S P E C I A L R E P O R T

FAO/WFP CROP AND FOOD SECURITY ASSESSMENT MISSION TO YEMEN

9 December 2009

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, ROME

WORLD FOOD PROGRAMME, ROME

This report has been prepared by Mario Zappacosta,Tayeb El Hassani and Jan Delbaere, under the responsibility of the FAO and WFP Secretariats with information from official and other sources. Since conditions may change rapidly, please contact the undersigned for further information if required.

Henri Josserand
Deputy Director
Trade and Markets Division, FAO
Fax: 0039-06-5705-4495
E-mail: giews1@fao.org

Daly Belgasmi
Regional Director for Middle East,
Central Asia and Eastern Europe, WFP
Fax: 0020-2-528-1735
E-mail:wfp.odcbureau@WFP.org

Please note that this Special Report is also available on the Internet as part of the FAO World Wide Web www.fao.org *at the following URL address:* http://www.fao.org/giews/ and http://www.wfp.org/food-security/reports/CFSAM

The Special Alerts/Reports can also be received automatically by E-mail as soon as they are published, by subscribing to the GIEWS/Alerts report ListServ. To do so, please send an E-mail to the FAO-Mail-Server at the following address: ***mailserv@mailserv.fao.org****, leaving the subject blank, with the following message:*

subscribe GIEWSAlertsWorld-L

To be deleted from the list, send the message:

unsubscribe GIEWSAlertsWorld-L

Please note that it is now possible to subscribe to regional lists to only receive Special Reports/Alerts by region: Africa, Asia, Europe or Latin America (GIEWSAlertsAfrica-L, GIEWSAlertsAsia-L, GIEWSAlertsEurope-L and GIEWSAlertsLA-L). These lists can be subscribed to in the same way as the worldwide list.

TABLE OF CONTENTS

Page

Mission Highlights 4

1. OVERVIEW 4

2. SOCIO-ECONOMIC CONTEXT 5
2.1 The macro-economic situation 5
2.2 The agricultural sector 6
2.3 Poverty and population 8
2.4 Policy framework and safety nets 8

3. FOOD PRODUCTION IN 2009 9
3.1 Area planted with cereals in 2009 10
3.2 Factors affecting yields 11
3.2.1 Rainfall 11
3.2.2 Irrigation 12
3.2.3 Inputs (seeds, fertilizers, pesticides) 12
3.2.4 Pests and diseases 13
3.3 Other crops 13
3.4 Livestock and fodder production 13
3.5 Cereal production estimates for 2009 14

4. CEREAL SUPPLY/DEMAND SITUATION 16
4.1 Cereal markets, trade and prices 16
4.2 National cereal supply/demand balance in 2010 17

5. HOUSEHOLD FOOD AND NUTRITION SECURITY 18
5.1 Household livelihoods in rural areas 18
5.1.1 Rainfed agriculture 18
5.1.2 Irrigated agriculture 18
5.1.3 Livestock breeding and rearing 19
5.1.4 Migration and remittances 20
5.1.5 Other livelihood activities 20
5.1.6 Solidarity within the communities and across regions 20
5.2 Current food insecurity and prospects 20
5.2.1 Food access 20
5.2.2 Food consumption 21
5.2.3 Food utilization 21
5.2.4 Transitory food insecurity 21
5.2.5 Chronic food insecurity 22
5.3 The role of the World Food Programme to address food insecurity 23
5.4 Food assistance requirements in 2010 23

6. RECOMMENDATIONS 24

ANNEXES
ANNEX 1 Rainfall pattern and vegetation profiles during 2009 season compared to 2008 and 10-year average 25
ANNEX 2 Monthly rainfall distribution during summer 2009 compared with 2008, and with 1999-2008 long-term average for selected governorates 27

Mission Highlights

- Inadequate seasonal rains have affected the 2009 rainfed cereal production in parts of Yemen.
- Aggregate cereal crop production in 2009, estimated at 706 000 tonnes, is slightly lower than the previous year level, but about 24 percent below the 2007 bumper crop.
- Per-capita domestic cereal production stagnated at about 30 kg per person per annum in the last decade covering on the average only about one-fifth of the country's consumption requirements.
- With cereal imports accounting for up to 80 percent of consumption requirements (with 90 percent of wheat and 100 percent of rice), the recent surge in international food prices has significantly affected domestic prices. For instance, wheat prices peaked in April 2008 at YER 6,400 per 50 kg bag, more than double the level a year earlier.
- Although there has been a reduction in cereal prices from their peak levels, prices are still higher than their pre-crisis levels of 2005/06.
- The total cereal import requirements in 2010, estimated at about 3.2 million tonnes (mainly wheat and wheat flour), are expected to be imported commercially.
- An estimated 2 million people, including conflict affected, refugees, and other vulnerable people are likely to face increased food insecurity and will require targeted food assistance estimated at about 100 000 tonnes during 2010.

1. OVERVIEW

An FAO/WFP Crop and Food Security Assessment Mission visited Yemen from 3 to 17 October 2009 to estimate the 2009 main season cereal production and assess the overall food security situation for the 2010 marketing year (January/December). The Mission included two experts from the FAO Emergency Operations and Rehabilitation Division of the Technical Cooperation Department (TCES) that drafted emergency agricultural rehabilitation projects as inputs in the 2010 Yemen Humanitarian Response Plan.

In Sana'a, the Mission held meetings with various national and international institutions to discuss the current situation of agriculture and food security and its prospects. In addition, it acquired the latest information available on agriculture, trade, policy, prices and humanitarian assistance. Over a period of 8 days, the Mission visited the Governorates of Al Hudaydah, Sana'a, Dhamar, Ibb and Taizz. These Governorates represent about 55 percent of national agricultural land, accounting for about 60 percent of domestic production of cereals.

During the fieldwork, the Mission interviewed government officials, rural community leaders and other key informants as well as traders, farmers and poor rural households. The Mission inspected standing crops and those recently harvested. It also gathered information on different aspects of household food security and main livelihoods systems. It examined the evolution of local prices of the main food and cash crops, production and income-generation possibilities, and the effects of the adverse climatic events on agriculture and livestock production. In the visited governorates, the Mission received strong support from local authorities and technical personnel.

The 2009 agricultural season was characterized by erratic rainfall (it started late with some dry spells) although the total seasonal rainfall was around average to slightly above average in most areas. Some crop failures were observed in few areas, and in a few other areas yields were poor compared to expected results.

After thoroughly examining all relevant factors and based on the rather limited available data and information, the Mission has estimated the 2009 cereal harvest at about 706 000 tonnes, which is slightly lower than in 2008, but almost 24 percent less than the 2007 bumper output.

Concerning the availability of grazing feed and drinking water for livestock, the September-October rains have been useful. The NDVI profiles for Yemen indicate that the vegetation cover in 2009 was improving in most governorates as compared to their situation in 2008 and to the long term average of 1999-2008. The satellite data is also supported by the Mission field observations and discussions with farmers, pastoralists and livestock traders. The condition of the livestock was generally good, especially in Hadramaut Governorate where residual soil moisture due to last year's flooding has improved access to pasture.

The cereal import requirement for 2010 (January/December) has been estimated at about 3.2 million tonnes, including 2.48 million tonnes of wheat, 383 000 tonnes of rice and about 330 000 tonnes of maize. This amount is expected to be fully covered through commercial imports. Normally, 90 percent of wheat requirements and 100 percent of rice requirements are met through imports.

The high food prices prevailing during much of 2008 have worsened the food security situation of poor households which have already been suffering from moderate to severe food insecurity. Chronic household food insecurity is widespread and severe and the country has one of the worst malnutrition rates in the world. Child malnutrition is a special concern, with very high prevalence of underweight and stunted children and high prevalence of wasted children. The situation has been compounded by the renewed conflict between a local group and the Government causing additional displacement of large sections of population especially in Sa'dah Governorate.

Overall, an estimated 2 million people, including conflict affected, refugees, and other vulnerable people are likely to face increased food insecurity and will require targeted food assistance, estimated at about 100 000 tonnes during 2010.

Critical emergency seed support will be necessary to enable farmers next year. In the case of livestock, emergency support will be needed for feed provision to small-scale livestock owners, with special attention to IDPs in Sa'dah. Over the medium and longer term, the development of a water management strategy (dealing also with suitable alternatives to qat production) and the establishment of a food security information system need to be considered.

2. SOCIO-ECONOMIC CONTEXT

2.1 The macro-economic situation

Yemen is classified as one of the Least Developed Countries and, according to the 2009 Human Development Report of the United Nations Development Programme (UNDP), it is ranked 140th out of 177 countries in the Human Development Index, with a per capita GDP of USD 2 235 (at purchasing parity power). The service sector is the largest economic sector with almost 54 percent of GDP, followed by industry (27 percent) and agriculture (19 percent). Services are dominated by government services (21 percent) and transport (13 percent). Tourism has potential, but is hampered by limited infrastructure and security concerns. The largest industrial output is oil refining, followed by food processing, metal products, consumer goods and construction materials.

Despite some progress made since 1990, date of unification of the Yemen Arab Republic and the People's Republic of Yemen, the country still faces multi-dimensional challenges for development. The country's limited endowment of natural resources, coupled with high demographic pressure, poses serious concerns about the future. In fact, Yemen's economy highly depends on the oil sector that in 2007 accounted for 85 percent of export earnings and about 70 percent of government revenue. This makes external and fiscal accounts highly vulnerable to volatility of international oil prices. In addition, oil reserves are relatively small and they are expected to be depleted in about 10-12 years. The continued decline in oil production, combined with low oil prices, is expected to broaden the fiscal deficit and limit government spending, made for about 50 percent by fuel subsidies (about 14.5 percent of GDP in 2008) and public sector wage bill. Groundwater resources are also facing a rapid process of depletion with the level of table water falling by some 2 meters per year, being the extraction for drinking and irrigation purposes not fully compensated by rainfall. Development is also hampered by limited human resource capacity, reflected in low rates of literacy and enrolment. In particular, gender inequalities in education are quite alarming, with 65 percent of women are considered illiterate compared with 27 percent of men.

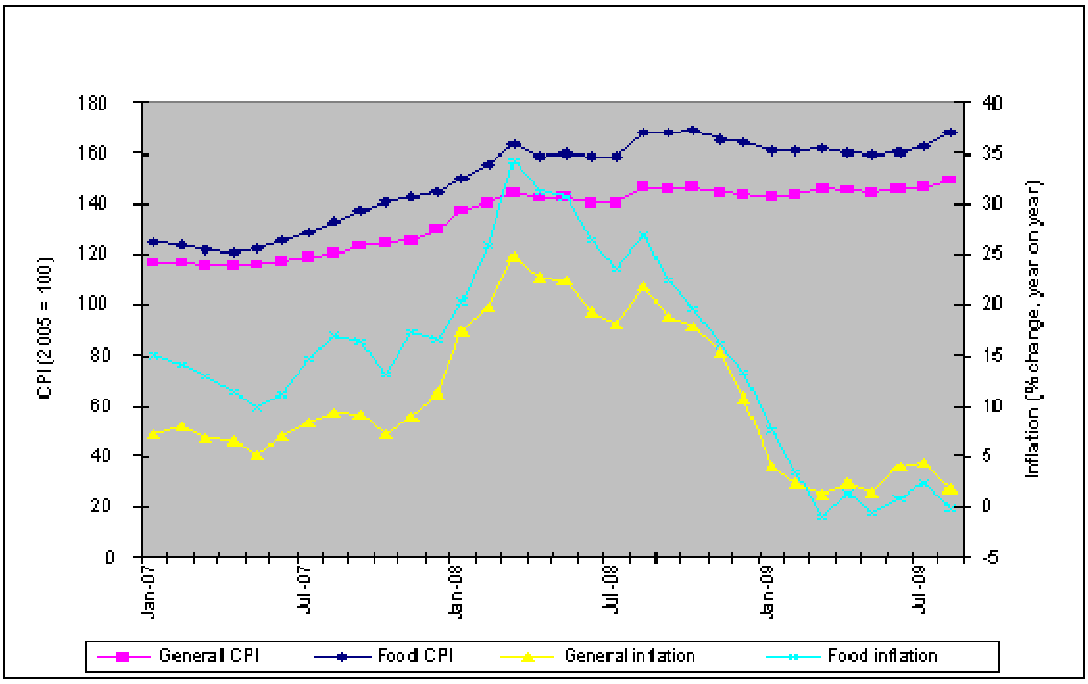
Economic growth has gradually declined from 4.6 percent in 2005 to 3.2 percent in 2008 as a consequence of falling oil production. According to the International Energy Agency, Yemen's average crude oil production in 2008 was 300 000 barrels/day, compared to about 320 000 barrels/day in 2007 and 410 barrels/day in 2004. However, in 2009, real GDP growth is forecast at 3.8 percent due to the sales of natural gas following the recent finalization of the Yemen Liquefied Natural Gas (YLNG) facility that will in part offset the decline in oil production.

