

# DROUGHT IN SYRIA

NODIRA AKHMEDKHODJAEVA

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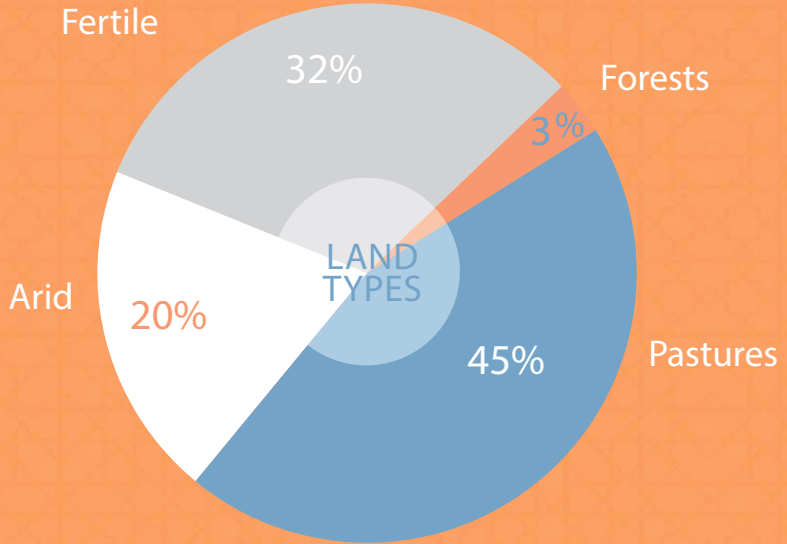
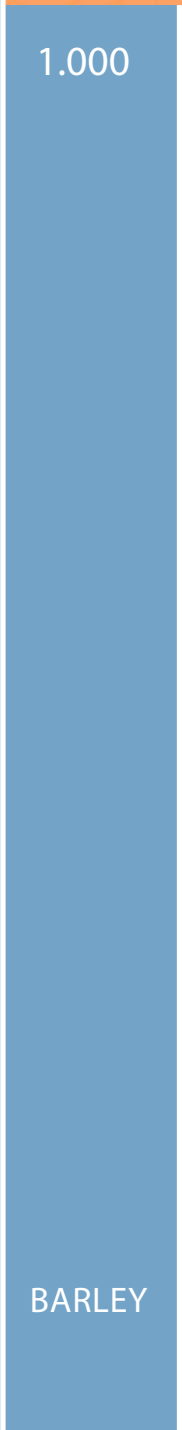
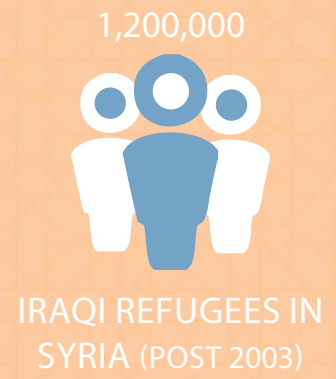
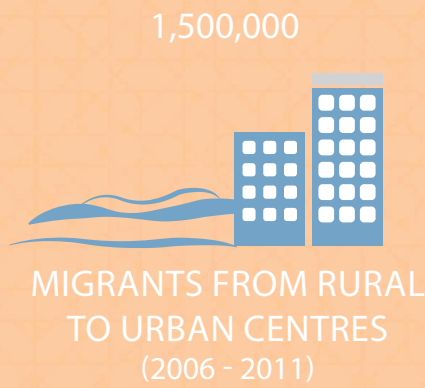
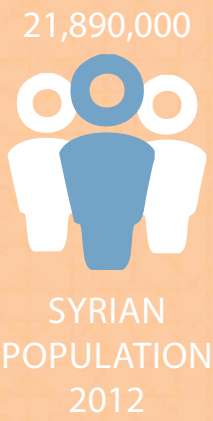
"RECONSTRUCTION IS GOING TO HAVE TO DEAL WITH THE ISSUE OF DROUGHT AND PERMANENT WATER SHORTAGES THE COUNTRY WILL FACE, IN PART BECAUSE OF POLICIES OF THE PAST SIX DECADES AND IN PART BECAUSE OF CLIMATE CHANGE."

THE ALEPPO PROJECT

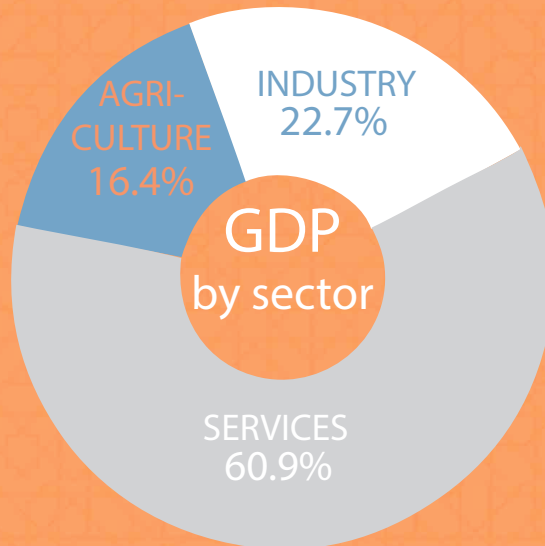


مشروع حلب

1.650



Source: Ministry of State for Environmental Affairs, Syria/World Bank/UNDP



Source: CIA Factbook



ACREAGE DEVOTED TO MAJOR CROPS (MILLION HECTARES)

Source: USDA and FAO

# 89.9%

of agricultural land relies on rainfall  
(World Bank, 2010)

