

Global drought - opportunities and risks

Drought - welcome to the new normal

The US is undergoing the worst drought since at least 1956. Although still far from the mega-drought Dust Bowl years, a changing climate means that extreme weather is here to stay long term, and that drought will become part of the new normal. This poses a range of short- and long-term opportunities and risks – which our global strategy, commodities economics and sector teams examine collaboratively. See our drought sector reports published today for more ideas.

Commodities - grain pains & corny threat for gasoline

All key agricultural commodity markets have tightened dramatically on the deteriorating supply outlook, resulting in high prices and an urgent need to ration demand. Near term, corn and soybean prices should stay elevated. Though we cannot rule out further spikes, we expect prices to cool off by mid 2013. US gasoline demand also could rise sharply if ethanol blending mandates are waived.

US economy - micro not macro impacts

Although the drought is likely to curb farm production and boost food prices, the overall macroeconomic impact should be limited. The farm industry is a small share of the economy, and higher crop prices only partially pass through into processed food prices. In coming months the drought could distort the high frequency data, but it will not alter our overall outlook.

GEMS - food inflation spike should not provoke rate hikes

El Niño will have uneven consequences on growth in global emerging markets (GEMs). The grain price spike will bring limited but generalized upward inflation pressures, as food prices command a bigger share of the CPI basket in GEMs than in developed economies. But central bankers are unlikely to hike policy rates in the short run as the focus seems to be on growth. Only a more protracted food price spike could push GEM central bankers to react, but our central scenario remains that this is a one-off food inflation spike.

China & India - changing diet & moderate drought effects

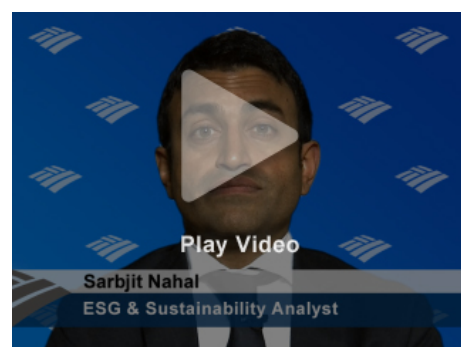
As China grows wealthier, rice consumption has peaked, with meat consumption rising. The government discourages industrial uses of corn, but corn imports should continue to rise sharply due to animal feed demand. India will likely face an autumn harvest drought, reducing growth to 5% for 2H12, but late rains should protect next summer's crop. A poor monsoon has a relatively low market impact.

Entry points for fighting drought

To invest in the themes of fighting drought and in promoting food, water and energy security, we created a list of stocks covered by BofAML that we consider long-term solution providers. We highlight seven entry points: 1) water; 2) fertilizers; 3) crop science; 4) farming; 5) energy efficiency; 6) second generation biofuels; and 7) renewables. Our Investment Strategy team has also introduced a tradable stock screen under the Bloomberg ticker MLEIARID.

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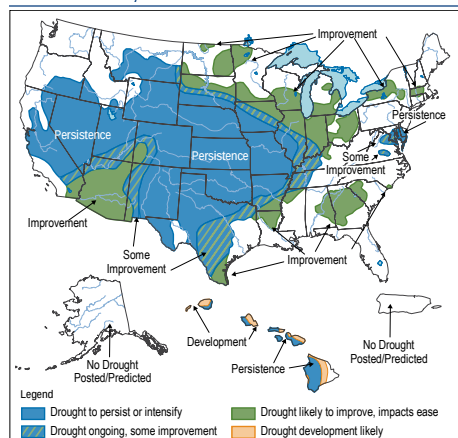
Refer to important disclosures on page 46 to 48. Link to Definitions on page 45.

Contents

Global drought opportunities & risks	3
Drought 101	6
Commodities - Grain pains	14
US Economics - Micro not macro	20
GEMs - Food price spike; no rate hikes	23
India - Drought growth, inflation risk	26
China - Less grain, more meat	29
Fighting Drought Exposure stock list	32

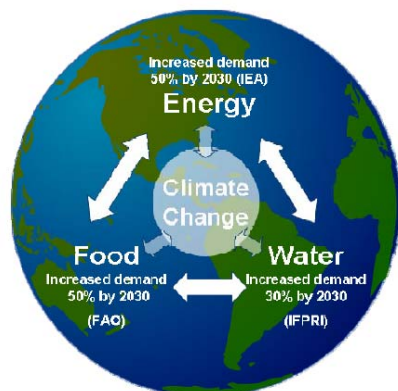
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Chart 1: US seasonal drought outlook to November 30, 2012



Source: National weather Service Climate Prediction Center; BofA Merrill Lynch Global Research. Data as of August 16 2012. depicts large-scale trends based on subjectively derived probabilities guided by short- and long-range statistical and dynamical forecasts

Chart 3: A perfect storm of global events?



Source: HM Treasury, FAO, IEA, IFPRI, BofA Merrill Lynch Global Research

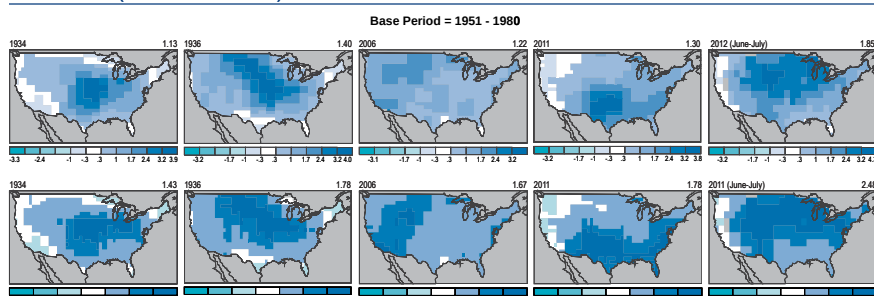
Global drought opportunities & risks

Global drought poses a range of short- and long-term opportunities and risks, in our view. We examine the theme in this collaborative report by our global strategy, commodities, economics and sector teams. See our global industry reports published today for more sector views.

2012 US drought

The US is undergoing the worst drought since at least 1956. July 2012 was the hottest month in the lower 48 US states in records going back to 1895, capping the hottest 12 months ever in the continental US (Chart 11). As of 28 August 2012, 62.9% of the lower 48 states suffered from moderate to exceptional drought. The US Department of Agriculture (USDA) has taken the unprecedented step of declaring more than 50% of US counties as natural disaster areas because of the continuing drought and heat. Although it has not reached Dust Bowl proportions – the current drought covers more area than the 1936 drought – and is expected to worsen through at least November (Chart 11).

Chart 2: US Jun-Jul-Aug surface temperature anomaly (°C) – Dust Bowl (1934, 1936) vs. current era (2006, 2011, 2012)

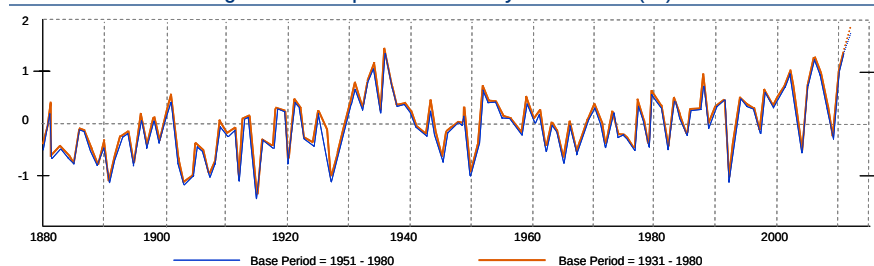


Source: NASA Goddard Institute for Space Studies, BofA Merrill Lynch Global Research. The top row shows the temperature anomalies in °C and the bottom row shows the temperature anomalies in the 1951-1980 standard deviation

Long term, a perfect storm is brewing Changing climate means extreme weather is here to stay

There is a growing peer reviewed body of climate modelling and statistical observations showing a link between certain extreme weather events – including very high temperatures and drought – with climate change. There is growing belief that such events will become more frequent and more severe.

Chart 4: US Jun-Jul-Aug surface temperature anomaly – 1880-2012 (°C)



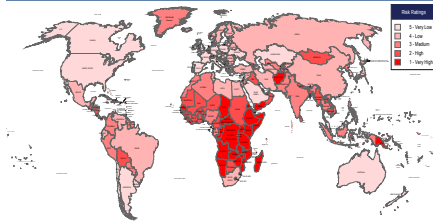
Source: NASA Goddard Institute for Space Studies, BofA Merrill Lynch Global Research

Growing challenges to food, water and energy security

The US drought reiterates the growing long-term challenges on food, water and energy security. By 2030 global food demand is set to increase by 50%, water demand by 40% and energy demand by 50% (Chart 3). As the UK's former Chief

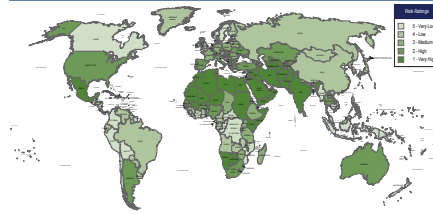
Scientific Advisor Sir John Beddington stated, “This threatens to create a perfect storm of global events,” which poses key questions for governments, stakeholders, corporates and investors as to how to meet these demands while adapting to and mitigating climate change.

Chart 5: Global food needs



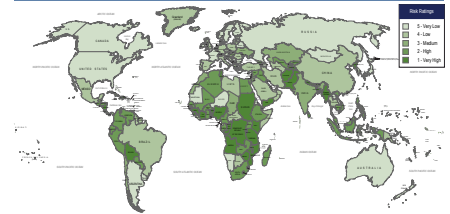
Source: BofA Merrill Lynch Global Research (WDWW (Who Does What Where) Geographical Risk Screening Model)

Chart 6: Global water needs



Source: BofA Merrill Lynch Global Research (WDWW (Who Does What Where) Geographical Risk Screening Model)

Chart 7: Global energy needs



Source: BofA Merrill Lynch Global Research (WDWW (Who Does What Where) Geographical Risk Screening Model)

Entry points for investors

For investors wishing to invest in the themes of fighting drought and in promoting food, water and energy security – we have created a list of more than 175 stocks covered by BofAML that we consider long-term solution providers. We highlight seven entry points: 1) water; 2) fertilizers; 3) crop science; 4) farming; 5) energy efficiency; 6) second generation biofuels; and 7) renewables. Click here for a full list of these stocks: - [Fighting Drought](#).

An Investment strategy stock screen on fighting drought

Our Investment Strategy team has introduced a tradable stock screen under the Bloomberg ticker MLEIARID (Table 1). The screen is an equally weighted subset of the stocks in our global coverage universe with a high or medium exposure to the Fighting Drought theme with a market capitalization of \$5Bn. We apply minimum liquidity criteria, so that for a \$100mn buy trade in the screen, no single stock would exceed 20% of average daily volume. We also apply shorting criteria so that no one stock exceeds 50% of shortable inventory in a \$100mn sell trade.

28 September 2012

Table 1: An Investment strategy stock screen on fighting drought

Ticker	Name	Country	MCap (US\$ mn)	Fighting drought sub-sector	FD exposure
ECL US	ECOLAB INC	US	18,666	Water Treatment	Medium
SVT LN	SEVERN TRENT	UK	6,715	Water Infra. & Supply	High
SEV FP	SUEZ ENVIRONNEMENT	France	6,249	Water Infra. & Supply	Medium
UU/ LN	UNITED UTILITIES	UK	8,086	Water Infra. & Supply	High
VIE FP	VEOLIA	France	5,979	Water Infra. & Supply	Medium
CF US	CF INDUSTRIES	US	13,598	Fertilisers	High
ICL IT	ICL (ISRAEL CHEMICALS)	Israel	15,079	Fertilisers	High
SDF GR	K+S GROUP	Germany	9,406	Fertilisers	High
MOS US	MOSAIC GROUP (THE)	US	24,557	Fertilisers	High
BAS GR	BASF	Germany	80,519	Crop Science	Medium
DD US	DUPONT	US	47,207	Crop Science	Medium
MON US	MONSANTO	US	48,734	Crop Science	High
SYNN VX	SYNGENTA	Switzerland	33,842	Crop Science	High
GGR SP	GOLDEN AGRI-RESOURCES LTD	Singapore	6,444	Farming	High
BWA US	BORGWARNER INC	US	8,278	Efficiency – Auto	High
CON GR	CONTINENTAL AG	Germany	20,225	Efficiency – Auto	Medium
IR US	INGERSOLL RAND	US	14,092	Efficiency – Buildings	High
JCI US	JOHNSON CONTROLS	US	18,748	Efficiency – Buildings	Medium
KNEBV FH	KONE	Finland	18,128	Efficiency – Buildings	High
ABBN VX	ABB LTD	Switzerland	44,512	Efficiency – Inds. & Integ.	Medium
ALFA SS	ALFA LAVAL	Sweden	7,830	Efficiency – Inds. & Integ.	Medium
2308 TT	DELTA ELECTRONICS	Taiwan	9,350	Efficiency – Inds. & Integ.	High
ELUXB SS	ELECTROLUX AB-SER B	Sweden	7,220	Efficiency – Inds. & Integ.	Medium
G1A GR	GEA	Germany	5,642	Efficiency – Inds. & Integ.	High
GE US	GENERAL ELECTRIC CO.	US	236,731	Efficiency – Inds. & Integ.	Medium
SU FP	SCHNEIDER ELECTRIC SA	France	33,950	Efficiency – Inds. & Integ.	Medium
6273 JP	SMC CORP	Japan	10,824	Efficiency – Inds. & Integ.	High
ARM LN	ARM	UK	13,261	Efficiency – IT	High
ASML NA	ASML	Netherlands	22,105	Efficiency – IT	High
CSCO US	CISCO SYSTEMS	US	99,232	Efficiency – IT	Medium
EMC US	EMC CORPORATION	US	60,021	Efficiency – IT	High
EQIX US	EQUINIX INC	US	9,534	Efficiency – IT	High
INTC US	INTEL	US	113,197	Efficiency – IT	High
CRM US	SALESFORCE.COM	US	24,341	Efficiency – IT	High
VMW US	VMWARE	US	42,120	Efficiency – IT	High
PHIA NA	PHILIPS ELECTRONICS	Netherlands	22,722	Efficiency – Led & Light.	Medium
SIE GR	SIEMENS	Germany	89,560	Efficiency – Led & Light.	Medium
MRO LN	MELROSE	UK	5,001	Efficiency – Smart Grid	High
ALO FP	ALSTOM SA	France	10,928	Efficiency – Transport	Medium

Source: BofA Merrill Lynch Global Research. FD exposure = BofAML estimates of current sales derived from fighting drought and in promoting food, water and energy security-related products, services, technologies and solutions.

Disclaimer: These stocks have been selected according to the specified screening criteria and do not constitute a recommended list. Investors should also consider other factors including fundamental opinions, financial risk, investment risk, management strategies and operating and financial outlooks in their decision making process.

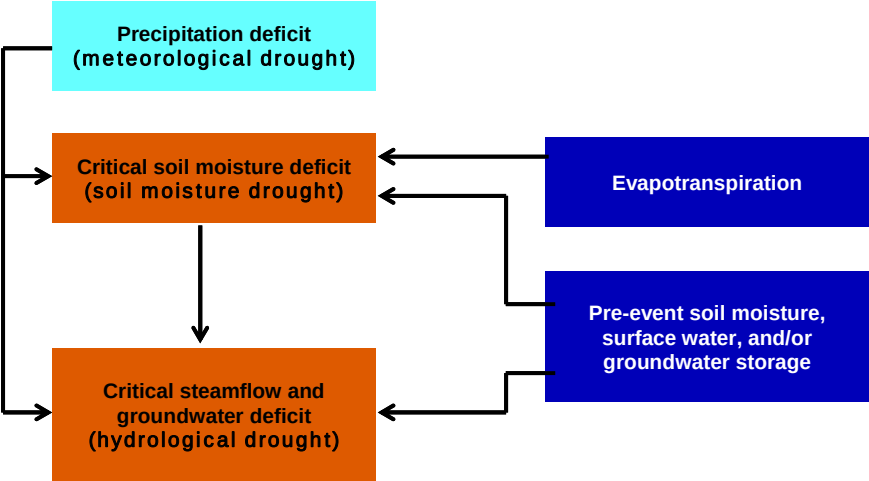
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Drought 101

Welcome to the new normal?

Drought can be formally defined as a deficiency of rainfall over a period of time (usually a season or more), resulting in a water shortage for some activity, group, or environmental sector.

Chart 8: Processes and drivers for drought



Source: IPCC, BofA Merrill Lynch Global Research

"I wonder if in the next 500 years - or the next 1000, there will be summers when rain will fall in Inavale [Nebraska]. Certainly not as long as I live will the curse of drought be lifted from this country."

– Don Hartwell, Inavale, Nebraska, 1937

Source: Egan, *The Worst Hard Time: The Untold Story of Those Who Survived the Great American Dust Bowl*, 2005.

What may be considered a drought in Bali would not be a drought in Libya.

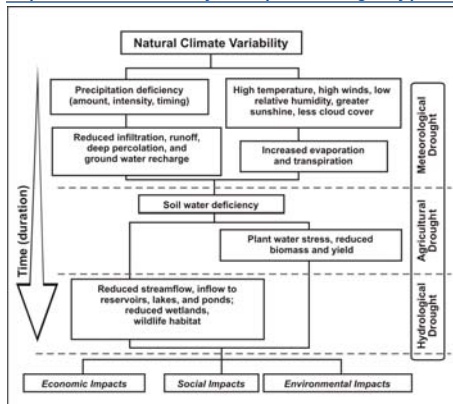
- **Drought is a normal, recurrent feature of climate** and is often referred to as a creeping phenomenon. It occurs almost everywhere, although its features and impacts vary from region to region, making a precise definition difficult (Table 2).
- **Lack of precipitation is often the primary cause** but increased potential evapotranspiration (induced by enhanced radiation, wind speed or vapor pressure deficit) as well as pre-conditioning (such as pre-event soil moisture; lake, snow or groundwater storage) can contribute (Chart 8).
- **There are four basic approaches to measuring drought: meteorological, hydrological, agricultural, and socioeconomic.** The first three approaches deal with ways to measure drought as a physical phenomenon. The last deals with drought in terms of supply and demand, tracking the effects of water shortfall as it ripples through socioeconomic systems (Table 2).

