazing lands due to moisture stress • Increased livestock diseases and deaths due to less fodder 	<ul style="list-style-type: none"> • Decrease re-production due to heat stress • Decreased milk production due to heat stress • Decreased grazing lands due to moisture stress • Increased livestock diseases and deaths

D: Results of surveyed households in the selected districts

Indicators	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
Survey Sample					
No of survey villages	3	3	3	3	3
Number of survey households	30	30	30	30	30
Households socio-economic conditions					
Population density					
Av. Household size	6.57	6.37	6.27	5.97	8.13
% Male	48.7	52.9	53.2	58.1	53.7
% Female	51.3	47.1	46.8	41.9	46.3
% widows	1.3	2.1	4.3	1	4.7
Literacy					
% Literacy (above 10 years of age)	83.1	46.5	27.5	67.5	8.6
Household Poverty (below the national poverty line) (% hh)					
Poverty ranking	40	70	64	58	78
Wealth group (% hh)					
% Very poor	32	60	52	50	58
% Poor	8	10	12	8	10
% average	18	18	8	22	20
% well off/rich	42	12	28	20	12
Housing (% hh reporting)					
Own house	93	67	93	73	77
Type of house (% hh reporting)					
Mud house	57	33	73	73	27
Huts- (non-durable material)	0	20	3	0	67
Durable/semi-durable house (bricks + muds)	43	47	23	27	6
Number of rooms in the house (% hh reporting)					
Single room house	13	67	47	13	93
Two rooms house	53	20	40	30	7
3-4 rooms house	34	13	13	57	-
Other facilities in the house (% hh reporting)					
Safe drinking water	53	63	86	93	40
Flush latrine/dry pit covered	90	20	7	53	3
Television	63	40	33	63	50
Refrigerator	5	30	1	33	23
Washing machine	43	30	-	13	23
Human diseases (% hh reporting)					
Hepatitis	10	-	3	-	10
Tuberculosis	10	7	10	7	10
School facility (% hh reporting)					
School facility < ½ Km	73	87	33	7	20
Main Occupations/Livelihoods in the village (% hh reporting)					
Govt. Servant	13	13	3	33	7
Pvt. Servant	10	0	17	0	3
Self employed	3	3	7	0	0
Labors	17	43	37	3	13
Shopkeeper	0	3	7	3	0
Pension	37	3	0	3	0
Agricultural/	3	20	10	53	73
Livestock/fishing	0	0	0	0	0
House wife/No. Occupation	17	15	19	5	4
Earning dependence (% hh reporting)					
Depend on 1 person	63	36	53	60	23
Depend on 2 person	13	53	37	17	30
Depend on more than 2 person	24	11	10	23	67
Women involvement (% hh reporting)					
To involve women in work	3	50	30	3	50

Indicators	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
Sources of income (% hh reporting)					
Farming crops	4	17	10	59	19
Livestock	-	-	-	22	4
Agri-labour	-	47	3	-	41
Non-farm labour	11	7	33	-	7
Off-farm service (govt./private)	74	20	13	15	23
Business/shopkeeper	11	10	13	4	7
Fishing	-	3	-	-	30
Farming (% hh reporting)					
Own land	70	20	3	73	23
Owner-cum-tenant	30	67	30	27	40
Tenant only	-	13	67	-	37
Farm size (% hh reporting)					
< 1 acre	83	90	93	77	73
1 – 2 acre	16	10	7	17	10
> 2 acres	1	-	-	6	17
Share of tenant in production (% hh reporting)					
25% share	-	21	-	-	-
40% share	-	0	-	-	100
50% share (irrigated)	56	79	100	77	-
75% share (rainfed)	44	-	-	100	-
Livestock keeping					
% keep livestock	57	77	67	90	63
Av. # of Cattle/ Buffalo	1	1	1	2	1
Av. # of Sheep/goat	2	3	2	41	1
Av # of Poultry	2	3	2	1	2
Source of money for purchase of inputs (% hh reporting)					
Own source	83	-	100	25	-
Loan from relative/ friend	-	33	-	25	-
Loan from shopkeeper	-	50	-	25	-
Loan from Town market trader	17	17	-	25	80
Other (fishing middlemen)	0	0	0	0	20
Constraints in improving crop production (% hh reporting)					
Aridity/drought	-	-	50	67	-
Crop diseases	6	25	28	17	30
High cost of Fertilizers	50	75	22	17	30
Shortage of labour	6	-	-	-	-
Salinity	-	-	-	-	4
Shortage of water	19	-	-	-	33
Low rains	19	-	-	-	0
Traditional technology	-	-	-	-	4
Extension advice (% hh reporting)					
To get advice	23	-	7	20	-
Food security					
Food availability					
Crop yields/acre					
Wheat	1008	1400	1320	880	1376
Rice	0	1160	1120	0	1520
Miaze	1120	0	0	1000	0
Pulses	0	1445	0	890	0

Indicators	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
Net own food availability through out the year (% hh reporting)					
Wheat as own source	3	0	3	4	3
Rice as own source	-	80	50	-	30
Maize as own source	17	-	-	17	-
Access to food (% hh reporting)					
Food was easily available	70	97	77	90	30
Source of access to food (% hh reporting)					
From other farmer	-	55	39	44	-
From nearby town	67	7	43	7	89
From shopkeeper in the village	33	38	17	48	11
Impact of high 2008 food prices on food security (% hh reporting)					
Bought cheaper food	30	3	-	7	37
Reduced quantity consumed	27	-	13	23	33
Both of the above	43	97	87	70	30
Food Utilization					
Meals eaten per day (% hh reporting)					
Two times	40	13	20	17	100
Three times	60	87	80	83	-
Fruits eaten during last seven days (% hh reporting)					
Not eaten	50	77	97	17	80
Eaten 1-2 days	34	7	0	74	14
Eaten > 2 days	16	16	3	9	6
Meat (beef, poultry, fish) eaten during last 7 days (% hh reporting)					
Not eaten	53	67	87	17	37
Eaten 1-2 days	43	27	13	66	24
Eaten > 2 days	3	7	0	16	40
Milk and milk products eaten during last 7 days (% hh reporting)					
Not eaten	40	47	47	17	73
Eaten 1-2 days	17	37	40	7	27
Eaten > 2 days	16	10	7	76	0
Monthly income (% hh reporting)					
<Rs 5000	17	33	40	29	50
Rs. 5000 – 10000	60	57	54	37	47
Above 10,000	33	10	6	46	3
Bank account	33	33	7	47	3
Monthly expenditure					
Av. hh expenditure per month	8061	6011	5595	8655	9252
% expenditure on food items in total expenditure	50	72	77	69	81
Debit to reimburse (% hh reporting)					
Has debit to reimburse	63	20	53	20	90
Amount of debit (% hh reporting)					
Rs.1000 - 5000	0	40	26	50	11
Rs.5000 - 10000	29	40	26	17	26
Rs. 10000 – 20000	30	0	32	0	16
> Rs. 20000	41	20	16	33	47
Purpose of debit (% hh reporting)					