After years of surplus, trade balance in 2009 is expected to register a widening deficit as rising international commodity prices pushed up the import bill (the country is a net importer in all major categories of products, except fuels) and falling oil production held back export growth. The international economic crisis has also depressed remittance inflows from expatriate workforce, especially in Gulf countries, that usually represent about 5-6 percent of GDP. All these factors have contributed to increase the current account deficit up to an

estimated record of USD 2.6 billion in 2009. Dwindling oil receipts and remittances have also determined the gradual drawdown of foreign reserves that, at the end of July 2009, were estimated at USD 6.8 billion from a peak of USD 8.8 billion in October 2008. At the same time, import cover has fallen steeply, from 13.4 months at end-2006 to 8.1 months in July 2009. Despite the increase in nominal value, the external public debt to GDP has fallen from 38 percent of GDP in 2008 to about 22 percent in 2008 and it stood at about USD 5.7 billion at the beginning of 2009, mainly owed to concessional sources.

Inflation is forecast at low 3.6 percent for 2009, compared to 19 percent in 2008 and 7.9 percent in 2007. As reported in Figure 1, food inflation (excluding qat) rose steadily from October 2007 to March 2008, reflecting the surge in international food prices. It registered a peak of 34.3 percent on a year-to-year basis and then dropped significantly until the beginning of 2009. The general and food CPIs in August 2009 are very similar to those registered one year before, showing that prices stabilized around their highest levels.

Figure 1: Inflation rates and consumer rice indexes (2007-2009)



2.2 The agricultural sector

Agriculture plays an important role in Yemen's economy: although it contributes only to 15 percent of national GDP, it employs more than half of the labour force and provides livelihood to more than two-thirds of the population. Arable land in Yemen is estimated in 1.3 million ha and distributed amongst 1.2 million landholders. This gives an average farm size of 1.1 ha. The distribution is however far from being even, with 80 percent of farmers cultivating less than 1 ha and only 4 percent of them cultivating more than 5 ha. In particular, in densely populated highlands (e.g. the Governorates of Ibb and Taizz) 70 percent of farmers have less than 0.5 ha. Ownership is primarily private (76 percent) or shared (21 percent) whereas number of households leasing land under sharecropping (*wakf*) is low (only 2 percent). Landlessness is particularly prevalent for marginalised social groups such as, for example, the *Akhdam* people in Al Hudaydah Governorate, where the majority works as agricultural labourers or sharecroppers with low wages.

Sorghum, wheat, millet, maize and barley occupy the main share of planted area with 58 percent, followed by 17 percent with cash crops (namely qat, cotton, coffee, sesame and tobacco), 12 percent with fruits and vegetables, 10 percent with forage crops (80 percent represented by sorghum) and 4 percent with pulses. Prior to the 1970s, domestic cereal production was almost sufficient to cover national requirements. However, since the 1980s, there has been a structural shift away from cereals and towards high value crops such as vegetables, fruits and qat. In the last five years, the country has imported from 3 to 3.5 million tonnes of cereals (mostly wheat and some minor quantities of rice and maize), representing between 75 and 85 percent of domestic utilization.

Crop performance is determined by quantity and distribution of rainfall as well as by access to irrigation water. In fact, about 50 percent of cultivated land is rainfed, while 31 percent is irrigated from groundwater, 10 percent from floods (spate) and the rest from dams, streams and water tankers. Cereal crops are often

rainfed, with occasional use of supplementary irrigation, and yields are usually very low, between 0.6 and 1.6 tonnes of grains per ha. Sorghum feeders, often irrigated, produce on average 13 tonnes per ha. Costs of groundwater extraction are kept very low by Governmental fuel subsidies, increasing considerably water pumping activities and speeding up the process of groundwater reserves depletion. The introduction of a more equitable system of pricing water has high importance in order to save the environment and to redesign crops profitability.

As the predominant cash crop, being more profitable of any other cash crop by 10 to 20 times, qat production plays a key role in rural economies: it accounts for about 6 percent of national GDP and one-third of agricultural GDP, with about 15 percent of employment in the country. Qat production has deeply increased from 76 100 tonnes in 1991 to 165 700 tonnes in 2008 and it is concentrated in the Governorates of Sana'a, Al Bayda, Amran, Hajjah and Ibb. Qat crop uses about 70 percent of groundwater and the strong expansion of area planted in the last decades is the main factor behind the process of depletion of underground water reserves.

Livestock represents about 20 percent of agricultural GDP and it plays a crucial especially in poor household economy, contributing to poverty alleviation, food security and gender equality. The size of national herd of sheep and goats is estimated at almost 17.5 million animals, plus 1.5 million heads of cattle and 370 000 camels. Sheep and goats are found across most of the country, with the greatest concentration of sheep in Al Hudaydah (11 percent) and of goats in Hadramaut (22 percent). Camels are concentrated in the drier Governorates, such as Al Mahrah and Hadramaut that have almost two-thirds of the national herd. Livestock systems vary from pastoralism, agro-pastoralism to mixed crop-livestock systems and, more recently, small-scale intensive animal production units. Animals are kept for meat, milk, sour milk, butter and draught power as well as wool, skin and manure.

Agricultural and livestock systems vary greatly according to the geography and climate that characterize the five main agro-ecological zones and they may be summarized as follows.

Zone 1: The Central and Northern Highlands

It consists of rough mountainous highlands, up to more than 3 000 metres, with a temperate, rainy summer and a cool, moderately dry winter. This is the most rich and fertile zone in the country, with regular rainfall. With more than 14 million inhabitants, it is the most densely populated zone. Terrace cultivation on steep mountains is an old method of soil conservation and water harvesting and is the typical form of subsistence farming. Most agriculture is rainfed and major crops are sorghum, wheat, barley and lentils. Livestock are fed with cut fodder during the rainy season and are left to graze stubble after harvest.

Zone 2: The Tihama Plain

The plain stretches along the Red Sea coast for around 45 km width. The climate is tropical, hot and humid, while rainfall averages only 130 mm annually and occurs in irregular, torrential storms. This zone accounts for 15 percent of national population and represents one of the poorest regions in the country. Major food crops are sorghum and millet, while melons, bananas, papaya and mangos are cash crops. Fodder is locally produced in good quantities, in particular sorghum, and it is then traded in the whole country.

Zone 3: The Southern Coast from Aden to the border with Oman

The coastal plains overlooking the Gulf of Aden has an average temperature of 25°C in January and 32°C in June, with an average annual rainfall of 127 mm. Only about 10 percent of the Yemen population lives here. Spate irrigation is still used near Aden, where cotton is grown. There is limited livestock because of the scarcity of fodder. Fishing is an important source of livelihood. Large land owners with access to irrigation cultivate fruits and vegetables, while small farmers often rely on maize, barley and sorghum from rainfed plots.

Zone 4: The Middle Plateau of Shabwah and Hadramaut

The Middle Plateau is characterized by desert highlands interspersed with *wadis*, or river valleys, that are dry in the summer. Agriculture is generally rain and flood (spate) fed. However, where irrigation is available, plantations of palm trees for dates, banana and mango are important cash crops for exports.

Zone 5: The Arid Quarter (desert)

Here, very little agricultural activity beyond pastoralism is possible. It is inhabited by a few Bedouins who rely on trade of goats and camels. Pastoralists stay in traditional grazing areas during summer and migrate to mountain pastures during the extremely dry winter.

2.3 Poverty and population

According to the 2007 Poverty Assessment, 35 percent of the population could not fulfil their basic food and non-food needs. The percentage of poor has fallen from 40.3 percent of the population in 1998 to 34.8 percent in 2005/06. However, poverty has declined dramatically in urban areas, passing from 32.2 percent in 1998 to 20.7 percent in 2005/06, while the percentage of poor in rural areas has remained at about 40 percent. About one-third of the national poor are concentrated in rural areas of three governorates, namely Hajjah, Taizz and Al Hudaydah, while another 16 percent is in rural Ibb and Amran. The greatest incidence of extreme poverty is in rural areas of Amran, Shabwah and Al Bayda, affecting about one-third of their population.

Poverty is strongly associated with lack of education: the heads of two out of three poor households did not enjoy any formal education, most of them are illiterate. Female headed households, headed by widows, or where the spouse cannot be economically active (disability, illness) are the poorest. Households headed by women who never married are less at risk, because they tend to allocate their resources more wisely, spending less on qat and tobacco but more on education. Yemen ranks last[1] on the Gender Empowerment Measure in the 2009 Human Development Report, because of the strong gender disparities in education levels and the economic power concentrated with men. Poverty, low education levels and the marginal role of women lead to four out of five births taking place at home, and a very high maternal mortality rate (365 for every 100 000 live births).

Poverty levels are heavily influenced by population growth. In fact, although fertility rates have declined from 7.7 to 5.3 births per woman between 1975 and the present, Yemen has still one of the world's highest rates of population growth, over 3 percent. Projecting data of the latest population census in 2004, Yemen's population in mid-2010 is estimated at 23.2 million and, at the current rate of growth, it is expected to double in about 20 years. Currently, about 45 percent of population is below the age of 14, which has major social and economic implications, especially with respect of access to social services and employment.

2.4 Policy framework and safety nets

On June 2008, the Ministry of Agriculture and Irrigation has released two working documents on mid and long-term Sustainable Development Plan for Agriculture, Food Security and Poverty Reduction based on the MDGs. The documents build on the review of the Poverty Reduction Strategy Paper 2003-2005 and suggest policy measures for agriculture and food security in the framework of the Yemen's Strategic Vision 2025. The guiding principle of the documents is "to generate a sustainable increase of agricultural production to improve food security as well as farmers income, reduce the level of poverty and address unemployment". The policy programme is articulated into eight main chapters:

1. Irrigation and water management.
2. Income growth and employment generation in agriculture sector through direct commodity support (sectors of cereals, livestock, fruits, vegetables and coffee).
3. Pro-poor economic development (land distribution and credit support).
4. Improving food nutrition and shock resilience through better safety nets.
5. Channel a sustainable qat supply/demand trend.
6. Strengthening institutions for research and extension in agriculture.
7. Expansion and rehabilitation of rural road network.
8. Investments.

Under the auspices of the Ministry of Agriculture and Irrigation and the Ministry of Planning and International Cooperation, the development of a National Food Security Strategy is currently underway. This exercise is supported by several donors, such as the European Commission (EC), the World Bank and the German Agency for Technical Cooperation (GTZ). A first draft is expected to be presented in January 2010, while the final document will be disseminated in May 2010.

The country has a long tradition in implementing social safety net programs to provide financial support to most vulnerable households. Currently, three programmes are in place: the Social Welfare Fund, the Social Fund for Development and the Public Works Project.

[1] The index was computed for only 109 countries.

The Social Welfare Fund (SWF) is the main social assistance programme, initially established to compensate for reductions in subsidies. Since 2002, the SWF is supported by the EC via technical assistance. The objectives of the SWF are to support poor individuals and families with cash to improve their living standard. SWF provides permanent social assistance and temporary relief to recipients without income or income earning potential. In 2007, payments amounted to YER 19 billion, providing over 1 million beneficiaries direct monthly cash payments and lump-sums for emergencies. In July 2008, payment levels have been doubled to a maximum of YER 4 000 per family per month. While administrative costs of the SWF are relatively low, the main concerns relate to its capacity to reach the poorest people (need for better targeting) and its scale to have a sizable impact on poverty reduction. In response to the new social welfare law, a survey has been recently completed to identify the poorest and most vulnerable households with the final aim to improve targeting and expand the number of beneficiaries up to 1.7 million households, nearly all households below the poverty line. At the beginning of 2008, as a response to the crisis of rising food prices, the United Arab Emirates donated half a million tonnes of wheat that have been in part distributed to SWF beneficiaries under the supervision of the Yemen Economic Corporation. The Social Fund for Development (SFD) was established in 1997 with World Bank funds and it aims at raising living standards and promoting income earning opportunities for the poor. The program has three components: Community Development, Institutional Support and Capacity Building; and Small-Scale Enterprise Development. It works with local communities on health, education and infrastructure projects to improve access to basic social services and giving access to micro-credit.

Public Works Project (PWP) was established in 1996 with World Bank funding and it aims to create jobs, providing the poor with small development projects, enhancing community participation and developing local contracting firms. During 2001-05, PWP carried out 1 270 projects, benefiting about 7.4 million people. Projects are demand driven and include small scale infrastructure, such as education and health facilities, water supply and sanitation, road rehabilitation, vocational training and social security.