Table 2: Approaches to measuring drought

Type	Overview
Drought	Period of abnormally dry weather long enough to create a serious hydrological imbalance
Soil moisture or agricultural drought	Shortage of precipitation (mostly root zone soil moisture) during the growing season impinging on crop production or ecosystem function
Hydrological drought	Shortage of precipitation during the runoff and percolation season primarily affecting water supplies (streamflow, lake and/or groundwater levels)
Meteorological drought	Abnormal precipitation deficit
Mega-drought	Very lengthy and pervasive drought, lasting much longer than normal, usually a decade or more
Socioeconomic drought	Associates the supply and demand of some economic good with elements of meteorological, hydrological, and agricultural drought

Source: National Drought Mitigation Center, BofA Merrill Lynch Global Research

Chart 9: Sequence of drought occurrence & impacts for commonly accepted drought types



Source: National Drought Mitigation Center (US)

Table 3: 12Y evolution of moderate to exceptional drought for lower 48 states

Date	% of lower 48 states
Current (at Aug. 28 2012)	62.89
3 months ago	37.37
Start of calendar year	28.49
Start of water year	29.13
1Y ago	29.50
3Y ago	13.84
6Y ago	49.95
9Y ago	47.09
12Y ago	22.86

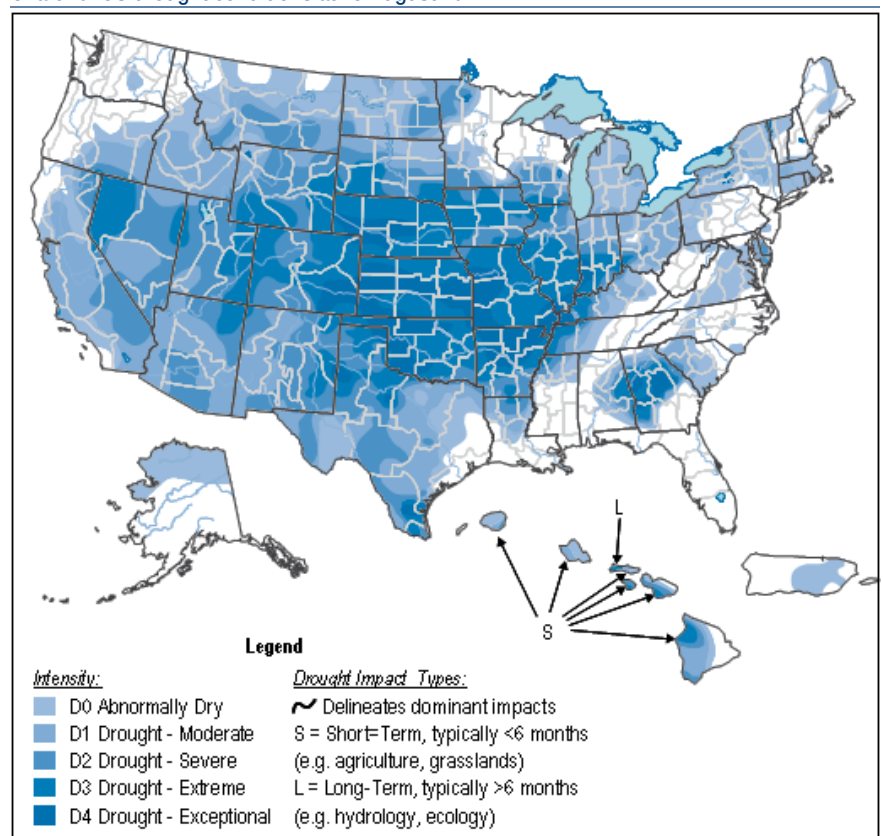
Source: National Drought Mitigation Center

- **Water scarcity is linked to socioeconomic drought**, and changing pressure on water resources by human uses may influence climate and drought conditions, such as by declining groundwater levels, enhanced local evapotranspiration and associated land-atmosphere feedbacks.
- **The impacts of drought result from the interplay between the natural event and the demand people place on water supply** (such as less precipitation than expected), and human activities can exacerbate the impacts of drought (Chart 9). While all droughts originate from a deficiency of precipitation or meteorological drought, other types of drought and impacts cascade from this deficiency – potentially encompassing crop yields, general ecosystem functioning, water resources and electricity production (Chart 8).
- **Weather and climate elements may interact to increase the impact of droughts** with enhanced air temperature, enhanced wind speed or increased incoming radiation all factors, while climate phenomena such as monsoons affect changes in drought occurrence in some regions.

The 2012 US drought

As of 28 August 2012, 62.9% of the lower 48 states suffered from moderate to exceptional drought (Table 3).

Chart 10: US drought conditions at 28 August 2012



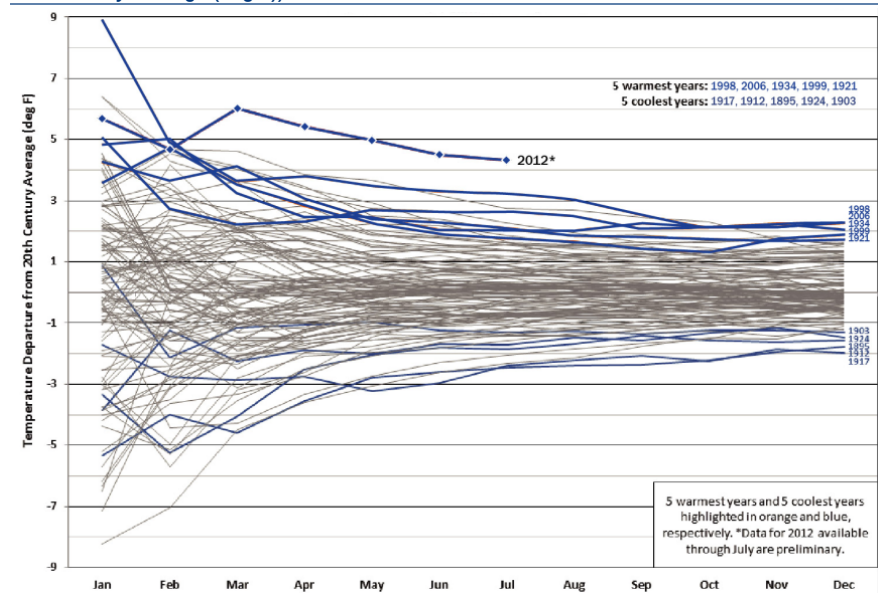
Source: The Drought Monitor, National Drought Mitigation Center.

The globally-averaged temperature for July 2012 marked the fourth-warmest July since record keeping began in 1880. July 2012 also marks the 36th consecutive July and 329th consecutive month with a global temperature above the 20th Century average (Source: NOAA).

Hottest July in 118 years

July 2012 was the hottest month in the lower 48 US states in records going back to 1895, capping the hottest 12 months ever in the continental US, according to the National Oceanic and Atmospheric Administration. The average temperature in the 48 states was 77.6 degrees Fahrenheit (25.3 Celsius), or 3.3 degrees above normal. The old record was set in July 1936.

Chart 11: 2012 is the warmest year since 1895 (in terms of temperature departures from the 20th century average (deg F))



Source: NOAA's National Climatic Data Center., BofA Merrill Lynch Global Research Year-to-date temperature anomalies for contiguous US – January 1995 – July 2012

Lack of rainfall

Precipitation is well below average levels across the lower 48 states for the year to date, and particularly since Spring and Summer 2012. The lack of rainfall coupled with extreme heat means that rainfall has been unable to keep up with evaporation – thus exacerbating the drought.

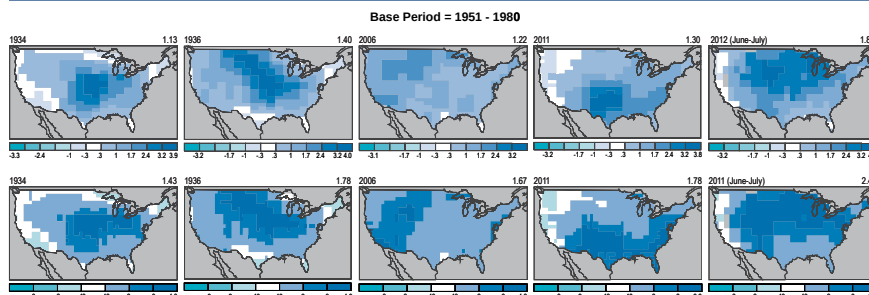
Low soil moisture

Root zone soil moisture levels are running low because of the extreme temperatures and lack of rainfall. Levels are among the lowest in a century and are expected to get worse as the year wears on. This is worrying as water content is decisive to ensuring that crops thrive – and because soil moisture deficits not only damage agriculture, but also forests, pastures, building infrastructure and health.

It is not the Dust Bowl, but it is getting worse

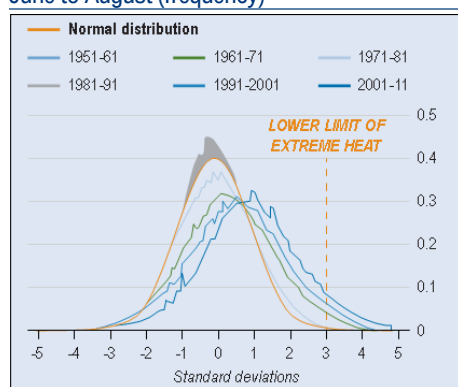
This US drought is not as severe as the multi-year mega-drought of the Dust Bowl in the 1930s when 2.5 million people moved out of the regions affected, 100 million acres of land was affected, and 75% of topsoil was lost by the end of the decade. However, with a growing proportion of the lower 48 states hit by drought, the US Department of Agriculture (USDA) has taken the unprecedented step of declaring more than 50% of US counties natural disaster areas. The National Weather Service Climate Prevention Center also believes that the drought will continue to persist or intensify in the coming months through at least the end of November, with crop yields continuing to drop.

Chart 12: US Jun-Jul-Aug surface temperature anomaly (°C) – Dust Bowl (1934, 1936) vs. current era (2006, 2011, 2012)



Source: NASA Goddard Institute for Space Studies, BofA Merrill Lynch Global Research. The top row shows the temperature anomalies in °C and the bottom row shows the temperature anomalies in the 1951-1980 standard deviation

Chart 13: Global temperature deviations from June to August (frequency)



Source: Goddard Institute for Space Studies, BofA Merrill Lynch Global Research. Temperature deviations from the 1951+-1980 reference period in 250km wide cells around the Earth's surface

Extreme weather is here to stay

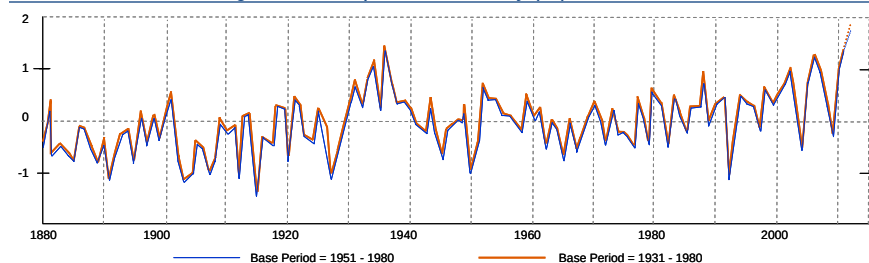
The overwhelming majority of scientific opinion on climate change is that the Earth's climate system is unequivocally warming, and it is more than 90% certain that humans are causing it through activities that increase concentrations of greenhouse gases (GHGs) in the atmosphere. From the perspective of drought, scientists are beginning to link certain extreme weather events including very high temperatures with climate change.

Growing focus on the climate change/extreme weather link

Peer reviewed climate modelling – and more importantly, actual statistical observations of past extreme weather events and temperatures – increasingly show a direct link to climate change. There is a growing belief that such events will become more frequent and more severe in the coming years. Sceptics remain – but this work reinforces evidence that climate change is occurring and that it is increasingly harmful:

- **Extremes are much more frequent and more intense worldwide.** Extremely hot temperatures covered about 0.1% to 0.2% of the globe from 1951 to 1980. But in the last three decades, while the average temperature has slowly risen, the extremes have soared and now cover about 10% of the globe (Chart 13).

Chart 14: US Jun-Jul-Aug surface temperature anomaly (°C)



Source: NASA Goddard Institute for Space Studies, BofA Merrill Lynch Global Research

“The odds that natural variability created these extremes are minuscule, vanishingly small. To count on those odds would be like quitting your job and playing the lottery every morning to pay the bills.”
– James E. Hansen, Director of NASA Goddard Institute for Space Studies (Washington Post, 2012)

- **Recent extreme weather events may be attributed to climate change.** Catastrophic droughts in Texas and Oklahoma (2011), the Russian heat wave of (2010), and the European heat wave (2003) according to scientists can be wholly or partly attributed to climate change (Source Hansen et. al, National Academy of Sciences 2012; National Oceanic and Atmospheric Administration 2012). There is growing belief that the current US drought falls within this category.

Weather can cause up to a 1.7% rise or fall of GDP (Source National Centre for Atmospheric Research (based on an analysis of 70Y of weather data)

From 2000 to 2008, the Americas suffered the most economic loss from climate-related disasters, accounting for the highest proportion (54.6%) of total loss, followed by Asia (27.5%) and Europe (15.9%) (Chart 15)

- **Natural variability is being altered by climate change.** While none deny its impact on extremes, the variability of day to day weather – as well as recurring climate patterns such as El Niño and La Niña – are potentially being altered by climate change with greater odds that the “climate dice” roll warmer (Source Hansen et. al, Proceedings of the National Academy of Sciences 2012).

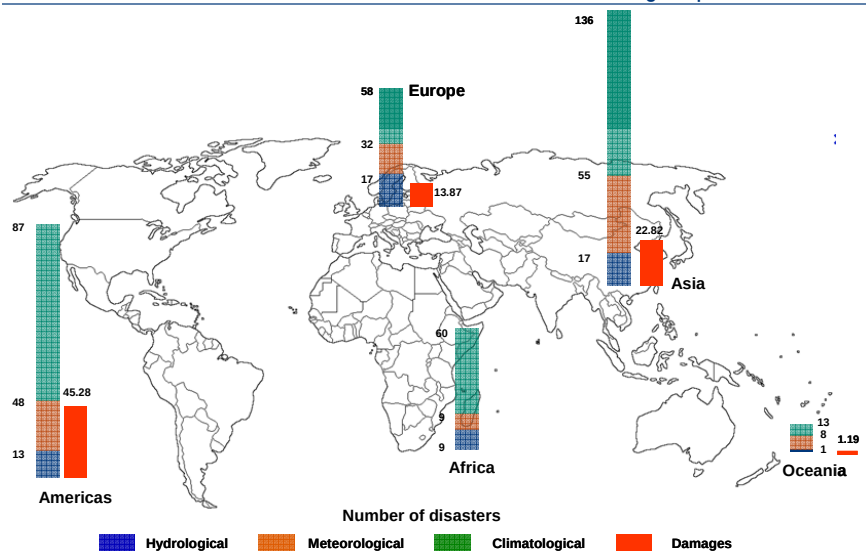
Climate-related losses are skyrocketing

Since 1980, global weather- and climate-related disaster losses have ranged from a few billion to a high of US\$200bn in 2005 (in 2010 dollars) as a result of Hurricane Katrina (Chart 15). And these estimates do not include indirect and intangible losses. The number of reported weather- and climate-related disasters, their direct financial costs, and in affected population have increased over the past decades (Chart 15).

8-17x increase in weather and climate event costs over 30Y

Material damages caused by natural disasters, mostly weather- and water-related, have increased more rapidly than population or economic growth. Globally, annual material damage from weather and climate events has been found to have increased eight-fold between the 1960s and the 1990s, while the insured damage has been found to have increased by 17-fold in the same interval, in inflation-adjusted monetary units (Chart 16). Between 1980 and 2004, the total costs of extreme weather events totalled US\$ 1.4tn, of which only one-quarter was insured (Chart 17).

Chart 15: Weather and climate-related disaster occurrence and average impacts 2000-2008

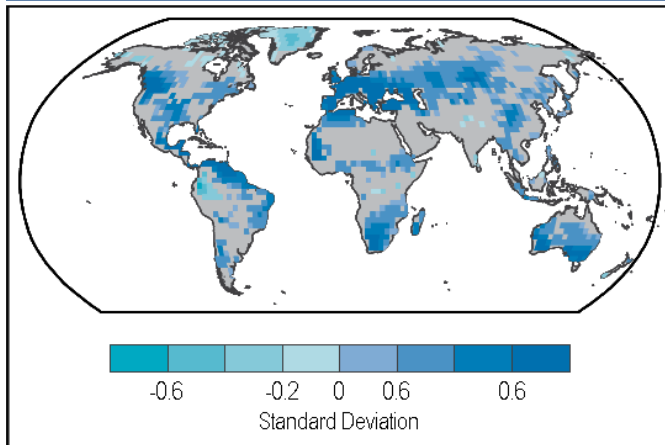


Source: IPCC. Include 2008. The number of climatological (e.g. extreme temperature, drought, wildfire), meteorological (e.g. storm) and hydrological (e.g. flood, landslides) disasters is given for each region, along with damages (2009 US\$ bn)

Unprecedented extreme weather here to stay long-term

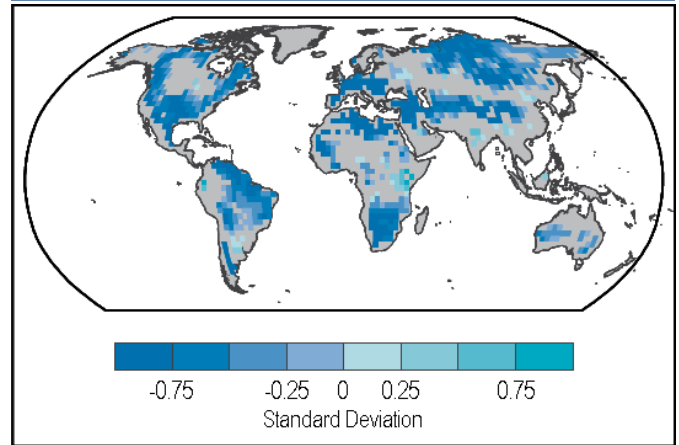
While it is all too easy to link any and all incidents of extreme weather events with climate change, scientific evidence increasingly points to the worsening of droughts, heat waves and floods in the coming century because of global warming. And, drought could become part of the new for climate.

Chart 16: Projected changes in dryness: consecutive dry days (June to August, 2081-2100)



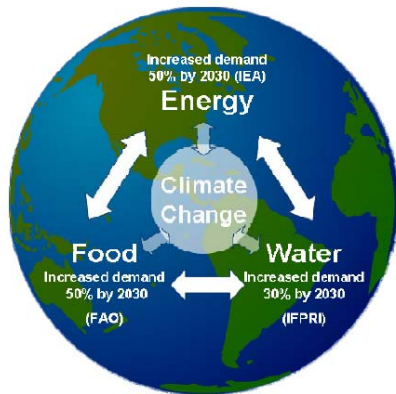
Source: IPCC, BofA Merrill Lynch Global Research. Consecutive dry days = days with precipitation; <1 mm.

Chart 17: Projected changes in dryness: soil moisture anomalies (June to August, 2081-2100)



Source: IPCC, BofA Merrill Lynch Global Research. Soil moisture anomaly = anomaly in water stored in or at the land surface and available for evapotranspiration

Chart 18: A perfect storm of global events?



Source: HM Treasury, FAO, IEA, IFPRI, BofA Merrill Lynch Global Research

A perfect storm is brewing

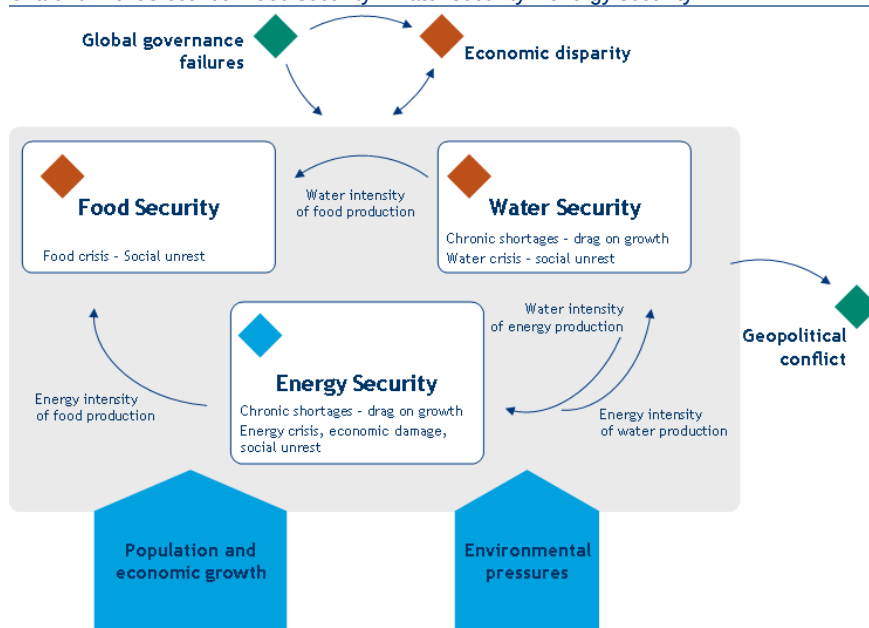
Increased challenges to food, water & energy security

The US drought underscores increased long-term challenges to food, water and energy security. By 2030 global food demand is set to increase by 50%, water demand by 40% and energy demand by 50%. As the UK's former Chief Scientific Advisor Sir John Beddington stated, "This threatens to create a perfect storm of global events," which poses key questions for governments, stakeholders, corporates and investors. These include whether we: can feed 9 billion people equitably, healthily and sustainably; cope with the demands on water; provide enough energy to supply the growing population coming out of poverty; and can we do this while mitigating and adapting to climate change (Chart 18)?