# 10.1%

of agricultural land relies on irrigation  
(World Bank, 2010)

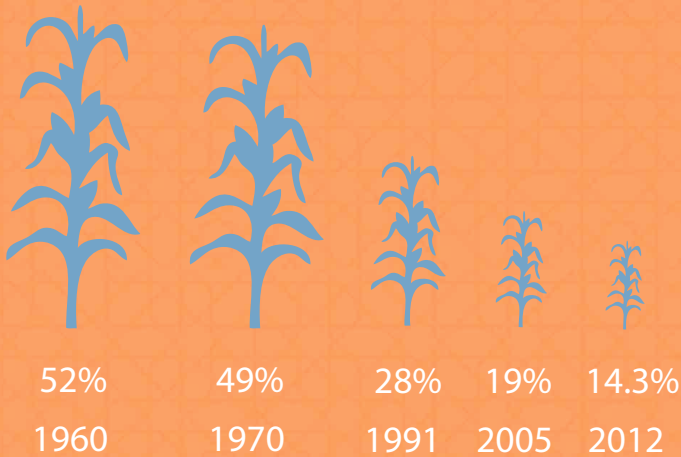
# ~60%

of agricultural land was affected by 2007-08 drought (IRIN, 2009)

Due to climate change, man-made desertification, lack of irrigation and government mismanagement, **800,000** people lost their entire livelihood (UN and IFRC, 2009)

## LABOUR FORCE EMPLOYED IN AGRICULTURE SECTOR

## LOSS OF AGRICULTURAL LAND

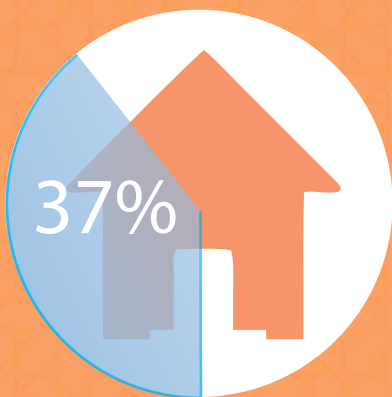


Between 1970 and 1999 2.7 million hectares of farmland was transformed to meadows and grazing land. The estimated damage from this process is estimated to be around

# 127,000,000 USD

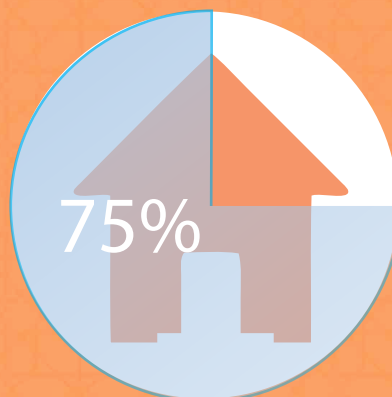
(Syrian official sources, 2008)

## INFORMAL SETTLEMENT, PERCENTAGE OF TOTAL



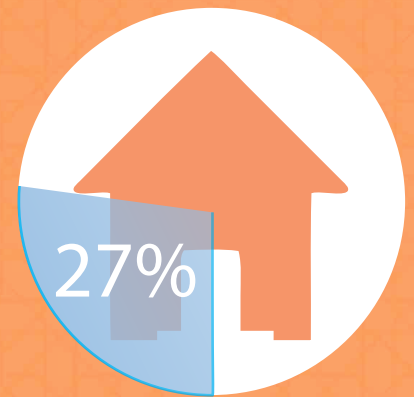
### ALEPPO

Before the conflict in Syria, 37% of the city's area consisted of informal settlements (UN-Habitat)



### AL-HASSAKEH

After several droughts between 1990 and 2005, informal settlements rapidly proliferated to become 75% of the city. (Barout, 2013)

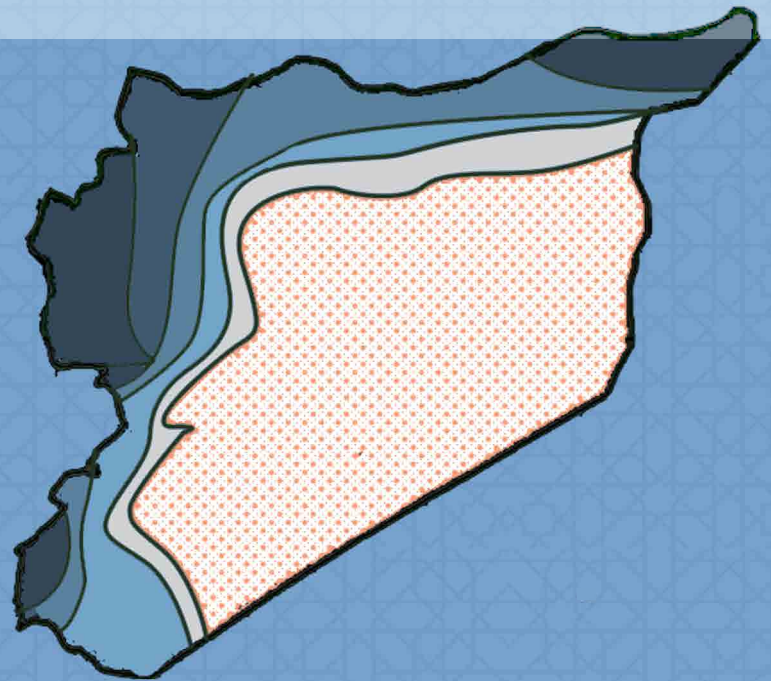
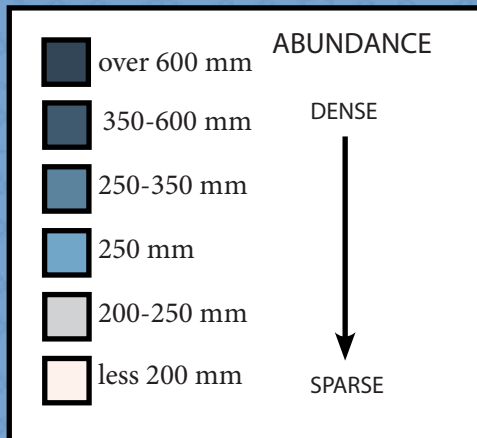