Indicators	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
To buy food	50	100	31	33	42
For ceremonies	15	0	13	17	0
To cover health expenses	15	0	38	33	15
To buy agri-inputs, feed etc.	5	0	12	0	15
To by animals	0	0	0	17	0
Source of debit (% hh reporting)					
From relative/fried	63	60	38	100	23
From village lender	26	40	50	0	9
Micro-credit	5	0	0	0	5
From land lord etc.	5	0	13	0	64
Shocks (% hh reported)					
High food prices	37	50	87	67	63
Flood	0	42	31	100	90
Drought	0	6	45	20	0
Land slides	42	2	0	0	0
Windstorm	0	33	24	0	0
Earthquake	4	0	0	0	0
Diseases	0	17	0	0	0
Coping with the shocks (% hh reporting)					
Borrowing	6	0	0	17	7
Change home structure/location	90	3	0	3	0
Extra Labour	0	40	47	80	0
Temporary migration	0	50	53	0	94
Suggestions for improvement (% hh mentioned)					
Agriculture & water resources development (including Dams/ plantations)	30	59	53	67	0
Forestry development	54	0	0	0	0
Develop early warning system	0	10	13	0	3
Drainage improvement/water and sanitation	0	27	0	0	92
External assistance/training/ food by NGOs & Govt.	9	30	30	33	7
Climate change impacts					
Impact on yield (% hh reported)					
Decreased	57	50	67	33	53
No change	13	17	7	37	40
Increased	30	33	27	30	7
Reasons for yield decrease (% hh reported)					
Crops diseases	10	23	27	10	30
High input cost	40	33	0	30	27
Flood	0	27	0	0	37
Drought	0	0	60	20	0
Shortage of water	50	17	13	40	7

Indicators	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
Impact on irrigation water (% hh reported)					
Decreased	80	47	70	63	97
No change	20	53	30	37	3
Increased	-	-	-	-	-
Reasons for irrigation water decrease (% hh reported)					
Increase in temperature	0	0	10	0	0
Low rain	23	0	0	0	0
Poor irrigation system	0	43	0	0	0
Political interference	0	0	0	0	10
Don't know	77	57	90	100	90
Impact on milk production (% hh reported)					
Decreased	70	63	83	73	80
No change	13	17	7	20	7
Increased	17	20	10	7	13
Reasons for milk decrease (% hh reported)					
Animal diseases	30	97	67	40	43
Crop diseases	17	0	0	30	7
Droughts	0	0	0	23	0
Lack of fodder	13	0	27	7	10
Shortage of water	40	3	7	0	40
Climate change adaptations					
Wheat sowing time (% hh reporting)					
Early sowing	0	97	100	100	37
Late sowing	30	0	0	0	60
No change	70	3	0	0	3
Reasons for change in sowing time of wheat (% hh reporting)					
Climate change	22	0	7	0	7
High temperature	0	93	67	50	27
Lack of irrigation water	22	7	0	0	63
Low rainfall	56	0	0	40	3
Drought	0	0	20	10	0
Other reasons (fertilizer etc)	0	0	6	0	0
Other crops sowing time (% hh reporting)					
Early sowing	0	93	67	100	37
Late sowing	30	0	3	0	60
No change	70	7	30	0	3
Reasons for change in sowing time of other crops (% hh reporting)					
Climatic change	44	93	97	0	0
Crop diseases	0	0	3	0	90
Heavy rains	0	0	0	70	0
Lack of water	0	7	0	0	10
Low rain	56	0	0	30	0
Change in crop varieties (% hh reporting)					
Early maturing varieties	8	100	95	100	16
Same varieties	92	0	5	0	84

Indicators	Abbottabad	Rajanpur	Jangh	Musakhel	Shadadkot
Reasons for change in varieties					
Arid area	0	0	0	100	0
Early varieties	0	100	0	0	0
Lack of water	0	0	100	0	100
Low rainfall	100	0	0	0	0
Change in number of irrigations(% hh reporting)					
Reduced irrigation	25	100	5	69	100
No change	58	0	95	19	0
Increased irrigation	17	0	0	13	0
Reasons for change in number of irrigations					
Arid area	0	0	20	100	0
Low rain	67	0	0	0	0
Political interruption in water supply	0	0	0	0	100
Tail canal area	0	100	0	0	0