3. FOOD PRODUCTION IN 2009

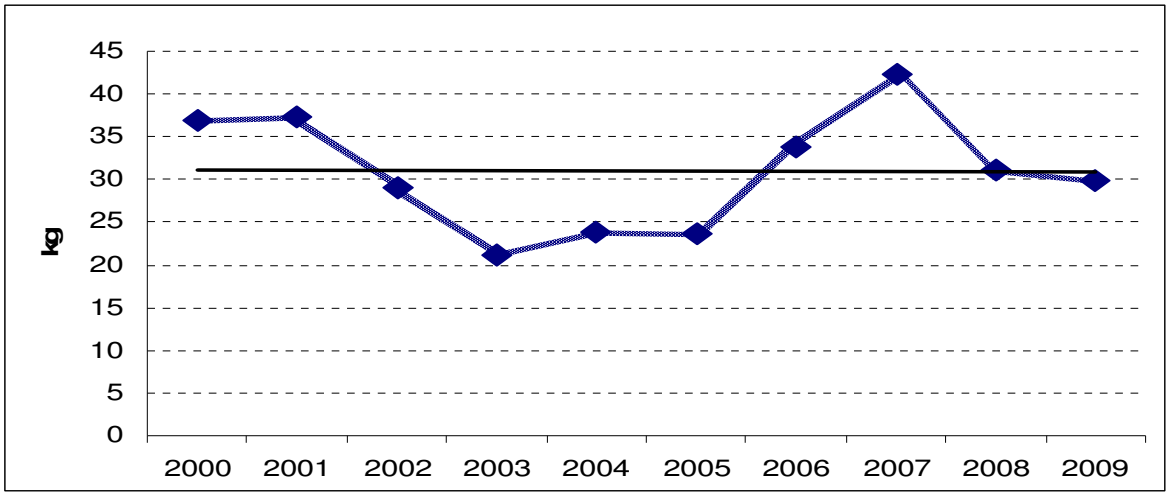
The distinct agro-ecological zones of Yemen and their topography impose diversified agronomic conditions for crops and livestock production. Rainfall amount and distribution, temperature and humidity are highly variable between these zones. This explains the great botanical diversity and quality of grazing lands, as well as variations in growing seasons, land use and crop and livestock production systems that prevail in Yemen.

The land use of the upland areas, particularly in the north, is based on the unique practice of terracing which permits reliance on rain-fed agriculture, in an area where rainfall is relatively sparse, by impeding the immediate runoff and erosion which the topography would otherwise allow, and ensuring the recharge of soil moisture and local groundwater. This terracing is extremely ancient and highly labour-intensive, with entire hillsides covered with stone bunds and earth banks interspersed with terrace areas which may be as narrow as one metre in steep areas.

Rainfed agriculture for producing staple food and fodder to meet household needs and livestock feed requirements is mainly practiced in the mountainous area and the Highland Plain with this sophisticated terrace systems. Most of the cereals and pulses are grown there but qat is also widely cultivated in the highlands with a variety of vegetables and fruit orchards. Down to the hillsides towards the Tihama Plain, diversified cereal crops and tropical fruit trees are practiced during the two main growing seasons, with the possibility to produce short cycle vegetables between the seasons. Terraced agriculture is an old but effective Yemeni method of soil conservation, runoff control and water harvesting. Rainfall variability and water scarcity are the most limiting factors for agricultural production in Yemen.

Trends in per-capita cereal production over the past ten years are shown in Figure 2 below. It is quite evident that cereal production in Yemen is on a long-term stagnation (at about 30 kg/person/annum) as indicated by the trend line. Fluctuations around the trend reflect poor or relatively good cropping seasons/years but the overall trend is stagnant.

Figure 2: Trend in per capita cereal production (2000-2009)



Cereal imports account for an average of up to 80 percent (with 90 percent of wheat and 100 percent of rice requirements). Such level of dependence on imports inevitably exposes Yemen to the fluctuations in international food prices, including the recent high food prices in 2007/08.

3.1 Area planted with cereals in 2009

For each governorate, the area planted to cereals was assumed to be similar to the average of the period 2004-2008. This is assumed due to the fact that planted area to cereals varied a little between years over the specified period. It increased from about 685 500 ha in 2004 to 890 600 ha in 2007 and then back to 760 000 ha in 2008. Total cereal planted area remained thus stable at 58 percent of total cropped areas between 2004 and 2006; it jumped to 60 percent in 2007 and back again to 55 percent in 2008. This reduced share of cereals was compensated by a concomitant increase of area planted to qat in 2008. In fact, qat area steadily increased between 2004 and 2008 at a rate of 3.3 percent per year from 122 843 ha in 2004 to 146 810 ha in 2008. Since 2005 it has consistently increased at a higher rate of 7.3 percent adding around 4 800 ha each year. Areas of vegetables, fruit crops, pulses and fodders have also steadily increased over the same period, but at much lower rate than for qat. Field observation has confirmed the trend of increased share of qat in total cropped area across governorates where this crop is grown and that such increase would be at the expense of cereals.

Based on these trends and some qualitative adjustments made by the Mission from field observations and discussions with experts, farmers and traders, the 2009 planted area under cereal crops has been estimated at about 756 000 ha, including sorghum (60 percent), millet (15 percent), wheat (14 percent), maize (6 percent) and barley (5 percent).

Table 1: Estimated area planted (ha) in 2009 by governorates

Governorates	Sorghum	Maize	Millet	Wheat	Barley	Total Cereals
Amran	35 462	2 700	12 910	5 060	7 994	64 126
Sana'a City	1 600	177	31	478	479	2 765
Sana'a	28 600	5 002	660	26 010	13 595	73 867
Al Hudaydah	115 337	2 510	51 565	0	0	169 412
Dhamar	33 835	8 490	915	24 802	5 244	73 286
Ibb	23 866	7 637	1 935	15 783	2 772	51 993
Taizz	34 126	5 830	7 088	106	163	47 313
Ad Dalih	6 120	1 351	2 082	109	131	9 793
Al Mahwit	12 034	1 478	1 411	446	465	15 834
Hajjah	71 144	1 800	21 051	968	942	95 905
Al Bayda	20 692	620	997	2 008	849	25 166
Sa'dah	12 704	1 125	600	1 705	1 501	17 635
Lahj	8 282	947	2 574	97	48	11 948
Abyan	16 801	824	5 197	251	0	23 073
Hadramaut	12 052	95	679	4 731	343	17 900
Al Jawf	4 279	760	409	19 680	1 571	26 699
Shabwah	4 065	299	1 067	1 643	345	7 419
Al Mahrah	489	4	30	17	0	540
Ma'rib	3 914	554	316	4 878	816	10 478
Adan	158	35	95	0	0	288
Raymah	9 067	875	410	252	88	10 692
YEMEN	**454 627**	**43 113**	**112 022**	**109 024**	**37 346**	**756 132**

3.2 Factors affecting yields

3.2.1 Rainfall

The Red Sea Convergence Zone (RSCZ) and the monsoonal Inter-Tropical Convergence Zone (ITCZ) affect rainfall patterns in Yemen. The precipitation is in the form of storms of high intensity and limited duration and extent, but the ITCZ storms have a larger aerial extent than those of the RSCZ. The relative importance of the RSCZ and the ITCZ in different parts of the country is reflected in the seasonal rainfall distribution: RSCZ, whose influence is most noticeable in the west of the country, is active from March to May and to some extent in the autumn, while the ITCZ reaches Yemen in July-September, moving north and then south again so that its influence lasts longer in the south.

The relationship between mean annual rainfall and topography is clearly evident. Rainfall rises from less than 50 mm along the Red Sea coast to a maximum of 700-800 mm to the west of the main watershed west of Sana'a, and falls steadily to below 50 mm along the Gulf of Aden and also inland. The seasonal rainfall distribution is illustrated by monthly averages for selected stations in Annex 1. All the averages are to some extent bimodal but the relative importance of the main rainfall-producing mechanisms is illustrated by this distribution. The RSCZ in the early season March to May is more important in the west nearer the Red Sea coast, and also in the north of the country where the effect of the ITCZ loses its impact.

The bimodal pattern of rainfall distribution implies that there are two distinct growing seasons in a year. The first season starts with an onset of rainfall in March at the earliest and in April-May if belated. The season is characterized with a cessation of the rains and an onset of a dry spell from June-July. During this period the reduced moisture content is expected to allow the first season crops to mature and to be harvested. The second season is characterized by an onset of rains in July-September with expected cessation and on-set of dry spell in October. The two seasons provide for the planting of an impressive array of crops, including cereals, pulses, vegetables, fruit crops and fodders that are both short term maturing and long cycle growing.

The Satellite based Normalised Difference Vegetation Index (NDVI) and the monthly rainfall distribution patterns for several representative administrative units of Yemen are summarised in Annex 1. The time profiles of crop specific NDVI and rainfall patterns compare the current season 2009 with last year and with last ten years average (1999-2008). Late and erratic rainfall during April to July 2009 have delayed the first season planting of sorghum, millet, wheat and barley crops, for harvest from October 2009, in some parts of the country such as the Governorates of Dhamar, Al Hudaydah and Taizz. As a result, the NDVI in July

indicates below average vegetation for most of Yemen. However, heavy rains in late August occurred over most of the country and improved the vegetation cover index in several production areas.

Field observations and interviews with farmers indicate that 2009 growing season does not depart much from an average rainfall year under arid and semi-arid conditions of Yemen. Despite some localized areas where 2009 rainfall was very poor, the overall assessment is that 2009 rainfall is similar to/or slightly better than 2008. This assessment is supported by differences in monthly rainfall distribution patterns shown in Annex 2 for selected governorates. In Ibb, for example, the 2009 rainfall was higher in amount than the 1999-2008 average and well distributed except during late summer season in October, while in the Governorate of Ad Dali monthly rains were much below average. Although the Mission was unable to visit Ad Dali for security reasons, this Governorate and some parts of the Governorates of Ibb (Al Sabra district), Taizz (Al Janadiah, Al Mesrakh, Khadeer and Maqbana districts), Al Hudaydah (Al Zaidiah, Al Munirah districts) and Dhamar (Qa'a Jahran district) are reported to have suffered from relatively dry weather conditions in October. It is worth noting that this had coincided with the critical grain filling stage of sorghum crops.

3.2.2 Irrigation

Irrigation is widely practiced by Yemeni farmers who extract water from the aquifer through pumping and 2009 was no different than previous years. This practice is encouraged by subsidised diesel fuel policies but also because of expanded qat cultivation in the country as returns from this crop are 10 to 20 times higher than with any other alternative crop. About half of the total cropped area (1.3 million ha) is irrigated and most of it from wells (62 percent) followed by floods or spate irrigation (20 percent), dams (12 percent), streams (4 percent) and other water irrigation sources (2 percent). Use of runoff from watershed areas in spate irrigation is a very common practice especially in the Tihama plain. Floods or spates are diverted into adjacent terraces by effective traditional ditches called *Masqua*. The seasonal flood (*Sayl*) is diverted by small earth or stone bunds (*Ogma*) in the *wadis*, dry riverbeds that flow with water during periods of precipitation. In most of the mountainous parts of Yemen, farmers have constructed many small canals to divert water by gravity towards selected areas for irrigation.

While stream flows are mainly used to irrigate cash crops, vegetables and fruit trees, spate irrigation is essentially used for cereals, for wheat and barley in the highland (e.g. Dhamar and Sana'a) and for sorghum, millet and maize in the lower plains. In the Tihama plain and the other coastal plains, farmers rely on the runoff from *wadis* draining areas of higher rainfall. The lower reaches of the *wadis* are used for irrigated agriculture to the extent that water resources allow, with crops like cotton, sorghum, millet and sesame. This irrigation is based in the upper basins on the diversion of normal flows and on the lower plains through the use of spate flows to recharge the soil moisture directly or to recharge the underlying aquifer with groundwater which is later pumped for irrigation. Spate irrigation was traditionally based on temporary embankments, but permanent structures have been built on the major deltas to divert water into distribution canals. Also, under dry weather conditions, the potential benefit of spate irrigation greatly diminishes in terms of irrigated acreages, as is the case during this season according to farmers and officials interviewed in Al Hudaydah Governorate.

Much of Yemen's water resources are pumped to irrigate qat for local consumption as well as vegetables and cash crops (bananas, mango) for export. In the Tihama plain, a clear tendency towards expanding irrigated cropped areas to vegetables and fruit crops has been traced over the past fifteen years. Export centres already exist in Al Hudaydah for banana and mango crops. Under water scarcity conditions of Yemen, water use policy and water use efficiency issues still remain among the most important constraints for increasing crop productivity and development of irrigated agriculture in the country.

3.2.3 Inputs (seeds, fertilizers, pesticides)

Under rainfed dry weather conditions, farmers do not use improved seeds and fertilizers for reasons associated with climate variability and limited soil moisture. However, when irrigation water is available (e.g. in Dhamar, Al Hudaydah, Ibb), improved wheat seeds are often used. To encourage farmers to use improved wheat varieties, seeds are subsidized up to 75 percent. Field information indicates that for rainfed crops, farmers use about 150 kg/ha for wheat, 110 kg/ha for barley, 20 kg/ha for sorghum and 15 kg/ha for millet. Under irrigation, the seeding rate is around 200-250 kg/ha for wheat; 35-50 kg/ha for sorghum; 30-40 kg/ha for millet and 80 kg/ha for maize. In 2008, some 57 800 tonnes of fertilizers were imported, including 36 000 tonnes of urea, 14 800 tonnes of compounded NPK fertilizers and 4 700 tonnes of super triple phosphates.

The Agriculture Research and Extension Authority (AREA) of Yemen, based in Dhamar with eight regional branches and five specialized centres for advisory services, has developed good wheat varieties from local germ plasm and presented a project in support of seed multiplication for promising cultivars. Each year, some 300 000 tonnes of seeds are imported covering just about 10 to 12 percent of national needs. Most farmers carryover seed from one year to the next from their own harvests as the simplest, safest and cheapest method of seed security.