### DAMASCUS

As of 2009, around 27% of the area under the city's jurisdiction consisted of informal settlements (Khadour & Kafa, 2009)

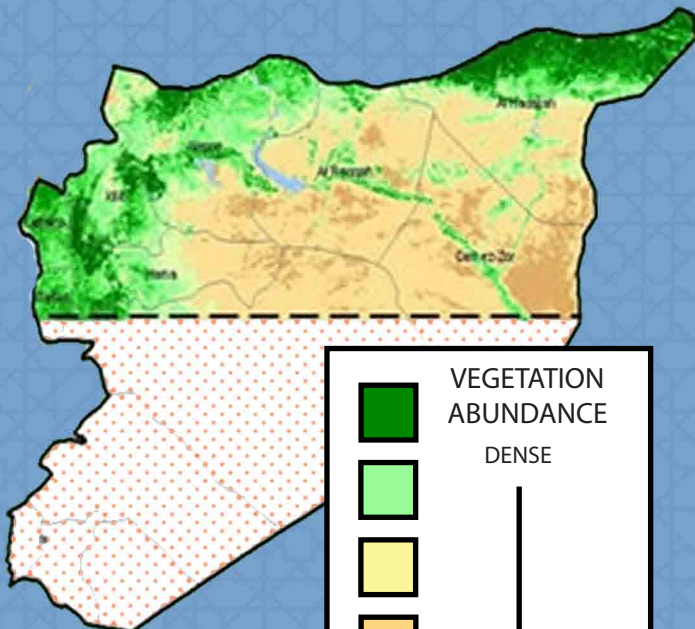


“ About 60% of Syria lying east of Aleppo and Damascus has a desert or semi-desert climate with an annual rainfall below 200mm/8 in. This is the hottest region in summer and it is often quite cold in winter with occasional snow and frequent frost. To the north and west of this desert region there is a band of steppe country where some non-irrigated cultivation can be carried out. This belt, often called the Fertile Crescent, includes the large cities of Aleppo and Damascus. Here annual rainfall is between 200 mm/8 in and 500 mm/20 in. Temperatures throughout the year are very similar to those found in the Syrian Desert. (BBC, 2012) ”

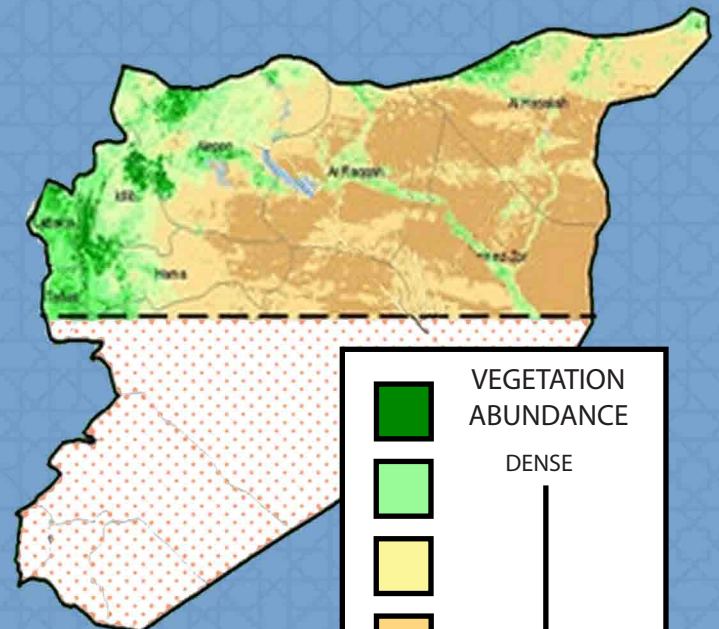
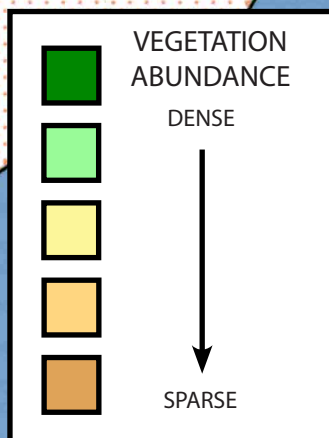


**RAINFALL**

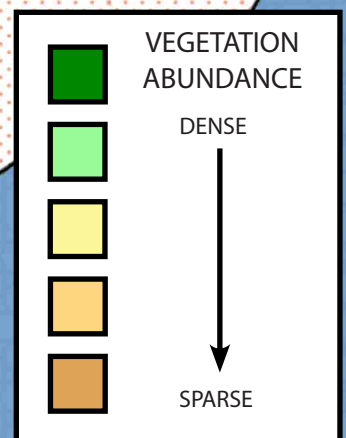
Ministry of Agriculture and Agrarian Reform 2004



April 2007



April 2008



**SATELLITE-DERIVED VEGETATION INDEX COMPARISON**  
MODIS TERRA SATELLITE

Water shortages on their own do not cause conflict but have clearly been a factor in the emergence of Syria's civil war. Changing climate conditions, increasing water scarcity and the failure of the government to respond drove much of the migration from rural areas to cities. It also contributed to rural communities' general dissatisfaction with the government that underlies the conflict. Syria's government adopted a number of policies from 2000 onwards which favoured services and tourism, and neglected agriculture, one of Syria's most important traditional economic sectors. The shift in economic thinking, combined with the government's mismanagement and inefficiency, worsened the impact of drought on rural communities, leading to massive movements to cities at a time when they were already over-stretched.

