Chapter 5. Focus and perspectives

This focus section complements CropWatch analyses presented in chapters 1 through 4 by presenting two topics of relevance to global agriculture. Section 5.1 presents an overview of extreme atmospheric factors that interfered with crop production over the monitoring period. In section 5.2, a closer look is provided on a subject of general interest to agricultural development in China and the world. The current issue examines soybean production, in particular the unusual situation of one major global buyer and just three main producers.

5.1. Disaster events

In the four months covered by this edition of the CropWatch bulletin (October 2013-January 2014), several disasters across the globe have affected people, properties, and agriculture. Most notably, events have included typhoon Haiyan, along with a range of other flooding, extreme weather, and drought events.

While the overview of disaster events in this section is meant to deepen the understanding of factors influencing global crop production, objectively describing recent disasters in the absence of detailed *ad hoc* studies is not always straightforward. While dedicated disaster data bases include some measure of the magnitude of impacts (and thereby allow the separation of real disasters from anecdotal ones picked up by the media), they are not updated in real time and rarely focus on agriculture. Moreover, for many of the atmospheric factors that lead to negative impacts on agriculture, their actual effect can only be assessed through field visits and models. Low or high frequencies of occurrence (e.g. "highest rainfall in 35 years") or descriptions of spatial extent (“10,000 hectares flooded in Somerset”) are not, per se, accurate indicators of impact in the absence of knowledge about the absolute intensity of the event and its specific local impacts.

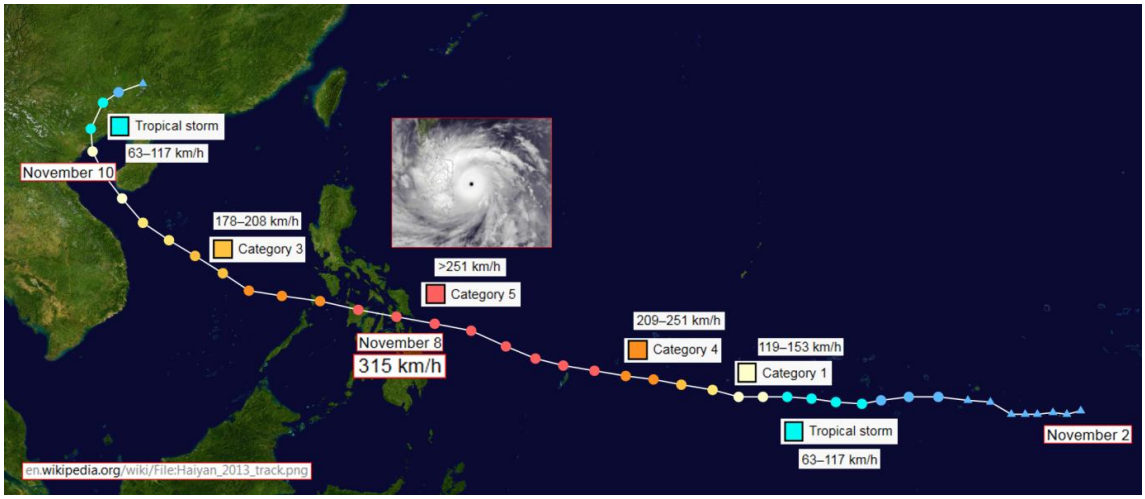
Furthermore, the risk exists that any ‘objective’ reporting is influenced by the media’s pre-selection of stories, which is based on readers’ interests, while other factors of serious insecurity are omitted. Indeed, war and civil unrest have recently returned to several areas of Africa (South Sudan, Nigeria, and Central African Republic), not to mention chronic unrest in areas such as the central and eastern Congo (DRC). In terms of suffering and food insecurity, these conflicts dwarf most natural disasters.

Typhoon Haiyan and other storms

The main weather event over the reporting period undoubtedly was typhoon Haiyan in the Philippines. Haiyan (also known as Yolanda) affected East Asia in November and made lasting impacts on crop production in areas where floods recede only slowly and where perennial crops will recover only after several years. After making landfall and creating havoc in the Philippines, Haiyan also affected Vietnam and China.

According to the Centre for Research on the Epidemiology of Disasters (CRED) and FAO, the typhoon was one of the worst disasters in the recent history of the Philippines, inflicting severe suffering (4 million people were displaced, with another 8 million also affected), loss of life (6,200 people died and 1,800 are still missing at the time of writing), and destruction of goods and infrastructure (worth at least 808 million U.S. dollars). The final economic loss is expected to reach around US$10 billion. Figure 5.1 illustrates the track and intensity of the typhoon.

Figure 5.1.Track and intensity of typhoon Haiyan between November 2 and November 10



Note: Intensity is indicated with the categories from the Saffir-Simpson Hurricane Wind Scale, with the corresponding range of wind speed and the maximum wind speed over the Philippines on November 8.
Source: Based on data and maps from Wikipedia and Wikimedia Commons.