3.2.4 Pests and diseases

Despite the prevalence of pest and diseases, it is only with qat cultivation and other cash crops that farmers use pesticides to control the spread of the diseases, more so under irrigated agriculture conditions. Rust, the main fungal disease of cereals, was not considered to be a serious problem to production during the 2009 growing season.

3.3 Other crops

Other important crops that are widely grown in Yemen are represented by cash crops such as qat, coffee, cotton, tobacco and sesame as well as fruit crops (mango, banana, dates, grapes, pomegranate and oranges), vegetables, pulses and fodder crops (forage sorghum, alfalfa and various grasses). Qat, pulses and fodders are essentially produced for local consumption, while a modest fraction of cash crops, fruit and vegetables is exported (essentially dates, grapes, melon, grapes, mango, banana, papaya, coffee and vegetables). Fruit orchards and natural vegetation support an evolving bee keeping activity and honey production is reported as a profitable sector. Most important constraints to vegetables and fruit production are low productivity and high post-harvest losses due to harvesting techniques, rough handling and poor packaging and weaknesses in transport networks.

Table 2: Area (000 ha) and production (000 tonnes) of main non-cereal crops

Crops		2004	2005	2006	2007	2008	Average 2004-08
Qat	Area	122.8	123.9	136.1	141.2	146.8	134.2
	Prod.	118.2	121.4	147.4	156.3	165.7	141.8
Cash crops	Area	71.6	73.3	80.4	83.4	85.5	78.8
	Prod.	66.0	68.9	81.5	86.4	88.8	78.3
Vegetables	Area	72.3	73.5	75.6	85.1	84.8	78.3
	Prod.	833.2	877.8	904.5	995.4	1 037.3	929.6
Fruits	Area	80.8	82.8	85.2	87.8	90.7	85.5
	Prod.	742.4	764.8	862.0	922.4	959.0	850.1
Pulses	Area	33.1	36.6	44.9	50.3	47.7	42.5
	Prod.	59.8	58.6	80.4	94.9	90.3	76.8
Fodder crops	Area	121.9	122.8	127.8	147.0	155.8	135.1
	Prod.	1 505.2	1 541.3	1 626.9	1 870.9	2 000.4	1 708.9

Source: Agricultural Statistics Year Book 2008, published in March 2009 by Department of Statistics and Agricultural Information, the Ministry of Agriculture and Irrigation, Sana'a, Yemen.

3.4 Livestock and fodder production

Livestock in Yemen is dominated by sheep and goats, constituting the largest numbers as detailed in Table 3. Livestock systems vary from traditional pastoralist to agro-pastoral systems and, more recently, small-scale intensive animal production units. Yemen's animal health status is of primary concern as there are various endemic diseases in the country, which limits access to regional markets and reduce farmers' income. Diseases include Rinderpest, Foot and Mouth Disease, Rift Valley Fever and Sheep Pox. Awareness is high among farmers about the need for animal health care due to losses from diseases.

Table 3: Livestock (number of heads)

	2004	2005	2006	2007	2008	2009 [1/]
Sheep	6 712 366	7 723 973	8 197 024	8 588 782	8 889 389	9 324 969
Goats	7 423 621	7 695 661	8 041 955	8 413 602	8 708 078	8 969 320
Cattle	1 392 969	1 447 240	1 463 700	1 494 707	1 530 580	1 558 130
Camels	281 712	357 010	359 137	365 282	372 587	390 732
Total	**15 810 668**	**17 223 884**	**18 061 816**	**18 862 373**	**19 500 634**	**20 243 151**

Source: Agricultural Statistics Year Book 2008, published in March 2009 by Department of Statistics and Agricultural Information, the Ministry of Agriculture and Irrigation, Sana'a, Yemen.
1/ Data for 2009 are estimated by the Mission.

Under normal weather conditions, grazing pastures are estimated to cover around 40 percent of the country's livestock energy requirements, and up to 53 percent in the case of sheep and goats. The pasture's contribution to livestock feeding systems varies greatly from region to region because of the highly variable rainfall pattern. In the Dhamar area, pastures are reported to contribute to the livestock feed requirements by around 30 percent. Thus, the animal feeding system in Yemen still relies heavily on grazing pastures. During the rainy season of June to August, livestock is normally kept away from cultivated terraces and fodder is harvested to be fed either green or made into hay to be fed during dry seasons (winter period). Stubble grazing which is also part of the feeding system is widely practiced. After the stubble has been utilized, grazing becomes open for all herds until the next season. Besides grazing, animals are fed with green fodder such as forage sorghum and alfalfa, both grown under irrigation. During field visits, especially in Al Hudaydah, Taizz and Ibb, the Mission observed that large quantities of fodder sorghum were transported for sale in the neighbouring villages and markets. Dual purpose cereals such as rainfed barley, which is produced for grain and/or forage, also provide additional feeding options for livestock. It was also reported from field visits that farmers and herders need to supplement their livestock during the dry winter season.

The NDVI profiles for Yemen indicate that the vegetation cover in 2009 was improving in most governorates as compared to their situation in 2008 and to the long term average of 1999-2008. The satellite data is also supported by the Mission field observations and discussions with farmers, pastoralists and livestock traders. In general, sheep and goats were seen to be in good animal health and body weights conditions in the field and in the markets for all governorates visited. It was also reported that pastures in Hadramaut plateau are particularly productive this season as a consequence of the floods that occurred in 2008 and the relatively good rain during 2009.

Despite ongoing effort to improve livestock performance, however, animal productivity remains quite low in Yemen. Yemeni live animals are well appreciated for their quality meat in neighbouring Saudi Arabia which represents a potentially good market for Yemen export of agricultural products.

3.5 Cereal production estimates for 2009

The analysis of rainfall distribution during the 2009 growing season compared with previous three seasons and with long term average, coupled with farmers' interviews and field observations, allowed the Mission to group governorates into three main categories: (i) Governorates where this season crops are better off, with expected higher yields than in 2008 (Dhamar, Ibb, parts of Taizz); (ii) Governorates where this season crops and their expected yields are comparable to those of 2008 growing season (Amran, Sana'a, Al Hudaydah, parts of Taizz, Al Mahwit, Lahj, Al Bayda, Abyan, Al Mahrah, Hadramaut, Shabwah) and (iii) Governorates where expected yields are clearly lower than in 2008 (e.g. Ad Dali, Hajjah).

As reported in Table 4, estimated yields for 2009 cereals crops vary from 1.1-1.2 tonnes/ha in Dhamar and Ibb to 0.77-0.78 in Al Bayda and Adan. Al Jawf Governorate reports the highest average yield for cereals, with 1.4 tonnes/ha, especially due to the good performance of wheat crop. An important field observation was made in relation to timing and extent of soil moisture deficit with regard to the grain-filling stage of cereals. Sorghum fields lacking enough moisture at this critical physiological stage were mainly observed in Al Hudaydah and Ibb Governorates. Although in these cases grain yields may be very low, it is worth to mention that all green biomass is still available to be used by farmers as feed.

Table 4: 2009 Area (ha), production (tonnes) and yield (tonnes/ha)

Governorates	Sorghum			Maize			Millet			Wheat			Barley			Total Cereals	
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.
Amran	35 462	30 852	0.87	2 700	3 753	1.39	12 910	9 231	0.72	5 060	6 047	1.20	7 994	5 996	0.75	64 126	55 878
Sana’a City	1 600	1 486	0.93	177	266	1.50	31	21	0.69	478	574	1.20	479	363	0.76	2 765	2 710
Sana'a	28 600	22 880	0.80	5 002	6 503	1.30	660	422	0.64	26 010	33 813	1.30	13 595	9 517	0.70	73 867	73 135
Al Hudaydah	115 337	103 803	0.90	2 510	3 765	1.50	51 565	33 517	0.65							169 412	141 086
Dhamar	33 835	29 098	0.86	8 490	13 584	1.60	915	641	0.70	24 802	37 203	1.50	5 244	3 933	0.75	73 286	84 459
Ibb	23 866	23 150	0.97	7 637	13 365	1.75	1 935	1 258	0.65	15 783	22 096	1.40	2 772	1 996	0.72	51 993	61 865
Taizz	34 126	28 666	0.84	5 830	8 512	1.46	7 088	4 395	0.62	106	117	1.10	163	117	0.72	47 313	41 806
Ad Dali	6 120	4 590	0.75	1 351	1 756	1.30	2 082	1 249	0.60	109	109	1.00	131	92	0.70	9 793	7 796
Al Mahwit	12 034	9 507	0.79	1 478	2 217	1.50	1 411	903	0.64	446	535	1.20	465	358	0.77	15 834	13 520
Hajjah	71 144	59 050	0.83	1 800	3 060	1.70	21 051	13 473	0.64	968	1 016	1.05	942	678	0.72	95 905	77 277
Al Bayda	20 692	15 685	0.76	620	744	1.20	997	598	0.60	2 008	2 008	1.00	849	606	0.71	25 166	19 641
Sa'dah	12 704	10 595	0.83	1 125	1 491	1.33	600	406	0.68	1 705	1 853	1.09	1 501	1 114	0.74	17 635	15 458
Lahj	8 282	7 040	0.85	947	1 338	1.41	2 574	1 616	0.63	97	107	1.10	48	35	0.73	11 948	10 136
Abyan	16 801	14 499	0.86	824	1 318	1.60	5 197	3 264	0.63	251	261	1.04				23 073	19 342
Hadramaut	12 052	9 244	0.77	95	124	1.30	679	433	0.64	4 731	6 245	1.32	343	245	0.71	17 900	16 290
Al Jawf	4 279	3 659	0.86	760	1 069	1.41	409	254	0.62	19 680	31 370	1.59	1 571	1 123	0.72	26 699	37 474
Shabwah	4 065	3 703	0.91	299	400	1.34	1 067	680	0.64	1 643	1 924	1.17	345	229	0.66	7 419	6 936
Al Mahrah	489	345	0.71	4	5	1.20	30	19	0.63	17	20	1.15	0	0	0.00	540	388
Ma’rib	3 914	3 370	0.86	554	693	1.25	316	211	0.67	4 878	6 897	1.41	816	605	0.74	10 478	11 777
Adan	158	118	0.75	35	39	1.11	95	63	0.66							288	220
Raymah	9 067	6 818	0.75	875	1 246	1.42	410	298	0.73	252	276	1.10	88	61	0.69	10 692	8 699
YEMEN	**454 627**	**388 158**	**0.85**	**43 113**	**65 246**	**1.51**	**112 022**	**72 950**	**0.65**	**109 024**	**152 471**	**1.40**	**37 346**	**27 067**	**0.72**	**756 132**	**705 892**

Note: Totals computed from unrounded data.

Aggregate cereals production in 2009 is estimated at 706 000 tonnes, very similar to 2008 level, but almost 24 percent below the bumper output obtained in 2007. Time series data for the past five years are provided in Table 5 for comparison purposes.

Table 5: Area (ha) and production (tonnes) of cereal crops from 2004 to 2009

		2004	2005	2006	2007	2008	2009 1/	2004-08 Average
Sorghum	Area	428 883	429 986	453 011	520 963	442 819	454 627	455 132
	Prod.	263 428	263 691	401 823	502 304	376 728	388 158	361 595
Maize	Area	38 468	38 504	43 301	51 961	43 647	43 113	43 176
	Prod.	32 410	31 108	69 274	86 596	65 813	65 246	57 040
Millet	Area	99 341	99 737	112 955	133 287	113 294	112 022	111 723
	Prod.	66 383	66 640	82 276	98 731	74 048	72 950	77 616
Wheat	Area	83 801	86 010	110 709	141 498	123 103	109 024	109 024
	Prod.	103 265	112 962	149 173	218 520	170 446	152 471	150 873
Barley	Area	34 998	34 515	36 985	42 903	37 326	37 346	37 345
	Prod.	24 791	21 189	27 745	34 681	26 704	27 067	27 022
Total	Area	685 491	688 752	756 961	890 612	760 189	756 132	756 401
	Prod.	490 277	495 590	730 291	940 832	713 739	705 892	674 146

Source: Agricultural Statistics Year Book 2008, published in March 2009 by Department of Statistics and Agricultural Information, the Ministry of Agriculture and Irrigation, Sana'a, Yemen.