Before peaceful demonstrations that preceded the civil war, Syria was in the midst of one of its worst recorded droughts. From 2006 to 2010, water shortages caused serious declines in agricultural output across the country. Average rainfall during those four years was the lowest recorded in more than a century. With only a tenth of cultivated land under irrigation, the country is highly dependent on rainfall. It is also highly dependent on agriculture for employment, with around 20 per cent of the population working on farms or food processing.

From 2006 up to the start of the protests in early 2011, an estimated 1.5 million rural residents migrated to cities, mostly to Damascus, Daraa, Homs and Aleppo. By 2010, 160 villages in the countryside around Aleppo had been almost abandoned. This enormous migration had a major impact on the conflict's development and will have serious ramifications for any eventual reconstruction.

Although any government would have been hard pressed to handle a drought that reduced rural incomes so severely, the Syrian government did a particularly poor job responding to the problems. Agricultural support had declined since 2004, with the government reducing extension services and other backing for rural constituencies. Its supposed turn towards a free market – actually a focus on crony capitalism in major cities – led it to neglect agriculture. Longer-term failures to invest in irrigation and new markets as well as subsidies that did little to help rural development contributed to the weakening of rural economies and mass migration to cities. The government paid almost no attention to those moving to cities, who were often forced into marginal areas with few jobs. This rapid urbanization followed shortly after the arrival of more than a million Iraqi refugees who fled the 2003 U.S. occupation.

The longer-term lessons are clear:

- Urban reconstruction will have to account for the likelihood that once people move to cities, they rarely return to the countryside. Urban populations, depleted in Aleppo by the conflict, may rise significantly when the war ends.
- Reconstruction will have to recognize that Syria is likely to face a permanent state of absolute water shortage due to climate change and low drought resilience.
- Rebuilding agricultural services and connections between cities and their agricultural hinterlands must be an essential part of reconstruction.
- Syrian agriculture will need to move towards more effective irrigation and reduce water use.



**SYRIA** is drying up and will only get drier. This will have a profound impact on the conflict and the way in which the country might eventually recover. The impact on cities such as Aleppo will be significant especially because the urban population in Syria grew by 50 per cent between 2002 and 2010. Migration to cities will only increase if the conflict is resolved and city resources will be further stretched. Syria will suffer from persistent food insecurity without a massive and expensive overhaul of agriculture and water management.

The 2006-2011 drought was the worst since meteorological records have been kept for the region. Natural variation in rainfall coincided with longer-term reductions in precipitation in the Eastern Mediterranean to produce the longest and driest period in at least a century. From 1900 to 2005, there were six periods where monthly rainfall averages fell to a third or lower of norms but none of these droughts lasted more than two seasons. Not only did the recent drought last an unprecedented four seasons but rainfall levels were significantly lower than previous dry periods.<sup>1</sup>

Syria has been a state of water stress since about 1970.<sup>2</sup> Population growth, development and poorly managed agriculture pushed it into a state of scarcity around 2000. Withdrawals of fresh water rose by a third in the decade after 1993. Most water comes from rivers that flow from other countries with the majority from the Euphrates. The country is depleting its groundwater rapidly.

The area around Aleppo produces a significant portion of the country's agricultural output. The coast, while wetter, is mountainous and the southeast of the country is arid. From 2006-2007, rainfall averages in the Aleppo region fell to as low as 15 per cent of normal and did not recover fully until 2011. The region's agriculture is heavily dependent on rainfall with only 10 per cent of production relying on irrigation.

The oil and wheat producing areas of the North East are a significant source of income but the areas are under-developed and have been particularly poorly resourced by the government. They are areas of extraction, not investment and therefore the drought hit people particularly hard. Few had other economic opportunities or much in the way of savings to fall back on.

