Chapter 5. Focus and perspectives

Building on the CropWatch analyses presented in chapters 1 through 4, this chapter presents first early outlook of crop production for 2017-2018 for countries in Southern Hemisphere (section 5.1), as well as sections on recent disaster events (section 5.2), the Perspectives in crop production in Africa (5.3) and an update on El Niño (5.4).

5.1 Production outlook

The production outlook for the current bulletin includes only the major producers in the southern hemisphere, as assessments for the northern hemisphere would be too hypothetical at this early stage in the season. Wheat production results for Argentina, Australia and Brazil are listed in Annex B. The text below also includes estimates for Egypt and South Africa.

For Argentina, CropWatch puts the winter wheat production of 2017-18 (harvest extends into January 2018) at 11.080 million tons, a significant drop of 4.7% below the previous year's value, resulting from the combined decrease of yield (-1.6%) and cultivated area (-3.2%). At the provincial level, the major producer (Buenos Aires) did relatively well (0.8 % below 2016). Among the major wheat provinces, only Santa Fe did very poorly (-10.1%). The remaining minor producers fared even worse, a decrease of 25.5%. Poor environmental conditions, especially at the late growing stages covered in this bulletin are the main factor behind the mediocre outcome of the season. More seriously, the 2017-2018 is yet another year in a time series of national productions which appear to have become very variable over the last decade, almost at the level of Australia.

In Australia, the drop in wheat production reached 22.1% with 24.606 million tonnes output. Again, poor climatic conditions are to blame in a mostly semi-arid setting which has demonstrated huge variability in the past, for instance -57.0% in 2006-2007 and a spectacular +157.9% in 2003-2004 after an equally dramatic drop of -58.3% in 2002-2003. Therefore, even if the 2017-18 performance may appear catastrophic, it fits well into the history of Australian wheat production and also indicates a very skillful management of very variable water resources. All States did poorly in 2017-2018 particularly the second largest producer, New South Wales with a production drop reaching 34.3%. The smallest drop was recorded in Victoria with -9.6%.

Brazil, the smallest, but also the most dependable wheat producer in the hemisphere, production reached 7,876 million tonnes, up 4% over 2016-17. The southernmost and most "temperate" State of Rio Grande do Sul did particularly well with more than half the national production (4.818 million tonnes, up 6.4%).

South Africa currently cultivates about a third of its wheat area of the 1970s or 1980s. Just before the turn of the century, South Africa still used to be a relatively important wheat producer with an output around of 3 million tonnes which was, at the time, comparable to the output of Brazil. While the second has about doubled its production over the last twenty years, the production in South-Africa has undergone a constant erosion to the extent that the country now imports more wheat than it produces: the output is now 20% less than at the beginning of the century, with-however-a very low inter-annual variability. The extremes reached -37% (2002-2003) and +31% in 2015-16, according to data in FAOSTAT. The low variability is partly due to irrigation: the crop is grown throughout the country as an irrigated

winter crop (with the Free State being the major producer) and under rain-fed conditions in the Mediterranean climate of the south-west.

The current seasons output is estimated by CropWatch at 1.356 million tonnes, corresponding to a drop of 20.4% compared with the previous season. Here again, there is a direct link between poor rainfall and output, which has also affected other crops (e.g. grapes) as well as other water uses in the south-west. According to the section on disasters in this issue of the crop bulletin, Cape Town, the major city in Mediterranean South Africa, is expected to run out of water in April, if winter rainfall does not start early, before April.

Finally, CropWatch also includes a wheat production estimate for Egypt: 11.749 million tons, 7.2% over last year's output. Due to virtually all wheat being irrigated under very favorable conditions of intense sunshine and dry desert conditions, pest incidence is low and the production very dependable.

5.2 Disaster events

Introduction

The current section focuses on disasters that occurred between November 2017 and January 2018. With some exceptions disasters that occurred during October 2017 that were covered in the November 2017 CropWatch bulletin are not covered here again.

Next to the reports about earthquakes-some deadly, as in Mexico, Iran-Iraq and Honduras-and volcanic eruptions-some of which required the precautionary displacement of nearby populations-and countless epidemics-from diphtheria to dengue to plague -, the salient points remain the humanitarian situation affecting the Middle-East, Myanmar and Bangladesh and, in Africa, most of the Sahel including Mauritania, the Horn and Central Africa. Late January reports by FAO and WFP confirm that hunger continues to intensify in the war stricken zones of Africa.

The most severe disasters that occurred during the reporting period include several cyclones in South-east Asia as well as floods in central and southern America, in particular in Peru. The country has been mentioned in the disaster analyses throughout 2017, starting with the disastrous Putumayo floods which also affected neighbouring Ecuador, Colombia and Bolivia. Out of close to 600 disaster reports examined to prepare the present note, 86 (15%) mention floods in various locations in Peru.