Food-water-energy nexus

Food security, energy security and water security are linked by a series of sometimes reciprocal inputs, and influenced by other factors such as population, economic growth and environmental pressures along with the two overarching factors of global governance failures and economic disparity. Trade-offs between the three resources, as well as between users in the form of resource rationing, will, in our view, become an increasingly important issue, as will managing these trade-offs.

Chart 19: Nexus between food security – water security – energy security



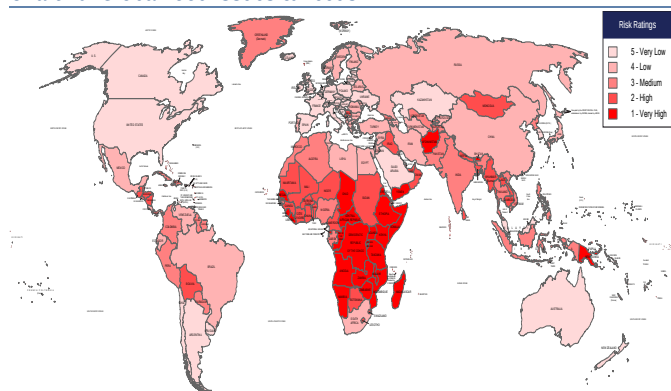
Source: WEF, BofA Merrill Lynch Global Research

Demand for cereals (for food and animal feed) is projected to reach 3bn tonnes by 2050. Annual cereal production will have to grow by 1bn tonnes and meat production by over 200mn tonnes to reach a total of 470mn tonnes in 2050, 72% of which will be consumed in EMs (Chart 21)

Global food crisis, food demand to increase by 40% by 2030

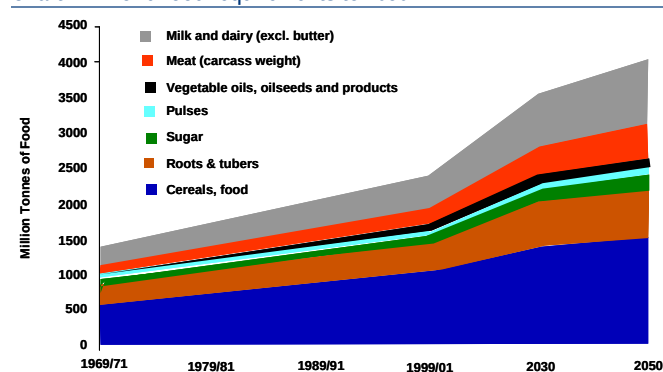
Global food demand – as reflected by total crop and livestock demand and production – could rise by 40% by 2030 and double by 2050 – meaning that a 70% increase in production output would be needed to feed the world (Chart 21). Overall demand for agricultural products is expected to grow at 1.1-1.5 per cent per year to 2050, with population growth, increases in per capita consumption and changes in diets leading to the consumption of more livestock products being the main drivers of such expected changes. Demand for meat is expected to grow by 85% to 2030 (Chart 21) – posing significant water challenges as it takes 15,500l of water to produce 1kg of beef, compared with 1,500l for 1kg of grain.

Chart 20: Global food issues & needs



Source: BofA Merrill Lynch Global Research (WDWW (Who Does What Where) Geographical Risk Screening Model)

Chart 21: World food requirements to 2050



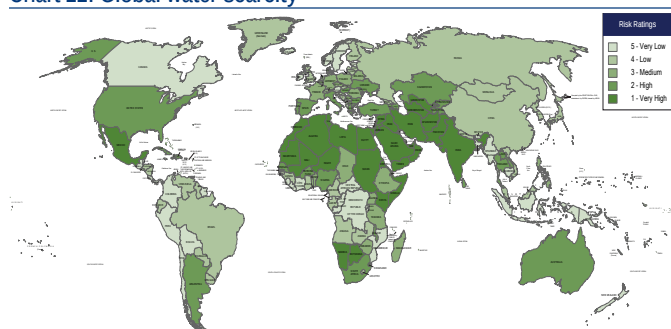
Source: FAO, BofA Merrill Lynch Global Research

Water withdrawals have tripled over the last 50 years as the population grew and demand increased, with agriculture accounting for about 70% of global water use and industry 20% (Source: UN)

Global water crisis, demand to increase by 30% to 2030

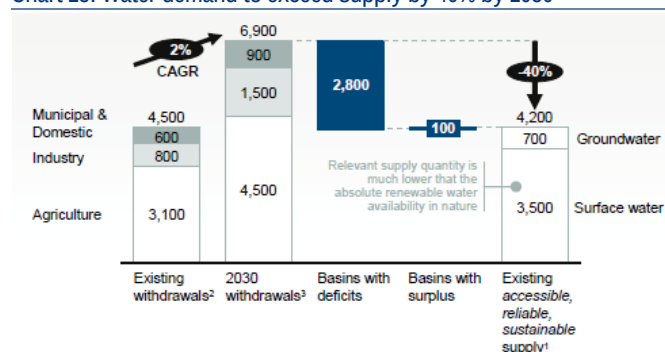
One billion people lack access to clean drinking water. Water is under growing pressure both on the supply side with insufficient fresh water, uneven distribution, poor quality, non-revenue water, and climate change – and on the demand side for agriculture, industry, and residential users. By 2030, under an average economic growth scenario and if no efficiency gains are assumed, global water requirements will grow at 2% CAGR from 4,500bn m3 today to 6,900bn m3 (Chart 23). Water demand is set to overshoot supply by 40% and that 3.9 billion people – close to half the world's population – will be living under conditions of water stress. The supply/demand imbalance could make water scarcer than oil and manifest itself in increased domestic social unrest and trans-boundary disputes (50 countries on five continents are potential locations for future conflicts over water)

Chart 22: Global water scarcity



Source: BofA Merrill Lynch Global Research (WDWW (Who Does What Where) Geographical Risk Screening Model)

Chart 23: Water demand to exceed supply by 40% by 2030



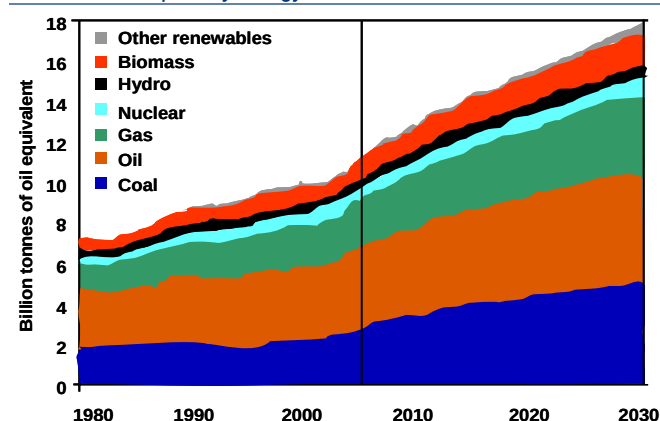
Source: Water 2030 Global Water, BofA Merrill Lynch Global Research

Short-term variations in economic growth have only marginal impacts on long-term energy and climate change trends

Global energy crisis

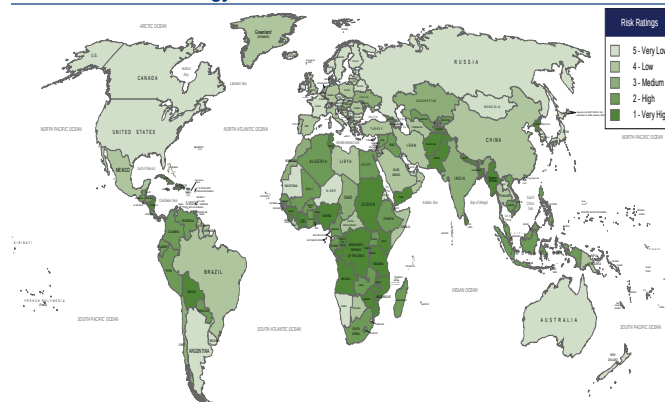
The world is facing a global energy crisis, with close to 9% of GDP being spent on energy. Primary energy demand is expected to increase by up to 50% by 2030 with demand to grow for all energy sources including coal, oil, natural gas, nuclear, hydro and renewables (Chart 24). Emerging markets will account for 90% of the projected growth in global energy demand. As a result, energy-related CO2 emissions are likely to increase by 20%, following a trajectory consistent with a long-term rise in the average global temperature in excess of 3.5°C – and potentially resulting in irreversible climate change, according to the IEA.

Chart 24: World primary energy demand to 2030



Source: IEA, BofA Merrill Lynch Global Research

Chart 25: Global energy infrastructure needs



Source: BofA Merrill Lynch Global Research (WDWW (Who Does What Where) Geographical Risk Screening Model)

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Commodities - Grain pains

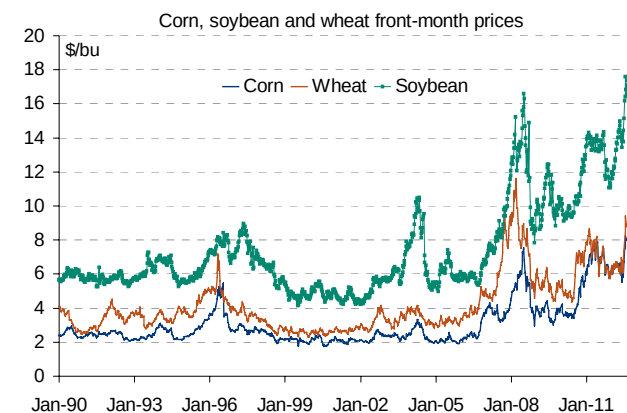
Due to one of the worst droughts ever...

The US has had the worst drought since the 1950s this year, which has stretched across the entire Corn Belt. An early and mild planting season bolstered expectations for a record US corn crop, but the drought changed that outlook dramatically. The combination of extremely hot and dry weather led to a sharp reversal in supply and demand fundamentals in the US and global grain markets, with soybean and corn balances tightening sharply. Meanwhile, extremely dry weather conditions in Europe, the Former Soviet Union (FSU) and Australia are also reducing the available supplies of wheat.

...crop conditions for corn and soybeans are very poor...

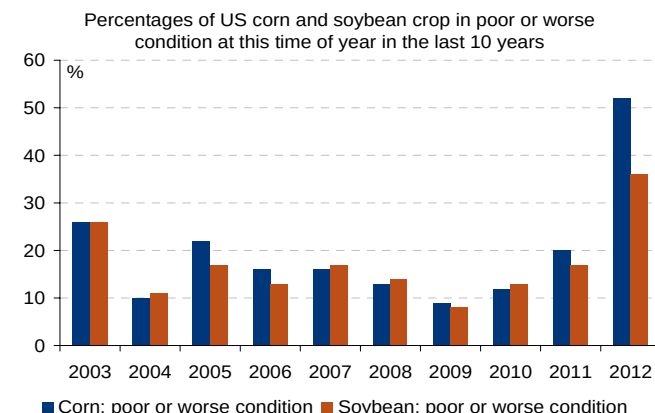
In response, prices recently surged in all major grains markets on the requirement for demand rationing (Chart 27). In the US, CME corn futures are up 29% since mid June, while wheat is up 43% and soybeans 21%. Although corn, soybean and wheat prices have retreated somewhat in recent days, they still hover at or close to previous record highs due to worsening crop conditions. According to the latest estimates, more than half the corn crop (52%) is in poor or worse condition, up from just 9% in mid June (Chart 27). The soybean crop also is exhibiting serious quality deterioration, with 36% rated in poor or worse condition. Overall, the quality of this crop is the worst in 24 years, despite large acreage expansion. Given the advanced maturity of this year's crop and the early stress it endured, the recent rain simply arrived too late.

Chart 26: The US has experienced the worst drought since the 1950s, and corn and soybean prices are now at record highs



Source: USDA, BofA Merrill Lynch Global Research

Chart 27: As a result, crop conditions for both corn and soybeans are now extremely poor when compared to history



Source: USDA, BofA Merrill Lynch Global Commodity Research

...leading to sharp revisions in corn and soybean yields

The adverse crop conditions have irreversibly damaged grain yields this harvest season, leading to significant production losses. From June to September the USDA cut its forecast for this year's corn yield by a whopping 43.2 to 122.8 bushels per acre, and the soybean yield by 8.6 to 35.3 bushels per acre. These are some of the biggest downward adjustments ever. In response, the USDA projects an annual decline of 14% in US soybean production and 13% in corn production

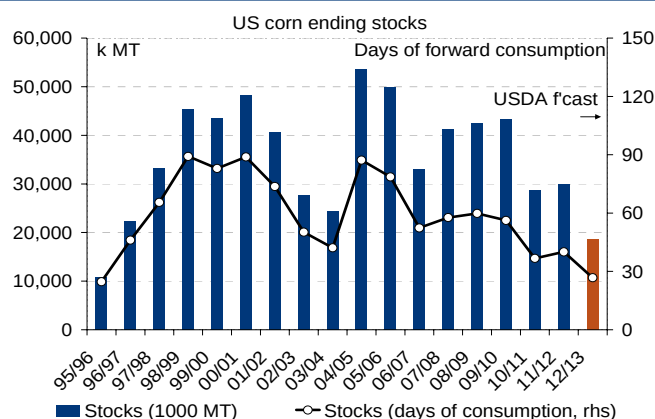
Dry conditions in FSU & Australia are supportive for wheat

Meanwhile, hot and dry weather elsewhere is not helping the wheat outlook. World wheat production also will likely decline as the harvest in Russia, Ukraine and Kazakhstan is disappointing. Jointly, the FSU exports 25% of global wheat, but production is expected to be down 30% from last year due to the lack of rain and severe drought. Despite government statements indicating that Russia will not ban wheat exports, the current pace of exports may not be maintained, and some form of restriction may be necessary to ensure adequate domestic supplies. Moreover, dry conditions in the major growing regions in Australia also are threatening yield potential. All these factors are providing support to wheat prices. Should the Russian export bans from 2010 be re-established, wheat prices would likely spike up substantially.

The crisis comes as global grain stocks sit at very low levels

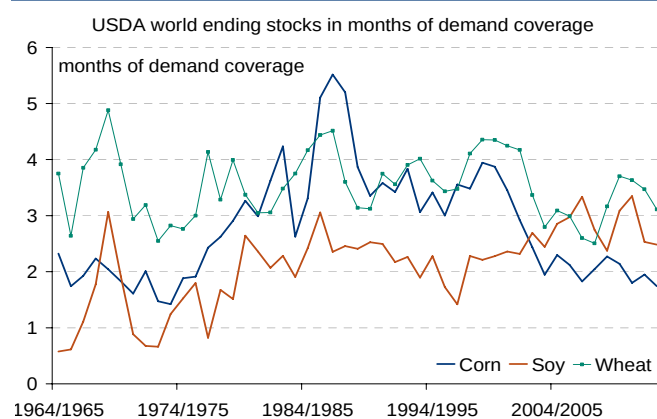
Unfortunately, the current crisis comes at a time when inventories are already at relatively low levels around the world. Because of sharply reduced production, US corn ending stocks at the end of the 2012-13 marketing year are expected to decline to 785 million bushels, from 1181 million bushels last year. The USDA projection is now 61% lower than in June (Chart 28). We estimate inventories will cover just 27 days of consumption, the lowest stocks-to-use ratio since 1995-96. US soybean stocks also are expected to fall due to the decline in production. Stocks of South American soybeans are low as well, thus requiring a record harvest in South America to avoid shortages in the coming year. Overall, stocks of corn, soybeans and wheat around the world are too low to provide an adequate cushion (Chart 29).

Chart 28: In the United States, corn ending stocks in the 2012-13 year have been revised lower by 65% from June



Source: USDA, BofA Merrill Lynch Global Commodity Research

Chart 29: Inventory levels for corn are right below two months of forward demand coverage, highlighting the limited available cushion



Source: USDA, BofA Merrill Lynch Global Commodity Research

...requiring demand rationing in the US and globally

The decline in available supplies and low inventories results in an urgent need to ration demand in the US and worldwide. Otherwise it is difficult to see how minimum operating levels for stocks can be maintained, especially in the case of US corn. We expect the feed sector to switch out of corn and into wheat domestically in the United States. US corn exports will have to decline because high US corn prices reduce demand for corn for feeding purposes globally. We also expect some corn-based ethanol rationing. Likewise, we expect demand for soybeans will have to be rationed globally.

Soybean, corn, wheat prices spike on fundamentals

All key agricultural commodity markets have tightened on the deteriorating supply outlook for this year. While wheat inventories are slightly above three months of forward demand coverage, demand substitution out of corn and into wheat could be creating further upside pressure. Potential substitution out of corn-based into sugar-based ethanol also has pushed sugar prices up.

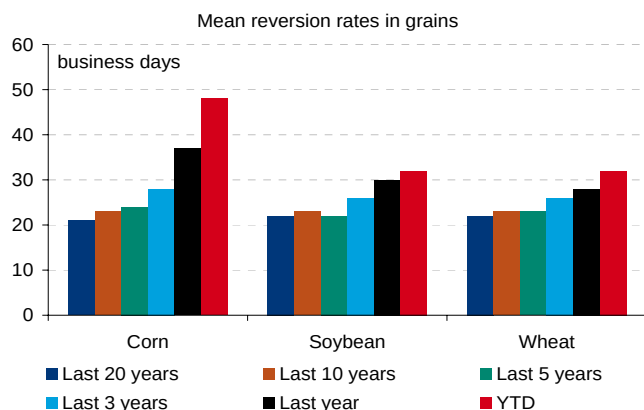
Volatility is still catching up

With crop conditions deteriorating rapidly for corn, and America facing the worst soybean crop since the devastating drought of 1988, realized volatility for both of these two key commodities has picked up. But the uplift in implied corn volatility has been much less pronounced than the actual move in realized vols. In our view, high prices, but also high volatility, will likely be needed to crowd out some corn demand and maintain minimal ending stocks for corn in the US.

High prices will crowd out some demand, eventually

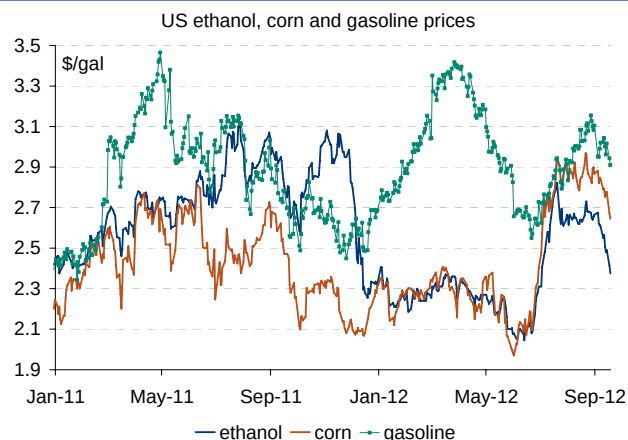
While it is always very challenging to call for the top in a market like corn or soybeans where inventories remain very low ahead of a bad crop, it is also true that grain prices typically show a great degree of mean reversion (Chart 30). The high prices will eventually crowd out some demand as rapid rationing is required in corn consumption in order to absorb the cut in production and maintain ending stocks for corn in the United States at minimum operating levels. High corn prices already have been squeezing margins at biofuel refineries, although more recently the drop in corn prices supported margins again (Chart 31). In our view, corn prices will have to remain high near-term in order to ration enough demand.