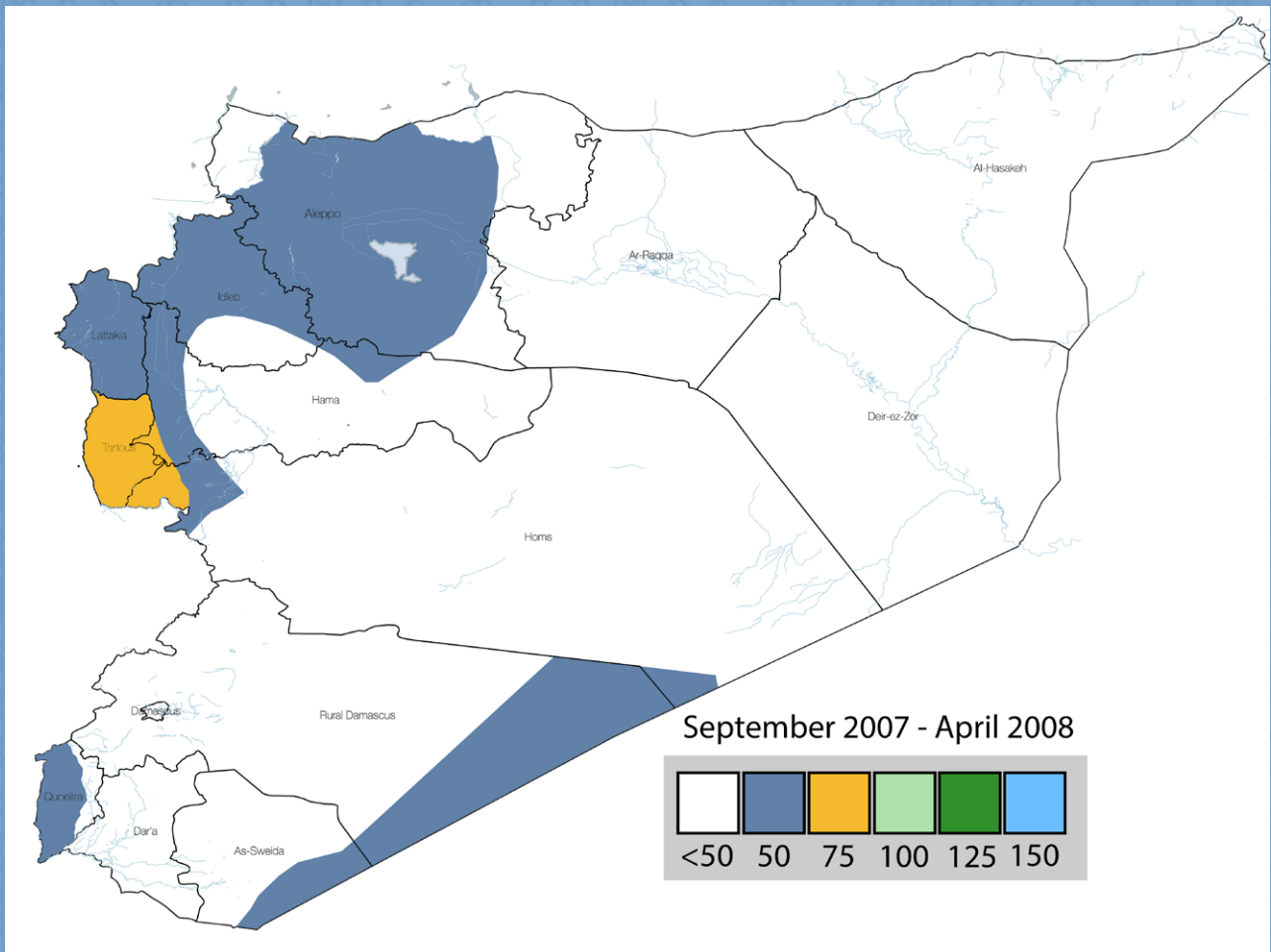
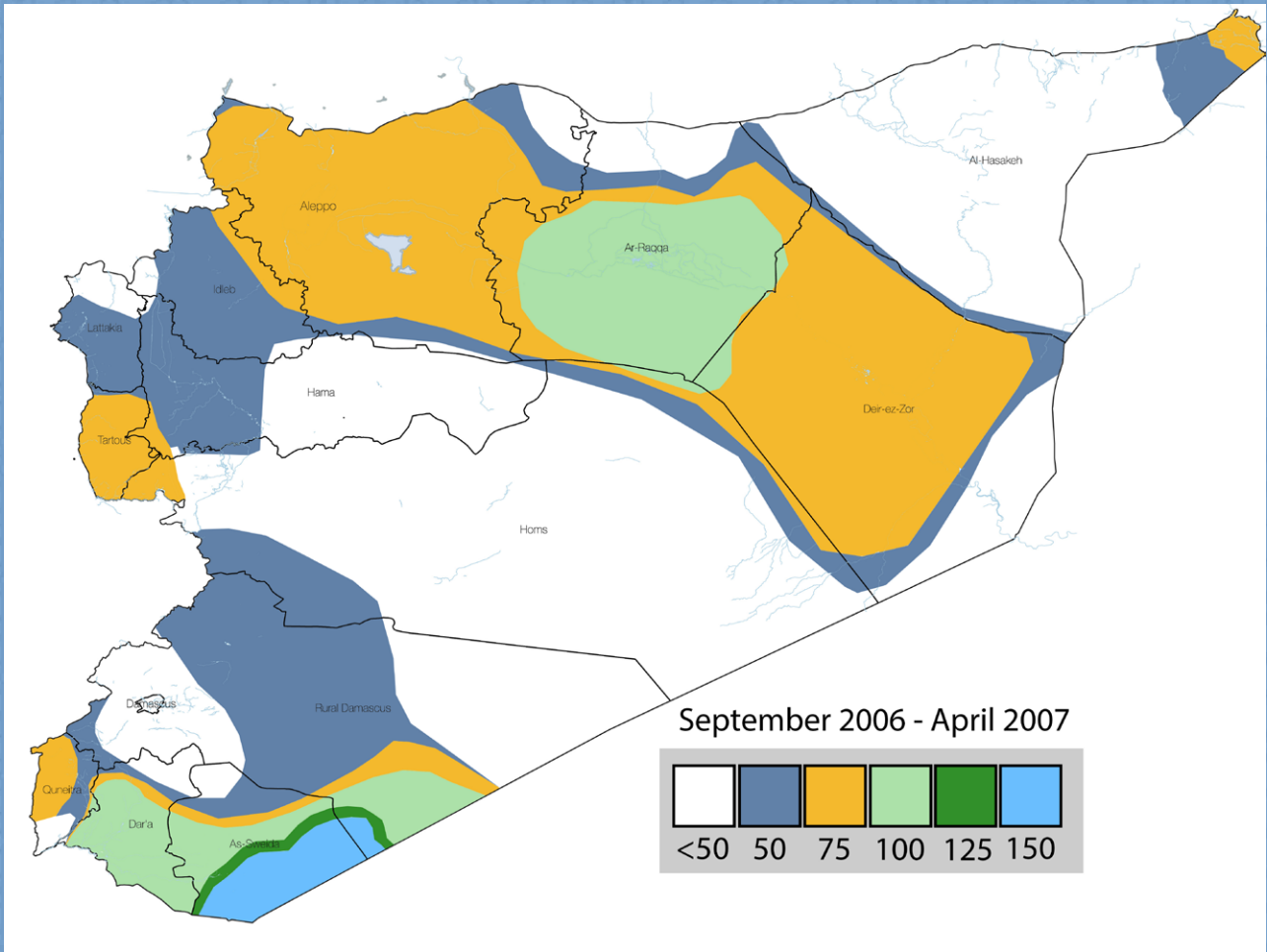
## AGRICULTURE