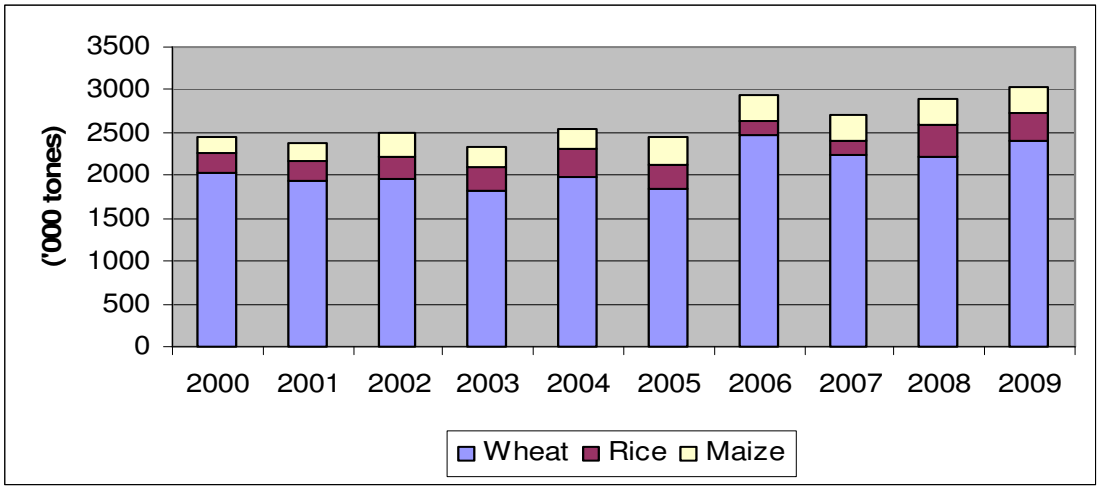
1/ Data for 2009 are estimated by the Mission.

4. CEREAL SUPPLY/DEMAND SITUATION

4.1 Cereal markets, trade and prices

The structure of wheat market, the most important cereal in local diet, is different depending on whether the product is locally produced or imported. The local wheat chain is remarkably short and features only small enterprises: farmers sell individually to wholesalers which then pass on to retailers. The market is quite fragmented and information exchange is very limited. The final consumers buy local wheat usually in spice markets and personally take to millers to grind the grain according to their taste. Conversely, the imported wheat chain relies upon an extensive network of wholesalers that purchase from a handful of key agents who represent private importers. About 80 percent of the cereal consumed in the country is imported. Figure 3 indicates annual wheat, rice and maize imports. Over the years the country did not face constraints in commercial imports which to have been quite responsive to the fluctuations in national production. There are six big importers in Yemen and four of them own silos and port facilities and provide industrial milling and packaging services. These importers are amongst Yemen's largest industrial groups, with financial interests in many sectors. Larger traders import wheat mainly from Australia, USA and Syrian Arab Republic, while smaller traders tend to import from India and China. Between 90 and 95 percent of imported wheat is immediately processed into flour at the sea port in Aden and Al Hudaydah, usually by the same trade company.

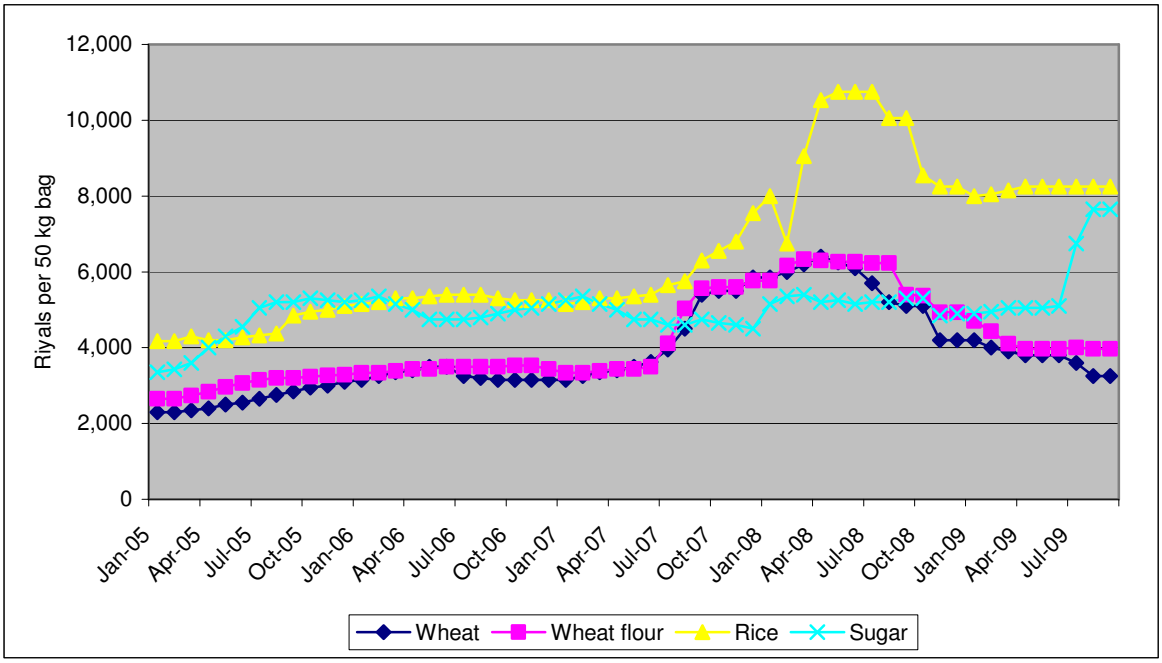
Figure 3: Commercial cereal imports 2000-2009



Imports of wheat have steadily risen through the years. This is a reflection of the stagnant levels of domestic production coupled with population growth. Note also the slow increase in maize imports, mainly used as animal feed.

Wholesale prices of main food commodities (wheat, wheat flour, rice and sugar) are indicated in Figure 4. As imports cover the bulk of local food consumption, domestic prices follow closely the trend in the international markets. In September 2009, the average price of a 50 kg bag of imported wheat was YER 3 250, down from the record YER 6 400 of April 2008 and similar to the level of the end of 2006/beginning of 2007. In the case of rice, the second most important cereal, wholesale prices have declined from the record achieved in mid-2008 with more than YER 10 000/50 kg bag and since March/April 2009 have stabilised at about YER 8 250.

Figure 4: Monthly wholesale prices of selected commodities (2005-2009)



Current price levels, however, are still significantly higher compared to prices in early 2006 and the first half of 2007 which were YER 5 100 and 5 400 respectively. Prices of local wheat varieties are usually higher than prices of imported wheat because local varieties are considered as a specialty, with higher content in protein and catering for niche markets such as consumption during Ramadan or by Yemeni expatriate community in Gulf countries. Evidence of the distinctive nature of local wheat varieties is given by the fact that they are sold in the major cities through spice retail outlets rather than in ordinary supermarkets or grocery shops.

4.2 National cereal supply/demand balance in 2010

A disaggregated version of the 2009/10 national grain supply/demand balance, considering separately wheat, rice, barley, maize and sorghum crops, is summarized in Table 6 and it is based on the following Mission's estimates and assumptions:

- Total cereal production is estimated at 706 000 tonnes. As this estimate is based on a field assessment carried out during the month of October 2009, final production figures may vary when all crops will be harvested by the end of December 2009.
- Food use is estimated at 3.5 million tonnes, using a 2010 mid-year population of 23.2 million persons and an apparent average cereal consumption of 151 kg/person/annum. Per capita consumption comprises 112 kg of wheat, 16.5 kg of rice, 12.5 kg of sorghum, 7 kg of maize, 2.5 kg of millet and 0.5 kg of barley. Cereals represent about 60 percent of the daily calories requirements (2000-2100 kcal/capita/day), the rest being covered by sugar and oils, and to a lesser extent by meat, fruits and vegetables.
- Seed requirements are estimated at about 41 000 tonnes on the basis of recommended seed rate in the country and a planted area of 756 000 ha of cereals in 2009. The following seed rates have been used: 25 kg/ha for sorghum, 80 kg/ha for maize, 180 kg/ha for wheat, 120 kg/ha for barley and 20 kg/ha for millet.
- Feed use is forecast at about 263 000 tonnes, mainly through imported maize.

- Post harvest losses and other uses are estimated at 91 000 tonnes, with rates ranging from 7 percent for millet to 15 percent for maize and sorghum. Total losses averaged about 13 percent of the total production.
- Cereals stocks, mainly wheat and wheat flour in the silos of main private traders, are expected remain unchanged between the beginning and the end of the marketing year 2009/10 at an estimated 1.6 months of food consumption.
- The cereal import requirement in 2010 is estimated at about 3.2 million tonnes, including 2.48 million tonnes of wheat, 383 000 of rice and about 330 000 of maize. This amount is expected to be fully covered through commercial imports.

Table 6: National cereal supply/demand balance, January/December 2010 (tonnes)

	Wheat	Sorghum	Rice	Maize	Millet	Barley	Total
Domestic availability	**502 471**	**418 158**	**35 000**	**105 246**	**82 950**	**31 067**	**1 174 892**
Stock change	350 000	30 000	35 000	40 000	10 000	4 000	469 000
Production	152 471	388 158	0	65 246	72 950	27 067	705 892
Total utilization	**2 986 199**	**418 158**	**418 231**	**434 819**	**82 950**	**31 067**	**4 371 426**
Food use	2 601 327	290 327	383 231	162 583	58 065	11 613	3 507 147
Seed use	19 624	11 366	0	3 449	2 240	4 482	41 161
Feed use	0	28 242	0	219 000	7 538	8 266	263 046
Losses	15 247	58 224	0	9 787	5 107	2 707	91 072
Closing stocks	350 000	30 000	35 000	40 000	10 000	4 000	469 000
Import requirement	**2 483 728**	**0**	**383 231**	**329 573**	**0**	**0**	**3 196 534**

Note: Totals computed from unrounded data.

5. HOUSEHOLD FOOD AND NUTRITION SECURITY

5.1 Household livelihoods in rural areas

The most important modes of crop cultivation are rain fed, spate irrigated and pump irrigated. Some households farm themselves, others are share croppers and, the most vulnerable ones have no land and supply farm labour. For many households livestock is also an important source of income. Other sources are salaries, pensions and remittances.

5.1.1 Rainfed agriculture

The rainfed mode is the most uncertain in Yemen because of the inconsistent rainfall in the country; productivity differs across localities and across years. Therefore farmers apply risk reducing strategies such as intercropping of various cereals and pulses and staggered planting over time. Cereal production has also a double purpose. If rainfall is not sufficient, especially in the crucial stages like flowering of filling of the grains, the biomass will be used or sold as forage; if rains were well distributed, grains will be harvested and the remaining biomass still serves as fodder. In areas mainly depending on rain fed agriculture (for instance parts of Ibb and Taizz Governorates) drought could have a significant effect on food security.

In arid zones, rain fed grain production may fail most of the times, but some fodder is usually produced. Farmers often plant without expecting much, but knowing that if the rainfall would be favourable they may get an extra harvest. Such a livelihood system would clearly be too unreliable and therefore almost all households engage in other, often more lucrative, livelihood modes, such as livestock production, agricultural labour, skilled labour, salaried work, pensions, remittances, etc. These households are affected if drought completely destroys their production, but the other livelihood strategies are usually sufficient to avoid food insecurity. It is only when other strategies are also affected that food insecurity would become acute. For instance, if fodder and pasture become insufficient, farmers may have to sell part or all of their stock in distress, losing an important livelihood strategy for the future.

5.1.2 Irrigated agriculture

Spate irrigation depends also on the annual rainfall. In general, spate irrigation is more reliable than rain fed agriculture, but obviously less than pump irrigation. Pump irrigation benefits from subsidized fuel used to power the pumps. Nationwide, much more water (more than 90 percent for agricultural needs is pumped up) from the aquifers than that is naturally recharged, therefore the water table is continuously getting deeper and in coastal areas sea water intrusion creates a salinity problem. For the time being, most farmers still successfully produce irrigated crops. Where conditions are suitable, qat is grown, sorghum is cultivated as fodder in the lower areas (for example the Tihama plain) and in the higher areas also cereals such as wheat

for grain is planted. However, within some years, more and more farmers will not manage anymore to pump enough water from the existing wells, which will imperil their livelihood.

Share cropping

Many rural households enter into share cropping agreements with landowners. For example, the landowner may supply land and water and inputs whereas the sharecropper provides all the labour and will return 50 percent of the harvest to the landowner. In other cases, only land is provided by the owner, still the sharecropper will give him 25 percent of the harvest. Similarly, livestock may be given in care to a household, who has to guard it and let it graze, sometimes even provide forage and in return can keep half of the offspring.

Issue of fuel subsidies and cost of water

Diesel fuel, used to operate water pumps, is heavily subsidized and, once a pump is installed and maintained, fuel constitutes, apart from labour, the main cost associated with supplying water to crops. The resulting "cheap" water costs influences the micro-economic decisions of individual farmers. Similarly, farmers living upstream in a valley can take as much water as they can at the expense of farmers further downstream. As a result of these distortions, water is not allocated in an optimal way and over-used. One may for instance question the use of large amounts of water to produce relatively low cost forage.

The rural economy is currently based on these (distorted) prices. Cheap water is essential for forage production, which is important for livestock production which is essential for the food security of many poor households. Any policy to rationalize the water use in Yemen in order to maximize the income per unit of water utilised, has to take into account its importance for food security in the country, and be should foresee measures to avoid direct negative impacts on food security. It is estimated that only 20 percent of the current petroleum subsidies directly benefits the poor. Savings from eventual reduction of such subsidies could be better targeted to alleviate rural poverty.

Supplementary irrigation

Some crops are mainly rain fed, but the farmer has the possibility to provide once or twice a dose of water to the crop, especially if water stress during critical growth stages would endanger good productivity.