Annex 5: Stake holder's mapping

Annex 5a: Government institutions working on Food and Agriculture in Pakistan

Organization	Mandate	Relevance to food security	Remarks
Government Organizations			
Planning Commission of Pakistan, Islamabad	Overall planning (including agriculture)	<ul style="list-style-type: none"> A food and agriculture section established to oversee agriculture sectors and approve large projects. Task Force on Food Security has been established in 2008 	The current five year plan (2010 – 15) has included food security as a separate chapter.
Pakistan Institute of Development Economics (PIDE), Islamabad	Federal level semi-autonomous under the Planning Commission to conduct economic related research	<ul style="list-style-type: none"> A centre of excellence on food security has been recently established A centre of excellence for environment and climate change has been recently established. 	These are being strengthened, could be valuable as a major source for data
Ministry of Food, Agriculture and Livestock, Islamabad	The main focal Ministry for food, agriculture and livestock at Federal level	<ul style="list-style-type: none"> Food and agriculture related policy formulation and enforcement Initiate projects on improving agriculture productivity Compile agriculture statistics 	
Agriculture Prices commission - APCom (Now Agriculture Policy Institute - API), Islamabad	Under MINFAL to advise on support pricing policies and research	<ul style="list-style-type: none"> Determines minimum guaranteed prices for major crops (based of cost of production) 	
Pakistan Agricultural Storage and Services Corporation (PASSCO, Ltd), Lahore	Under MINFAL for market interventions stabilization of prices of major commodities	<ul style="list-style-type: none"> Procurement of wheat and rice (mainly from Punjab) Storage and distribution of food commodities Strategic reserves 	From this year the government plans to involve private sector in the procurement and storage.
Pakistan Agricultural Research Council (PARC)	Federal level semi-autonomous under MINFAL to coordinate agriculture research with provincial agriculture departments.	<ul style="list-style-type: none"> Well established research institutes/centers at national and provincial level (NARC, Islamabad and AZRI Quetta). Main research focus on evolving crop varieties and development of improved technologies for improving agriculture productivity. 	
Livestock development Board, Islamabad	Semi-Autonomous under MINFAL to work towards the development of livestock and dairy development	<ul style="list-style-type: none"> Responsible to plan, promote and provide advice and direction for accelerated development of Pakistan livestock and dairy industry 	Recently established, focus more on meat production farms
Horticulture Development and Export Board, Lahore	Autonomous organization to promote fruits production and exports	<ul style="list-style-type: none"> Established Horticulture development and export company 	Recent establishment
Statistics Division, Islamabad	Mainly responsible for framing policies and compilation of statistical information on socio-economic indicators including agriculture	<ul style="list-style-type: none"> Federal Bureau of Statistics <ul style="list-style-type: none"> Collection and compilation of statistical data on socio-economic indicators; Statistical year book Household income and expenditure survey 	
Population Census Organization, Islamabad	Under Statistics Division	Population survey and Compilation of demographic data 10 year basis	Last census in 1998
Agricultural Census Organization, Lahore	Under Statistics Division	<ul style="list-style-type: none"> District wise agriculture census 	Last agriculture census in 2000.
Provincial food departments	To regulate food distribution, quality and prices at provincial level	<ul style="list-style-type: none"> District-wise food inspectors 	
Provincial agricultural Ministry	Development of provincial agricultural policies	<ul style="list-style-type: none"> Policy development Manage agricultural extension and livestock departments 	
Agricultural Extension Department	Under Provincial Agriculture and Livestock Ministry	<ul style="list-style-type: none"> Provide advice to farmers Agricultural officers up to Union Council levels Field Assistants at village level 	
Provincial livestock departments	Under Provincial Agriculture and Livestock Ministry	<ul style="list-style-type: none"> Livestock research Veterinary services Field staff up to Union Council/village level 	
Provincial Agriculture research	Under NWFP Agriculture University	<ul style="list-style-type: none"> Specialized agricultural research institutes/research stations up to district level Development of crop varieties and Research trials on crop management practices 	

Multi-lateral/UN organizations/NGOs			
World Bank Resident Mission, Islamabad	Financial institution for fighting poverty	<ul style="list-style-type: none"> • Help sharing knowledge, building capacity and forging partnerships in the public and private sectors. • Infrastructure projects: Roads, Irrigation • Climate change research • Global Food Crisis Response Program (GFRP) 	
Asian Development Bank, Islamabad	Regional financial institution for fighting poverty and improving standard of living	<ul style="list-style-type: none"> • Promoting environmentally sustainable growth • Food security and climate change 	
UN Food and Agricultural Organization (FAO), Islamabad	Fighting hunger	<ul style="list-style-type: none"> • Improve productivity of food crops • Agriculture based livelihoods • Climate change adaptation (new proposal being drafted) 	
UN World Food Programme (WFP), Islamabad	Fighting hunger	<ul style="list-style-type: none"> • Through provision of emergency food aid • School feeding programme • Food aid through social safety nets • Food security assessments 	
Sustainable Development Policy Institute (SDPI), Islamabad	National NGO for policy research and advocacy on social and environment issues	<ul style="list-style-type: none"> • Food security assessments • Climate change impact assessment and capacity building 	
Oxfam GB, Islamabad	International NGO for advocacy on policy and field interventions through partner NGOs at micro level.	<ul style="list-style-type: none"> • Works on gender equality, sustainable livelihoods, girls' education and humanitarian assistance • Climate change adaptation at grass-root 	
Action Aids, Islamabad	Aims at reducing poverty in Pakistan. Work on issues related to Globalization, WTO, Food and water rights, governance, women's Rights, Human Security	<ul style="list-style-type: none"> • Active mainly in humanitarian assistance • Distribution of food aid to Internally displaced persons 	
Plan International, Islamabad	Implement programmes at grassroots level in health, education, water and sanitation, income generation and DRM	<ul style="list-style-type: none"> • Currently work with children to protect them for their rights to school 	

Annex5b: Key actors in Climate Change and DRM (source: Oxfam GB, 2009a)

Name of the organization	Mandate	CC related Mandate	CC related Capacities /Projects	Remarks
Ministry of Environment (MoE)	Environment, Focal point Multilateral Environment Agreements, Focal point Global Environment Facility (GEF)	Focal point CC UNFCCC; DNA for CDM; Focal Point IPCC.	CDM Cell, (though understaffed); National Communication to UNFCCC CDM Strategy Forestry sequestration projects (through provincial forest depts..	Main actors on CC Policy (both mitigation and adaptation); and influence position of Pakistan in International negotiations.
Pakistan Meteorological Department (PMD)	Scientific and service entity working under the Ministry of Defense; Meteorological services throughout Pakistan; Weather Forecast and monitoring; Maintains records of historical data on various climatic parameters; Seismology and Geomagnetism.	Focal point World Meteorological Organization (WMO); Strong role in disaster preparedness (early warning systems); Conduct Climate change related research (including modeling) in collaboration with GCISC. Participate in policy dialogue at national	Trained staff in modeling based research; weather forecasting, early warning systems (floods, drought, EQ, cyclone etc.).Conduct CC research	Potential Strong role in CC policy dialogues