Tropical cyclones, depressions and storms of various severities

Hurricanes Maria and Irma were reported in the November 2017 CropWatch bulletin. However, additional detail is provided below because more complete information is now available and because countries and their agricultural sector sometimes struggle for years before they recover, as was highlighted in previous bulletins about the impact of hurricane Matthew in Haiti (September-October 2016).

Maria touched Dominica on 18th September, few days after Irma hit the island on 6th September. Irma was very long lived and eventually turned east and died off the northern European coast after having brought about damage for about 64 billion US$. Maria is the 10th strongest storm on record (the strongest in the Atlantic) and it is considered to have been the worst natural hazard-induced disaster on record in Dominica; it also caused widespread damage in other Caribbean islands (about 40 died), particularly in Puerto Rico. In Florida, the damage to the agricultural sector amounts to 2.5 billion US$. The total damage brought about by Maria reaches 92 billion US$.

In relative terms, the losses due to Maria were heaviest in Dominica, which was directly on the track of the cyclone. The total damage in the country is now estimated at 1.3 billion US$, equivalent to more than

double the Islands GDP. About one third of the damage occurred in agriculture, the sector which suffered one of the largest damages, just after housing and before tourism, which is the mainstay of the economy. The livestock and animal production sector suffered very heavily as country-wide losses include cattle (45% lost), pigs (65%), small ruminants (50%), broiler chickens (90%), layers (90%), rabbits (50%), and beehives (25%). An estimated 65% of coconut trees, 80% of cocoa trees and 80% of citrus trees were damaged. Four months after the disaster, over 80% of houses still have inadequate roofing, one child in six has not returned to school and the vast majority of islanders have no electricity. According to ACAPS the hurricane severely damaged farm housing, irrigation infrastructure, feeder roads, livestock production, forest reserves, and fishing boats. Although emergency replanting of food crops took place immediately after the disaster, about one third of the population is still borderline food insecure, according to the WFP.

Other tropical cyclones and storms include Damrey (or Ramil in the Philippines), Otto in the Caribbean basin, Ockhi in the Indian Ocean, Kai-tak (Urduja in the Philippines; 13 to 23 December), Tembin (Vinja in the Philippines) from 20 to 26 December, Agaton (Bolaven) at the beginning of January, Ava (Madagascar, early January)

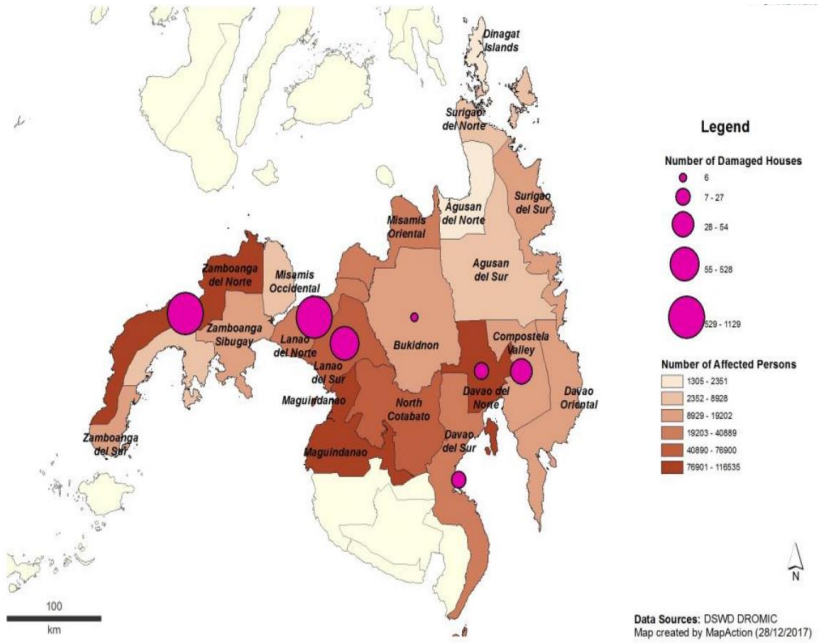
Damrey prevailed from 31 October to 4 November in the Philippines, Vietnam, Cambodia and Thailand, causing about 1 billion US$ damage. About 40 people died but overall losses were limited in the agricultural sector except in Vietnam. More than 125,000 hectares of rice and vegetables were destroyed and aquaculture was severely affected, with 133,000 hectares of shrimp farms flooded and over 70,000 aquaculture cages swept away. The Government of Vietnam estimates the economic loss to be 630 million US$.