Qat

Qat production, which represents one-third of agricultural GDP, seems to be the most profitable enterprise in irrigated highlands. A recent World Bank study[2] found that most profits in qat production remain with the farmers and that all actors in the value chain can earn a healthy profit. The value chain is very efficient and the product quality (recognizing issues with pesticide safety however) is guaranteed up to consumer level. Qat production generates attractive profits and a regular, daily inflow of revenue. The labourers involved in the maintenance and harvest earn a daily income from qat, in this way contributing to rural food security. The producer value of the entire qat sector in Yemen is estimated some eight times higher than the value of the wheat sector. Alternatives to qat, such as coffee, are currently not as profitable. Maybe that fruits and vegetables could bring a solution. Because of continuing urbanization, income and population growth, it is projected that (high value) fruit and vegetable consumption in Yemen will grow by 5 to 6 percent annually over the next decennia.

On the other hand, qat consumers spend a considerable part of their income for their habit, which could have been spent on more basic needs. The effects on consumer's productivity should not be neglected. Moreover, once consumed, qat impedes the absorption of nutrients by the human body. It is hence worrying that a WFP/UNICEF survey found that nearly half of pregnant and lactating women consume qat, which has detrimental effects on the nutritional status of women and children alike.

5.1.3 Livestock breeding and rearing

Livestock plays a key role in the food security of Yemen. Most rural households own some livestock and, when necessary, offspring or fattened animals are sold to provide income to be spent on basic needs such as cereals. Livestock is not only herded to feed on range land but also widely depends on forage produced or purchased by the farmers. For many poor households the possession of livestock makes the difference between food security and food insecurity.

[2] Analysis of 5 value chains – Yemen; World Bank Rural Development Team – SMEPS – KIT, 2009.

5.1.4 Migration and remittances

In case of hardship, migration for work to cities in Yemen or to neighbouring countries (Saudi Arabia, Kuwait, United Arab Emirates) by the husband or adult males in the households is a common practice. Migration to neighbouring countries is often illegal, leaving the workers sometimes in a precarious situation. International migration is often intended for several years, but the stay can be cut short, since migrants are vulnerable to international developments such as economic or political crises. In spite of this, international migration is a preferred option to send remittances home. Some, rural, elderly households receive remittances of their adult children, working in cities; elderly who do not receive remittances, nor pensions, are among the most vulnerable households.

5.1.5 Other livelihood activities

There are a lot of other possible livelihoods activities possible such as fishing in the coastal areas, beekeeping, skilled labour, petty trading, remittances, etc. and households depending on several activities at once are less vulnerable. Some landowners even sell the water they can pump from their land.

5.1.6 Solidarity within the communities and across regions

Poor households, confronted with hardship can often count on solidarity from neighbours, milk is often given to families with small children, and city dwellers sometimes donate bags of grain to poor villagers. If an entire region suffers from drought, herdsmen can often graze their flock in the pastures of adjacent, less hit regions. Landowners often refuse advanced labour saving technology, because they want to be able to provide employment opportunities to those who need work. However, if all households are similarly poor, as observed in a village constituted mainly of land labourers, the solidarity is reduced and destitute households may go for days with very little to eat.

5.2 Current food insecurity and prospects

Food security is a situation wherein all people at all times have economical and physical access to safe, sufficient, nutritious food. With the exception of governorates affected by the conflict in Sa'dah, household food security in 2009/10 in general is expected to be similar to that of the previous years in most of the country. Hence, apart from the Sa'dah conflict effect and the Somali refugees, no emergency situation caused by weather-related shocks exists. Nonetheless, chronic food insecurity among certain vulnerable population groups remains serious, aggravated over the last years by higher food prices and the global economic crisis.

5.2.1 Food access

A good number of farmers produce cereals under rain fed conditions. If the weather is favourable, they produce grains, if not, fodder. The grain harvest is usually partly sold and partly stored for home consumption. These grains (usually sorghum or wheat, sometimes maize or barley) only cover a minor part of the household needs. Rain fed cereals in the higher rainfall areas of Ibb and Taizz during the Jul -Nov 2009 season are an important crop for many households. In some areas, 2009 grain production may be below normal level, but the biomass produced for fodder is also valuable and gives households sufficient income. In some more arid areas (such as in Western Taizz and Eastern Ibb) visited by the Mission, unusual good grain harvests were observed. In rain fed areas in Eastern Taizz, only forage cereals are harvested. Rain fed grains will be harvested by households in 2009 in scattered areas in Sana'a, Amran, Dhamar, Taizz and, depending on further rains, maybe in Al Hudaydah and probably in other areas of the country. These grains are usually just sufficient for a few months of consumption.

During the October 2009 field visits, the CFSAM team never came across situations where dry weather conditions have affected the rain fed production in such a way that it would make households food insecure. Firstly, in spite of late arrival of rains, almost nowhere there was complete crop failure. Secondly there were almost always alternative livelihood strategies. However there are households who can not provide sufficient quality food for their members even with ample and well distributed rainfall; they need to be considered as chronically food insecure.

Spate irrigation depends also on the annual rainfall. During 2009, in the areas visited, rainfall was such that spate irrigation allowed for a normal harvest. Farmers in some regions (example Dhamar for wheat) produce also pump irrigated cereal grain, which provides a much more reliable harvest, also in 2009. Generally, households purchase the most part of their basic food in the market. Since 1995, cereals produced in the

country always accounted for less than 30 percent of the total cereal consumption. Since food availability in the markets is satisfactory, food security is hence defined by the purchasing power of households. Cereal prices went down from the peak of 2008 but are still higher than during the period before 2006. The global economic crisis has reduced income opportunities and remittances for some households. In many households, income is partly allocated to qat consumption, even among poor households, leaving less means for the primary household needs, such as the procurement of sufficient nutritious food.

5.2.2 Food consumption

The most food insecure households have a poor quality diet, mostly cereal, tea and sugar. Only when extra financial means are available, vegetables are consumed and in some areas dried fish. If the household has poultry, eggs may be included in the diet. During periods without income many poor households are vulnerable for insufficient food intake.

5.2.3 Food utilization

It is usually the husband who purchases food and decides what will be consumed each day. Food insecure households dispose of inadequate food quality. Moreover, care practices of the usually low educated mothers are inadequate. For instance, small children rarely receive exclusive breast feeding of up to 6 months and they have to eat the food prepared for the adults. Some households prepare or receive some milk however. Hygiene and sanitation are insufficient among most food insecure households; this is reflected in a high prevalence of child diarrhoea. All these explain why nutrition statistics reveal malnutrition rates among the worst in the world[3] (53 percent stunting and 12.5 percent wasting in 2003; 32 percent of infants with low birth weight in 2006) and widespread micronutrient deficiencies (for instance, up to 80 percent of children suffering from iron deficiency). The Mission frequently observed young children who were very small for their age.

5.2.4 Transitory food insecurity

Because of various shocks affecting the country, an important number of households is temporarily unable to meet their minimum food requirements. The impact of the dry weather conditions in 2009 did not turn out to be as initially feared. The weather variability and consequent uneven rain fed agricultural production has in some places affected households, but not to a critical extent. Based on Mission's observations, rain fed agricultural production of households in many parts of the country is expected to be quite normal. In addition, in most of the areas usually characterized by dry weather conditions, rain fed agricultural production is rarely the main and only source of livelihood of the rural population.

The Sa'dah Crisis

The conflict in the Sa'dah Governorate of northern Yemen erupted in 2004, when a local group (Al-Shabab Al-Momen) clashed with the Government. The conflict escalated in the spring of 2007, displacing 77 000 people. Recently further escalations took place and currently around 150 000 IDPs are estimated to be affected. Many IDPs were unable to cultivate their land; herding of livestock has limitations because of landmines; in addition, they were harassed by militias. All these factors led them to move to more secure districts and governorates. Continued volatility and lack of access to IDPs means that it is difficult, sometimes impossible, for humanitarian agencies to reach them. Also because of this conflict, exports from Yemen to Saudi Arabia became more difficult, leading to a larger supply of cereal grains (especially sorghum) in many governorates, which is currently reflected in a reduced price of this basic food commodity. Since most food insecure and vulnerable people are net food buyers, this has a positive effect on their food security. However, since the border to Saudi Arabia is effectively also closed for livestock, market prices for animals are extremely low. As most farmers as well as many IDPs depend on livestock sales as a source of income to buy food (and fodder), their purchasing power has decreased accordingly, thereby nullifying possible positive effects of lower cereal prices on their food security.

Refugees from Somalia

In Yemen there are over 130 000 registered refugees (2008) – the vast majority are Somalis, fleeing the protracted civil war since 1992. In 2008, 50 000 new refugees arrived in Yemen (UNHCR) – almost double the numbers from 2007. In 2009, the number of arrivals continues to increase, with an average of 4 boats

[3] If these numbers are compared to the WHO World Health Statistics, Yemen has 3rd highest prevalence of stunting and 2nd highest prevalence of underweight of all countries listed in the database.

arriving each day. There is also an increasing number of Ethiopian Oromos crossing the Gulf. Most refugees don't speak Arabic, reducing work opportunities in the host community. The majority of refugees in Basateen (urban area of Aden) are engaged in informal employment; refugees in the Kharaz camp have limited productive or employment opportunities due to the isolation and harsh climate of the area.

The lingering impact of high food prices and the economic crisis

Yemen is a net food importer with already high levels of food insecurity and malnutrition. Hence, the country was severely affected by the global increase in food prices, particularly in mid-2008. The price of wheat almost doubled between March 2007 and March 2008 when it reached YER 6 400 per 50 kg bag. As a result of high food prices, 65 percent of average household income is spent on food, families were taking children out of school, reducing expenditures on health, and cutting meals and substituting less nutritious foods. The 2008 WFP food security assessment found that the food security in the poorest governorates deteriorated as a consequence of the price shock and UNDP estimated that as a result the number of people living under the food poverty line doubled from 13 percent to 27 percent of the Yemeni population. This situation has become even worst due to the global economic and financial crisis that affected Yemen and also countries hosting Yemeni workers who support their home base through remittances.

5.2.5 Chronic food insecurity

Across the country however, there are population groups who persistently fail to meet their basic food requirements. These groups became more numerous because of high food prices and global economic crisis.

Vulnerable groups

They are typically households depending exclusively on daily or temporary labour; households with many children; rural households without irrigated land or without livestock, without land. They do not have diverse livelihood strategies. If the household is headed by a widow, or the husband is economically inactive for instance because of illness, the situation is even worse. The elderly people are often in a vulnerable condition, depending on the capacity of their relatives to support them. A low education level re-enforces these vulnerabilities.

One particular vulnerable group is the Akhdam, who are commonly believed to descend from Ethiopian soldiers from a failed invasion of Yemen in the 6th century AD. Akhdam men often do cleaning or shoe making jobs; women and children often beg. Many Akhdam suffer from prejudice and have also low self esteem. In the group visited, the adults had low education. Income from the men was used for qat consumption while proceeds from begging by women and children are used for food for the family. Better education and integration in Yemeni society could improve their situation.

Social status

Because of their chronic food insecurity and often poor care practices, serious chronic malnutrition can be found among these population groups. Based on 2005 DHS data[4], stunting and underweight is more severe among poor than non-poor households, and more severe in rural than urban areas. Even if poor household food security is recognized as an underlying cause of malnutrition, the current draft National Nutrition Strategy for Yemen is focused to conducting nutrition interventions whereas household food security is only marginally addressed, and equated as agricultural production only. The fact that most household's food has to be obtained through markets and that the poorest households have chronic problems accessing sufficient nutritious food for a healthy life is at present neglected in the draft strategy.

Within poor and habitually food insecure households, children, especially girls, often do not attend school, depriving the next generation of the necessary tools to uplift them from poverty. According to the World Bank, the Gross Enrolment Ratio for girls in primary schools increased from 51 percent in 1999/00 to 76 percent in 2007/08. One reason may be better cultural acceptability because of more female teachers. However in rural areas, and among the poorest (and most food insecure) households, enrolment is still low, particularly for girls, and declined by 5 percent over the last 8 years. Such poor households expressed to the Mission their interest in school meal programmes with take home rations.

[4] Yemen Poverty Assessment, the Government of Yemen, the World bank, and the United nations Development Programme, 2007

Regional distribution of chronic food insecurity

Several sources produced, with various methods, different food insecurity or poverty maps of the country, but none of these maps are recent and they are not really consistent with each other. The current CFSS, which is collecting primary data across the country, will give a better view on how chronic food insecurity is distributed across the country.

Trends

Natural resources for agriculture are exploited beyond a sustainable level in Yemen. Over time, the water and salinity problem will affect currently prosperous farmers: in Al Hudaydah, previously fertile *wadis* became affected by salinity, caused by seawater intrusion and lack of water since too much water is consumed at the top of the valley leaving the bottom deprived of it. In most areas more groundwater is pumped than the natural recharge, decreasing continuously the water table.

5.3 The role of the World Food Programme to address food insecurity

The WFP is the most important food assistance organisation in the country and it implements several donor supported programmes.

The Emergency Operation (EMOP) to assist flood affected people, after the October 2008 heavy rains and flooding in the eastern Governorates of Hadramaut and Al Mahrah targets 43 000 people whose homes and livelihoods had been seriously damaged.