Within the Philippines, about 20 of the country's 81 provinces were affected. In the areas most directly hit, record wind speeds reached more than 300 km per hour—measured on the islands of Leyte and Samar in the eastern Visaya Group. Losses to the agricultural sectors therefore occurred mostly in the Visayas and include fisheries, livestock, and paddy crop (of which 35 percent is produced in the area); an estimated 150,000 ha of rice paddies, maize, and other cash earners such as coconut, sugarcane, banana, cassava, mango, and vegetables have been affected. The typhoon coincided with the harvesting of the 2013 main paddy crop, representing just above half of the annual production in the central Philippines. The planting of the mostly irrigated 2013/14 secondary season rice was underway. Fortunately, the harvest of maize had been completed about a month earlier, resulting in some damage to stored produce only, but nothing comparable with the impact on rice for which the combined loss due to Haiyan and Nari (in the north) is put at 5 percent of the national production. Since the country is a net paddy importer, imports are likely to increase.

In Vietnam, Haiyan affected mostly the northern part of the country (Quảng Ninh Province on November 10) at a time when it had been downgraded to tropical storm and winds were still strong but precipitation was no longer exceptional. In China, Haiyan reached Hainan province where approximately 25,000 hectares of crops were destroyed.

In addition to Haiyan, other storms are also worth mentioning, including—in the beginning of October—cyclones Phailin and Nari. While Phailin created havoc on the East Indian coast, cyclone Nari affected the Philippines on October 12 and later made landfall on the central coast of Vietnam on October 15. Despite its relatively modest wind speeds (102 km per hour), Nari had a big impact, killing people, flooding homes, and destroying cropland. Affected provinces in Vietnam include Quang Nam, Thua Thien-Hue, Quang Ngai, Quang Tri, Nghe An, Quang Binh, and Binn Dinh.

A few weeks later, on November 10—on the heels of Haiyan but in another part of the world—a rare tropical cyclone hit Somalia, causing the typical damage associated with excess rainfall in normally semi-arid areas. The event created intense suffering among populations not used to cyclones.

Extreme temperatures, rainfall, and droughts

Other extreme weather events during the reporting period include extreme temperatures, rainfall, floods, and droughts. In Cambodia, during the last days of September, heavy rainfall and flash floods affected close to half a million people and claimed 152 lives in 16 of the country's 24 provinces; an estimated 300,000 hectares of rice were affected. Although Nari was of no direct concern to Cambodia, the timing of the events was such that abundant rain over the Mekong basin in Vietnam and Laos eventually reached Cambodia at a time when floods would normally have been receding, providing an example of a remote cyclone worsening the effect of a local flood.

Other floods, sometimes accompanied by landslides in hilly terrain, are reported from Thailand (October), Vietnam (November), Indonesia, and Brazil (mostly the south-eastern states of Rio and Bahia, in December), the United Kingdom (first with local events in early December—including a record tidal surge—then widespread from late December to early January), the Philippines, Bolivia, and Peru (Huancavelica Province, in January.)

Cold waves were observed in the occupied Palestinian territory in December, accompanied by heavy rain fall and snow storms that affected both the West Bank and Gaza. In north America, low temperatures and limited snow cover occurred in the first dekad of January, impacting parts of Canada, the eastern United States (with record lows close to -40°C), and north east Mexico. The economic loss is important but agriculture is not a major sector in the area. On the other hand, snow cover was abundant over the main maize, soybean, and wheat areas, which has resulted in good soil moisture. Despite the cold spell, NOAA's National Climatic Data Center indicated that the "warm West" counterbalanced the "cold East" for the contiguous United States in January, with overall monthly temperature only slightly below average.

In Australia, significant droughts and fires were reported, first in mid-October and later in January and early February 2014.

5.2. Soybean: a story of three producers and one buyer

The production and trade in soybean, a major crop and one of the four CropWatch focus areas, presents some interesting particularities. For starters, with a global production of about 260 million tons, the crop is unique among the major agricultural commodities in that 80percent is produced by just three countries (United States, Brazil, and Argentina) and 91 percent by just six (add China, India, and Paraguay). Next, more than half (56 percent) of the traded volume (90 million tons, 2009-2011 average) is bought by just one country: China (50 million tons during 2009-2011). Since 1995, China has gradually become the main customer of the top three producers—the country now depends on imports for about 80 percent of its soybean supply.

Another interesting aspect is that the current pattern of major market suppliers only partly reflects the global agroclimatic production potential, suggesting there is much untapped potential for some already established producers to increase their production and for others to enter the global soybean production scene.