Syria was one of only a handful of countries in the Middle East with a genuinely mixed economy and a high degree of food self-sufficiency. Up until the 1970s, agriculture was the largest sector of the economy and even in 2003 it contributed 23 per cent of GDP and employed a third of the workforce. As the drought emerged, crop production fell significantly. Production of wheat, the key staple food in a bread eating country, fell 38 per cent in the 2008-2009 winter season to the lowest level of production in 17 years. Syria imported wheat for the first time in 2008 as food insecurity spread. By 2012, wheat production was down to around two million tons a year, less than half that before the drought and the conflict.

The impact of drought on communities depends heavily on how governments respond. Pressure on water resources has been growing for more than a century, but there has only been a meager response from Damascus to manage this worsening risk. Unsustainable agriculture and poor water management only exacerbated the risks from periodic droughts and the deepening impact of global warming. Short-term policies also did little to help rural communities when the water shortages started in 2008. Throughout the 1950s and 1960s, the focus had been on large-scale water intensive agriculture with significant inputs from the state. But after 1987, the state started to cut subsidies for pesticides, fertilizers, fuel and machinery. Cuts in farm support accelerated after 2004 when a new economic plan put the emphasis

# SEASONAL PERCENT OF NORMAL RAINFALL COMPARISON

Source: adopted from USDA



on privatization and support for a limited number of government cronies. The government abandoned compulsory purchase of crops and allowed markets to operate more freely. For those in a position to export, there were gains, but the transition to a more free market system inevitably created stresses and inequality.

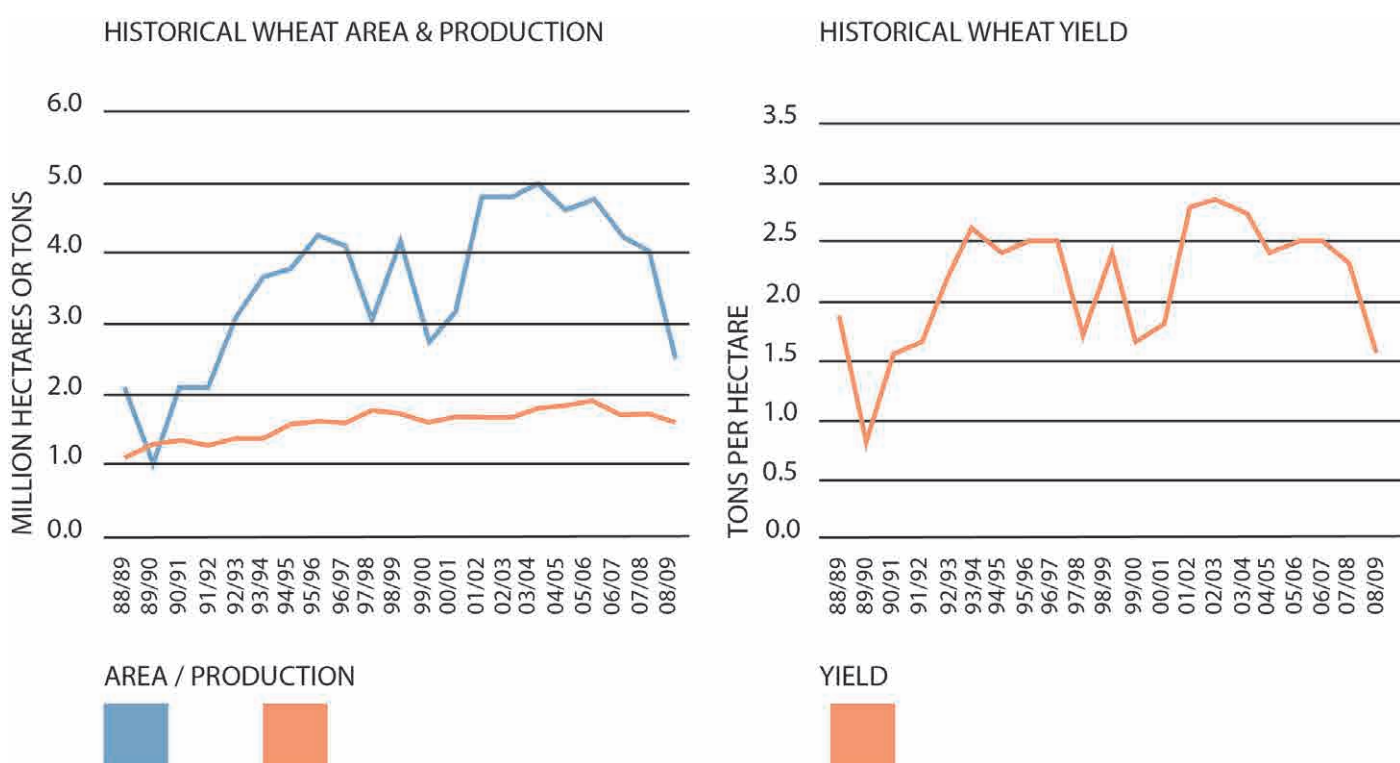
State farms began to be dismantled in 2000 with most being sold off to well-connected business figures. Land ownership has concentrated in the past 15 years with many groups, particularly Kurds, increasingly driven off their lands. Large areas of former arable land have reverted to arid land suitable only for grazing. The attitude of the government is summed up by a comment from Khaled al-Share', the director of the National Plan for Countering Desertification and the director of Land Management who said that the reasons for this were not government policies but illiteracy among farmers, poverty and mismanagement of farmlands.<sup>3</sup>