Chart 30: Even then, it is also true that grains prices typically show a great degree of mean reversion



Source: BofA Merrill Lynch Global Commodity Research

Chart 31: High corn prices will likely crowd out some demand as rapid rationing is required in corn consumption



Source: EIA, BofA Merrill Lynch Global Commodity Research

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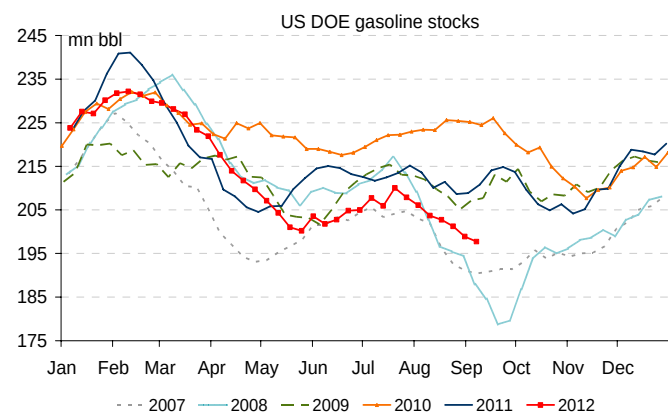
A corny threat to gasoline Gasoline demand could rise sharply...

The US gasoline market is undersupplied, as best reflected in strong refining margins and low gasoline inventories even as this is officially the end of the US driving season (Chart 32). However, the gasoline market could tighten further if the government was to waive the Renewable Fuel Standards (RFS)¹ given the repercussions of the drought. In this context it is important to remember that 40% of US corn is used to produce ethanol, and in turn, 10%, or about 850 thousand b/d, of all gasoline sold is ethanol. As a result of drought, the corn yield was revised lower, leading to sharply lower corn production forecasts (Chart 33).

...if the ethanol blending mandates are waived

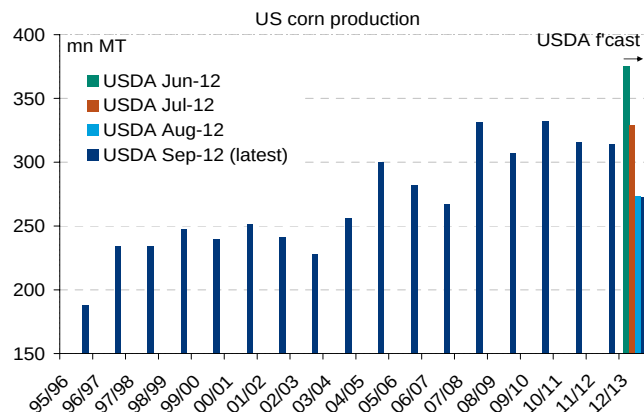
Although a temporary waiver of the government's ethanol blending mandate could alleviate the tightness in the US corn market, the loss in fuel ethanol production could generate additional gasoline demand. While unprecedented, such a step could be necessary if not enough corn demand can be rationed otherwise. In our view, a waiver of RFS poses a significant and positive tail-end risk for the oil market.

Chart 32: The US gasoline market is tight as best reflected in very low inventory levels



Source: EIA, BofA Merrill Lynch Global Commodities Research

Chart 33: The extreme drought and high temperatures in the Midwest has led to sharp downward revisions in US corn production



Source: USDA, BofA Merrill Lynch Global Commodities Research

A tight corn market requires large-scale demand destruction

The problem is further aggravated by low corn inventories following years of market deficits that have drawn down the available supplies. We believe the severe shortfall in US corn production will likely require significant demand rationing across the entire spectrum of corn demand, including ethanol production, or else inventories will drop even further. In the absence of demand destruction of at least 10% relative to last year, it is hard to see how the stocks-to-use ratio can remain above 5%, the minimum operating level.

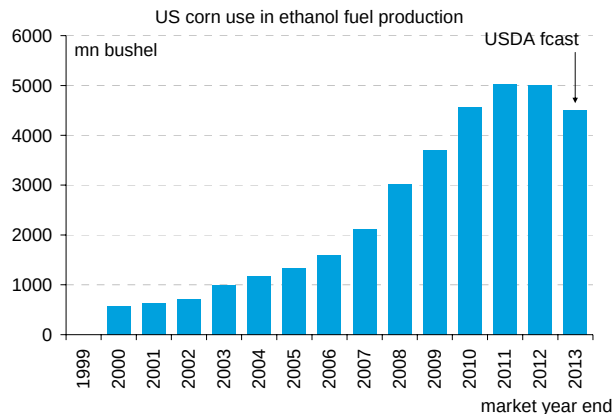
Ethanol production will have to fall substantially

In the absence of any ethanol demand destruction (i.e., repeating last year's corn consumption for ethanol production of 5,000 million bushels), we would require a combined reduction by other sources of corn demand of 450 million bushels for the corn stocks-to-use ratio to stay above the critical 5% level. This is equivalent

¹ 9 billion gallons of renewable fuel were required to be blended into transportation fuels (gasoline and diesel) in 2008 which increases to 36 billion gallons by 2022

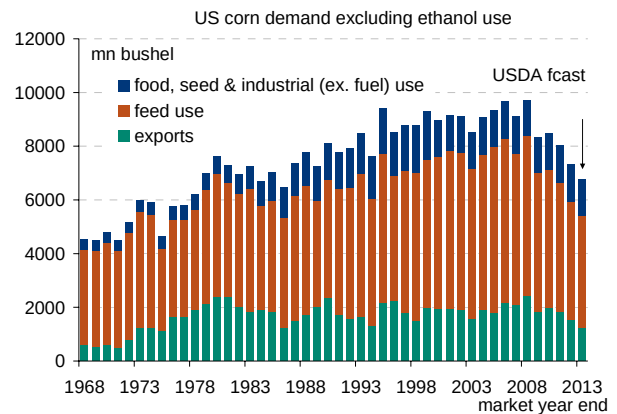
to a cut in non-fuel corn consumption (i.e., food, seed, industrial, feed and exports) of 16% down to the lowest level since the mid 70s – hardly a realistic projection. So it is difficult to avoid ethanol demand destruction given the acute tightness in corn. The USDA already assumes a 10% cutback in fuel ethanol production, equivalent to 90 thousand b/d of gasoline (Chart 34 and Chart 35).

Chart 34: Ethanol production will inevitably have to fall this year...



Source: USDA, BofA Merrill Lynch Global Commodities Research

Chart 35: ...as the burden on cutting back corn demand has to be shared across the entire spectrum of corn demand

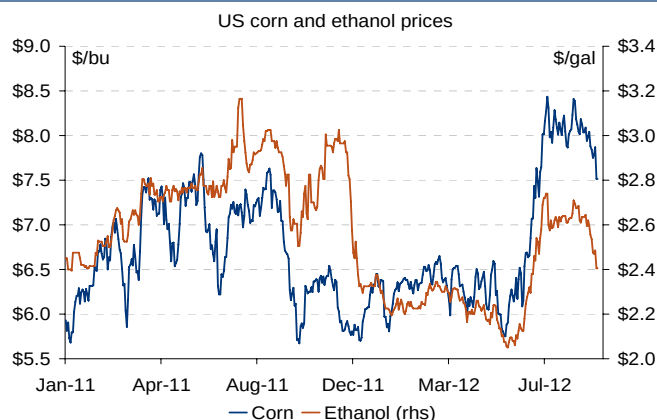


Source: USDA, BofA Merrill Lynch Global Commodities Research

For that, ethanol producer margins have to turn negative

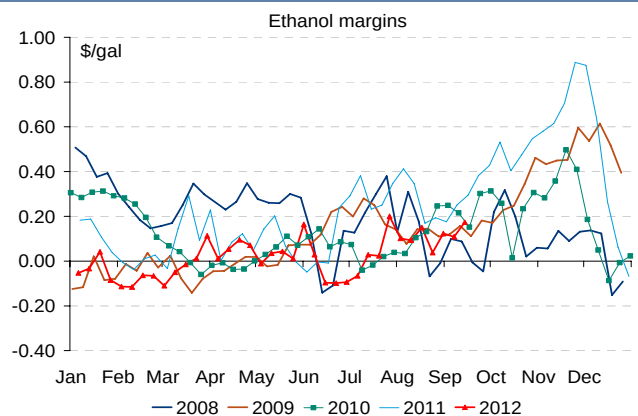
Put simply, we will require outright US ethanol production cutbacks to balance the US corn market. This will only occur if the price of corn is sufficiently high to push ethanol producer margins into negative territory. This began as the sharp rally in corn prices from the beginning of June to the end of July (up nearly 40%) outpaced the rise in ethanol prices (20%) (Chart 37). More recently, though, rising distillers dried grain (DDGS) prices, a by-product of ethanol sold as livestock feed, have been contributing meaningfully to ethanol producers' revenue, boosting margins into positive territory (Chart 38). Assuming current ethanol prices of \$2.55/gal, corn prices have to rise back up to 830 cents/bu, from 742 currently, to show zero producer margins.

Chart 36: The sharp rally in corn prices outpaced the rise in ethanol prices in June and July, contributing to negative producer margins



Source: USDA, BofA Merrill Lynch Global Commodities Research

Chart 37: More recently, ethanol margins turned up again, suggesting corn prices will have to stay high to ration enough demand

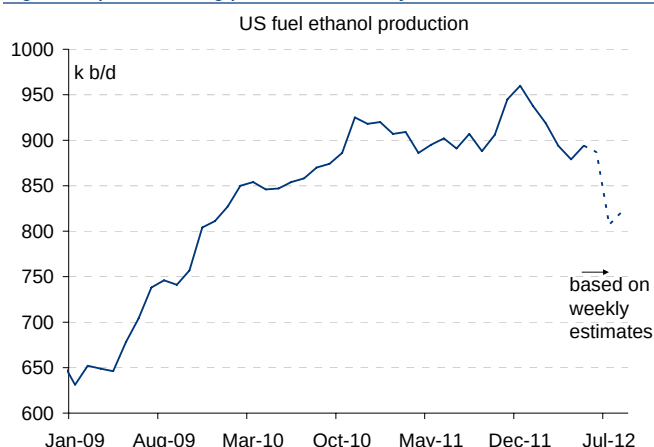


Source: Bloomberg, BofA Merrill Lynch Global Commodities Research

Ethanol production already has been declining

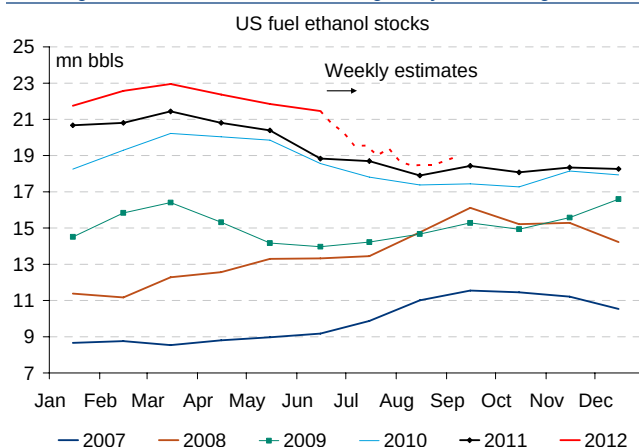
Ethanol production has already been impacted by high corn prices. After reaching highs of 960 thousand b/d at the end of December, ethanol production plummeted to three-year lows and currently stands at 816 thousand b/d (Chart 38). Ethanol production has been falling as rising corn prices have hurt margins so badly that producers are shutting in production. For instance, Valero has already shut down three ethanol plants totalling 330 million gal/yr of ethanol producing capacity, or 10% of the company's total capacity, and Valero reportedly only operated at half capacity in July. Due to falling output, ethanol stocks have been drawing rapidly since reaching record highs in March (Chart 39) and the surplus is diminishing quickly.

Chart 38: Ethanol production has already been severely impacted by high corn prices having plummeted to a 3-year low



Source: EIA, BofA Merrill Lynch Global Commodities Research

Chart 39: As a result, ethanol stocks have been falling rapidly after reaching record levels in March, although they are still high



Source: EIA, BofA Merrill Lynch Global Commodities Research

A key risk to lower ethanol production is waiving the RFS...

If the EPA is able to relax some mandated use of ethanol (13.8 billion gallons in 2013), this would quickly facilitate ethanol demand destruction. In turn, this could imply higher gasoline demand. Already, one-third of the US House and 25 Senators have asked the EPA to reduce or suspend ethanol blending targets. Five states (North Carolina, Arkansas, Georgia, New Mexico, and most recently Texas) have formally petitioned the EPA for a full or partial waiver on blending mandates on concerns that the price of feed for poultry and meat farmers is severely damaging the industry. The EPA is now accepting public comments for 30 days, and will have 90 days to mid-November to make a decision on granting the waiver.

...due to political reasons and precedence

Of course a key risk to this view is that ethanol use in the US cannot decline sharply because the RFS does not get waived. For one, political reasons could prove to be a deterrent. Corn Belt states like Iowa and Ohio are key battleground states and with the EPA decision deadline set for just weeks after the election, pressure may not be forthcoming. Secondly, a similar petition requested by Texas in 2008 was rejected, which set a high standard of precedence for a petition to be successfully granted. It would need to be shown that blending mandates caused severe harm to the overall economy, not just contributed to it. Still, as our analysis above shows, such a case can potentially be made given the severe shortfall of corn. In the absence of a waiver, corn prices might have to rise even further to achieve the required demand rationing out of corn.

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US Economics - Micro not macro

The economic impact of the drought will be micro – curbing farm production and boosting food prices – but it will have only a small macro effect. As we argue below, the farm industry is a small share of the economy and there is only partial pass-through of higher commodity food prices into prices of processed food. In the coming months, the high frequency data could be distorted by the drought, but it will not alter our overall outlook.

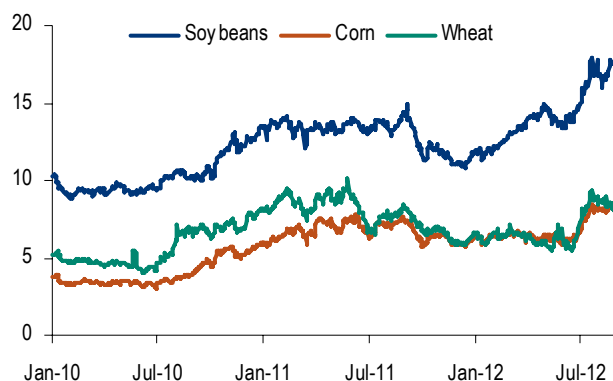
Price pressures and pass-through

The drought has hit the corn and soybean crops hard: according to the US Department of Agriculture (USDA) at the end of August, 86% of US corn acreage and 83% of soybean acreage had drought conditions. (These are down slightly from peaks of 89% and 88%, respectively, in late July.) The USDA's National Agricultural Statistics Service reported that for the week of August 26, 52% of US corn and 38% of the soybeans were rated in very poor to poor condition. On August 10, the USDA lowered its corn production forecast significantly, down 13% from 2011 to the lowest level since 2006 – and it expects the lowest average yield since 1995.

As a result, corn and soybean prices have risen 40% and 33%, respectively, from the end of May (Chart 40). Prices for other grains, such as wheat, have risen as well. We expect these grain price increases to eventually raise food prices and put additional upward pressure on headline inflation. However, the pass-through of volatile food commodity prices with food or general inflation is both lagged and incomplete. As a result of the drought, the USDA predicts that food prices will rise 0.5pp faster than otherwise in 2013 – up 3-4% on the year. The Kansas City Fed reaches a similar estimate. (Henderson, Jason and Nathan Kauffman, "Initial Impacts of the 2012 Drought," *The Main Street Economist Agricultural and Rural Analysis*, Federal Reserve Bank of Kansas City, Issue 2, 2012.)

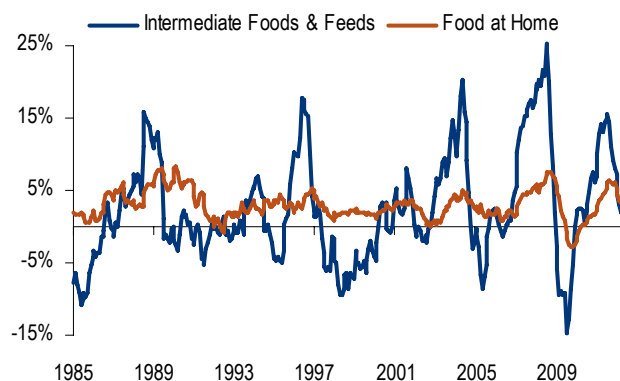
Why is the impact of higher grain prices on wholesale (producer) and retail (consumer) prices both muted and lagged? First, food prices travel through a chain of production in which pass-through is incomplete. Farmers and processors at various stages have limited market power, so some of the higher grain prices show up in reduced margins. The PPI for intermediate goods foods and feeds leads food at home in the CPI by about 3-6 months – but also is more than three times as volatile in recent decades (Chart 42).

Chart 40: Price of food commodities have increased (\$/bu)



Source: BofA Merrill Lynch Global Research, Wall Street Journal, Haver Analytics

Chart 41: Int. foods & feeds leads "food at home" (%yoy change)



Source: BofA Merrill Lynch Global Research, Bureau of Labor Statistics, Haver Analytics

The USDA estimates that only about \$0.24 out of every dollar spent on food at home – and less than \$0.05 of each dollar spent eating out – reflects the cost of farm commodity sales, which puts a limit on the size of the pass-through effect of higher grain prices and likely draws out its impact over time. The field corn crop is most adversely impacted from the current drought rather than the sweet corn that people eat directly off the cob. The vast majority of corn grown in the US is field corn: mostly used for animal feed, with about 40% diverted to ethanol production. The remainder is for commercial and industrial uses, including corn oil and corn syrup, which eventually is likely to impact prices of many processed foods.

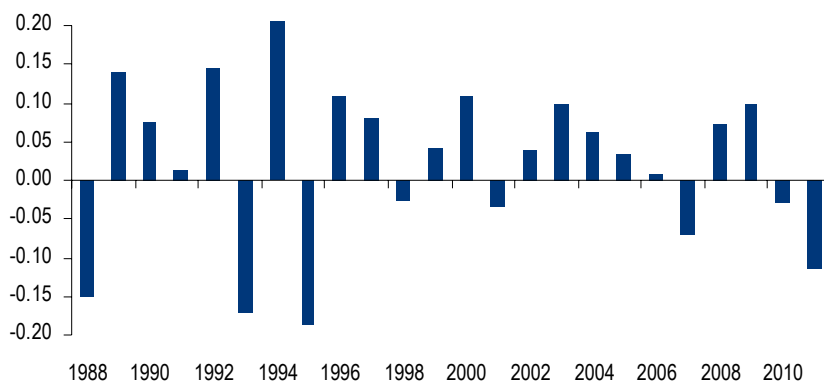
When food prices rise, consumers can and do cut back on their spending on food – substituting to cheaper foods when possible, and going to cheaper restaurants or choosing cheaper menu items. Research shows they also cut back somewhat on non-food purchases, all of which helps soften the blow to headline inflation. As a result, we expect the peak in monthly CPI inflation rates to occur by late fall, but the year-on-year inflation rate for the food component – which is about 14% of the total CPI – will likely peak next summer at around 3% annually. In addition to the reasons noted above, our below-consensus expectations for growth and employment next year also mute the jump in food inflation.