Otto (20-26 November) was one of the rare recent cyclones that originated in the Caribbean and then crossed the central-American land bridge along the Nicaragua-Costa Rica border and eventually died in the Pacific. Since tropical cyclones are powered by the condensation of moisture evaporated from the sea, they cannot survive over land. Otto nevertheless caused about 200 million US$ damage in the three affected countries: Nicaragua, Costa Rica and Panama.

Ockhi developed in the Indian Ocean and moved from the southern tip of Sri Lanka to north-west India between 30th November and 6th December, also affecting the Maldives. Total damage is in excess of 5 billion US$ with about 500 casualties. Most damage to agriculture is reported from Gujarat.

Typhoon Tembin, known in the Philippines as Typhoon Vinta, affected Caroline Islands, Philippines, Malaysia and Vietnam between the 20th and the 26th December. Fatalities reached 266 and the total damage was put as 42.4 million US$. Mindanao was among the most severely affected areas; the island is a major agricultural region, producing more than half of the maize output of the Philippines, and about 25% of the rice. ACAPS reported at the end of December that extensive damage to agriculture has been caused by the combined effects of the storm, flash floods, and landslides. Food stocks have also been washed away or depleted. ACAPS further notes that Mindanao was badly affected by El Nino-related drought in 2016. Reports issued in January put the damage in agricultural at about 30 million US$, of which two thirds are paddy production loss. Over 200 people lost their lives.

Figure 5.1. Impact of tropical storm Tembin (Vinta) in Mindanao island, Philippines.



Source: https://www.acaps.org/sites/acaps/files/products/files/171228_start_acaps_briefing_note_philippines_tropical_storm.pdf.

Floods

During the first half of November floods were reported from Costa Rica and, throughout the month from Colombia and Peru, where they led to severe and sometimes deadly landslides. Tropical depression Otto (end of November) brought floods to Panama and other Central American areas. The Peruvian and Colombian floods lasted well into December, as excessive precipitation caused new floods in different areas. At the end of December, floods were also reported from Bolivia. Generally below average temperatures accompanied the floods. In January floods affected Argentina.

Floods also occurred in several European countries (France, Germany, Greece, and Hungary) during the reporting period and locally delayed sowing of winter crops.

Figure 5.2: Theewaterskloof dam, the main water supply for Cape Town, South Africa, on 8 February 2018.

Source: https://www.bloomberg.com/news/articles/2018-02-08/south-africa-plans-to-declare-drought-a-national-disaster

Drought

Drought conditions prevailed early November in part of the Paraguayan Chaco, but mostly in parts of southern Africa. Rains were late in many monsoon summer rainfall areas. In Zimbabwe in late January,

according to Relief Web, some farmers were close to completely writing off the season, because of the high likelihood of below-average rains for the remainder of the season. This will reduce crop yields and harvests across most parts of the country. In the western Cape province of south Africa, which enjoys a Mediterranean, Cape Town is expecting to completely shut off water supply on 14 April (dubbed "day zero") because reservoirs that normally provide water to cities are almost empty.

Cold wave

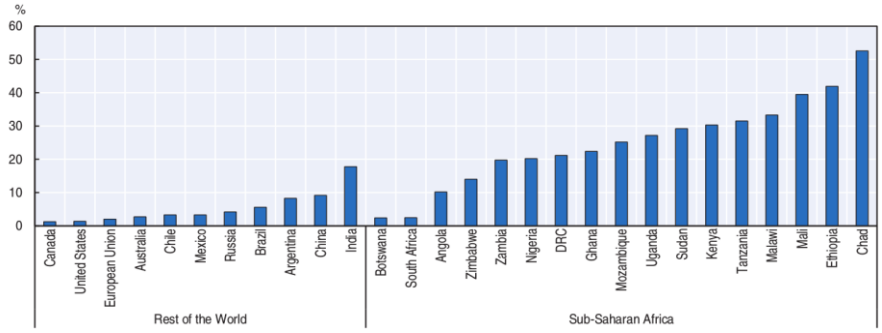
A cold wave affected Central America starting in November, lasting into January 2018. In Morocco, about 4000 families suffered from the cold wave that set in in January.

5.3 Focus: Perspectives in crop production in Africa

Introduction

According to World Bank data (WB 2018), over the last ten years, agriculture has contributed, on average, a stable percentage of about 4% to GDP worldwide, down from 8% in 1996. In sub-Saharan Africa, the average remains high at 23% with lowest values in southern Africa (Botswana, Lesotho, Zambia, Swaziland, Zimbabwe and South-Africa) and the highest (above 25%) in eastern Africa and the Sahelian countries (Uganda, Tanzania, Ethiopia, Sudan, Chad, and Mali) and the neighboring Central African Republic. Both Chad and Sierra Leone are above 50% while, values for North African countries is at 10% or just above (Figure 5.3).

Figure 5.3: Agriculture as share of total GDP in 2014. Source: OECD-FAO 2016, based on World Bank data. DRC: democratic Republic of the Congo.