## MIGRATION

Migration from rural areas to cities has traditionally been low in Syria. A 2002 survey showed that the country had one of the lowest rates of internal migration in the region.<sup>4</sup> Aleppo Governorate had one of the lowest rates of lifetime migration and Aleppo itself showed almost no net migration. A large proportion of the population lived in rural areas where incomes were not significantly different from cities, the provision of social services was reasonably good and housing was much cheaper than urban areas.

However, changes in government policies after 2000 had a major impact on migration, which was then worsened by the drought in the final years of that decade. Particularly after 2004, the government moved funding away from rural areas and reduced support for agriculture. The emphasis of Syrian economic policy was to promote the private sector, although this was held closely in the hands of those with links to the regime.

The combination of drought and government policies was to precipitate probably the largest rural to urban migration in the country's history. Some 800,000 farmers lost their livelihoods with the most deeply affected in the northeast of the country. In some cases herders lost 85 per cent of their livestock. By 2010, more than 1.5 million people had abandoned homes in the country and moved to cities, with Aleppo, Damascus, Daraa and Homs receiving the largest numbers. Poverty rates doubled in southern Syria from 2007-2011 due to the drought.<sup>5</sup>





Declines in the agricultural workforce occurred before the drought, with nearly half a million people, or a third of agricultural employees, leaving the sector between 2001 and 2007. Most job losses occurred among women. It is unlikely that agricultural employment will return to previous levels when the war ends.

## FOOD SECURITY

The impact on Syrians came not just from the drought and the reduction in government support for agriculture but from worsening food security. Syria had a fairly good food security record up to the mid-2000s. While agriculture was inefficient and wasteful of water, it did make the country self-sufficient in key crops such as grains. Subsidies provided security for the poorest, although the system of support was uneven and politicized. According to the UNDP, 2.02 million people were living in extreme poverty in 2002, making up 11.4 per cent of the population. This had risen to 17.4 per cent of the population in 2008 as the government's quasi reform packages began to bite.<sup>6</sup>

In 2006, the government sold off its grain reserves to take advantage of high global prices. No reserves were available when the drought hit, leading to reductions in subsidies and worsening food insecurity. Although all Syrian households were entitled to subsidized food, the implementation was uneven, with families in remote areas unable to register. Families also had to prove that men in the family had completed military service in order to receive rations. In many cases, women who headed households found themselves cut out of the system.

## CONFLICT

Linkages between climate change, drought and conflict are complicated.<sup>7</sup> In Syria it does seem that drought combined with multiple other factors to raise the risk of social unrest, something that was identified by UN officials in 2008, nearly four years before violence began. The linkages are never mechanical.<sup>8</sup> A government that puts in place policies to mitigate the impact of drought is unlikely to see the rural to urban migration, increased competition and dissatisfaction that water shortages can bring.

The sources of Syria's conflict are myriad and complex: institutional and economic decay under Assad family rule, deep religious and ethnic fissures, inequality and discrimination as well as the wider dynamics in the Middle East. Many of these factors have been heightened by the drought and accompanying migrations as social tensions in cities boiled over.

## ALEPPO

Aleppo's relationship with its rural hinterland has long been complicated. The city was once at the center of a large web of trading links extending far into Asia but it was also closely connected to the surrounding farming region, one of the most important in Syria. The relationships between urban and rural people have not always been easy. Policies since the 1950s favored industrial development over agriculture and farm incomes have not risen as fast as those in the cities. Urban migration has been taking place for decades at a low level but was particularly accelerated during the drought and the economic reforms of the early 2000s that liberalized the urban economy without helping rural areas.

Aleppo itself is facing serious problems with water, more to do with the conflict than the drought. Water supplies within Aleppo itself are under serious threat, according to UN Habitat.<sup>9</sup> Water supplies have been reduced by up to 90 per cent and waste collection systems are not coping with demand.

The safety of Aleppo's 2,400 km of water networks remains at risk as fighting continues in proximity of the few big water pumping stations. In 2014, in an explosion in al-Midan neighborhood of Aleppo, three

out of four major pipes that pump water from Suleiman Al-Halabi station were destroyed, cutting off supplies to major parts of the city.<sup>10</sup>

Near Aleppo, harsh climatic conditions have affected the yield of a traditional cash crop – Aleppo pepper, a chili that is an important flavoring around the region and something of an emblem of the city.<sup>11</sup>

## LOOKING AHEAD

North West Syria has been identified as a “hot spot” for the impact of climate change. It is an arid area reliant on the Euphrates and subject to regular droughts that have shortened from a 55-year cycle to one as low as seven or eight years. Rain-fed agriculture and herding are going to come under increasing stress while irrigation is going to be unsustainable in its present form. Much of this area is under the control of the Islamic State and has seen some of the worst fighting in the war. Even if ISIS were to be defeated and some more moderate form of government established, it may not be possible or desirable to return agriculture to its pre-war state.