Interestingly, the USDA also anticipates that the price of beef and veal may be 0.5pp lower than otherwise, as ranchers react to the higher price of feed by culling their livestock more quickly than otherwise. Of course, a thinner herd next year may result in higher meat prices then. This dynamic has occurred during past shocks to feed grain supplies, according to researchers at the USDA and the Kansas City Fed. Overall, we expect a modest rise in food price inflation and a very muted impact on overall inflation, unless the drought were to worsen further.

Small impact on production

Farm output will affect the production side of the economy directly through crop output and indirectly through spending on agriculture machinery and other related goods. In total, however, the effect on the economic growth is limited given that the farm industry is a small share of the economy. To put it into perspective, farm output – which means crop production – is less than 1% of GDP. This means that only big swings in output will impact the GDP statistics. Chart 43 shows the average value added from the farm industry to GDP over the last few decades; the maximum absolute contribution was 0.2pp in the mid 1990s. The last time there was a summer drought comparable to the current episode was in 1988, when farm output sliced 0.15pp from annual growth.

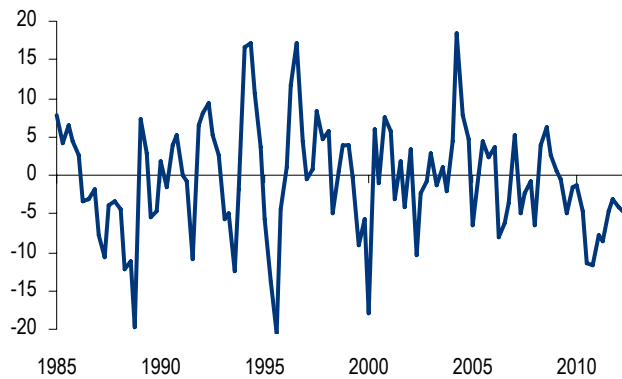
Chart 42: Average value added from farm industry to real GDP growth



Source: BofA Merrill Lynch Global Research, Bureau of Economic Analysis, Haver Analytics

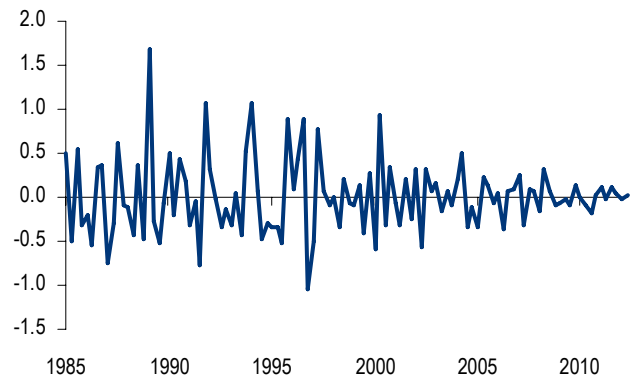
Simply examining the annual contribution will not reflect the potential quarterly distortions. The best way to look at the quarterly volatility is through farm inventories. Both crop production and consumption will lead to fluctuations in farm inventories. Since the mid 1980s, the change in farm inventories has remained in the range of +/- \$20bn (Chart 44). Compared to a \$15.6tr dollar economy, this is tiny amount. In addition, the change in farm inventories has shrunk as the economy has continued to grow, so it is even less important on a contribution basis (Chart 45). It is likely that farm inventories fall sharply in Q3 and Q4, accounting for a drag of a few tenths. However, this would be reversed in the subsequent quarters as farmers build back their inventory.

Chart 43: Change in farm inventories (\$,bn saar)



Source: BofA Merrill Lynch Global Research, Bureau of Economic Analysis, Haver Analytics

Chart 44: Contribution to GDP from farm inventories (pp, quarterly)



Source: BofA Merrill Lynch Global Research, Bureau of Economic Analysis, Haver Analytics

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GEMs - Food price spike; no rate hikes

Rising food prices, again

In recent weeks, the drought in the US and other Northern Hemisphere countries sent grain prices up as much as 27%.² In our view, this event, which is linked to the weather phenomenon known as “El Niño,” will have uneven consequences on growth among the global emerging markets (GEMs). This spike will likely lift up inflation, as food prices command a bigger share of the CPI basket in GEMs than in developed economies. But we do not expect central bankers in the emerging markets to hike policy rates in the short run, as the focus seems to be on growth at this point. Only a more protracted food price spike could push GEM central bankers to react, as in this scenario, other prices and inflation expectations could end up increasing as well.

A one-year or a two-year event?

The present drought will not necessarily impact agricultural yields in 2013 as well, according to experts we have contacted. A multi-year drought in the US corn areas is extremely rare, and has not happened since the 1930s. Most of the longer-run impact may involve winter wheat plantings. Corn planting after the winter will depend on whether soil moisture is recharged over the winter, so ultimately it will depend on the rains this fall and into the winter. The same applies to soybean production, in a context in which seeds from the next season may be brought from the Southern Hemisphere, where production promises to be strong.

The North-South divide on production

The weather phenomenon associated with the US drought has affected production in countries around the world, but the impact will be negative for some countries and positive for others. In general, countries in the Northern hemisphere have experienced less rain and will see a drop in agricultural production. The opposite applies to countries in the Southern hemisphere:

- **Asia ex-India.** [China is mostly self-sufficient in major grains](#), as net imports of rice, wheat and corn, as a percent of apparent consumption, were 0%, 0.7% and 0.8%, respectively, in 2011. Grain production has been increasing for eight years in a row, contributing to a significant accumulation of State reserves. Unlike the US, China's weather has not been so bad this year. In 2012, China's summer harvest (25% of annual production) increased 2.8%. In July, weather conditions for grain production were slightly worse than the historical average. This might have some impact on autumn crops (70% of annual production). However, the weather improved in early August, and China will most likely have a relatively fine autumn crop this year.
- **EEMEA.** Russia and South Africa will be the most affected countries, as we expect overall harvests to decline 15%. Continued droughts in the key food-producing regions of Russia have started to find their way into weaker harvest projections. As of 1H12, Russia had harvested 12% of its acreage, with an average productivity nearly 30% lower than last year. Droughts have also hit neighbouring Ukraine and Kazakhstan, where governments have cut the crop outlook on falling yields. In South Africa, maize stocks have improved significantly in recent months (67% yoy in June) and may temper the impact of the surge in US corn prices. Nevertheless, the South African Grain Information Service (SAGIS) is currently predicting the 2012/13 maize crop will be the smallest in five years, which may temper the ability of S. Africa to export large amounts of maize.

Table 4: *El Niño* effect through CPI food weight in EM

	El Niño impact	Food Weight on CPI
Asia		
China	Less rains	32.5
India	More rains	24.3
Indonesia	More rains	20.0
South Korea	Less rains	27.1
EEMEA		
Poland	No impact	24.2
Russia	Less rains	37.0
South Africa	More rains	25.4
Turkey	Less rains	26.2
LatAm		
Brazil	Less rains North, more rains South	23.2
Mexico	Less rains	23.3
Argentina	More rains	37.9

Source: BofA Merrill Lynch Global Research

² Measured by the Bloomberg Commodity Grain Index.

- **LatAm.** El Niño brings higher-than average rains in southern Brazil, Chile, Mexico, Uruguay, and central and northeast Argentina, and dry conditions to Colombia and northern Brazil. El Niño is expected to benefit Brazil's productivity, while the latest USDA World Agricultural Supply and Demand Estimates (WASDE) numbers point to a 7.0% yoy increase in the output of the five main crops. Argentina will definitely be the major LatAm winner. The September WASDE report forecasts Argentine soybean and corn production will increase around 33% yoy each.

Table 5: Wheat production (mmt)

	2010/ 2011	2011/ 2012 E	2012/ 2013 E
World	652	695	663
EU-27	136	137	133
China	115	118	118
India	81	87	94
United States	60	54	62
Russia	42	56	43
Canada	23	25	27
Australia	28	30	26
Pakistan	24	24	23
Middle East 1/	20	18	18
N. Africa 2/	16	18	17
Ukraine	17	22	15
Argentina	17	15	12
Kazakhstan	10	23	11
Brazil	6	6	5

Source: BofA Merrill Lynch Global Research, USDA World Agricultural Supply and Demand Estimates (WASDE) as of September, 2012

1/ Lebanon, Iraq, Iran, Israel, Jordan, Kuwait, Saudi Arabia, Yemen, United Arab Emirates, and Oman

2/ Algeria, Egypt, Libya, Morocco, and Tunisia

mmt = million metric tons

Table 6: Soybean grain production (mmt)

	2010/ 2011	2011/ 2012 E	2012/ 2013 E
World	265	236	258
Brazil	76	66	81
United States	91	83	72
Argentina	49	41	55
China	15	14	13
EU-27	1	1	1

Source: BofA Merrill Lynch Global Research, USDA World Agricultural Supply and Demand Estimates (WASDE) as of September, 2012

mmt = million metric tons

Table 7: Corn production (mmt)

	2010/ 2011	2011/ 2012 E	2012/ 2013 E
World	831	877	849
United States	316	314	274
China	177	193	200
Brazil	57	73	70
EU-27	56	65	62
Argentina	25	21	28
Southeast Asia 1/	23	25	26
Mexico	21	18	22
Ukraine	12	23	21
South Africa	11	12	14
Canada	12	11	13
Egypt	7	6	6
South Korea	0	0	0

Source: BofA Merrill Lynch Global Research, USDA World Agricultural Supply and Demand Estimates (WASDE) as of September, 2012

1/ Indonesia, Malaysia, Philippines, Thailand, and Vietnam

mmt = million metric tons

Rising inflation, but not much

Given that food prices take a relatively high share of EM CPI baskets (Table 4), it would be reasonable to expect an increase in headline inflation. Nevertheless, the global economic downturn could moderate these effects:

- **Asia ex-India.** In China, we expect the surge in US grain prices will most likely have a limited impact on food inflation because: (1) China is relatively self-sufficient in grain; (2) 57% of its soybean imports are from non-US markets, and additionally, US soybean production is less affected than corn production; (3) the major channel of transmission from global corn and soybean prices to China's inflation is pork, whose price cycle is independent and likely to be in a downturn in 2H12. China's domestic grain prices may respond somewhat to the global price surge, but the rise could be short lived. We expect 2012 and 2013 eop CPI inflation at 3.5% and 4.0%, respectively.
- **EEMEA.** We expect [food price inflation to rise significantly in 2H in EEMEA](#), with Russia being the most affected country. In Russia, we expect food inflation to add at least 300bp in the next 2-3 months. We have increased our 2012 eop CPI forecast to 6.7%, expecting it to drop to 4.9% by 2013 year-end. In South Africa, while we expect headline inflation to pick up further in the September data to 5.4%, we project relief in inflation over 4Q12, with headline inflation falling back toward 5%. Next year we expect pass-through from higher food prices to push headline inflation up to 6.0% by mid-year. We expect renewed inflation relief in 2H13, with headline CPI falling back to 5.0%

by end-2013. In Poland, food prices have been the main deflationary pressure on the index the last two months, despite the somewhat weaker harvest this year. We expect eop 2012 and 2013 CPIs at 3.9% and 2.0%, respectively. In Turkey, we believe the market expectations and CBT's forecasts for year-end 2012 and 2013 CPI inflation are too optimistic. We forecast year-end 2012 and 2013 CPI inflation at 6.8% and 8%, respectively, compared to the CBT's forecasts of 6.2% and 5.1%.

- **LatAm.** The biggest food inflation upside risks in LatAm are in Brazil, in our view. ([Food prices not deflationary anymore](#)). In Brazil, pressures from global and perishable food prices seem aligned and pointed upward. We expect inflation to remain above 5% in 2H, reaching 5.4% yoy in December (with upside risks). In Mexico, global food and perishable prices will likely move in opposite directions. Moreover, the impact of global corn prices on tortillas seems to be somewhat limited, as these are made of white corn, which is domestically produced – and its harvest was good. In the coming months, however, we expect inflation to stay above 4% yoy. In Chile, local and global food prices will also move in different directions. Perishable food disinflation has already run a long way, but pass-through to some prices such as bread seems higher. That could bring some upward inflation pressures in 2H.

GEM central bankers focused on growth

Food price changes may have some implications for the timing of monetary policy decisions. Food-price shocks like the ones we are considering are supply-side and non-persistent. As a result, they should not lead to monetary policy reactions unless they contaminate inflation expectations or other prices.

- **Asia ex-India.** In China, as the surge in US grain prices will have limited impact on food inflation, policies should continue to focus on bolstering growth. Further cuts to the reserve requirement ratio (RRR) and interest rates are needed to bolster growth. We expect the PBoC to cut RRR twice (100bp in total) and keep interest rate on hold before year-end 2012.
- **EEMEA.** In Russia, the CBR delivered a surprise rate hike in September, with the key reason being the acceleration of the headline inflation above its 6% target. Although this increases the risk of another 1-2 rate hikes this year, we consider CBR will stay on hold due to the economic slowdown. In South Africa, we expect the SARB could cut rates 50bp in November. In Poland, we increase the cumulative size of the easing cycle to 125bp over 2012 and 2013, up from 75bp previously. In Turkey we expect another 50bp cut in the lending rate.
- **LatAm.** In Brazil, we now expect the BCB to remain on hold at its next meeting in October, ending its easing cycle. In Mexico, we expect Banxico to remain on hold in 2H as inflation remains above the target band. Banxico is not in a rush to hike either, given the slack in the labour market. In Chile, the potential impact of higher food prices on inflation may marginally help delay cuts if it avoids headline inflation dropping below the target of BCCh.

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India - Drought growth, inflation risk

India will likely face drought in the autumn harvest, although a late revival of rains should protect next summer's crop. The seasonal rainfall deficit, at 5% of average, has slipped below the drought level of 10% from 20+% in mid July. This will likely reduce growth to 5% levels for the September and December 2012 quarters. It also will likely delay RBI rate cuts, as drought-driven agflation will likely stick inflation at high 8% levels given the recent diesel price hike.

In fact, growth concerns are aggravated by the fact that this is the first time the Indian economy will face drought at high interest rates, unlike in 2002 or 2009 when interest rates were soft. That said, the impact of a poor monsoon on the markets is relatively low. It is largely restricted to the three key sectors – autos, cement and consumers – that are most impacted by slackening of rural demand. Banks could also see an increase in agricultural non-performing loans. See our latest monsoon report [here](#).³

Delayed rains to hit autumn harvest

We expect delayed rains to impact the autumn harvest, although the recent revival should buffer the summer 2013 crop. The seasonal rainfall deficit, at 5% of average, has slipped below the drought level of 10% from 20+% in mid July (Chart 45). This has impacted the sowing of the autumn harvest in July and August. This, in turn, has shrunk cropped areas across most crops, except sugarcane.

Growth, rural demand to slow in 2H12

We expect growth to slow to 5% levels in the September and December quarters – from 5.5% in June – when the full impact of the drought will be felt (Table 8). Assuming that the delayed rains improve moisture conditions in the north, the summer 2013 harvest should be relatively normal. As a result we expect growth to revive to cross 6.5% in the March quarter.

We estimate that autumn – *kharif* – harvest's farm income will slow to 7.4% from 12.4% in 2011 and 37.7% in 2010 due to the ongoing drought. See our latest rural demand report [here](#).

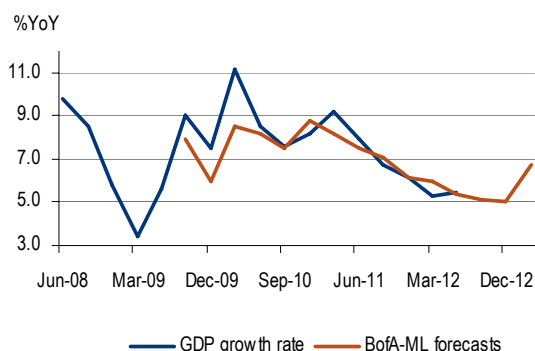
³ India has two main crops – the rice dominated autumn *kharif* and the wheat dominated winter *rabi* – that account for about 8% of GDP each.

Chart 45: Pick up in rainfall in recent weeks...



Source: IMD

Chart 46: Growth slowdown aggravated by drought



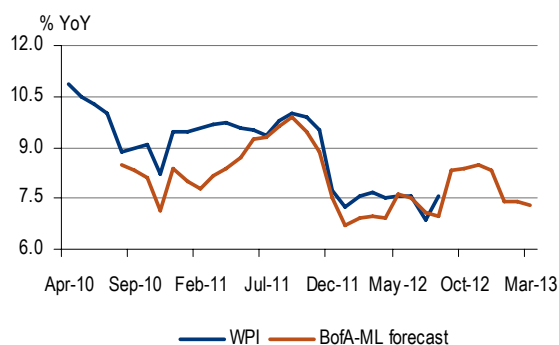
Source: CSO, BofA Merrill Lynch Global Research estimates

Table 8: ...has helped improve sowing since July

Crop/mn hectare	Normal area	September 21	% yoy	July 20	% yoy
Rice	35.9	36.4	-3.5	14.5	-6.5
Coarse cereals	20.9	17.6	-10.6	9.5	-23.8
Pulses	10.3	10.0	-6.5	4.0	-11.6
Oilseeds	17.4	17.5	-1.8	10.9	-16.1
Sugarcane	4.7	5.3	4.1	5.3	2.3
Cotton	10.9	11.5	-4.0	8.4	-10.4
Jute and mesta	0.9	0.9	--	0.8	-6.9

Source: Ministry of Agriculture

Chart 47: Rainfall deficit and oil price to push up agflation, inflation



Source: Ministry of Industry, BofA Merrill Lynch Global Research estimates

Agflation will keep inflation at 8% levels

We estimate that rising agflation will stick inflation at 8% levels in August and September, especially given the recent diesel price hike (Chart 48). A 5% swing in agflation impacts inflation by 175bp. This will likely force the Reserve Bank of India to put rate cuts on hold till inflation abates. At the same time, we expect the RBI to ease liquidity to support growth, given that growth is slipping below its 6.5% target (5.6% BofAMLe). See our latest inflation report [here](#).

Earnings will be under pressure

A poor monsoon results in weaker consumer demand, especially in rural areas. This results in earnings downgrades. The weight of the sectors hurt by monsoons is small, however, so the impact of the monsoon on overall EPS downgrades may be limited. We expect the trend of earnings downgrades over the last 18 months to continue, though the pace of downgrades will slow.

Market impact historically has been mixed

Even though sentiment-wise, a poor monsoon should lead to poor market performance, usually other factors such as general economic recovery or global events impact market performance more. Of the three years when rainfall was less than 90%, only one year had negative performance during the monsoon in June-September. Usually poor market performance during that period is followed by stronger performance in the October-December period (Table 10).