When considering, in addition, the share of the population that derives its income from agriculture (29% worldwide), at 55% Africa clearly emerges as the continent where agriculture most directly affects the livelihoods of people. Highest values occur in the same groups of countries as above as well as in the centre of the continent. Values in excess of 70% are common (e.g. in Ethiopia, Madagascar) and sometimes reach 90% (Burundi). The high percentages also stress the lack of diversification of African farming (OECD-FAO 2016). The comparison of the proportion of people who derive their livelihoods from agriculture with the contribution of agriculture to GDP indicates a generally low level of efficiency of farming, for instance in countries such as Zimbabwe (67% and 11%, ratio 6.0) and Cameroon (62% and 16%, ratio 4.0). The most favourable ratios include the Sudan (33% and 40%, ratio 0.8), Tunisia (12% and 10%, ratio 1.2) and the most populous country in Africa, Nigeria (27% and 21%, ratio 1.3).

Subsistence farming

"subsistence farming" refer to the fact that farmers grow their own food with generally limited access to markets. According to the Alliance for a Green Revolution in Africa, smallholder farms constitute approximately 80% of all farms in sub-Saharan Africa (SSA) and employ 175 million people directly. Christiaansen and Demery (2018) conclude that, among the "wisdoms" about African farming that remain

true, we must include a generally limited access to markets and to credit, and the fact that farms are operated as family units cultivating small fields (NEPAD 2013). Other "wisdoms" are evolving, for instance the market of agricultural land is expanding, resulting from changing land ownership patterns away from communal ownership. The authors also find that the role of African women in agriculture, who traditionally cook and cultivate, is decreasing. OECD-FAO (2016) however stress that "in many countries women constitute at least half of the labour force".

One of the recent changes is income diversification, i.e. non-farm income is increasing in rural areas along with a loss of the income seasonality: more and more rural people now tend to engage in some small agribusiness and trade crops throughout the year. An interesting observation is also that fluctuations on African markets are mostly unconnected from global markets, and that a major component of prices remains the seasonal component brought about by the dry/wet season cycle which predominates over much of the continent and largely conditions prices.

Technological and socio-economic context

Regarding (3) "backward technology", the World Bank report notes that there is an increase in the use of inputs (e.g. mineral fertiliser) in some of the most populous countries such as Nigeria and Ethiopia and that "technology" also includes such factors as improved varieties. Ward et al (2016) quote work by Walker and colleagues according to which more than 60% of some crops cultivated in Africa (wheat, maize, soybean) consist of improved varieties and hybrids. It appears that the national agricultural policies and context play a major role in the adoption of improved practices by farmers. In general, however, "agriculture is not intensifying as much as expected, given population pressure and better market access." In particular, mechanization and irrigation and cropping intensities remain well below their potential. It seems obvious that prevailing poverty, which includes low levels of education and the limited access to credit also result, to varying extents, from a lack of investments and commitment to agriculture of both governments and other institutions, such as national banks (Mittal 2009, ATV 2010). The same applies to crop insurance which remains an underdeveloped sector in Africa, despite about 20 years of "pilot" initiatives, mainly pushed by the World Bank and other development actors (Vargas-Hill, 2010).

The WB report by Christiaansen and Demery makes an important observation about Africa's agricultural technology debate, "that input use may not always be profitable, because of poor soil, poor-quality fertilizer, high transport costs, limited market access, and so forth. The implicit profitability assumption of modern input use deserves further scrutiny". In other words: in many cases it is the overall context which is not conducive to the development of African agriculture. In fact, the World Economic Forum blog (WEF 2016) lists largely the same factors as the WB report, but includes cross sector collaboration as a "key component of successfully being able to execute investment commitments"; this largely coincides with the "inclusive growth" promoted under NEPAD.

Two-thirds of the respondents to a survey on enabling environments by GrowAfrica (2018) "recognized that companies cannot overcome specific constraints within value chains and market systems, unless they work with public-sector partners, and they called for improvements in this area". This observation is at the basis of the African Development corridors which aim at providing an enabling environment for most socio-economic sectors (education, agriculture, transport and communications, energy) in relatively limited areas (corridors) under public/private and development partners cooperation arrangement. Based on the experience in other parts of the world (North-East Thailand, Brazilian Cerrado), it is conjectured that the more developed areas will act as examples and will boost development "by contagion" in other areas. The February 2015 CropWatch bulletin (CropWatch 2015) has additional detail, including info on rather optimistic assessments of the global potential of African agriculture, including for

agricultural exports, by the World Bank (2009) and Ferguson et al (2011). Only time will tell is the optimisms was justified in a context where the current African population is close to one billion, and projected to increase to 2.1 by 2050, increasing the share of the African population to 22% (from about 13% currently). The question of exportable surpluses in the future is constrained by local demand for agricultural food and feeds, the shrinking share of "available" land, land degradation (conservation agriculture is developing but slowly, ACT 2014), competition with other sectors such as tourism (national parks) and mining, commodity prices (Feed Africa 2016) and climate change. For the latter, the recent 2015-16 El Niño drought was already mentioned and covered in detailed in previous CropWatch bulletins. Whether the 2015-16 drought prefigures future conditions is unknown.