Name of the organization	Mandate	CC related Mandate	CC related Capacities /Projects	Remarks
		and international levels.		
Planning Commission	Planning Approval of projects (above Rs. 40 million and/or projects with above 25% foreign exchange)	No specific mandate related CC but the environment section has a focal person, participates in meetings on CC in the MoE.	Strong senior staff with technical understanding of development. A Task Force under the Planning Commission to guide on CC policy has been formed.	Most important and key player to influence development sector policies Potential strong role including CC sectoral policies in the country.
Global Change Impact Studies Centre (GCISC)	Working under the Planning Commission as independent entity. Conducting modeling based research on climate change and its impact on agriculture and water resources. On this basis adaptation strategies will be developed.	The only CC related research centre in Pakistan (core scientific staff)	Implemented capacity enhancement project on CC modeling as well as other research by core team. Secretariat to PM committee on CC Dr. Ishfaq Chair PC Task Force on CC Secretariat to PC Task Force on CC	Though not part of the Policy decisions, has high influence on CC policy decisions (Through Dr. Ishfaq Ahmad, Chief Coordinator GCISC.
Alternate Energy Development Board (AEDB)	Develop and promote alternate energy (wind, solar, small hydro)	Participates in CC related discussion in the MoE.	Strong capacities/ sections in renewable/ alternate energy; CDM unit in AEDB; Working on alternate renewable energy projects with potential for CDM (but lack staff and capacities for CDM)	Strong role in developing renewable energy policy Potential strong role in policies related to Mitigation to CC
Energy Conservation Centre (ENERCON)	Under the MOE works on energy conservation and efficiency improvement	MD heads CDM committee on energy. Participates in CC related discussion in the MoE.	Strong capacities/ sections in energy conservation/ efficiency (Potential for CDM, but no capacity). Implemented several projects through GEF related to climate change mitigation.	Strong role in energy conservation policy; Potential strong role in CC mitigation
Pakistan Environmental Protection Agency (Pak-EPA)	Under the MOE develop and implements environmental regulations in the country (with support from provincial EPAs)	The DG heads CDM committee on industrial and waste management projects) Participates in CC related discussion in the MoE.	Strong technical capacities (monitors ambient air pollution in major cities and industrial areas).	Potential strong role in policies related to Mitigation to CC.
Ministry of Water and Power	Policy and regulations related to water and power.	No CC related capacities (could find a suitable person to meet)	A policy on alternate/renewable energy approved through Cabinet. CDM has been included for CC mitigation in the policy. No significant work on CC mitigation.	Strong role in energy policy decision. Potential strong policy influence in policies related to CC mitigation (energy (alternate/renewable).
Ministry of Food, Agriculture Ministry of Livestock (recently separated from agriculture)	Policies and regulations for food and agricultural Deal with matters related to international trade.	Strong technical experts but no focus on climate change related work especially (adaptation) Participates in CC related policy dialogue.	No policy on agriculture developed in general and for CC adaptation in particular. No specific projects directly related to CC for adaptation.	Strong role in agricultural related policy decisions. Potential strong influence on climate change policy decisions on adaptation for agriculture.
Pakistan Agricultural	Under the Ministry of	Relevant programmes	Strong technical experts (CC	Strong players for

Name of the organization	Mandate	CC related Mandate	CC related Capacities /Projects	Remarks
Research Council (PARC) National Agriculture Research Centre (NARC)	Food and agriculture, conduct/coordinate research on agriculture at national level (with a large network to coordinate agricultural research in the provinces).	not geared to integrating CC; No specific programme on climate change adaptation research.	related adaptation research in bits and pieces). Study of Himalayan Glaciers (mapping GLOFs) in collaboration with ICIMOD; Various projects on drought resistant varieties, introduction of alternate crops, genetic improvements, pest and disease control, water harvesting and modern irrigation techniques that might have relevance to CC adaptation.	agricultural related policies but not proactive in influencing agricultural related CC policies. Experts now members of the Planning Commission Task Force on CC.
Pakistan Council of Renewable Energy Technology (PCRET)	Under Ministry of Science and Technology, conduct research on renewable energy technology (solar, bio energy etc.)	Research capacities in technology development (has link to CC mitigation). No specific programme on CC.	Demonstrating solar and bio energy projects on a small scale (Potential for CDM, but no capacity).	Participate in renewable energy policy dialogues, but less influential.
National Institute of Oceanography	Ocean related research	To coordinate with PMD on Early Warning Systems, (Tsunami, Cyclone etc.)	Measuring sea level rise; satellite monitoring (support from SUPARCO) To monitor salt intrusion and loss of land due to sea rise. Initiating research to assess impact of climate change/sea level rise on the coastal region	Research focus, also attend policy meetings on climate change.
Pakistan Council of Research on Water Resources	Research on water Resources in Pakistan	Some technical experts involved in water related projects that has direct relevance to CC adaptation.	Research on water Resources and its relationship with CC. Conducting modeling based research on water modeling for CC. Projects on water harvesting, ground water depletion and their causes that has relevance to climate change.	Currently working in isolation, little influence on policy.
World Bank (WB) and Asian Development Bank (ADB)	Main donors for development projects (including infrastructure projects)	CDM Carbon funds Climate change and Disaster assessments as part of the programme.	CDM projects in hydro WB Capacity building project on CDM ADB study of the impact of climate change (1998) WB study on the impact of climate change on agriculture (planned)	Potential strong policy influence through funding. So far not very active on CC policy.
Donors (DFID, NORAD, SDC)	Development Cooperation (including environment)	Climate change/DRM as the strategic priority areas for most donors (both mitigation and adaptation)	DFID institutional capacity assessment study on climate change (through IUCN) funding for TAP led by IUCN; NORAD capacity building project for CDM in industrial sector; SDC focus on CDM projects in forestry sector.	Influencing CC/DRM policies through Diplomatic links, CC information and projects.
UN agencies	Sectoral Development, advocacy, capacity building, facilitation in policy development	CC taken as cross sectoral in various programme DRM as main theme under one UN	Projects on CC mitigation (FERTS, Wind Energy through GEF); Environment and DRM themes under One UN include climate change as cross cutting; UNDP MDG carbon fund;	Playing an important role in influencing CC and DRM policies through projects, information sharing and funding.

Name of the organization	Mandate	CC related Mandate	CC related Capacities /Projects	Remarks
		UNDP focal point for CC	UNIDO CDM capacity building project through NORAD funding; UNESCO project on developing early warning system for Tsunami; Some UN agencies have established Emergency and rehabilitation Units for Disaster Management.	
LEAD Pakistan	NGO to provide leadership on Sustainable Development Produce Lead fellows (spread all over the country)	CC recently taken up as an integral part of the Lead programme	Building CC team; Research papers on CC issues; Conducted stakeholders awareness raising meetings on CC in provinces; Awarded project on Consultation for second National Communication to UNFCCC; Lead member in the Planning Commission TF on CC.	Strongly influencing CC policy decision through active participation in various forums/ organizing workshops/consultations.
IUCN	Conservation of Nature and Natural Resources	An ongoing programme on climate change.	Technical Advisory Panel on Climate Change Scoping study on CC DFID study on CC Participates in global dialogues on CC Member of Planning Commission TF on CC	Strongly influencing CC policy through TAP, information sharing and participation in various forums.
SDPI	Advocacy and research on environment and sustainable development	Plans to establish a team on CC research	Building CC team; Shafqat Kakakhel renowned UNEP member part of SDPI and member of TF. Initiated Youth Network on CC.	Potential influence on CC policy through Shafqat Kakakhel, Technical advisor SDPI.
NDMA/PDMAs/DDMA s	DRM policies Capacity enhancement including relief and recovery coordination	Focus only on DRM	Capacities being strengthened in NDMA. PDMAs and DDMA s are still to be established.	Strong influence on DRM policy development. Potential significant role in mainstreaming CC in DRM policy.
Other small I/NGOs: Oxfam/ Concern Worldwide/ Church World Service (CWS)/World Vision/AKDN/ Islamic Relief/ Save the Children/Action-ed/ Focus/CRS/ RDPI	Community based livelihood recovery and rehabilitation; addressing vulnerabilities, livelihood and poverty issues.	Mainly involved in community based DRR projects including disaster response and recovery. Some focus on community CC adaptation projects on pilot basis (Oxfam, RDPI).	A strong cadre of social workers and community developers trained in community based livelihood and DRM projects).	Less influence in CC related policy decision; May join hands to raise voice of grass root communities and bring community issues upfront for mainstreaming CC and DRR in development policies.