The EMOP to support families affected by high food prices is targeted in districts where more than two-thirds of the population is living below the poverty line. This EMOP consists on the one hand of a general food distribution during a 6 month period to assist 378 000 families, targeted in collaboration with the Social Welfare Fund. On the other hand, it consists of a nutrition intervention with supplementary feeding to all pregnant and lactating women as well as children 6-24 months old and with therapeutic feeding of moderately acute malnourished children under-5.

The EMOP to assist war affected families in Sa'dah targets primarily the displaced people in the camps and in Sa'dah town and other towns. This EMOP also caters to returnees who have been able to return to their areas of origin and to war affected in general. It consists of a general food distribution targeting 150 000 beneficiaries, and includes a nutrition component for all children under-5.

The Protracted Relief and Recovery Operation (PRRO) providing food assistance to Somali refugees supports 47 000 of those with the highest needs. The PRRO is focused on Kharaz camp, peri-urban Basateen (around Aden) and on the reception centres for new arrivals along the coast.

The Country Programme (CP) serves as one of the few safety nets for vulnerable rural families in Yemen and consists of two activities. Nutritional support to mothers and children (and leprosy and TB patients) reaches almost 25 000 beneficiaries in 12 districts. Patients are provided with take-home family rations. The second activity, promotion of enrolment and attendance of girls up to grade 12 reaches an annual average of 96 000 schoolgirls in 89 beneficiary districts, the number of targeted girls increasing by 10 percent each school year. Take-home dry rations are distributed to the girls' families. Under the 2002-2006 Country Programme, girls' enrolment and attendance rates in WFP-assisted schools climbed up to above 60 percent and in some districts exceeded those of boys.

5.4 Food assistance requirements in 2010

Based on the findings of the CFSAM and on the current and future programmes of WFP, assistance is needed to address 1) transitory food insecurity: people affected by the Sa'dah conflict and Somali refugees, 2) chronic malnutrition and 3) the persistent low school enrolment rates especially among girls from food insecure homes.

The needs for the Sa'dah conflict affected persons is based on the expected number of IDPs and directly affected people, similarly, the Somali refugee support targets the expected number of people in camps and those in direct need. The high food price emergency needs assessment recommended, among others, a general food distribution to those with worst economic access to food and a nutrition intervention to stem the increase in malnutrition expected from the crisis. This resulted in a now ongoing WFP programme for 530 000 planned beneficiaries, which is now part of a proposed WFP recovery operation.

Table 7: Planned food assistance by WFP for 2010

	Beneficiaries	Tonnes
Conflict affected persons	150 000	34 000
Somali refugees	100 000	4 000
Food insecure from High Food Prices and Global Crisis (GFD)	500 000	12 000
Nutrition interventions	520 000	32 000
Education interventions	730 000	18 000
TOTAL	**2 000 000**	**100 000**

These numbers are subject to results and recommendations of future needs assessments and to the availability of donor resources.

6. RECOMMENDATIONS

The Mission recommends continuing food assistance for displaced and conflict affected people from the Sa'dah conflict, who have lost their normal means of subsistence, and for Somali refugees, especially in those camps with insufficient means of livelihoods. The Mission recommends continuation of support to food insecure people affected by the high food prices and global food crisis. In addition, it is needed to continue targeted food assistance (based on malnutrition rates and food insecurity situation) in the form of nutrition programmes, including training for mothers. In particular, it is recommended to strengthen school meal programmes. Take-home rations for girls would help remedy the situation that many girls, especially from poor and food insecure households are not enrolled in the primary education system. It is important that the school meal programs are designed to attract children from the poorest families to school, since they are currently most likely to be not enrolled.

The Mission benefited by the collaboration of experts from the FAO Emergency Operations and Rehabilitation Division of the Technical Cooperation Department (TCES) that drafted relevant project proposals to be included in the 2010 Yemen Humanitarian Response Plan (YHRP). The overall aim of YHRP was to respond to a series of acute and chronic humanitarian needs which have been triggered, or in some cases exacerbated, by a simmering civil conflict. The three projects are all ranked as high priority and address problems of seed availability for small and medium scale cereal farmers as well as of feed provision to small-scale livestock owners, with special attention to IDPs in Sa'dah. The titles of the projects are the following:

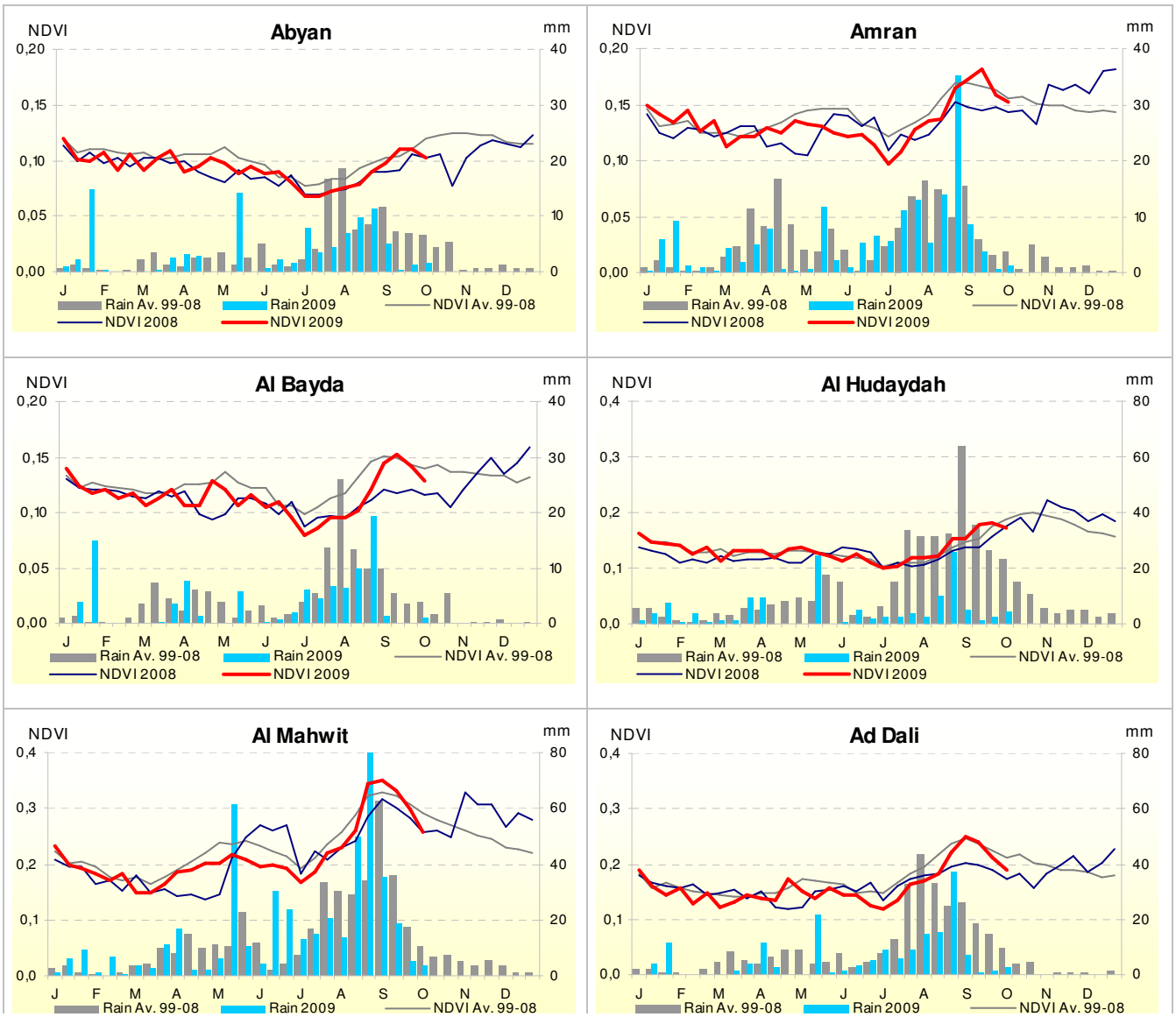
1. Emergency support to small and medium scale cereal farmers in the Republic of Yemen through the distribution of improved, drought-tolerant wheat, sorghum and millet seeds.
2. Emergency provision of livestock feed and veterinary drugs and medicines to IDPs and their host families in the conflict-affected northern governorates of Yemen.
3. Emergency provision of livestock feed to destitute small-scale livestock owners in the Republic of Yemen.

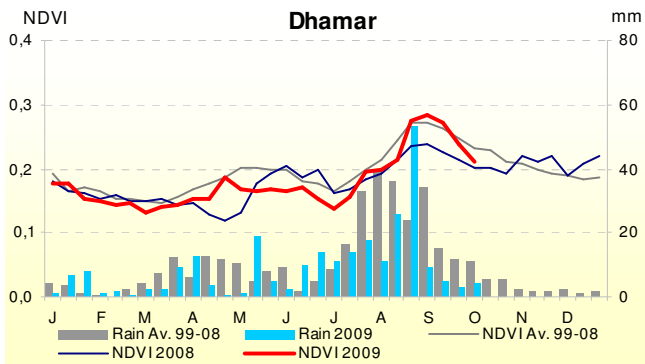
Access to water is already a major problem of the country and it will further exacerbate in the future if adequate police measures are not implemented. The Mission recommend to urgently develop a water management strategy that should properly address issues like the efficiency of irrigation systems, farmers' rights and pump licensing, better water harvesting and conservation techniques, and revising the real price of irrigation water (through a gradual reduction of fuel subsidies).

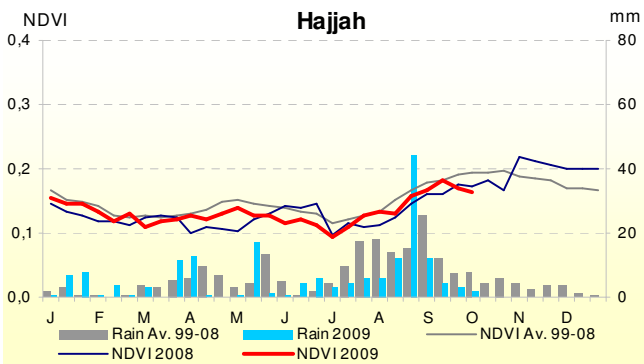
The establishment of a food security information system is considered by the Mission to be crucial to effectively monitor agricultural production and food security in the country and consequently to improve local capacity to respond to food emergencies.

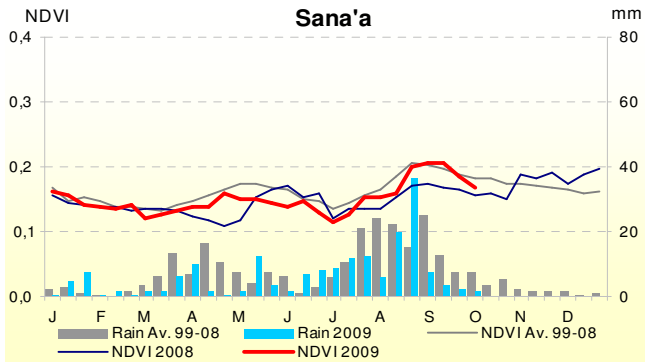
ANNEX 1

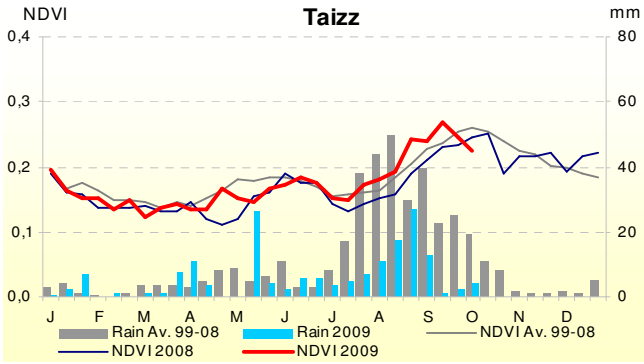
Rainfall pattern and vegetation profiles during 2009 season compared to 2008 and 10-year average

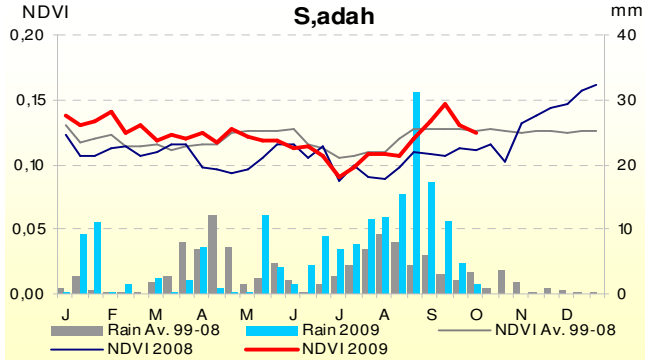


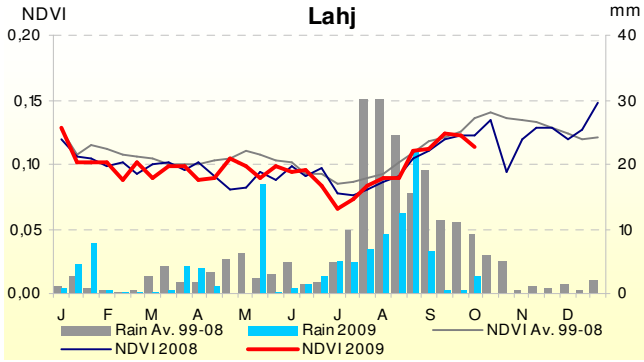

Dhamar
NDVI
mm
0,4
0,3
0,2
0,1
0,0
80
60
40
20
0
J F M A M J J A S O N D
Rain Av. 99-08
Rain 2009
NDVI Av. 99-08
NDVI 2008
NDVI 2009