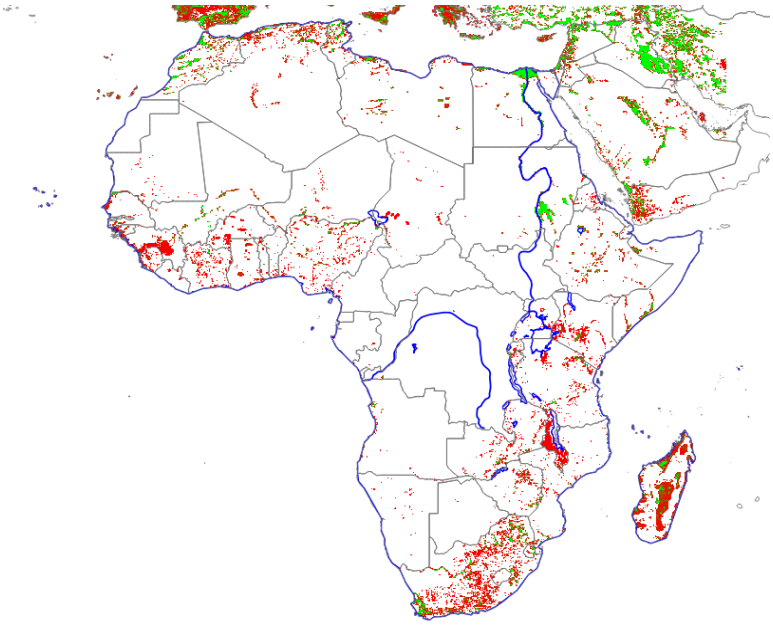
Environmental risks

Under (4), "A risky business" the Christiaansen and Demery report focuses on price risk, a subject which the present analysis mentioned under "Subsistence farming" above. The report also stresses that "The risks affecting African farmers go well beyond droughts".

While correct, the statement needs to be clarified. Most food insecurity on the continent is currently indeed man-made and brought about by war and resulting refugee movements in, but extending well beyond the Horn of Africa. The subject was covered in some detail in the August 2017 CropWatch bulletin (CropWatch 2017a). It remains that the continent is also confronted with chronic deficiencies in climate, in particular climatically very variable (i.e. risky because unpredictable) arid and semi-arid areas. According to Peel et al (2007), only 31% of the continent is "tropical" (Köppen's "A" tropical climates defined by temperature; they may be dry) and 12% is temperate (Köppen's "C" climate, a category defined based on temperature), mainly at high latitudes and elevations. Twenty countries, making up more than half (57%) of the continent belongs to Köppen's "B" climates which suffers from some form of water shortage (from outright desert to several of "semi-arid" climate). Semi-arid climates explain why rangeland and livestock-based farming systems play an essential part in African Agriculture. The issue was, again, covered in a previous issue of the CropWatch bulletins (CropWatch 2017b). According to Ward et al. 2016 "Dryland areas of Sub-Saharan Africa (SSA) contain one-half of the region's population and three-quarters of its poor." 126 million hectares are cultivated drylands (two thirds of the continent's arable land) , but only 5% is irrigated (Figure 5.4).

An additional factor to mention is the 2015-16 El Niño drought which has badly affected food production, health and the overall well-being of millions of people in eastern and southern Africa (IRI 2015, RISCURA 2015, IFPRI 2016, WHO 2016). The previous large humanitarian crises in Africa were those of the West African Sahel (from the early sixties to the mid-eighties) and the Ethiopian droughts of the mid-eighties. Droughts and the resulting humanitarian crises were widely assumed to be a "thing of the past". Currently (February 2018) there is again talk in parts of South Africa of declaring a National Disaster because of drought (Reuters 2018; Bloomberg, 2018). Much media coverage focuses on "zero day" when one of the largest South-African cities will run out of water, and on wine production, but the issue clearly goes well beyond cities, affecting agricultural production in Western Cape province at large.

Figure 5.4: percentage of irrigated land. Red: up to 20%; green more than 20% and up to 70%; white: unirrigated. Based on Siebert at al., 2013.