Source: Oxfam GB 2009a

Annex 5c: List of bilateral Donors

Agency	Main focus
European Union (EU)	Focuses on poverty reduction, notably through assistance in rural development and natural resources management as well as education and human resources development. Environment, climate change, food security are also addressed.
Department for International Development (DFID) UK	Poverty reduction through health and education, governance and livelihoods. Environment, climate change, food security are also addressed.
Canadian International Development Agency (CIDA):	In Pakistan with poverty reduction as its overarching goal, CIDA is concentrating its program of assistance on: democratic local governance; social development (basic education and primary health care, including HIV/AIDS); equality between women and men
Norwegian Aid development cooperation (NORAD)	Climate change and environment, child and women health, clean energy and macro-economic and poverty reduction.
Netherlands Bilateral Development Cooperation	Working on three themes- education, environment/water management, and good governance/human rights
Swiss Development Cooperation (SDC)	Reduce poverty through promoting a people-driven, equitable and ecologically sound development. The programme is structured around three broad domains: "Improving Governance", "Increasing Income", and "Reconstruction and Rehabilitation", Human Rights Based Approach with Gender and HIV/AIDS mainstreamed. Climate change and natural resource conservation are also addressed.
United States (USAID)	Economic growth (income and employment through agri-business), education, health, good governance, emergency assistance and humanitarian assistance.
Japan International Cooperation (JICA)	Education, health and small infrastructure.

Annex 5d: Partner NGOs Capacity mapping

Partner NGO	Main activities	Geographic area of focus	Target communities (Livelihood group)	Any other remark
SUNGI DEVELOPMENT FOUNDATION Address: #11, ST3#15, G7/2, Islamabad; Contact: 0321-4389847	<u>Livelihood</u> <ul style="list-style-type: none"> • Enterprise development • Natural resource management • Micro finance <ul style="list-style-type: none"> Capacity building of communities Policy advocacy • Health & Education <u>Food security</u> <ul style="list-style-type: none"> • -Organic agriculture /seed banks • Kitchen gardening • Orchard development • Alternate cropping & irrigation system • Live stock improvement <u>Climate Change adaptation</u> <ul style="list-style-type: none"> • Water conservation • Reforestation & conservation of forests • Alternative non fossil energy • Working toward promotion of more rain by forestation & promoting a carbon sponge 	Hari pur, Abbottabad, Mansehra, Batgram, Hazara Div NWFP, muzafferaabad div in AJK, Gilgit/baltistan.	Ultra poor Poor household in rural areas 70% with women 30% with men	MAIN THEMES: <u>Livelihood</u> 1: Good governance - Social mobilization - Human & Democratic rights - Policy advocacy 2:Sustainable livelihood -Enterprise development - Natural resource & Management - Micro finance 3: Social development - Community participatory infrastructure - Health - Education 4: Disaster management - Rescue relief - Rehabilitation - Reconstruction
Awaz CDS-Pakistan, 2440N/8A, D-Block Shamasabad Colony Multan Contact: +92-61-4784606, 4577409	<u>Livelihood</u> <ul style="list-style-type: none"> ➤ Building links of VDC,S(farmers) with agricultural extension program +Live stock department for the vaccination and aid access. ➤ Developing center prenatal/Technical skill in woman for livelihood opportunities. ➤ Microfinance support for agriculture and barriers. 	Five districts of south area of south Punjab, Multan, Muzaffer Gardh, D.G Khan and Rajanpur	Poor farmers and women from laborers in originalized of south Punjab.	Awaz has been working with 320 farmers/ woman groups in 160 villages in five districts of southern Punjab to sustain their livelihood and food security. Building their linkage with available public resources and department and financial support to them.

Partner NGO	Main activities	Geographic area of focus	Target communities (Livelihood group)	Any other remark
	<p><u>Food security</u></p> <ul style="list-style-type: none"> ➤ Policy research and advocacy on safe and clean drinking water and sufficient availability of irrigation water. ➤ Land right for woman and Tenents policy research and advocacy. <ul style="list-style-type: none"> ➤ Awareness rising for improves verity of seeds/ fertilizer/live stock raising/farming and dairy. <p><u>Climate Change adaptation</u></p> <ul style="list-style-type: none"> ➤ Advocacy and lobbying with govt. to establishing check dams for the preservation. ➤ Motivating and mobilizing communities for food preservation + alternate natural resources management/ crop irrigation/ cemented water culverts and channels. 			<p>Leading 213 NGO's/ CBO's and their CSON to address issues of food security as additional secretariat of GCAP Pakistan.</p> <p>Doing research on livelihood and food security issues and following up parliamentarians for policy level reforms.</p> <p>Mobilizing communities and raising awareness on climatic change and issues.</p>
<p>SAFWCO Address: Phase-1, Qasimabad, Contact: 022650996</p>	<p><u>Livelihood</u></p> <ul style="list-style-type: none"> • Agricultural resource center • Farmers groups are linked with Govt. agricultural support fund. • Nursery raising tree planting <p><u>Food security</u></p> <ul style="list-style-type: none"> • Kitchen grading • Organic farming • Livestock rearing movement • Flood processing training to women folk • Skilled based training <p><u>Climate Change adaptation</u></p> <ul style="list-style-type: none"> • Certified seed varieties • Water logging and scarcity of water • Disaster preparedness plan and village based disaster risk management committee • Advocacy with DDMA & PDMA on disaster preparedness 	<p>Districts Sangher, Thatta, Dadu, Hyderabad Niserabad Matiari</p>	<ul style="list-style-type: none"> • Small farmers • Minorities • Labor former • Women former • Poor communities 	<p>We would like to proceed towards Northern Sindh. Larkana, and coastal district , Shadadkot and Kashmor district in Program area in future.</p>
<p>Pakistan Fisher folk Forum (PFF) Address: School Hall, Ibrahim Hyderi Bin Qasim Town Karachi Contact: Hussain Tasawar 03462412044</p>	<p><u>Livelihood</u></p> <ul style="list-style-type: none"> • Policy advocacy on provincial and national level. • Promoting livelihoods through training, providing boats, nets to indigenous fisher folk, farming cooperatives. <p><u>Food security</u></p> <ul style="list-style-type: none"> • Advocacy for the restoration of Indus River and rehabilitation of Indus delta. • Advocacy work on deep sea fishing policy. <p><u>Climate Change adaptation</u></p> <ul style="list-style-type: none"> • Conservation of natural resources specially mangrove forests. • Awareness raising on climate 	<ul style="list-style-type: none"> • National and provincial • 9 district of Sindh and one district of Balochistan <p>Provincial (Sindh) National area</p> <p>Karachi + Thata+Kashmore</p>	<p>Fishing Communities</p>	