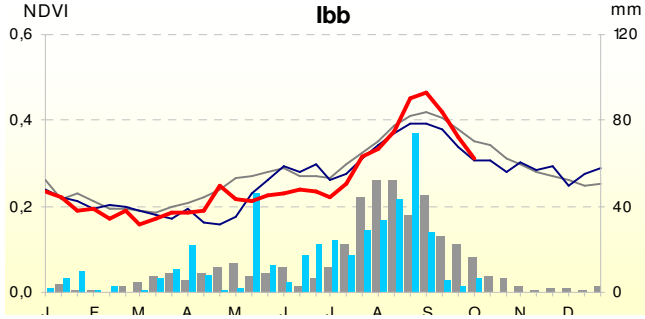

Hajjah
NDVI
mm
0,4
0,3
0,2
0,1
0,0
80
60
40
20
0
J F M A M J J A S O N D
Rain Av. 99-08
Rain 2009
NDVI Av. 99-08
NDVI 2008
NDVI 2009


Sana'a
NDVI
mm
0,4
0,3
0,2
0,1
0,0
80
60
40
20
0
J F M A M J J A S O N D
Rain Av. 99-08
Rain 2009
NDVI Av. 99-08
NDVI 2008
NDVI 2009


Taizz
NDVI
mm
0,4
0,3
0,2
0,1
0,0
80
60
40
20
0
J F M A M J J A S O N D
Rain Av. 99-08
Rain 2009
NDVI Av. 99-08
NDVI 2008
NDVI 2009

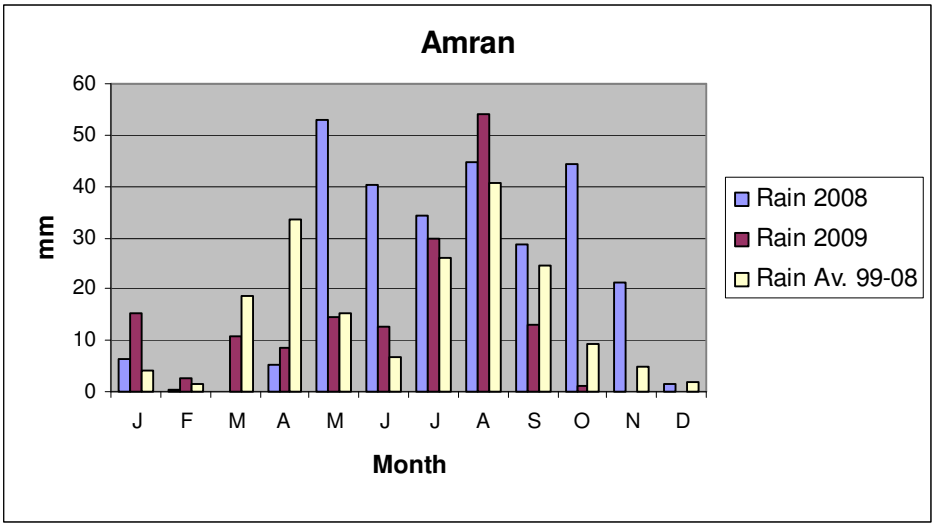

S,adah
NDVI
mm
0,20
0,15
0,10
0,05
0,00
40
30
20
10
0
J F M A M J J A S O N D
Rain Av. 99-08
Rain 2009
NDVI Av. 99-08
NDVI 2008
NDVI 2009

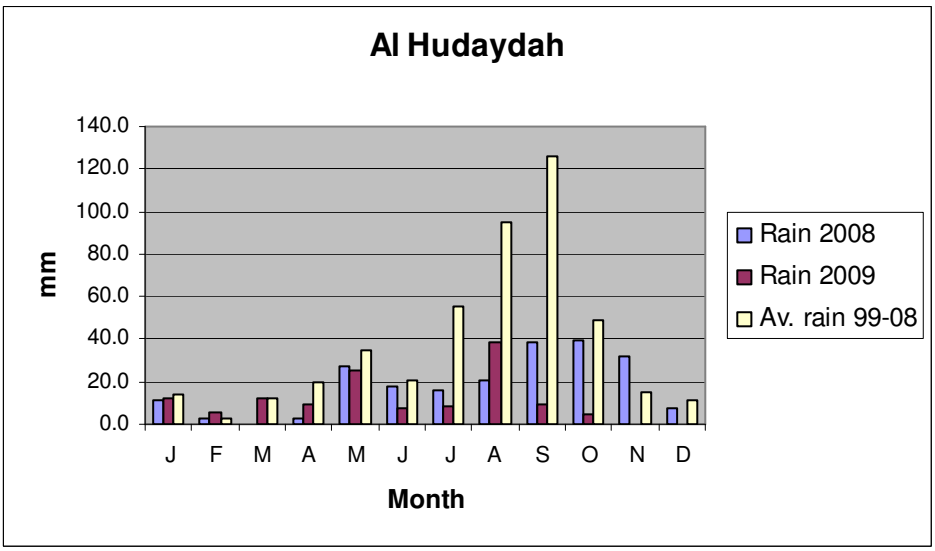

Lahj
NDVI
mm
0,20
0,15
0,10
0,05
0,00
40
30
20
10
0
J F M A M J J A S O N D
Rain Av. 99-08
Rain 2009
NDVI Av. 99-08
NDVI 2008
NDVI 2009

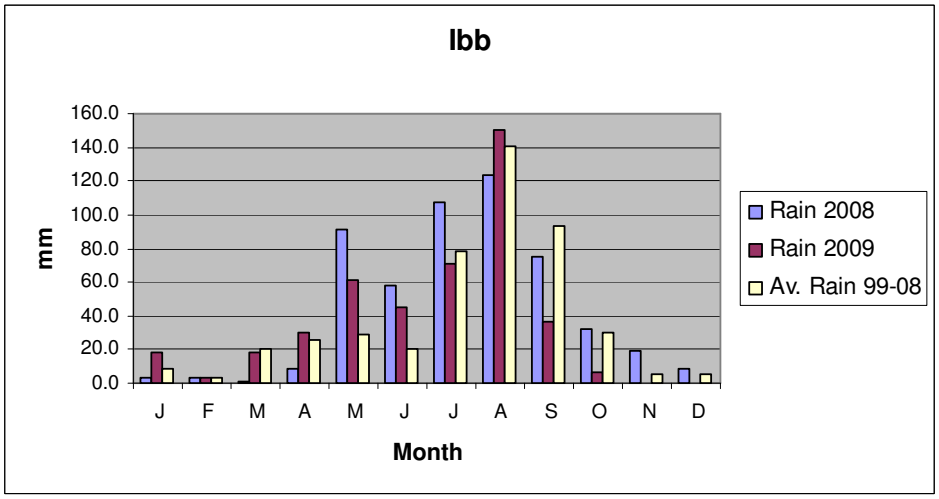

Ibb
NDVI
mm
0,6
0,4
0,2
0,0
120
80
40
0

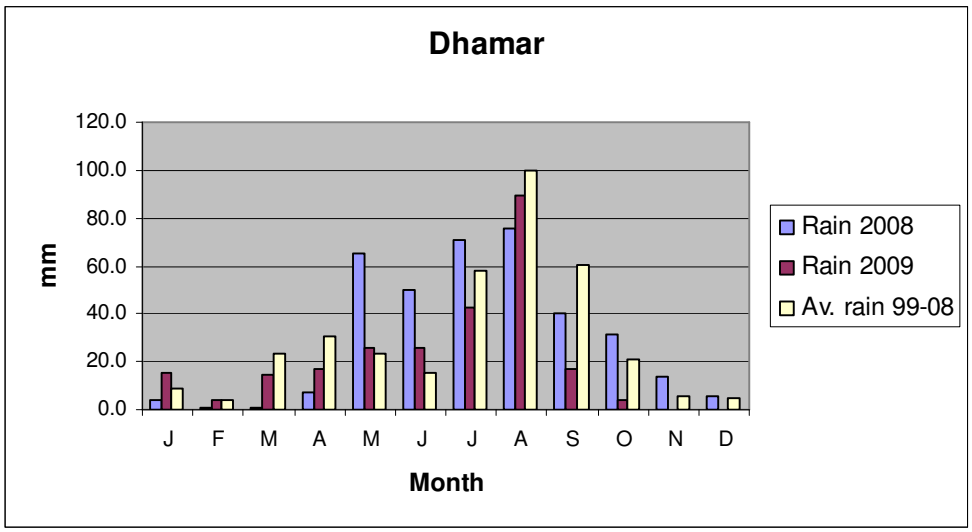
ANNEX 2

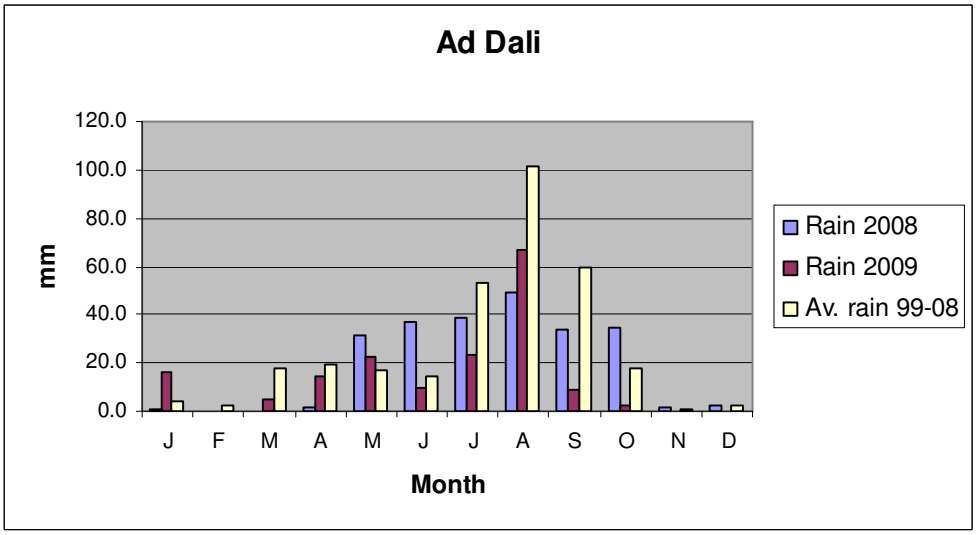
Monthly rainfall distribution during summer 2009 compared with 2008, and with 1999-2008 long-term average for selected governorates

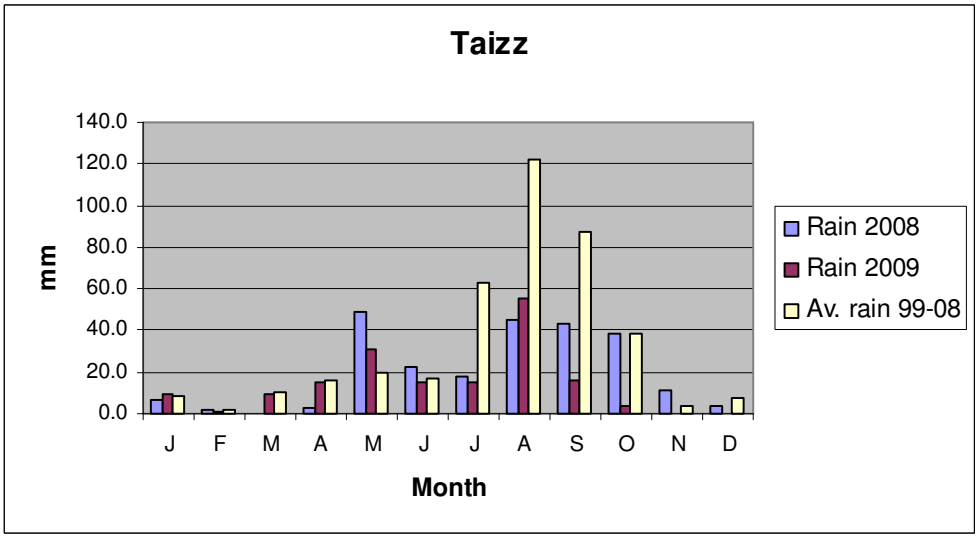







Dhamar
120.0
100.0
80.0
60.0
40.0
20.0
0.0
mm
J F M A M J J A S O N D
Month
Rain 2008
Rain 2009
Av. rain 99-08


Ad Dali
120.0
100.0
80.0
60.0
40.0
20.0
0.0
mm
J F M A M J J A S O N D
Month
Rain 2008
Rain 2009
Av. rain 99-08


Taizz
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
mm
J F M A M J J A S O N D
Month
Rain 2008
Rain 2009
Av. rain 99-08