Trends and potential developments

Altogether, both the reports by OECD-FAO (2016) and by Christiaansen and Demery (2018) depict a more dynamic situation than generally adopted. The first, in particular, stresses that "magatrends" are at work in African agriculture; they affect demography (overall population growth (1), the development of a middle class (2) and rapid urbanisation (3)). There is also (4) a fast development of information and communication technologies, which affect all sectors of the economy, including farming. For instance, Nigeria has developed a large-scale registration system of farmers onto "electronic-wallets" to facilitate fertilizer subsidy payments (Feed Africa 2016). It is also expected that modern technology including remote sensing will improve the current shortage of reliable statistical data (Nakweya, 2017).

One of the megatrends is changing food demand patterns (5), in particular increased demand for meat and bread and the products of organic agriculture (UNEP-UNCTAD 2008). According to Feed Africa (2016), "net food imports, which are expected to grow from US$35bn in 2015 to over US$110bn by 2025" constitute a powerful driver to increase agricultural production.

Because of the large share of agriculture in the GDP, agriculture contributes more than elsewhere to overall development. "Within each of the four sub-regions, the five biggest crops contribute more than 45% of total crop production value, with maize being the single most important staple crop". Rice, potatoes, sweet potatoes, cassava and plantains play the dominant role in Eastern and Western Africa, Eastern and Central Africa, Eastern Africa, Western and Eastern Africa and Eastern and Central Africa, respectively.

While production has generally kept pace with population growth, the increase was achieved through horizontal expansion of land, as the continent – contrary to other areas – is relatively well provided with currently uncropped areas with agricultural potential, even if protected areas are excluded. Land is indeed available as illustrated by land acquisitions in Africa by foreign investors or countries (sometimes termed "land grab"). Little detail is available but estimates of the total area concerned sometimes reach up to 30 million hectares (Deininger and Byerlee, 2011). The same source indicates that potentially available cropland with high agro-ecological potential and low population density that is currently

uncultivated reaches about 200 million hectares, of which 50% is less than 6 hours away from markets. According to table 5.2 in CropWatch (2015), the total potential increase in area for all crops in Africa reaches 130%, significantly less than projected population increases. Severe shortage of land and water is confined to northern Africa, parts of the Sahel, including areas in northern Nigeria. Water shortage occurs predominantly in the Nile valley in North Sudan and Egypt. According to the yield gap figure (Figure 5.6), large gap predominate almost everywhere, indicating the equally large potential for yield improvement.

In fact, some authoritative African sources even view the untapped agricultural potential as one of the contributing factors for poverty and food insecurity (Feed Africa 2016) and stress the potential for cash-crops that are well established in the continent, such as cocoa, coffee, cotton and cashew.

Figure 5.5: Human pressure on land and water. Source of data: FAO, 2011.

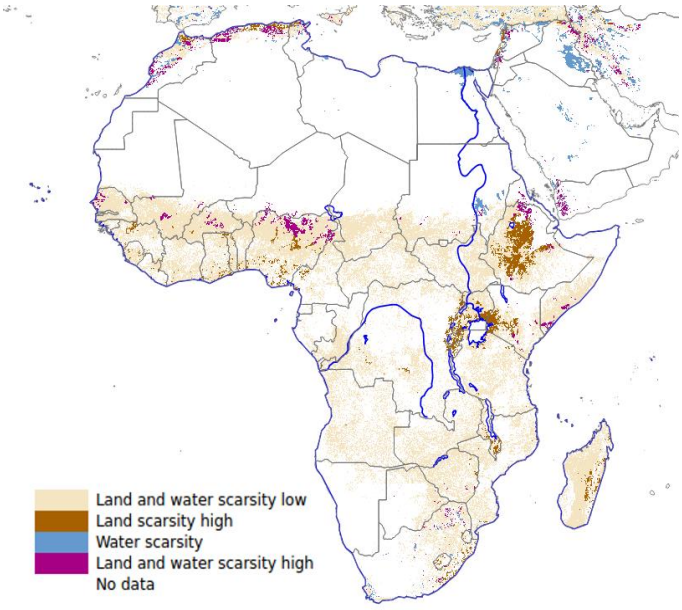
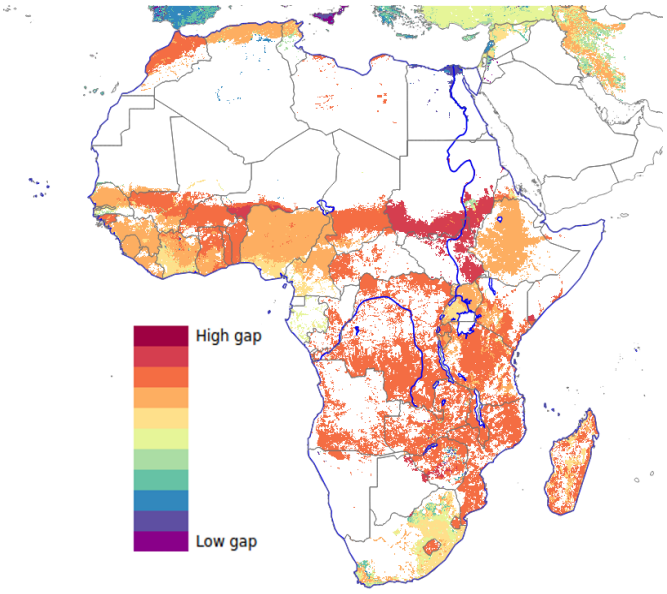