This short focus section briefly presents some background on the current situation, discusses global production potentials and production, and highlights differences in per hectare income from soybean among countries. Additional insights are planned to be shared as an article; the many experts who

already kindly contributed their insights on global soybean production for this focus section are listed in the acknowledgments.

Development of the current situation

Over the last 30 years, the list of top five producers of soybean has remained virtually the same (table 5.1). The table also lists the average per annum hectarage growth in percentage over the 2001-2012 period, to be compared to the world average of 2.7 percent. The numbers provide an interesting glimpse into how countries maintain or lose their ranking: in China, soybean areas continue to decrease, while the United States relies more on yield increase than on areas to maintain their position. Area increases larger than 10 percent per year occur in countries that clearly intend to increase their share of the Soybean market. They include several African countries (Benin +10.8 percent, Tanzania +11.1 percent, South Africa +13.1 percent and Zambia +16.5 percent).

Table 5.1. Indicators and statistics describing the ten top soybean producers

	Rank			2012 production (% of world total)	2008-2012 average yield in T/ha	2001-2012 yield trend (kg/(year.ha))	2001-2012 average annual area change (%)
	2008-2012	1999-2001	1989-1992				
United States	1	1	1	33.9	2.80	24	0.4
Brazil	2	2	2	27.2	2.83	27	3.6
Argentina	3	3	4	16.9	2.49	-14	4.8
China	4	4	3	5.2	1.77	8	-1.9
India	5	5	5	4.7	1.13	24	5.1
Paraguay	6	6	6	3.4	2.52	28	7.0
Canada	7	7	9	2.0	2.79	85	4.3
Bolivia	8	8	14	1.0	2.04	16	4.2
Uruguay	9	38	33	1.2	2.15	5	22.2
Ukraine	10	30	79*	1.0	1.71	66	18.9

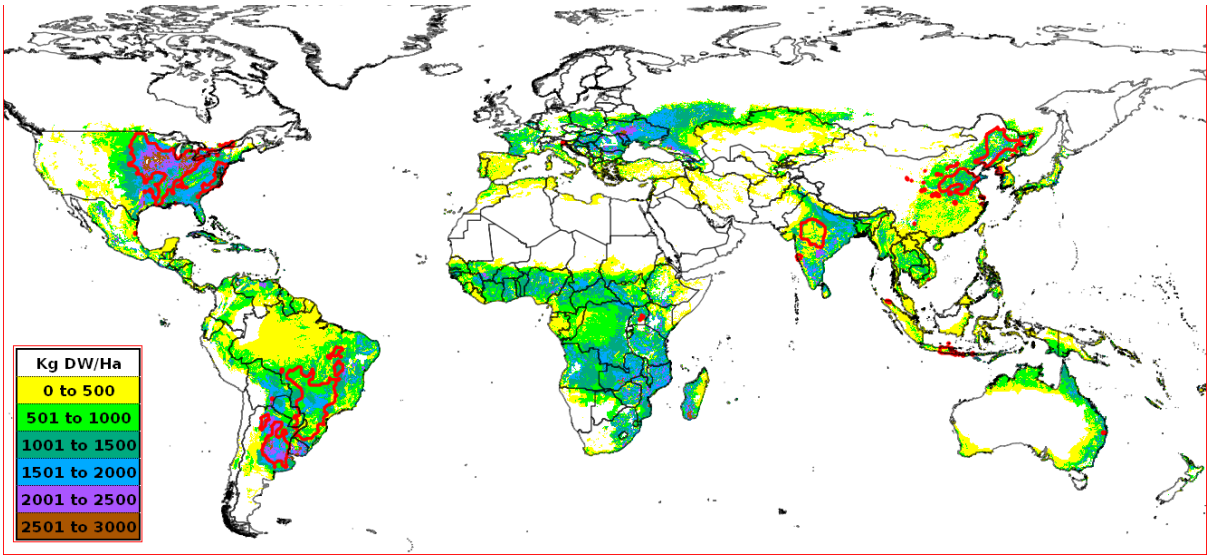
Note: Ranking follows the average 2008-2012 production. The rank for the Ukraine (*) corresponds to the USSR, of which the Ukraine used to be the main soybean producer.
Source: Authors based on FAOSTAT data

Yields are highest in the developed countries and close to 2.8 tons/ha. At the bottom of the list in terms of yield (among the ten main producers) are India (1.13 tons/ha), Ukraine (1.71 tons/ha), China (1.77 tons/ha), Bolivia (2.04 tons/ha), and Uruguay (2.15 tons/ha). Clearly, if India intends to maintain its current favorable dependency ratio of zero (that is, virtually no imports) a major effort will be required. An interesting question is whether soybean is undergoing a slowdown in yield growth, as is well documented for rice and wheat after 1990; analyses show that, if there is such a slowdown for soybean at all, it occurred recently and cannot currently be ascertained with any confidence.