Partner NGO	Main activities	Geographic area of focus	Target communities (Livelihood group)	Any other remark
	change through media, Govt. officials, civil society and community.			
DOBA FOUNDATION, Mohalla old Talkot Jhang Road Muzaffarabad. 0300-333-7373766	<u>Livelihood</u> Number of technical and vocational training <ul style="list-style-type: none"> • providing poor appropriate technology • Market linkage • Agricultural cooperatives • Rural transportation and Awareness raising • Micro infrastructure <u>Climate Change adaptation</u> <ul style="list-style-type: none"> • Research on climate change impacts on vulnerable • Capacity building/ awareness • Organic farming • Appropriate technology • Advocacy/ public hearing • DRM 	South Punjab Muzaffarabad Jhang Layyah	Land less Indigenous Small farmers Women Minorities Poorest/ widows	DRR as cross cutting Social mobilization and Gender as cross cutting
Thardeep Rural Development Program, Tharparkar	<u>Livelihood</u> <ul style="list-style-type: none"> • Micro credit & ent. Development • Natural resource management (grafting, promotion of drought resistance trees & plants) • live stock extension sries <u>Food security</u> <ul style="list-style-type: none"> • Family nutrition kits • Poultry units • Children and mother nutrition project <u>Climate Change adaptation</u> <ul style="list-style-type: none"> • Rain water harvesting • Deep irrigation • Solar power • Disaster risk reduction 	Tharparker Umer kot Jamshoro Dadu	Poorest families with working children focus on females	
Khwendo kov house #130, st #4, sec K-3, phase III Hayderabad Peshawar. 091-5822255	<u>Livelihood</u> <ul style="list-style-type: none"> • Micro enterprise program includes credit to women; capacity building of women to manage their business; skill enhancement including food processing, tye & dye handicrafts; facilitate enterprisers to market their products <u>Food security</u> <ul style="list-style-type: none"> • - Peace building activities to reduce poverty • - Live stock improvement • -Skill development to increase the income level of household • - Literacy among women and youth <u>Climate Change adaptation</u> NRM activities include <ul style="list-style-type: none"> • forestation , check dams • awareness raising of communities 	NWFP& FATA 1: six districts Karak Dir upper Lower Di khan Mansehra Butgram 2: FATA areas include Khyber agency FR bannu FR Peshawr Khyber agency Karak Dir upper Karak Dir upper	Women groups at village level Commercial institute Relevant government department Youth Men/Women/Children Government	

Partner NGO	Main activities	Geographic area of focus	Target communities (Livelihood group)	Any other remark
	<ul style="list-style-type: none"> capacity building water harvesting peace building activities 			
Pakistan Institute of Labor & Research (PILER)	<u>Livelihood</u> <ul style="list-style-type: none"> Advocacy, research and education on decent lively hoods & rights to work and work for all. (core labour rights, minimum wages, social protection, rights to land and shelter) Information dissemination 	Sindh & Punjab Mainly: NWFP & Baluchistan Partly: Hyderabad, Karachi, Shahdad pur, Lahore, Multan, Faisalabad, Hari pur, Peshawar, Quetta	<ul style="list-style-type: none"> Information sector Industrial workers Agricultural workers Home based workers Labour 	Out puts include: - Informed workers - Pro-worker legislation - reforms in labour - peace and conflict - resolution at regional & national level
Laar Humanitarian and Development Program, Badin, Sindh	<u>Livelihood</u> <ul style="list-style-type: none"> - Land reclamation - Diversified lively hood training - Agricultural livelihood exercise - Workers training <u>Food security</u> <ul style="list-style-type: none"> Land management Reclamation Efficient water and level management <u>Climate Change adaptation</u> <ul style="list-style-type: none"> Reclamation of degrading land Constructing intend ponds Provision of climate change tolerant seeds varieties 	Badin	Agriculture and fishing communities	
Shirkat ghah ,68 tipu block, new gardn town, Lahore	<u>Livelihood</u> <ul style="list-style-type: none"> Research , policy analysis Advocacy toward promotion and facilitation Promoting women through awareness and capacity building <u>Food security</u> <ul style="list-style-type: none"> Promoting women by sustainable agriculture Introducing women in kitchen garden <u>Climate Change adaptation</u> <ul style="list-style-type: none"> Water issue Policy analysis Indigenous solution from the gender perspective 	Rural Sindh Punjab NWFP Balochistan	Poor rural communities especially women within Policy makers National& Regional	Policy advocacy at national/provisional level through publication & films Net working and advocacy
LEAD PAKISTAN LEAD house, F-7 MARKAZ, Islamabad 92-51-2651511	<u>Livelihood</u> <ul style="list-style-type: none"> Action plan of livelihood Disaster properness Capacity building and skill development <u>Food security</u> <ul style="list-style-type: none"> Action plan for food security and agriculture <u>Climate Change adaptation</u> <ul style="list-style-type: none"> A national alliance on climate action which work toward adaptation, food security, livelihood, natural recourse management: <ul style="list-style-type: none"> Capacity building and institutional development Micro adaptation projects on ground Policy intervention the national level Disaster risk management 	National	For all three areas, LEAD has identified 100 CBOs working in communities all over Pakistan on issue of livelihood, climate change and food security	LEAD has developed its climate change action program(L-CAP) it will work on climate change A series of activities have been planned over the coming year with these CBOs.