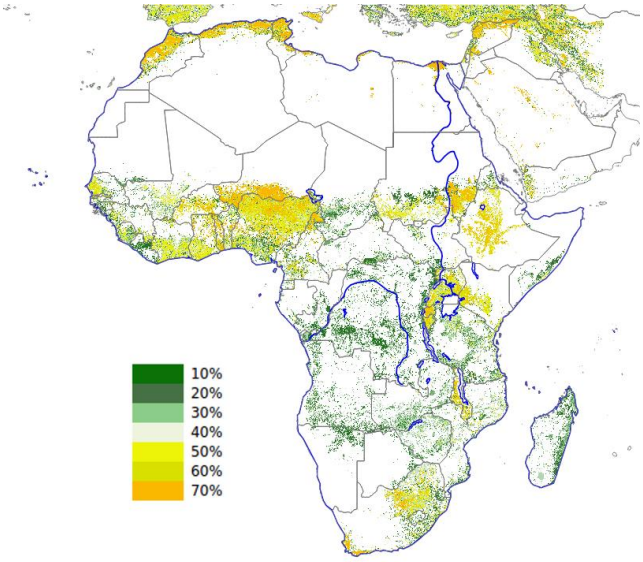
Figure 5.6: Ratio between actual crop productions in the year 2000 and that potentially achievable under advanced farming in current cultivated land for a combination of major crops. Source: FAO, 2011.



However, in countries where land is relatively short, the expansion of areas was achieved at the expense of fallow land. Such areas are relatively limited in the continent (Figure 5.7) and occur mostly in the monsoon rainfall maize growing areas of the South Africa North-East, the Great Lakes region and the

Highands of Eastern Africa, West Africa – especially Nigeria and Niger, and North Africa. It does not affect most of equatorial Africa and Madagascar.

Figure 5.7: Percentage of cropland per pixel. Data from Fritz et al 2015.



Actually, agricultural productivity by labourer (i.e. mechanization, use of inputs, improved varieties, irrigation) has increased by 1.6 over the last 30 years, but nevertheless less than in Asia where the factor reached 2.5 (OECD-FAO, 2016). Feed Africa (2016) has put forward an ambitious plan to eliminate poverty, hunger and malnutrition by 2025, and make Africa a net food exporter by developing those sectors where Africa has a comparative advantage. The ambitious plan calls for coordinated investments between 315 and 400 billion US$ in farming, infrastructure and agribusinesses. According to Ward et al. (2016), the cost of developing the irrigation potential irrigation in sub-Saharan drylands amounts to 60 billion US$ to develop 10 million Ha of new irrigation. Under a “medium cost” and economically viable scenario, they put the cost of large-scale irrigation at 12000 US$/ha and, for small-scare irrigation, at 4500 US$/Ha. This compares with a situation where public expenditure in African agriculture has remained about constant at 6% of agricultural GDP since the 1980s (Akroyd and Smith, 2007). The target defined by the Comprehensive Africa Agriculture Development Programme (CAADP), one of the priorities defined by the New Partnership for Africa's Development (NEPAD) programme of the African union is 10%. Currently, only one country in five reaches the target (NEPAD 2013)

In confirmation of the yield gap map in Figure 4, Ward et al (2016) state that “considerable technical potential exists for increasing productivity in drylands agriculture, particularly in cereals, roots and tubers, pulses, and oil crops” (for a map of African drylands, refer to CropWatch 2017b). According to Figure 5, however, the potential for the expansion of cultivated land is limited.

There is a risk that the development of a large commercial agricultural sector will creating an environment where small scale farmers are unable to compete with large businesses, exacerbating their poverty. On the contrary, WEF 2015 sees the potential partnership between agribusinesses and smallholders a one of the most promising drivers of the development of African Agriculture.