Table 9: Sensex usually recovers after drought

	Jun-Sep	Oct-Dec	Jan-Mar	Oct-Mar
Average	11.8%	2%	6.7%	8.3%
Drought years	10.0%	11%	-3.7%	6.8%
Non-Drought years	12.0%	0%	8.3%	8.5%

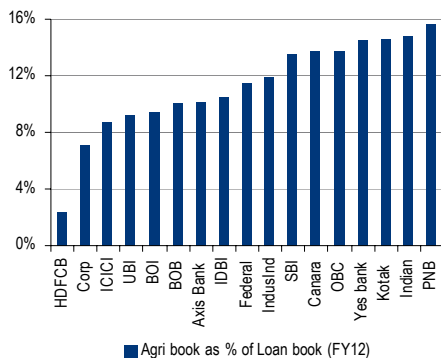
Source: BofA Merrill Lynch Global Research,
Drought years ('02, '04, '09)

Table 11: Auto company rural exposure high

Company	% of FY12 revenue from rural
Hero Motors	55%
Bajaj	35%
Maruti	25%
M&M (total)	45%
M&M (Tractors)	100%
M&M (UVs)	40%

Source: BofA Merrill Lynch Global Research

Chart 48: Agri book as % of Loan book (FY12)



Source: BofA Merrill Lynch Global Research; Companies

Table 10: No clear trend in Sensex performance in drought years

Drought year	Jun-Sep	Oct-Dec	Jan-Mar*	Oct-Mar*
2002	-4%	13%	-10%	1.9%
2004	17%	18%	-2%	16.3%
2009	17%	2%	0%	2.3%
Average	10%	11%	-4%	7%

Source: BofA Merrill Lynch Global Research

*Note: of next year

Sector impact

The monsoon influences rural income, so sectors with significant rural exposure will likely be impacted due to weak monsoons. However, when a poor monsoon season coincides with a general recovery in the economy, then the recovery takes center stage, resulting in stronger earnings growth as in 2009. So in our analysis we have excluded the 2009 data while looking at the impact of poor monsoons on the various sectors. Sectors likely to be hit due to poor monsoons include autos (especially two-wheelers), cement and consumer goods.

Autos

In previous years when the rains were weak, except 2009, auto volumes were typically weak during the monsoon period. Among the segments, 2W, 3W and the CVs were most impacted. Among auto companies with the highest exposure to the rural segment are Hero Motor (55%) followed by tractor maker M&M (45% total) (Table 6).

Cement

Cement demand may be hurt if construction activity is reduced due to a shortage of water. Falling rural demand may also hurt cement volumes. However, during the previous drought years the impact was minimal.

Consumers

In the event of drought and agflation, the three key issues to watch in our view are:

- Price hikes by companies to offset higher costs: Dabur is relatively better placed given lesser competitive intensity in its categories, while Nestle is worst off as its strong price hikes already hurt volume growth.
- Possibility of down trading: This is a bigger threat for commodity sensitive segments like soaps/detergents as well as personal products, so relatively negative for HUL and GCPL.
- Packaging costs: These are crude linked and can soften/worsen the impact of higher agri costs.

Banks

Poor monsoons also mean reduced ability of farmers to pay back agricultural loans, which would likely hurt banks, especially public sector undertaking (PSU) banks, which traditionally have higher exposure to the agri sector. A weak monsoon may increase the risk of agri nonperforming loans, increasing the stress on bank asset quality. Among the banks with relatively higher proportions of agri exposure are: PNB, Indian, Kotak, Yes Bank, OBC and SBI.

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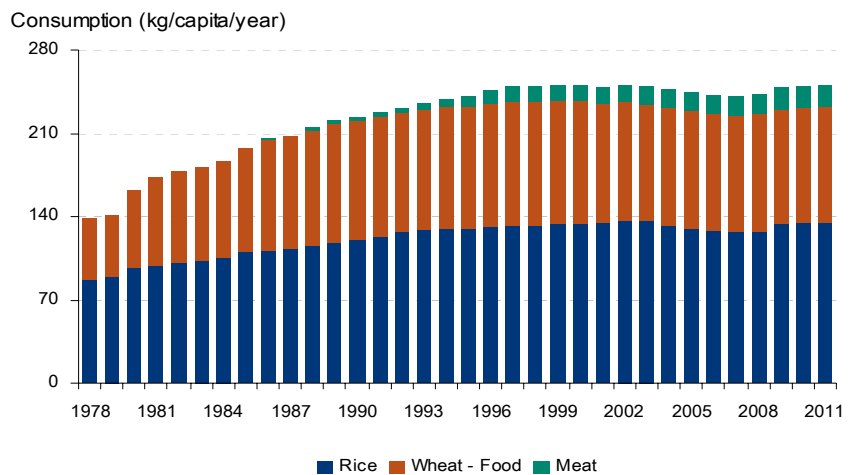
China - Less grain, more meat

China's grain consumption pattern has shifted noticeably in recent years – demand for rice and wheat as staples appear to have peaked. On the other hand, due to rising meat consumption, demand for corn as animal feed has been rising consistently. To reduce China's potential reliance on corn imports, the government recently started to discourage industrial uses of corn.

Diet change: less grain, more meat

Similar to what happened elsewhere, as the population becomes richer, the Chinese consume less staples but eat more high protein foods like meat, eggs, dairy products and fish (Chart 50).

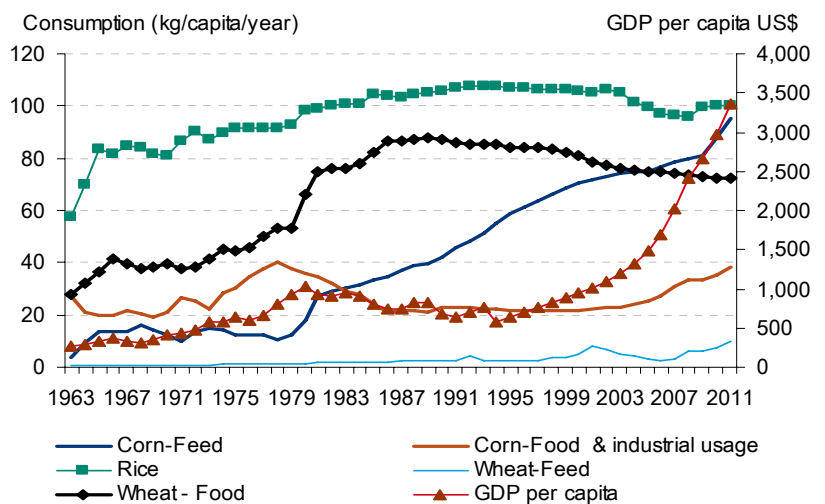
Chart 49: China's total food consumption 1978-2011



Source: USDA, CEIC, BofA Merrill Lynch Global Research

This is reflected by how grains are used in China over time (Chart 51).

Chart 50: China's per capita grain consumption 1963-2011



Source: USDA, CEIC, BofA Merrill Lynch Global Research

Per capita rice consumption has already peaked (Table 12). We estimate it is very likely China's total rice consumption may peak over the next few years as population growth slows.

Table 12: Rice consumption decline from the peak (Kg/capita/year)

	Peak	Now	Down
Japan	127	65	-49%
Korea	183	107	-42%
China	108	100	-7%

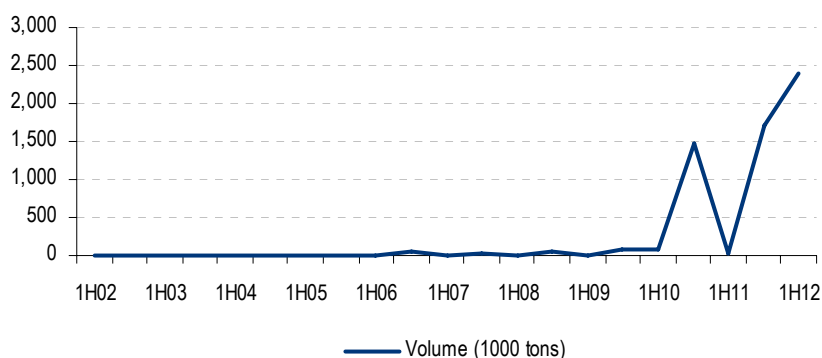
Source: USDA, CEIC, BofA Merrill Lynch Global Research

While rice is almost exclusively consumed as food, around 12% of China wheat output is used as animal feed (so far, there is little industrial use). While demand for wheat as a staple should decline, its use as animal feeds may increase. Between wheat and corn as animal feeds, Chinese farmers generally prefer corn because cattle and poultry prefer it. And, corn is usually cheaper. However, its price has risen in recent years due to a surge in industrial use, and lately the drought. As a result, there may be more feed demand switching to wheat. Wheat now accounts for about 10% of China's total animal feeds market.

Corn imports surged recently

China's corn imports have surged since 2010 as domestic inventory and output could no longer satisfy demand (Chart 51).

Chart 51: Corn imports surged recently

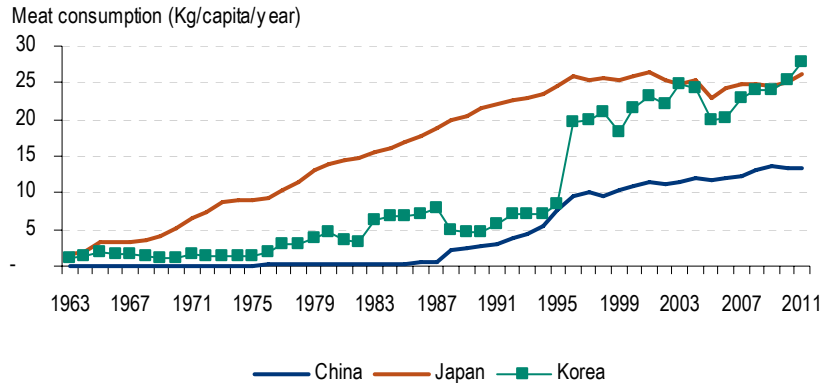


Source: CEIC, BofA Merrill Lynch Global Research

In 2008-2010, only 7-10% of corn was consumed by people in China, and we do not see any sign of a pickup in consumption. Rather the jump in corn demand is due to the rising feeds demand and industrial use.

China's per capita meat consumption has been on the rise but still lags far behind the levels in Japan and Korea (Chart 52).

Chart 52: China's per capita meat consumption is at half of the levels in Japan and Korea



Source: USDA, CEIC, BofA Merrill Lynch Global Research

Another significant influence on corn demand in China has been industrial use – between 2000 and 2011, it quadrupled and accounts for 30%+ of total corn consumption by now (though the central planner, NDRC, had wanted to cap the ratio at 26%). Industrial use mainly covers two areas: 1) ethanol production for both bio fuel and liquor; 2) starch, sugar and related products for F&B, paper and pharmaceutical. The split between the two was roughly 40/60 in 2010.

Industrial use of corn discouraged now

Concerned about the sharp rise in corn imports, the Chinese government has recently moved to discourage its industrial use. In April, the tax authority cancelled the 13% VAT input for industrial processors' corn purchase, which effectively raised the sector's effective VAT rate from 4% to 17%. On Aug 30, People's Daily, the Communist Party's official newspaper, conducted an interview with NIE Zhenbang, who retired four months ago from his post as the head of China's State Administration of Grain. NIE said that China should take serious measures to rein in corn's industrial uses in case China becomes too dependent on imports as it does for soybean. This suggests that additional policies are possible.

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The BofAML Global Fighting Drought Exposure stock list is not a recommended list either individually or as a group of stocks. Investors should consider the fundamentals of the companies and their own individual circumstances / objectives before making any investment decisions

Fighting Drought Exposure stock list

The current US drought underscores our long-standing view that we need to look for long-term solutions to the growing and interconnected challenges posed by the perfect storm of food, water and energy security and climate change.

As a result, together with our sector analysts, we have created a list of over 175 global stocks covered by BofA Merrill Lynch Global Research, which we consider as long-term solution providers in the fight against drought and in promoting food, water and energy security. Below we highlight the diverse range of entry points for those wishing to invest in the theme: 1) water (infrastructure, management, treatment); 2) fertilizers; 3) crop science; 4) farming; 5) energy efficiency (auto, buildings, industrials, it, LEDs and lighting, smart grid, transport); 6) second generation biofuels; and 7) renewables.

For each Fighting Drought theme, together with our BofAML Global Research sector analysts, we have estimated the level and materiality of companies' exposure to fighting drought and promoting food, water and energy security – and their combined role as a long-term growth driver. We have characterised each company's exposure as follows:

- **Low** – Fighting Drought products, services, and solutions are not material to global revenues and/or growth but are one factor, among others, for the business model, strategy and R&D of the company.
- **Medium** – Fighting Drought products, services, and solutions are an important factor for the business model, strategy and R&D of the company; material to sales and/or growth.
- **High** – Fighting Drought products, services, and solutions are core to the business model, strategy and R&D of the company; material sales and/or growth driver; pure play (i.e., 100% of sales from products, services or solutions which that help to fight drought).

Although it is difficult to accurately gauge the link between such exposure and share price performance (as many factors outside the scope of this analysis are likely to play a role in short- and long-term price development), we still consider fighting drought exposure an important and positive point to track given that drought is an increasingly present global reality.

Table 13: BofAML Global Fighting Drought Exposure stock list

Ticker	Name	Country	MCap (US\$ mn)	BofAML Ticker	BofAML Rating	Fighting drought sub-sector	FD exposure
ALFA SS	ALFA LAVAL	Sweden	7,830.29	ALFVF	NEUTRAL	WATER TREATMENT	Low
BN FP	DANONE	France	38,885.13	GPDNF	UNDERPERFORM	WATER TREATMENT	Low
034020 KS	DOOSAN HEAVY INDS.	Korea	5,427.82	DOHIF	BUY	WATER TREATMENT	Low
DOW US	DOW	United States	35,050.91	DOW	NEUTRAL	WATER TREATMENT	Low
DD US	DUPONT	United States	47,206.52	DD	BUY	WATER TREATMENT	Low
ECL US	Ecolab Inc	United States	18,666.28	ECL	BUY	WATER TREATMENT	Medium
GE US	GENERAL ELECTRIC	United States	236,731.41	GE	BUY	WATER TREATMENT	Low
HEXAB SS	HEXAGON AB	Sweden	7,745.00	HXGBF	BUY	WATER TREATMENT	Low
ICL IT	ISRAEL CHEMICALS	Israel	15,079.22	ISCHF	BUY	WATER TREATMENT	Low
KRA1V FH	KEMIRA	Finland	2,152.15	KMRAF	BUY	WATER TREATMENT	Low
3504 JP	Kuraray	Japan	4,049.96	KURRF	BUY	WATER TREATMENT	Low
6370 JP	Kurita Water	Japan	2,808.69	KTWIF	UNDERPERFORM	WATER TREATMENT	High
LXS GR	LANXESS	Germany	7,192.38	LNXSF	BUY	WATER TREATMENT	Low
7011 JP	MITSUBISHI HEAVY INDS	Japan	14,776.68	MHVYF	BUY	WATER TREATMENT	Low
NESN VX	NESTLE	Switzerland	204,691.94	NSRGF	NEUTRAL	WATER TREATMENT	Low

28 September 2012

Table 13: BofAML Global Fighting Drought Exposure stock list

Ticker	Name	Country	MCap (US\$ mn)	BofAML Ticker	BofAML Rating	Fighting drought sub-sector	FD exposure
PLL US	PALL CORP.	United States	7,160.59	PLL	NEUTRAL	WATER TREATMENT	Low
SCI SP	SEBACORP INDUSTRIES	Singapore	8,332.45	SCRPF	NEUTRAL	WATER TREATMENT	Low
SRCL US	StericYCLE	United States	7,756.70	SRCL	BUY	WATER TREATMENT	Low
3402 JP	TORAY INDUSTRIES	Japan	9,803.97	TRYIF	BUY	WATER TREATMENT	Low
VATW IN	VA TECH WABAG	India	231.66	XVWBF	BUY	WATER TREATMENT	High
6506 JP	Yaskawa Electric	Japan	1,715.73	YASKF	NEUTRAL	WATER TREATMENT	Low
DE US	Deere & Co	United States	33,043.76	DE	BUY	WATER MANAGEMENT	Low
ISXX US	Ilexx laboratories	United States	5,485.22	IDXX	BUY	WATER MANAGEMENT	Low
ITRI US	ITRON	United States	1,740.20	ITRI	BUY	WATER MANAGEMENT	Medium
MRO LN	MELROSE PLC	United Kingdom	5,000.50	MLSPF	BUY	WATER MANAGEMENT	High
SYNN VX	Syngenta Ag-Reg	Switzerland	33,841.64	SYENF	BUY	WATER MANAGEMENT	Low
ACM US	Aecom Technology	United States	2,312.79	ACM	UNDERPERFORM	WATER INFRA. & SUPPLY	Low
AGUAS/A CI	Aguas Andinas SA	Chile	4,139.50	XXSGF	BUY	WATER INFRA. & SUPPLY	High
AEG SJ	AVENG LTD	South Africa	1,491.90	AVEPF	UNDERPERFORM	WATER INFRA. & SUPPLY	Low
392 HK	BEIJING ENTERPRISES	Hong Kong	7,525.40	BJINF	BUY	WATER INFRA. & SUPPLY	Low
CSMG3 BZ	COPASA	Brazil	2,466.11	CSAOF	NEUTRAL	WATER INFRA. & SUPPLY	High
270 HK	Guangdong Invest.	Hong Kong	4,663.08	GGDVF	BUY	WATER INFRA. & SUPPLY	High
3 HK	Hong Kong & Ch. Gas	Hong Kong	21,543.40	HOKCF	BUY	WATER INFRA. & SUPPLY	Low
IAM CI	Invers. Aguas Met.	Chile	1,808.62	XVNF	UNDERPERFORM	WATER INFRA. & SUPPLY	High
IVRC IN	IVRCL Infrastructure	India	274.71	IIFRF	BUY	WATER INFRA. & SUPPLY	High
KEP SP	Keppel Corp	Singapore	16,604.78	KPELF	BUY	WATER INFRA. & SUPPLY	Low
KSB3 GR	Ksb Ag-Vorzug	Germany	873.58	KSVRF	BUY	WATER INFRA. & SUPPLY	Low
KEP SP	Kubota	Singapore	16,604.78	KPELF	BUY	WATER INFRA. & SUPPLY	Low
NJCC IN	Nagarjuna Const.	India	215.52	NGRJF	BUY	WATER INFRA. & SUPPLY	Low
OHLB3 BZ	Obrascon Huarte	Brazil	3,074.48	OHLNF	BUY	WATER INFRA. & SUPPLY	Low
PNN LN	Pennon GROUP PLC	United Kingdom	4,484.02	PEGRF	UNDERPERFORM	WATER INFRA. & SUPPLY	High
ROR LN	Rotork	United Kingdom	3,240.34	RTOXF	NEUTRAL	WATER INFRA. & SUPPLY	Low
SBS US	SABESP	United States	8,996.65	CSBJF	BUY	WATER INFRA. & SUPPLY	High
	Sabsep-ADR	United States	8,854.87	SBS	BUY	WATER INFRA. & SUPPLY	High
SVT LN	Severn Trent	United Kingdom	6,715.38	SVTRF	NEUTRAL	WATER INFRA. & SUPPLY	High
363 HK	SHANGHAI INDL HLDG	Hong Kong	3,182.25	SGHIF	BUY	WATER INFRA. & SUPPLY	Low
SEV FP	Suez Environnement	France	6,249.15	SZEVF	BUY	WATER INFRA. & SUPPLY	Medium
UU LN	United Utilities	United Kingdom	8,085.74	UUGWF	BUY	WATER INFRA. & SUPPLY	High
URS US	URS Corp	United States	2,631.89	URS	UNDERPERFORM	WATER INFRA. & SUPPLY	Low
VIE FP	Veolia	France	5,978.76	VEOEF	NEUTRAL	WATER INFRA. & SUPPLY	Medium
AKRN LI	Acron	Russia	2,170.26	XACJF	BUY	FERTILISERS	High
AGU US	Agrium Incorporated	United States	16,079.66	AGU	BUY	FERTILISERS	High
BG US	Bunge Limited	United States	10,169.78	BG	NEUTRAL	FERTILISERS	Low
CF US	CF INDUSTRIES	United States	13,597.89	CF	BUY	FERTILISERS	High
3983 HK	China BlueChem	Hong Kong	2,622.11	CBLUF	BUY	FERTILISERS	High
FATIMA PA	Fatima Fertilizer	Pakistan	530.03	XFTAF	BUY	FERTILISERS	High
FFBL PA	Fauji Bin Qasim	Pakistan	363.82	FJDF	UNDERPERFORM	FERTILISERS	High
FFC PA	Fauji Fertilizer	Pakistan	1,493.96	FAUJF	UNDERPERFORM	FERTILISERS	High
FHER3 BZ	Fertiliz. Heringer	Brazil	364.41	XFTLF	BUY	FERTILISERS	High
ICL IT	ICL (Israel Chemicals)	Israel	15,079.22	ISCHF	BUY	FERTILISERS	High
IPL AU	Incitec Pivot Limited	Australia	4,919.08	ICPVF	BUY	FERTILISERS	High
SDF GR	K+S Group	Germany	9,405.84	KPLUF	BUY	FERTILISERS	High
MOS US	Mosaic Group (The)	United States	24,556.59	MOS	BUY	FERTILISERS	High
PCHEM HK	Petronas Chemicals	Hong Kong	16,724.19	XOPNF	UNDERPERFORM	FERTILISERS	Low
OCIC EY	Orascom ConstrUCt.	Egypt	9,871.74	ORSCF	NEUTRAL	FERTILISERS	Medium
PHOR LI	Phosagro OAO	Russia	5,022.65	XTAZF	BUY	FERTILISERS	High
POT US	Potash Corp	United States	37,891.94	POT	NEUTRAL	FERTILISERS	High
SABIC AB	SABIC	Saudi Arabia	72,597.10	XAUBF	BUY	FERTILISERS	Low
SAFCO AB	SAFCO	Saudi Arabia	12,632.83	XDUAF	UNDERPERFORM	FERTILISERS	High
297 HK	Sinofert Holdings	Hong Kong	1,295.08	SNFRF	BUY	FERTILISERS	High
SQM US	SQM	United States	16,184.17	SQM	BUY	FERTILISERS	High
URKA LI	Uralkali	Russia	25,103.75	URALL	BUY	FERTILISERS	High
VALE US	VALE	United States	91,425.93	VALE	NEUTRAL	FERTILISERS	Low
BAS GR	BASF	Germany	80,518.83	BFFAF	BUY	CROP SCIENCE	Medium
BAYN GR	Bayer	Germany	72,891.33	BAYZF	BUY	CROP SCIENCE	Low