Annex 6: Detailed Recommendations for livelihood improvement, food security and climate change adaptation per agro-ecological zones

1. Hill torrent zone, Southern Punjab

Main Livelihood systems	Status of food insecurity	Climate change impacts	Broad Interventions
<p>i. Landless tenants - work for landlords at low wage rate in kind (such households exist throughout the district (including category ii and iii below)</p>	<ul style="list-style-type: none"> - Deficient in own food production for about 8-9 months and purchase from market (sell own food at harvest at lower price for household cash need) - Some keep livestock, managed by women that supplement food. - Poor health and hygiene of women and children due to lack of awareness 	<ul style="list-style-type: none"> - Prone to both flash floods and reverine floods. - Damage houses made of mud - Livestock deaths - Standing crops losses (loss of share) - Increased temperature reduce crop productivity, reducing their share in produce 	<p>Main Recommendation: A need to diversify non-farm income earning opportunities</p> <p><u>Improving Livelihoods</u></p> <ul style="list-style-type: none"> - Skill development for male and female members in non-farm work to increase their income - Community-based micro-credit schemes for reducing debts <p><u>Improving Food security</u></p> <ul style="list-style-type: none"> - Need to work with women to improve livestock productivity for supplementing food. - Improved livestock management practices, and awareness on health and hygiene. <p><u>Climate change adaptations</u></p> <p><u>Reducing impacts</u></p> <ul style="list-style-type: none"> - Disaster preparedness Early Warning System - Drills for evacuation - Raised food and fodder storages - Flood water diversions - Methods to reduce losses to mud houses - Adaptations to sowing windows, heat tolerant varieties (land lords). <p><u>Reducing risks</u></p> <ul style="list-style-type: none"> - Check dams, plantations upstream, diversions etc.
<p>ii. Small farmers along the Indus riverbed. Some family members work as labour on/off-farm</p>	<ul style="list-style-type: none"> - Deficient in own wheat but self sufficient in rice production (sell rice to purchase wheat) - Most keep livestock (buffaloes) managed by women to supplement food and cash (sale of products) - Water born diseases among children 	<ul style="list-style-type: none"> - These communities prone mainly reverine floods. - Damage houses made of mud and food storage - Livestock deaths - Standing crop losses - Damage peter engines, drinking and irrigation water - Increased temperature reduce crop productivity 	<p>Major Recommendation: A need to improve farm based livelihood systems</p> <p><u>Improving Livelihoods</u></p> <ul style="list-style-type: none"> - Improved cropping practices (including organic farming) - Introduce high value vegetable farming and linking to markets - Work with women towards value addition in livestock products and link them to markets. - A need to improve income from non-farm (Skills enhancement of women in handicrafts made from local material) and linking them to market). - Community-based micro-credit scheme for women small business <p><u>Improving food security</u></p> <ul style="list-style-type: none"> - Improved methods and varieties for rice production. - Value added vegetable production - Kitchen gardening with women

Main Livelihood systems	Status of food insecurity	Climate change impacts	Broad Interventions
			<ul style="list-style-type: none"> - Methods for processing of livestock products to be used for own consumption and sold to market for income - Water purification and a need to improve sanitation, health and hygiene practices of women and children <p><u>Climate change Adaptation</u></p> <p><u>Reducing impacts</u></p> <ul style="list-style-type: none"> - Disaster preparedness Early Warning System - Drills for evacuation - Raised food and fodder storages - Methods to reduce losses to mud houses and water purification - Skill development to repair own peter engines. - Adaptations to sowing windows, heat tolerant varieties. <p><u>Reducing risks</u></p> <p>Plantations on river side/ raised beds</p>
<p>iii. Rainfed farmers who depend upon Suleman hill torrents. Some family members supplement income working abroad.</p>	<ul style="list-style-type: none"> - Deficient in own food production for about 8-9 months and purchase from market - Sell pulses to meet for household cash needs - Livestock (managed by women) supplement own food. 	<ul style="list-style-type: none"> - Prone to mainly flash floods - Damage houses made of mud, food and fodder storages - Increased temperature reduce crop productivity and losses 	<p>Major recommendation: A need to improve farm based livelihood systems</p> <p><u>Improving Livelihoods</u></p> <ul style="list-style-type: none"> - Introduce improved high value traditional crops (pulses) - Methods to improve water harvesting/moisture conservation <p><u>Improving Food Security</u></p> <ul style="list-style-type: none"> - Improve productivity & income from high value pulses to improve affordability to purchase wheat - Rainwater harvesting, moisture conservation techniques. - Improve livestock management by women and raise awareness in health and hygiene <p><u>Climate change adaptation</u></p> <p><u>Reducing impacts (strengthening resilience)</u></p> <ul style="list-style-type: none"> - Disaster preparedness Early Warning System - Raised food and fodder storages - Methods to reduce losses to mud houses (raised plate form) - Adaptations to sowing windows, heat tolerant varieties. <p><u>Reducing risks</u></p> <p>Check dams, plantations upstream, diversions etc., water harvesting, raised field bunds.</p>

2. Coastal zone, Lower Sindh

Main Livelihood systems	Status of food insecurity	Climate change impacts	Broad Interventions
<p>Fishing based livelihood system (mostly wage labour for fishing and non-farm in cities, some agricultural land is also cultivated)</p>	<ul style="list-style-type: none"> - Deficient in crop-based food (own food for about 4-5 months, the rest is sold for meeting cash needs for paying credits and other household needs - Small fish is dried (by women) to supplement food. - Livestock is kept (managed by women) to supplement own food - Drinking water is brackish and poor drainage and sanitation has increased water born diseases - Poor nutrition, health and hygiene of children and women 	<ul style="list-style-type: none"> - Prone to storm surges and floods due to heavy rains upstream. - Affect houses made of tech material, standing crops, livestock, stored food and other productive assets. - Shallow water fishing has reduced - Salt water intrusion has increased salinity, affecting agricultural lands losses - Ground water tables have increased (brackish water). Women have difficulty is fetching drinking water. - Irrigation water has declined partly because of climate change - Crop yields have declined due to salinity and heat/moisture stress - Livestock (milk) productivity has declined - Mangroves have been degraded (important fish breeding grounds) 	<p>Main recommendation: A need to improve fishing based livelihood system and assist in developing alternative livelihood opportunities.</p> <p><u>Improving Livelihoods</u></p> <ul style="list-style-type: none"> - The communities should be equipped and trained for deep water fishing. - Introduce community-based micro-credit schemes for enable the wage labour to own small nets/boats - Assess non-farm income earning opportunities and improve skills of the poor communities (diversifying income) - Communities' awareness, conservation and sustainable management of these bushes and mangroves. <p><u>Improving food security</u></p> <ul style="list-style-type: none"> - Salt tolerant crops, species and varieties and technologies to reduce salinity. - Methods for reducing pollution of water, technologies for water purification/ desalinization of water for agriculture and drinking water use through solar energy - Improved water management technologies and methods - Detailed assessment of the drainage issue, identify issues and work towards improvement of drainage and sanitation to improve health. - Awareness raising of women on health and hygiene - Methods for food processing, improved methods for drying and storage of small fish by women - Improved methods for livestock productivity, fodder management, livestock management (by women) <p><u>Climate change adaptations</u></p> <ul style="list-style-type: none"> - Develop community based system linked to for early warning system for cyclones by PMD, - Enhance capacity of communities in evacuation - Introduce salt tolerant crops, species and varieties - Changing cropping patterns, methods, sowing windows (already in practice), short duration varieties - Methods to stop seas water inundation Bunds, diversions, mangroves plantation and conservation.