Global soybean potential and effects on current production

Figure 5.2 shows a global map of agroclimatic attainable yield—an indicator of countries' production potential and based on FAO Global Agro-Ecological Zones (GAEZ)—along with current major soybean production areas. To some extent, the current pattern of major market suppliers simply reflects the production potential, especially for the United States and Argentina, though less so for Brazil and India. However, the map also indicates a largely untapped potential, showing high potential areas for rainfed soybean on all continents, including some areas that are currently not major producers.

Figure 5.2. Agroclimatic attainable yield (kg of total dry weight/ha) for rainfed soybean compared to current major soybean production areas (in red)



Note: The map is based on data for rainfed soybean with intermediate inputs over currently cultivated land, 1961-90 reference period, overlaid with major soybean production areas according to EC/JRC (in red); dry weight includes all parts of the plants, including grains.
Source: Based on data from FAO GAEZ and EC/JRC.

As shown on the map, the areas with high and in some cases untapped potential cover either relatively large and contiguous areas, or more "dispersed areas" of non-contiguous but nevertheless grouped spots. Among the large contiguous areas, the first is in the United States (mostly in an area from Iowa to Ohio—already an established producer), followed by Argentina (provinces of Buenos Aires, Cordoba, and Santiago del Estero), east Uruguay, southern India (mostly in northwest Andhra Pradesh), central Ukraine and north Moldova, and south Russia (Kray of Krasnodar). The more dispersed areas with high potential include east Georgia, Romania, Serbia and Hungary, and several African countries along the Mozambique Channel, including north Mozambique, Zimbabwe, Madagascar, and the east Eastern Cape province in South Africa. The main disadvantage of these more dispersed areas may be their relatively high transport costs to concentrate the production and reach international markets.

Interestingly, the map also indicates that some major producing areas in fact are located in regions with relatively low production potential (including southern Brazil and China's northern plains and northeast areas). Moreover, it should be noted that some high potential areas also contribute very little to the global output of soybean because they grow other crops, such as the Ukraine (globally ranking 9th as producer and 7th as exporter) and Moldova.

India deserves a special mention because the main production zones in Madhya Pradesh, Maharashtra, and east Andhra Pradesh are irrigated in areas with low production potential for rainfed soybean. In East but particularly Southeast Asia, potentials are rather low due to poor sunshine conditions associated with abundant monsoon rain, conditions altogether unfavorable to soybean cultivation. In fact, in equatorial Southeast Asia, only Indonesia grows soybean in eastern Java. In comparison, conditions are significantly more favorable at the same latitude (but generally drier climate) in Southern Africa where, however, the soybean potential remains largely untapped.

Including irrigation does alter the global patterns, but not substantially in most areas; in Asia major producing areas in India and China (North China Plain, including southern Hebei, Shandong, southern Shanxi and northwest Henan provinces) benefit relatively little, while the potential for improvement is larger in China's North East region (southern Heilongjiang, west Jilin, and Liaoning). More substantive

yield increases (larger than 1 ton/ha) are probably possible in southern Nepal, northwest India and eastern Pakistan, as well as in Myanmar. For all areas with current underused potential, any future role will largely depend on the combination of production potential, local production costs, and proximity to major markets.

Income from soybean cultivation

Among the top ten producers, China has the highest income per hectare of soybean: US$1,239/ha, 7 percent above the income per hectare in the United States and about 30 percent above the global average, in a clear move to slow down the ongoing decreasing areas cultivated domestically. Overall, among all countries, China ranks 7th in the price offered domestically for soybean, below South Korea (US$4,660/ha) and Japan (US$2,453/ha), while low prices are offered in Pakistan (US$255/ha), Russia (US$479/ha) and the Ukraine (US$616/ha). However, compared to other summer crops, the income derived from soybean is unattractive in China: for wheat the income is 1.1 times larger than for soybean, for maize 1.2, for sugar beet 1.8, and as high as 4.0 for potatoes.

In terms of farmers' income growth over the recent decade (1999-2001 to 2009-2011), the major producers are usually close to the world average (global prices per hectare nearly tripled (an increase of 177 percent) in the ten years), which is the only economically sustainable approach in the long run. High values for income growth over the decade occurred in Uruguay and Bolivia (increases of 240 and 254 percent respectively), although the absolute values of income per hectare in both stay well below the world average, probably to compensate for transport costs in the two landlocked countries. In some countries, such as Argentina, soybean income increases are significantly lower than the world average due to environmental conditions more than producers' choice or national policy.

Clearly, soybean is most atypical among major crops, resulting from rapidly changing demand patterns and reflecting the combined effect of production potential and national agricultural policies. There is potential for change and for the reduction of existing vulnerabilities in the relatively long term, but also for new sources of vulnerability in the shorter term.