28 September 2012

Table 13: BofAML Global Fighting Drought Exposure stock list

Ticker	Name	Country	MCap (US\$ mn)	BofAML Ticker	BofAML Rating	Fighting drought sub-sector	FD exposure
DOW US	Dow	United States	35,050.91	DOW	NEUTRAL	CROP SCIENCE	Low
DD US	DuPont	United States	47,206.52	DD	BUY	CROP SCIENCE	Medium
MON US	Monsanto	United States	48,734.46	MON	BUY	CROP SCIENCE	High
MUF AU	Nufarm Limited	Australia	1,586.70	NUFMF	BUY	CROP SCIENCE	High
SYNN VX	Syngenta	Switzerland	33,841.64	SYENF	BUY	CROP SCIENCE	High
AGRO US	ADECOAGRO	United States	1,195.89	AGRO	BUY	FARMING	High
GGR SP	GOLDEN AGRI-RESOURCES	Singapore	6,443.82	GARPF	BUY	FARMING	High
FR SP	FIRST RESOURCES	Singapore	2,482.51	XUOEF	BUY	FARMING	High
SIMP U	PT SALIM IVOMAS PRATAMA TBK		2,114.35	XLMFF	BUY	FARMING	High
CZZ US	Cosan Ltd	United States	4,079.33	CZZ	BUY	ADVANCED BIOFUELS	Low
CSAN3 BZ	Cosan SA Ind Com	Brazil	7,267.49	CSIDF	BUY	ADVANCED BIOFUELS	Low
DD US	DuPont	United States	47,206.52	DD	BUY	ADVANCED BIOFUELS	Low
NES1V FH	Neste Oil	Finland	3,340.57	NTOIF	NEUTRAL	ADVANCED BIOFUELS	High
RDSB LN	Royal Dutch Shell	United Kingdom	230,338.51	RYDBF	NEUTRAL	ADVANCED BIOFUELS	Low
AQP LN	AQUARIUS PLATINUM	United Kingdom	334.34	AQBF	UNDERPERFORM	EFFICIENCY – AUTO	Low
BWA US	BORGWARNER INC	United States	8,278.41	BWA	BUY	EFFICIENCY – AUTO	High
CON GR	CONTINENTAL AG	Germany	20,224.70	CTTAF	NEUTRAL	EFFICIENCY – AUTO	Medium
JCI US	JOHNSON CONTROLS INC	United States	18,748.18	JCI	BUY	EFFICIENCY – AUTO	Medium
JMAT LN	JOHNSON MATTHEY PLC	United Kingdom	8,282.91	JMPLF	NEUTRAL	EFFICIENCY – AUTO	Low
LXS GR	LANXESS	Germany	7,192.38	LNXSF	BUY	EFFICIENCY – AUTO	Low
LKQX US	LKQ CORP	United States	5,666.19	LKQ	UNDERPERFORM	EFFICIENCY – AUTO	Low
MGA US	MAGNA INTERNATIONAL	United States	10,319.00	MGA	BUY	EFFICIENCY – AUTO	Medium
SOLB BB	SOLVAY	Belgium	9,956.19	SVYSF	BUY	EFFICIENCY – AUTO	Low
TESLA US	TESLA MOTORS INC	United States	3,381.12	TESLA	NEUTRAL	EFFICIENCY – AUTO	High
3402 JP	TORAY INDUSTRIES INC	Japan	9,803.97	TRYIF	BUY	EFFICIENCY – AUTO	Low
VCT LN	VICTREX Plc	United Kingdom	1,840.43	VTXPF	NEUTRAL	EFFICIENCY – AUTO	Low
CSR AU	CSR LIMITED	Australia	835.47	CSRLF	UNDERPERFORM	EFFICIENCY – BUILDINGS	Medium
IR US	INGERSOLL RAND	United States	14,092.36	IR	NEUTRAL	EFFICIENCY – BUILDINGS	High
JCI US	JOHNSON CONTROLS	United States	18,748.18	JCI	BUY	EFFICIENCY – BUILDINGS	Medium
KNEBV FH	KONE	Finland	18,128.34	KNYJF	UNDERPERFORM	EFFICIENCY – BUILDINGS	High
5202 JP	NIPPON SHEET GLASS	Japan	638.10	NPSGF	UNDERPERFORM	EFFICIENCY – BUILDINGS	Medium
UTX US	UNITED TECHNOLOGIES	United States	71,503.47	UTX	BUY	EFFICIENCY – BUILDINGS	Low
ABBV VX	ABB LTD	Switzerland	44,512.12	ABLZF	BUY	INDS. & INTEG.	Medium
ALFA SS	ALFA LAVAL	Sweden	7,830.29	ALFVF	NEUTRAL	INDS. & INTEG.	Medium
ALO FP	ALSTOM	France	10,928.30	AOMFF	BUY	INDS. & INTEG.	Medium
ATCOA SS	ATLAS COPCO AB-A SHS	Sweden	29,013.94	ATLKF	NEUTRAL	INDS. & INTEG.	Low
CRG IN	CROMPTON GREAVES	India	1,549.28	CPGZF	BUY	INDS. & INTEG.	Low
2308 TT	DELTA ELECTRONICS	Taiwan	9,349.86	DLTEF	NEUTRAL	INDS. & INTEG.	High
ETN US	EATON CORP	United States	15,767.51	ETN	BUY	INDS. & INTEG.	Low
ELUXB SS	ELECTROLUX AB-SER B	Sweden	7,220.36	ELUXF	NEUTRAL	INDS. & INTEG.	Medium
G1A GR	GEA		5,642.02	GEAGF	BUY	INDS. & INTEG.	High
GE US	GENERAL ELECTRIC CO.	United States	236,731.41	GE	BUY	INDS. & INTEG.	Medium
HEXAB SS	HEXAGON AB		7,745.00	HXGBF	BUY	INDS. & INTEG.	Low
HXL US	HEXCEL CORP	United States	2,411.27	HXL	BUY	INDS. & INTEG.	High
ISYS LN	INVENSYS PLC	United Kingdom	3,138.64	IVNSF	NEUTRAL	INDS. & INTEG.	Low
MEO1V FH	METSO	Finland	5,605.38	MXTOF	NEUTRAL	INDS. & INTEG.	Low
NEX FP	NEXANS	France	1,376.40	NXPRF	UNDERPERFORM	INDS. & INTEG.	Medium
PHIA NA	PHILIPS ELECTRONICS	Netherlands	22,722.22	PHGFF	NEUTRAL	INDS. & INTEG.	Medium
PRY IM	PRYSMIAN	Italy	3,972.78	PRYMF	BUY	INDS. & INTEG.	Low
RXL FP	REXEL SA	France	5,490.79	RXLSF	NEUTRAL	INDS. & INTEG.	Low
SU FP	SCHNEIDER ELECTRIC SA	France	33,950.43	SBGSF	BUY	INDS. & INTEG.	Medium
SIE GR	SIEMENS AG-REG	Germany	89,559.56	SMAWF	NEUTRAL	INDS. & INTEG.	Medium
SIEM IN	SIEMENS INDIA	India	4,620.45	SMNBF	UNDERPERFORM	INDS. & INTEG.	Low
6273 JP	SMC CORP	Japan	10,823.66	SMECF	BUY	INDS. & INTEG.	High
SPX LN	SPIRAX-SARCO ENG.	United Kingdom	2,712.60	SPXSF	NEUTRAL	INDS. & INTEG.	High
VK FP	VALLOUREC	France	5,361.24	VLOUF	UNDERPERFORM	INDS. & INTEG.	Low
AMZN US	AMAZON	United States	114,111.92	AMZN	BUY	EFFICIENCY - IT	Low
AMD US	AMD	United States	2,424.74	AMD	UNDERPERFORM	EFFICIENCY – IT	High

28 September 2012

Table 13: BofAML Global Fighting Drought Exposure stock list

Ticker	Name	Country	MCap (US\$ mn)	BofAML Ticker	BofAML Rating	Fighting drought sub-sector	FD exposure
ARM LN	ARM HOLDINGS	United Kingdom	13,261.42	ARMHF	BUY	EFFICIENCY – IT	High
ASML NA	ASML	Netherlands	22,104.53	ASMLF	BUY	EFFICIENCY – IT	High
CSCO US	CISCO SYSTEMS	United States	99,232.47	CSCO	BUY	EFFICIENCY – IT	Medium
EMC US	EMC CORPORATION	United States	60,021.00	EMC	BUY	EFFICIENCY – IT	High
EQIX US	EQUINIX INC	United States	9,533.96	EQIX	BUY	EFFICIENCY – IT	High
GOOG US	GOOGLE	United States	244,809.57	GOOG	BUY	EFFICIENCY – IT	Low
HPW US	Hewlett-Packard CO	United States	32,968.83	HPQ	BUY	EFFICIENCY – IT	Low
IBM US	IBM	United States	236,153.09	IBM	NEUTRAL	EFFICIENCY – IT	Low
INTC US	INTEL	United States	113,196.89	INTC	BUY	EFFICIENCY – IT	High
INXN US	INTERXION	United States	1,454.94	INXN	BUY	EFFICIENCY – IT	High
CRM US	SALESFORCE.COM	United States	24,340.80	CRM	BUY	EFFICIENCY – IT	High
TCY LN	TELECITY GROUP	United Kingdom	2,888.71	TLCTF	BUY	EFFICIENCY – IT	High
VMW US	VMWARE	United States	42,119.64	VMW	BUY	EFFICIENCY – IT	High
CREE US	CREE INC	United States	2,984.93	CREE	UNDERPERFORM	EFFICIENCY – LED & LIGHT.	High
2448 TT	EPISTAR	Taiwan	1,835.91	EPIPF	UNDERPERFORM	EFFICIENCY – LED & LIGHT.	High
2393 TT	EVERLIGHT ELECTR.	Taiwan	664.64	EVLEF	UNDERPERFORM	EFFICIENCY – LED & LIGHT.	High
PHIA NA	PHILIPS ELECTRONICS	Netherlands	22,722.22	PHGFF	NEUTRAL	EFFICIENCY – LED & LIGHT.	Medium
046890 KS	Seoul Semicond.	Korea	1,135.51	SLSOF	UNDERPERFORM	EFFICIENCY – LED & LIGHT.	1High
SIE GR	SIEMENS	Germany	89,559.56	SMAWF	NEUTRAL	EFFICIENCY – LED & LIGHT.	Medium
ITRI US	ITRON	United States	1,740.20	ITRI	BUY	EFFICIENCY – SMART GRID	High
MRO LN	MELROSE	United Kingdom	5,000.50	MLSPF	BUY	EFFICIENCY – SMART GRID	High
SQM US	SQM	United States	16,184.17	SQM	BUY	EFFICIENCY – SMART GRID	Low
ALO FP	ALSTOM sa	France	10,928.30	AOMFF	BUY	EFFICIENCY - TRANSPORT	Medium
BBD/B CN	BOMBARDIER INC	Canada	6,472.86	YBBD B	UNDERPERFORM	EFFICIENCY – TRANSPORT	High
CNI US	CANADIAN NTNL. Rail.	United States	38,919.94	CNI	NEUTRAL	EFFICIENCY – TRANSPORT	High
1186 HK	CHINA RAILWAY CONST.	Hong Kong	10,231.76	CWYCF	NEUTRAL	EFFICIENCY – TRANSPORT	Medium
390 HK	CHINA RAILWAY GROUP	Hong Kong	8,791.04	CRWOF	BUY	EFFICIENCY – TRANSPORT	High
1766 HK	CSR Corporation	Hong Kong	8,670.56	CSRGF	UNDERPERFORM	EFFICIENCY – TRANSPORT	High
FGP LN	FIRSTGROUP PLC	United Kingdom	1,987.29	FGROF	UNDERPERFORM	EFFICIENCY – TRANSPORT	High
GOG LN	Go-Ahead Group Plc	United Kingdom	945.88	GHGUF	NEUTRAL	EFFICIENCY – TRANSPORT	High
525 HK	Guangshen Railway	Hong Kong	2,183.53	GNGYF	NEUTRAL	EFFICIENCY – TRANSPORT	High
NEX LN	NATIONAL EXPRESS	United Kingdom	1,807.38	NXPGF	BUY	EFFICIENCY – TRANSPORT	High
SGC LN	STAGECOACH GROUP	United Kingdom	2,667.45	SAGKF	BUY	EFFICIENCY – TRANSPORT	High
VOS GR	VOSSLOH	Germany	1,131.72	VOSSF	NEUTRAL	EFFICIENCY – TRANSPORT	High
YZJ SP	Yangzijiang Ship.	Singapore	3,035.69	YSHLF	NEUTRAL	EFFICIENCY – TRANSPORT	Low
3898 HK	Zhuzhou CSR	Hong Kong	2,760.51	ZHUZF	UNDERPERFORM	EFFICIENCY - TRANSPORT	High
ENPH US	Enphase Energy Inc	United States	218.50	ENPH	BUY	CLEANTECH	High
FSLR US	First Solar Inc	United States	1,787.43	FSLR	BUY	CLEANTECH	High
3800 HK	GCL-Poly	United States	2,324.46	GCPEF	BUY	CLEANTECH	High
JASO US	JA Solar	United States	167.15	JASO	UNDERPERFORM	CLEANTECH	High
PWER US	Power-One	United States	818.42	PWER	UNDERPERFORM	CLEANTECH	High
SOL US	ReneSola	United States	132.81	SOL	UNDERPERFORM	CLEANTECH	High
SQM US	SQM	United States	16,184.17	SQM	BUY	CLEANTECH	High
SPWR US	Sunpower Corp-A	United States	536.83	SPWR	UNDERPERFORM	CLEANTECH	High
STP US	Suntech Power	United States	168.80	STP	UNDERPERFORM	CLEANTECH	High
TSLA US	Tesla	United States	3,381.12	TSLA	NEUTRAL	CLEANTECH	High
TSL US	Trina Solar	United States	320.60	TSL	BUY	CLEANTECH	High
YGE US	Yingli Green Energy	United States	272.81	YGE	BUY	CLEANTECH	High

Source: BofA Merrill Lynch Global Research. FD exposure = BofAML estimates of current sales derived from fighting drought and in promoting food, water and energy security-related products, services, technologies and solutions.

Population increase, higher living standards, over-exploitation of water, water pollution, ecosystem degradation and adverse climate change will mean that water demand will overshoot supply

Water

Water scarcity is a global reality – 1 billion people lack access to clean drinking water, 2.6 billion have no access to improved sanitation services and 1.4 million children under five die a year as a result of poor access to clean water and adequate sanitation (Chart 25). Water is under growing pressure both on the supply side (insufficient freshwater, uneven distribution, poor quality, non-revenue water, climate change) and the demand side (agriculture, industry, residential).

Water will become the oil of the 21st Century

In our *The Global Water Sector* report, we set out our view that the long-term supply challenges are enormous – and with no improvement in the efficiency of agricultural, industrial and residential water use, demand is projected to overshoot supply by 40% in the next 20 years, with half the world's population living under conditions of water stress by 2030. In our view, water may become scarcer than oil, with potential for the supply/demand imbalance to manifest in increased domestic social unrest and trans-boundary disputes (50 countries on five continents are potential locations for future conflicts over water).

US\$500bn market of up to 6% CAGR, US\$800bn by 2030-35

The current global dynamics of water supply and demand mean that the water sector offers numerous growth opportunities for those with exposure to the industry's value chain, in our view. Water is a US\$500bn market today, which, despite the recession, is delivering an estimated CAGR of up to 6% (Source: Global Water Intelligence). By 2030-35, we estimate that the water industry could be worth between US\$800bn and US\$1tn, with Asia and South America seeing the biggest growth as they tackle their burgeoning water needs and develop adequate infrastructure, often from scratch. For developed markets, the task is equally daunting, but will present lower growth opportunities linked to the upgrading and maintenance of their often antiquated water infrastructure.

Fighting drought via water stock list

We have mapped the global water sector's value chain and see find long-term opportunities for companies with exposure to three main areas: 1) water treatment: wastewater, industrial treatment, desalination, ballast water treatment, analysis, water quality, and bottled water; 2) water management: leak detection, smart metering technology, irrigation and household water management; and 3) water infrastructure: pipes, pumps and valves, engineering and construction; and supply: utilities).

Water treatment

In our view, a number of stocks are well placed to benefit from the theme of water treatment through their involvement in areas such as wastewater, industrial treatment, desalination, ballast water treatment, analysis, water quality, and bottled water, among other areas.

Water treatment will be key given rising water scarcity and increasing demand across agricultural, residential and industrial demand. Agriculture currently accounts for 70% of water use and demand will mount on the back of new diets. Industry will be under pressure to treat water as global demand rises from 22% of total demand to levels closer to the current 59% in developed markets.

There are significant opportunities around water treatment or the processes used to make water more acceptable for a desired end-use such as drinking water, usage or re-usage by industry, or return to the natural environment. Moreover,

this market is barely tapped with insufficient wastewater treatment around the world. For instance, wastewater reuse only stands at 2.41% of all water withdrawals globally (Source: FAO Aquastat). Globally, the estimate on total water reuse is less than the water used each day by US toilets at home. The ultimate goal needs to be to move to Israel and GCC-levels of water reuse of up to 75%.