3. Himalayan Mountain Zone (Gilgit-Balthishan, parts of NWFP, AJK)

Main Livelihood systems	Status of food insecurity	Climate change impacts	Broad Interventions
<p>Small farmers in high mountain areas (mainly heavily on limited local resources, difficult access). Fruits, off-season vegetables, and non-timber forest products has potential.</p>	<ul style="list-style-type: none"> - Largely deficit in food production due to small land holdings and single season cropping (in high mountains). - Livestock, potatoes, fruits, home gardening, wild plants and shrubs are used as supplemental food. - Malnourished (especially women and children) in high altitude. - Declining productivity due to intensive cultivation on fragile and deforested sloppy lands, causing erosion of top soil/terrace destruction 	<ul style="list-style-type: none"> - Decrease in snowfall (reduce water resources) - Intensive monsoon rains leads to land degradation and flash floods (silt accumulation in dams) - Rising temperature/intensive rains tend to rapid/early snow melting and enhanced glacial receding/ GLOFs/land sliding - Rising temperatures tend to increase crop yields and double cropping, fruits and off-season vegetables at high altitudes will be possible 	<p>Main Recommendation: Focus small farmers in high mountain areas</p> <p><u>Improving livelihoods</u></p> <ul style="list-style-type: none"> - Assessment to identify potential livelihood opportunities (some example: fruit processing, market, off-season vegetables, wood work) - Introduce demand side measures to reduce deforestation through the involvement of communities (e.g., efficient cooking stoves, liquid gas (LPG) and solar energy technologies) - Infrastructure development (roads) - Improved access to markets, organizing small farmers for cooperative marketing, private sector for cold chain development <p><u>Improving food security</u></p> <ul style="list-style-type: none"> - Increased investment in R&D for improving food crops (wheat, maize, rice, potatoes and beans) by agriculture extension, including improved management practices for traditional food crops, off-season vegetables - Awareness raising for women on nutritional aspects, kitchen gardening, food processing and drying etc. - Women, awareness raising on nutrition, health and hygiene for children, small scale drinking water, rainwater harvesting at home - Fruits and vegetable processing and drying by women. <p><u>Climate change adaptations</u></p> <ul style="list-style-type: none"> - Promote sustainable agricultural land use practices such as improved methods of cultivation, land contouring and terracing technologies and practices, introduction of cover crops, organic farming, improved orchard/tree plantation techniques, and off-season vegetable production. - Water conservation and harvesting methods. - Forest plantation, forest conservation, check dams, sustainable agriculture practices on sloppy lands, terracing, mulching to slow down flash floods and soil erosion. - Water harvesting, diversions, risk assessments, risk mitigations through regular discussions with communities. - The genetic varieties developed for plain areas may perform well and should be tested and introduced. Introduce fruit nurseries and vegetable farming.

4. Dry western mountains, Balochistan

Main Livelihood systems	Status of food insecurity	Climate change impacts	Broad Interventions
<p>Livestock herders in hill side (sheep and goats), depend on vast range lands that are degrading fast.</p>	<ul style="list-style-type: none"> - Deficient in crop-based food production but self sufficient in livestock based food production - Difficult access to external food. - Health and nutrition of women and children? 	<ul style="list-style-type: none"> - Flash floods have increased - Decrease in snowfall (reduce water resources) - Reduction in water from mountains - Range lands fodder reduced due to reduction in winter rainfall - The traditional Kareze irrigation is depleting and not maintained by communities 	<p>Recommendation: Focus of livestock based livelihood system</p> <p><u>Livelihood improvement</u></p> <p>Revitalization the past community grazing systems that was sustainable Link the communities to markets for milk and meat product marketing</p> <p><u>Food Security improvement</u></p> <p>Introduction of high yielding cross breeds suiting to the local conditions, working with communities to increase their awareness about artificial insemination Improved livestock management practices, and health and hygiene of women. Awareness raising for women on nutritional aspects, efficient use of livestock products, fruits drying and processing</p> <p><u>Climate change adaptations</u></p> <p>Introduce heat tolerant livestock breeds Water harvesting techniques Forest plantation, check dams, diversions to reduce risk of flash floods Organize the communities to revitalize the Kareze system</p>

5. Desert Zone, Tharparkar Sindh

Main Livelihood systems	Status of food insecurity	Climate change impacts	Broad Interventions
<p>Moons based mono-cropping, with livestock</p> <p>New introduction of mining and coal industry is an opportunity for increased wage labour</p>	<ul style="list-style-type: none"> - Deficient in crop-based food production but self sufficient in livestock based food production - Drinking water deficient, ground water deep and brackish - Sanitation and health problem 	<ul style="list-style-type: none"> - Monsoon droughts have increased. - Frequent crop failures - Livestock deaths, and diseases - Temporary migration to irrigated districts for wages in kind. 	<p>Recommendation: Focus on Thar desert communities</p> <p><u>Livelihood improvement</u></p> <p>Improve skills in mining labour activities Skill development of women in weaving/embroidery and linking them to market</p> <p><u>Food Security improvement</u></p> <p>Improved livestock management practices, and health and hygiene of women. Awareness raising for women on nutritional aspects, efficient use of livestock products, and processing</p> <p><u>Climate change adaptations</u></p> <p>Introduce heat and moisture tolerant crops and varieties Improve techniques for fodder management in case of drought Water harvesting techniques</p>