Climate change modeling shows that the Eastern Mediterranean will see significant rises in temperatures and declines in rainfall. Syria is particularly vulnerable. In short it has little resilience because:

- It relies on cross border river water and year-to-year rainfall.
- It has severely depleted ground water in the past four decades.
- Its agriculture lacks diversity and uses wasteful irrigation.
- It lacks the social and political systems to respond to drought.

In a state of war, Syria will be unable to prepare for the droughts to come, which will be more intense and frequent. Preparedness requires reductions in water use, the ability to mitigate the impact of drought when it occurs and plans to help farmers recover when the drought is over. Syria no longer has any of these capacities.

Syria is seeing its resilience decline. Water tables have dropped significantly and may not recover. This makes it ever more difficult to drill wells to supply water during droughts. Agricultural extension services – critical in building up drought resilience by helping farmers diversify crops, adopt new methods and improve use of rainwater – are no longer functioning and indeed were significantly reduced even before the conflict.

The international response to the drought in Syria was pitiful. In 2008 an appeal from the UN drew just 14 per cent of the requested funds. Syria’s poor relations with the West and ever intensifying competition for donor money meant that many of the projects that were implemented lacked effective coordination and had only a limited impact.<sup>12</sup>

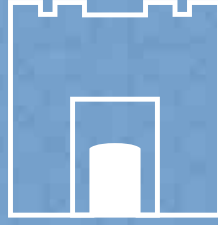
When the conflict in Syria ends, it will face massive economic challenges just at a time when climate change is going to have its greatest impact. Water is going to have to be central to redevelopment of cities and rural areas. Recurring droughts are going to mean more rapid urbanization, lower agricultural outputs and a greater reliance for Syria on global food markets.

## ENDNOTES

- 1 Colin P. Kelley, Shahrzad Mohtadi Mark A. Cane, Richard Seager and Yochanan Kushnir. Climate Change in the Fertile Crescent and implications of the recent Syrian Drought. PNAS. Vol 112. No 11. 3241-3246. March 17 2015.
- 2 The Falkenmark Water Stress Index puts a nation at a level of “water stressed” when it has less than 1,700 m<sup>3</sup> in run-off annually. Less than 1000 m<sup>3</sup> is a state of “water scarcity” and less than 500 is a “absolute water scarcity.” It measures national averages and therefore does not indicate particular shortages in a region within a country.
- 3 Worst Drought in Four Decades. Tishreen News. 4 November 2008
- 4 Kawaja, M.2002. Internal migration in Syria: findings from a national survey. Fafo Institute for Applied International Studies. [www.fafo.no](http://www.fafo.no) This was the latest comprehensive study of internal migration in Syria but comes before the droughts.
- 5 Olivier de Schutter “Report of the Special Rapporteur on the Right to Food, Mission to the Syrian Arab Republic.” 27 January 2011 [http://www.srfood.org/images/stories/pdf/officialreports/20110121\\_a-hrc-16-49-add2\\_country\\_mission\\_syria\\_en.pdf](http://www.srfood.org/images/stories/pdf/officialreports/20110121_a-hrc-16-49-add2_country_mission_syria_en.pdf)
- 6 Unpublished UNDP review of the Syrian Planning Commission tenth 5-year plan quoted in the Report of the Special Rapporteur on the Right to Food.
- 7 Gleick, P.H. 2014. Water, drought, climate change, and conflict in Syria. *Weather, Climate and Society* 6 (3):331–340
- 8 Hermans, L. 2011. Climate change, water stress, conflict and migration. Taking stock of current insights through the vulnerability lens. Symposium on Climate Change, Water Stress, Conflict and Migration. UPEACE/IES/ISS/UNESCO, 21 September 2011, the Hague. URL: [http://unesco.nl/sites/default/files/dossier/climate\\_change\\_water\\_stress\\_conflict\\_and\\_migration\\_o.pdf?download=1](http://unesco.nl/sites/default/files/dossier/climate_change_water_stress_conflict_and_migration_o.pdf?download=1)
- 9 UN Habitat. Urban Syria. URL: <http://mirror.unhabitat.org/categories.asp?catid=8224>.
- 10 Anjarini, S. 2014. Syria: drinking water and war profiteers in Aleppo. URL: <http://english.al-akbar.com/node/20189>
- 11 Nabhan, G. 2010. Drought drives Middle Eastern pepper farmers out of business, threatens prized heirloom chiles. *Climate change and food culture*. Grist. URL: <http://grist.org/food/2010-01-15-drought-drives-middle-eastern-peppers/>
- 12 Olivier de Schutter “Report of the Special Rapporteur on the Right to Food, Mission to the Syrian Arab Republic.” 27 January 2011



THE ALEPPO PROJECT



مشروع حلب

Center for Conflict,  
Negotiation and Recovery  
School of Public Policy  
Central European University  
Nador u. 9 | 1051 Budapest |  
Hungary Phone: [+36.1.327.3000](tel:+3613273000) | ext. 2540  
[aleppo@spp.ceu.edu](mailto:aleppo@spp.ceu.edu)