Water management

In our view, a number of companies are well placed to benefit from the theme of water management, vis-à-vis their involvement in areas such as leak detection, smart metering technology, high-tech and micro irrigation and household water management.

Water management has assumed greater importance in recent years as a strategy to improve efficiency and the sustainable use of resources. Water usage is growing faster than population growth – with US usage alone increasing 207% from 1950-2000 and per capita usage growing by 20% during that time (Source: EPA). In a situation of growing water scarcity, fragmented water management (and conflicting interests of stakeholders) is no longer cost effective or sustainable in the long term. Instead, there is also growing recognition that the current water crisis is as much a consequence of weak policies and poor management as natural scarcity. Effective water management enables users to reduce their demand, mitigate the risks associated with its shortage and reduce the need for capex intensive solutions.

More attention is now being paid to water losses and unaccounted for water, whether it is due to inefficient usage, leakages or information deficiencies. Given that agriculture accounts for 70% of global water use – as high as 95% in some EMs – and up to 60% of this water is wasted, smarter irrigation will be key to achieving more crop per drop. There is huge potential given that only 14% of irrigated land uses micro-irrigation and low energy precision application still has low global penetration.

Leakage and non-revenue water also costs utilities upward of US\$20bn/year in lost revenues, which should create substantial downstream basic and smart meter demand from water utilities. We forecast annual water meter spending to reach \$3.3 billion by 2016. Finally water efficiency will become as important as energy efficiency as 70% of the global population becomes urban by 2050.

Water infrastructure and supply

In our view, a number of companies are well placed to benefit from the theme of water infrastructure, vis-à-vis their involvement in areas such as construction and engineering, pipes, pumps and valves, water supply.

Water and sanitation infrastructure is sorely lacking in many emerging and developed markets, and water loss or non revenue water is a considerable problem around the globe. Crumbling and incomplete infrastructure are the primary cause of this – with the US alone estimated to need \$335bn in public water investments over the next 20 years in transmission and distribution, treatment and storage, among other areas (Source: Environmental Protection Agency).

Investing in infrastructure, including pipes, valves, meters and the complete distribution network will be critical to improving water loss rates. Water infrastructure is currently a US\$360bn+ market and is growing at CAGR of up to 6% in some segments. There are lower but stable rates for the highly fragmented utilities sector where only around 10% of customers are served by investor-owned companies – and performance depends on regulatory factors as well as fundamental drivers of revenue and cost. The prospects for this segment are, however, very different between developed markets, which are focused on maintenance and improving efficiency, and emerging markets, which are focused on building out infrastructure

Fertilizers

In our opinion, a number of stocks are well placed to benefit from the theme of fertilizers as a way of fighting drought through their involvement in areas such as agribusiness, ammonia, fertilizers, nitrogen, phosphates, potash, potassium chloride and urea, among other areas.

Approximately 40-60% of the world's food production is made possible through the effective use of fertilizers and the impact of their primary plant nutrients and secondary nutrients on soil. A well-balanced supply of nutrients increases yields and enhances crop quality, both of which are necessary to support growing demand. Fertilizers are thus key to improving a plant's root production, leaf and stem growth, flowering and fruiting, healthy root growth, earlier crop maturity, increased water use efficiency, and resistance to extreme temperatures, droughts, pests and disease. The global fertilizer industry totalled \$190 billion in sales during 2011.

Sustainability megatrends tend to drive long-term growth

Rising population and increasing demand for protein on a per capita basis will drive long-term demand for fertilizers higher in our view. Since demand for protein (beef, poultry, pork, etc.) tends to correlate positively with increases in wealth, we expect it to rise commensurate with increases in real income per capita in developing markets. Grains will be required for animal feed, and agricultural inputs (seeds, fertilizers and crop protection chemicals) will be needed to grow the grain in a manner that maximizes yield and farm income.

We expect demand for fertilizers to rise a bit more rapidly than for corn and soybeans as agronomic practices in emerging markets converge gradually with those in the developed world. We project long-term volume growth of approximately 3.0-3.5% a year for potash, 2.5-3.0% for phosphates and 2% for nitrogen. Taking into account price inflation, we anticipate long-term industry sales growth of approximately 5% that should support net earnings growth of nearly 7% after operating and financial leverage is taken into account.

Drought is fuelling short-term demand

Despite US and global instances of drought and crop damage, global demand for fertilizers remains strong. For the US, growing evidence of nutrient deficiencies in soil, dips in 2012 crop production, and tight stocks for certain crops have created conditions for continued high crop plantings and plant nutrient demand. This should mean strong demand for fertilizers as farmers focus on soil fertility – one of the factors they can seek to control in a drought – and seek to maximize their next crops in 2013 and 2014. Nitrogen fertilizers in particular should benefit given corn's high needs vs. soybeans, for instance. Historical trends bear this out with US fertilizer use spiking by up to 20% after declines in corn yields, for instance, in the early 1980s (Source: Potash Corp).

There is a risk that US farmers could be so hard hit that they forego investing in agricultural inputs – and at the least they will take a harder look at how much fertilizer they can afford. However, globally, there is still strong unfilled fertilizer demand from markets such as China, India, Southeast Asia and South America. South America in particular is expected to boost production to take advantage of higher crop prices.

Crop science, drought-resistant seeds & crops

In our opinion, a number of stocks are well placed to benefit from the theme of Crop protection as a way of fighting drought through their involvement in areas such as crop protection chemicals, field crops, fungicides, herbicides, insecticides, pesticides, seeds (conventional and genetically modified), seed treatment products, among others.

With drought one of the most important limitations for global agriculture, there is widespread consensus that agriculture needs to adapt to the threat with hardier plants and animals specially engineered to survive in conditions of intense heat and little rain. The last 40-50 years have seen farming practices and crop science make inroads to improve crop resistance to insects, weeds and diseases – and genetically engineered insect- and herbicide-resistant crops now dominate agriculture. Such efforts have helped to boost the drought tolerance of US corn by 1% a year over the last few decades (Source: Centre for Agricultural and Rural Development). It is certain that the damage of the current US drought would be much worse without these crop science advancements.

More crop per drop

There is now a growing need to achieve more crop per drop – to develop new crop and plant varieties which can tolerate mild drought such as larger roots to absorb more water, and smaller tassels to save more energy for making kernels, leaves that use less water for transpiration – and resume normal biology and output when normal precipitation patterns resume. Although controversial in some stakeholder circles, these include seeds and plants genetically modified to be tolerant of drought. While it is too early to say whether drought-tolerant crops have a sure-fire future and whether seeds can be developed to endure the most severe droughts, since biotech crops were first introduced in the 1990s, the technology has proved to be increasingly efficient.

From corn to other crops

The initial focus will be on corn given its importance to the agro-food industry – up to 75% of grocery products contain corn and it is a key feed for livestock and ethanol. Corn is the most studied and engineered grain – and the first large scale tests are currently under way in the US Midwest. Other crops gaining attention include: alfalfa because hay is key for feeding livestock; wheat; and resurrection plants, which can be deprived of water for weeks but spring back to life when watered, with the goal of isolating genes that allow those plants to recover quickly from drought and transfer those traits to crops such as corn. Similar ideas are in use to breed drought tolerance into livestock herds, such as cattle being bred with genes from African and Indian varieties accustomed to hot climates and poorer forage.

Advanced or 2nd generation biofuels

In our view, a number of stocks are well placed to benefit from the theme of second generation or advanced biofuels as a way of fighting drought through their involvement in areas such as cellulosic ethanol, algae fuel, biohydrogen, biomethanol, BTL from solid biowaste, DMF, BioDME, Fischer-Tropsch diesel, biohydrogen diesel, mixed alcohols and wood diesel.

Today's biofuels – known as first generation biofuels – are easily made from the sugars, starches, and vegetable oils found in arable crops such as corn, palm oil, rapeseed and sugarcane, among others. In 2010, global biofuel production reached 105bn litres and accounted for c3% of world fuels for transport (Source: Ren21). This was partly spurred by government mandates for blending biofuels in 31 countries (Source: Ren 21) – with the IEA estimating that it could meet 25% of global transport fuel demand by 2050.

Drought is heating up the food vs. fuel debate

Since the 2007-08 global food crisis and the current US drought, first gen. biofuels have come under growing attack for diverting crops to produce biofuels – the so-called food vs fuel debate. A 2011 report to the G20 by the United Nations' Food and Agriculture Association (FAO) warned that, "government-imposed consumption mandates [of biofuels] aggravate the price inelasticity of demand that contributes to volatility in agricultural prices," and that G20 countries should, "remove provisions of current national policies that subsidise (or mandate) biofuels production or consumption."

The 2012 US drought has devastated the annual corn crop and brought this debate back on to the US political agenda with bipartisan calls to scrap the Renewable Fuel Standard (with ethanol consuming 42% of the 2012 US corn crop). This debate is set to expand globally with global vehicle numbers expected to double to 1.5bn in the next 10 years

Nextgen. biofuels, turning trash into treasure

This has led to growing calls for the development of second generation biofuels that are made from "sustainable feedstocks" – in terms of availability, GHG emissions, and impacts on land use and biodiversity. Cellulosic ethanol production – although more challenging technically than firstgen. biofuels – is particularly attractive as it uses non-food crops or inedible waste products such as switchgrass, wheat straw and corn stover, and does not divert crops away from the food chain. Their potential is huge – with 20% of the agricultural and forest residue available in the EU, for instance, able to support half of its gasoline demands (Source: Novozymes). The technology could free up crops for food, reduce water demand, promote energy security and create agricultural and industrial jobs. That said, sustainability issues around land use still need to be tackled.

Energy efficiency

We have mapped energy efficiency exposure across a number of sectors' value chains to highlight the diverse range of entry points available to those wishing to invest in energy efficiency: 1) automobiles; 2) buildings; 3) industrials and integrated; 4) IT; 5) lighting and LEDs; 6) smart grid and energy storage; and, 7) transport: bus, rail and shipping.

In a resource-constrained world, energy demand needs to adjust to limited supply. The rationale for change includes: costs, economic competitiveness, energy security, environmental sustainability, access to energy, and fuel poverty.

2012 marks the stepping up of end-to-end commercial scale production of a number of 2nd gen biofuels

We believe that energy efficiency – the goal of efforts to reduce the amount of energy required to provide products and services – is a logical response. We also believe that the recession is making “less is more” the watchword of our era, with energy efficiency increasingly becoming the central plank of energy policy worldwide. We see energy efficiency as a key factor in the food-energy-water nexus and in limiting the impacts of climate change and extreme weather.

Global energy crisis

In our *Less is More: Global Energy Efficiency* report, we expressed our belief that the world is facing a global energy crisis, with primary energy demand expected to increase by up to 50% by 2030. Demand will grow for all energy sources – including coal, oil, natural gas, nuclear, hydro and renewables – with 90% of the projected growth in global energy demand coming from emerging markets. As a result, energy-related CO2 emissions are likely to increase by 20%, following a trajectory consistent with a long-term rise in the average global temperature in excess of 3.5°C – and potentially resulting in irreversible climate change, according to the IEA.

Greatest potential for energy, cost & emissions savings

End-use energy efficiency has a 40-year record of success, and in our view offers the greatest potential of any current technology to contribute to energy demand reduction and CO2 emissions abatement by 2030-35, potentially accounting for over 50% of total CO2 savings. Cost will be the key driver, in our opinion, with a general rule of thumb across sectors that every dollar spent on energy efficiency means US\$2-4 in lifetime cost savings.

Autos

In our view, a number of stocks are well placed to benefit from the energy efficiency theme in the auto sector through their involvement in equipment, products and services such as autocatalysts, diesel, electric vehicles (EVs), engine and transmission components, gasoline direct injection (GDI), light-weighting, li-ion batteries, natural gas, specialty polymers, turbochargers and tyres, among other areas.

With the global passenger car fleet set to double to almost 1.7 billion by 2035, the auto sector is under growing pressure in terms of oil consumption, energy security and CO2 emissions, and in improving fuel economy via efficiency gains. The path to automotive fuel efficiency is more of an evolution than revolution, which could involve a three-stage transition including: 1) leveraging technology to improve the efficiency of the internal combustion engine and light weighting of the vehicle; 2) increasing use of hybrid and hybrid electric powertrains; and 3) exogenous technology shocks. We anticipate the evolution will be market driven as consumers demand more fuel efficient vehicles to ultimately reduce personal expenditure on fuel.

Buildings

In our opinion, a number of stocks are well placed to benefit from the theme of energy efficiency in buildings through their involvement in equipment, products and services such as building automation, energy services, efficient HVAC systems, insulation materials and technologies, high-efficiency lighting (including LEDs) and appliances, windows (including multiple glazing and low-e), and the distribution of building products.

Buildings account for 40% energy use and 30% of CO2 emissions, with the biggest culprits, heating, cooling and lighting accounting for up to 60% of energy

consumption. Energy efficiency in buildings offers the greatest potential of any sector to make cost savings and reduce energy use (by 30% to 50% by 2030-50, according to the IEA). Long-term growth drivers are extremely favorable and include efforts to lower CO2 emissions and create affordable housing, and highlights the economic importance of the sector in terms of GDP and jobs, favourable demographics, emerging market growth, a focus on tackling fuel poverty, the potential to realise a green premium on efficient buildings, the low-risk nature of financing efficiency, and global urbanisation trends. We believe little of the huge energy efficiency potential of this sector has been captured to date.

Industrials and integrated investments, the enablers

In our view, a number of stocks are well placed to benefit from the energy efficiency theme for industrials and integrated through their involvement in equipment, products and services such as automation (building and industrial), controls, grid and smart grid, heat transfer, lighting, power distribution and generation, process management, renewable interconnections, and T&D, among others.

Industry accounts for 36% of CO2 emissions (Source: IEA). The long-term case for energy efficiency is clear – with 80% of energy lost across the value chain from inefficiencies between the gathering of energy sources and their eventual consumption in industry (Source: ABB). In no other area are so few players capable of making such a big difference, with energy efficiency in industry saving money, reducing the need for new power, and lowering GHGs.

The IEA estimates that industry could improve its energy efficiency by up to 26% and reduce CO2 emissions by up to 32% via the adoption of best practices and technologies that are already available. Industrial and integrated participants – capital goods in particular – are key enablers. And should benefit on the back of sustainability megatrends such as rising energy prices, EM growth in power and automation, expanding production volumes, grid and generation build out, renewable interconnections, and CO2, efficiency and environmental regulation.

IT, “big data”

In our view, a number of stocks are well placed to benefit from the theme of energy efficiency in IT through their involvement in equipment, products and services areas such as cloud computing, consolidation, data centre design and operation, DCIM, heating and cooling, power management, thin provisioning, virtualization, and semiconductors.

The global boom in big data resulting from social media and cloud computing has increased the world's total digital output tenfold from 2006-11. Data volumes are projected to grow a further 29x to 2020 (Source: IDC). This means a significant increase in computing infrastructure and support infrastructure, such as cooling. It also means that the sector is consuming upwards of 3-5% of electricity in markets such as the EU, the US and Japan (Source: ACEEE) and that its global CO2 emissions – 2% of the world's total – are already on par with the aviation sector. Rising energy consumption and prices lead to business/capacity constraints – such as for energy-hungry data centres – and we expect it to create significant opportunities for the greening of data centres, cloud computing and semiconductors.

Lighting & LEDs

In our opinion, a number of stocks are well placed to benefit from the energy efficiency theme in lighting in LEDs through their involvement in equipment,

products and services such as chips, CFLs, components, deposition equipment, LEDs, lighting management, lighting solutions, luminaries, MOCVD equipment, and process equipment, among others.

Lighting consumes 19% of electricity output; 30% to 75% systems inefficient. New technologies can reduce electricity consumption by up to two-thirds. Moreover, energy efficiency lighting sources such as LEDs, luminaries, control gear and intelligent lighting control tools and concepts can thus make significant contributions to reducing electricity use and cutting CO2 emissions. We anticipate strong growth for energy efficient lighting solutions. This should help the global lighting market to grow from €55-60bn in 2011 to €80bn by 2015 (Source: Philips). Long-term drivers include favorable legislation and a further reduction in costs with better performance.

Smart grid

In our opinion, a number of stocks are well placed to benefit from the energy efficiency theme in smart grid and energy storage through their involvement in equipment, products and services such as advanced metering infrastructure (AMI), automatic meter reading (AMR), batteries for grid storage, customer-side systems, distributed grid management, electric vehicle (EV) charging infrastructure, ICT integration, li-ion batteries, renewables integration, and wide area monitoring and control.

By 2020 smart grids are estimated to represent a global market of up to €50bn (Source: Alstom). Key market drivers include improved grid reliability and stability, the maximization of CO2-free energy, increasing energy efficiency, and reducing CO2 emissions. The smart grid should also facilitate and improve prospects for greater energy efficiency in buildings, IT and transport. Longer-term energy storage could be ground-breaking.

Transport - rail, bus and shipping

In our view, a number of stocks are well placed to benefit from the theme of energy efficiency in transport through their involvement in equipment, products and services such as locomotives, passenger rail operators, rail services, railway signalling and control systems, rail transport for freight, public bus and coach operators, rolling stock and fuel efficient shipbuilders.

The transport sector accounts for 23% of global emissions. Transport accounts for 6.5 billion tonnes of CO2 – or the equivalent of 1t of CO2 per inhabitant of the planet. The carbon footprint of transport is linked to the fact that almost 20% of the world's total delivered energy is used in the sector, where liquid fuels are the dominant source. Transportation alone accounts for more than 50% of world consumption of liquid fuels, and this share is forecast to increase to over 60% by 2035 (Source: International Union of Railways).

This means growing pressure in terms of fuel costs and energy efficiency. High fuel prices, energy security concerns, rising household bills, traffic congestion and environmental concerns are all leading to greater investments in rail and bus in particular. They are seen as solution providers, transporting more people further and faster, with lower emissions and congestion impacts.

Renewables

In our view, a number of stocks are well placed to benefit from the theme of cleantech as a way of fighting drought through their involvement in areas such as electric vehicles (EVs), wind, solar, among others.

With global energy use expected to grow by up to 50% in the coming 20 years, it is clear that clean(er) technologies like renewable energy will need to play an increasingly important role in meeting energy demand. They also have a significant advantage over fossil fuels in that they reduce the water scarcity and water treatment intensity challenges associated with fossil fuels – and lessen the burden on the water-energy nexus.

Fossil fuels were designed for a water-rich era

The current power sector is designed for a water-rich world, which will become an increasingly unsustainable challenge in the coming years. In the US, power plants account for up to 40% of all freshwater withdrawals (Source: UCS), with nuclear, coal, oil, gas and biofuels all using 600 gallons of water or more per MWh (Source: EFRI). Increasing drought will pose growing challenges in terms of accessing sufficient water and sufficient cool water to cool plants.

The drought is also reiterating concerns about the water intensity of fossil fuels (as well as nuclear). For instance, the oil industry produces 2.5x more water than oil, which is expected to increase to a factor 5x by 2025. Unconventionals such as shale gas and oil sands (see our Cracking Down on Fracking report) are particularly water intensive. And as discussed, biofuels raise fuel vs. food concerns.

Solar & wind promote water & energy security

One of the major advantages that renewables such as solar and wind have is that they are less water intensive than fossil fuels. They help to promote water and energy security, along with reducing the CO2 emissions which exacerbate climate change and extreme weather such as drought.

Link to Definitions

Industrials

Click [here](#) for definitions of commonly used terms.

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