This may be an optimistic view. Unless their access to credit is improved dramatically smallholder farmers will be unable to increase on-farm investments in productivity because of their limited capacity to “manage the risk-return trade-offs” when moving towards intensified agriculture (Livingston et al 2011) or agricultural innovations in general (NEPAD 2103). This is why some authors (Agada, 2016) insist that there is still ample scope to improve rainfed agriculture among others because this will benefit

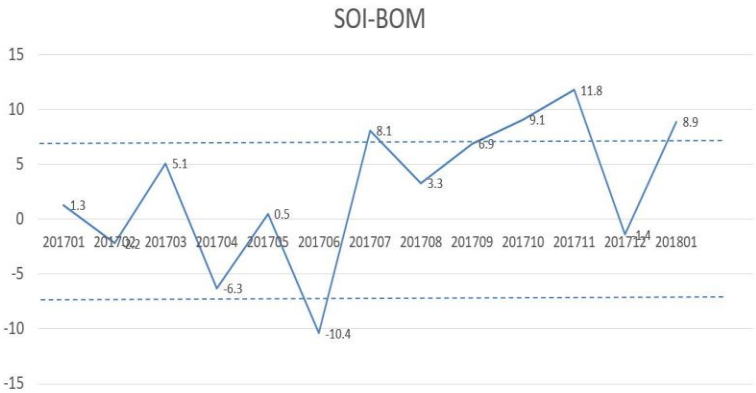
smallholders directly. The intensification of agriculture in general and the development of large scale commercial farming in Africa, however, is not an option; it is a necessity.

5.4 Update on El Niño

El Nino conditions have been neutral across the Pacific Ocean during the fourth quarter of 2017 but a weak La Niña continues in the Pacific Ocean. Figure 1 illustrates the behavior of the standard Southern Oscillation Index (SOI) of the Australian Bureau of Meteorology (BOM) from January 2017 to January 2018. Sustained positive values of the SOI above +7 typically indicate La Niña while sustained negative values below −7 typically indicate El Niño. Values between about +7 and −7 generally indicate neutral conditions.

During the current season, SOI increased from 6.9 in September to +9.1 in October and to +11.8 in November, and then decreased to -1.4 in December. It increased again to +8.9 in January 2018. The overall sustained large positive value indicates a weak La Niña is occurring. Australian BOM reports a weak La Niña WATCH at the current stage and from a global point of view. CropWatch will keep on monitoring the condition of La Niña.

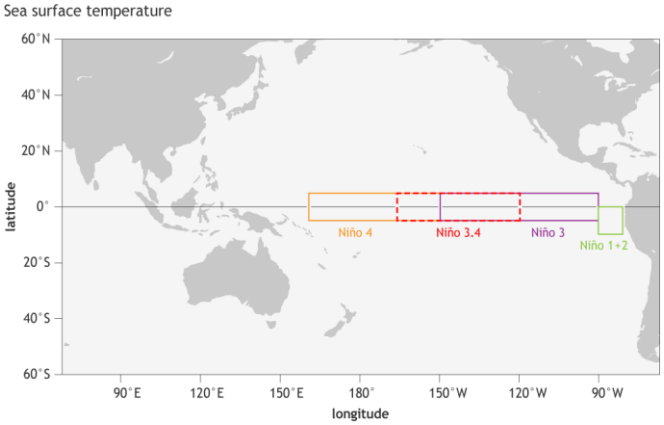
Figure 5.8. Monthly SOI-BOM time series for January 2017 to January 2018



Source: http://www.bom.gov.au/climate/current/soi2.shtml

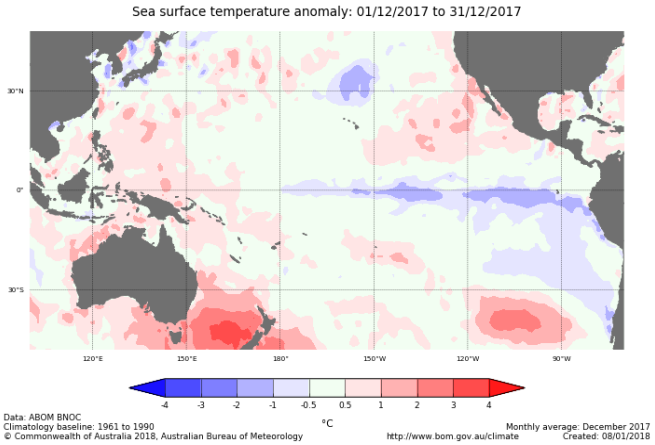
The sea surface temperature anomalies in December for NINO3, NINO3.4 and NINO4 regions were −0.9°C, −0.7°C, and −0.2°C in sequence, cooler than 1961-1990 average according to BOM (see Figure 2-3.). Both of BOM and NOAA surmise that the overall cooler condition indicates that a weak La Niña event is occurring during the southern summer and that it will probably continue into the following autumn.

Figure 5.9. Map of NINO Region



Source: https://www.climate.gov/sites/default/files/Fig3_ENSOindices_SST_large.png.

Figure 5.10. Sea surface temperature anomalies (December, 2017)



Source: http://www.bom.gov.au/climate/enso/wrap-up/archive/20180130.ssta_pacific_monthly.png