Chapter 5. Focus and perspectives

Building on the CropWatch analyses presented in chapters 1 through 4, this chapter presents initial CropWatch food production estimates for 2018 (section 5.1), as well as sections on recent disaster events (section 5.2), Mediterranean Agriculture: Features and recent trends (5.3) and an update on El Niño (5.4).

5.1 CropWatch food production estimates

Methodological introduction

Table 5.1 presents the first estimate by the CropWatch team of global maize, rice, wheat and soybeans production in 2018. It is issued at a time when many winter crops in the northern hemisphere are still growing and summer crops are in very early stages, or even to be planted; in the southern hemisphere the harvest of the summer season/monsoon season has been completed.

The estimate is based on a combination of remote-sensing models (for major commodities at the national level) and statistical trend-based projections for minor producers and for those countries which will harvest their crops later during 2017, for which no directly observed crop condition information is as yet available. In the table below, modelled outputs are red bolded. The percentage of modelled production varies according to crops: 18% for maize, 58% for rice, 83% of wheat (most of it being winter wheat) and 43% for soybeans. The share of modelled production will gradually increase and reach to 80% to 90% in the November bulletin.

It is important to note that the current bulletin increases the countries that are monitored in detail from 30 +1 ("1" being China) to 41 +1, to put more emphasis on some African and Asian countries. More countries may be added in the next bulletins. The 41 countries are described in detail in chapter 3 while a whole chapter is devoted to China (Chapter 4). The 41 + 1 countries are referred to conventionally as the "Major producers". "Others" include the 142 countries from Albania, Algeria, Armenia [...] to Venezuela, Yemen and Zimbabwe. The total output for "other" countries was obtained by adding national projections for 2018 rather than projecting the sum. The reason for doing so is that countries sometimes phase out crops for a variety of reasons (e.g. soybean in Macedonia or Syria) and production projections that turn negative can be set to zero. This effect remains hidden when sums are projected.

Production estimates

CropWatch estimates the global 2018 production of the major commodities at 1045 million tonnes of maize, up 1.8% over 2017, 745 millions for rice (up 0.6%), 697 million tonnes of wheat (a 3.2% drop below 2017) and 323 million tonnes of soybeans, virtually equivalent to 2017 (-0.1%). The major producers contribute 960 million tonnes of maize (+1.8%), 678 millions for rice (+0.6%), 629 million tonnes of wheat (-3.5%) and 302 million tonnes of soybeans (-0.5%). The share of the "minor producers" (shown as "Others" in the table) to the global production varies from 6.4% (soybean) to 9.6% (wheat) with maize and rice being at 8.2% and 8.9%, respectively. Compared with the final CropWatch estimates for 2017, the relative importance of "others" has decreased as the percentages were 7.7% for soybean, 15.2% (wheat), 12.1% (maize) and 10.2% (rice as paddy).

Major producers outperform "others" for maize and rice (1.8% Vs. 1.4% and 0.6% Vs. 0.3%, respectively) while minor producers outperform the major producers for wheat (0.5% Vs. -3.5%) and especially soybean (6.4% Vs. -0.5%) which is a common observation showing that more countries are trying to join

the closed club of soybean producers dominated by the USA, Argentina and Brazil and some of their south-American neighbours.

Table 5.1: 2018 cereal and soybean productions estimates in thousands tonnes. Although more complex situations do occur in the case of multiple cropping, numbers in black are trend-based while numbers in red generally corresponds to modelled crops that have been harvested or were growing at the time of reporting.

Table 5.1. CropWatch productions estimates, thousands tons

	Maize		Rice		Wheat		Soybean	
	Production (ktons)	% change from 2017	Production (ktons)	% change from 2017	Production (ktons)	% change from 2017	Production (ktons)	% change from 2017
Afghanistan	322	0.6	265	−16.7	3353	−21.7		
Angola	2791	4.1	72	13.1	4	1.9	20	12
Argentina	28819	−3.8	1516	−15.3	15674	−1.4	46942	−8.2
Australia	476	−0.7	490	−29.3	21123	−9.1	80	3
Bangladesh	3124	11.6	46724	3.2	1448	7.7	112	9.3
Belarus	280	−46.0			3033	9.7		
Brazil	86607	3.1	11137	−1.8	6740	7	97495	0.8
Cambodia	196	−42.0	8596	−2.2			186	9.6
Canada	13490	1.4			26691	−13.0	6977	5
China	194108	2.2	200959	0.2	115544	−2.8	14081	2.4
Egypt	6295	6.4	6897	5.4	11730	7	44	12.5
Ethiopia	8929	4.3	160	6.8	4595	9.9	111	6.3
France	12955	−7.0	51	−19.5	38484	1.1	430	19.2
Germany	3695	−11.0			29496	4.9	50	22.3
Hungary	7759	2.6	9	−5.8	5382	2.8	171	12.3
India	26464	2.8	167323	2.6	87584	−6.3	10608	−3.1
Indonesia	17769	−0.1	67665	−1.1			1017	4.9
Iran	728	−27.6	2527	4.9	13529	6.2	147	2.5
Italy	6299	−8.6	1522	0.6	6820	−5.3	1388	14.3
Kazakhstan	888	8.2	467	6.8	14451	−12.9	283	6.3
Kenya	3986	32.9	121	−4.7	156	−10.5	2	−7.0
Mexico	23439	−1.8	278	10.5	3883	3.3	565	12
Mongolia					233	0.7		
Morocco	47	−0.6	62	12.4	6814	−4.0	1	0
Mozambique	2085	2.2	41	−40.4	19	−2.5		
Myanmar	1987	3.9	25790	1.5	126	−8.5	131	6.6
Nigeria	11276	1	6934	4.8	13	−66.0	656	−1.5
Pakistan	6539	5.5	11584	1.3	23946	−1.4		
Philippines	7791	2.2	20950	3.8			1	−2.8
Poland	4877	2.1			12236	11.9	11	29.6
Romania	10863	0.7	36	−9.3	8172	6.5	320	14.9
Russia	18735	7.6	1091	1.7	54264	−7.9	3609	10.7
South Africa	13197	−6.8	3	0.4	1660	−7.2	1036	3.4
Sri Lanka	333	9.8	2501	0.1			9	13.3
Thailand	4685	−1.3	36502	−5.2	1	3.4	11	−4.8
Turkey	7628	7.3	914	0.2	20682	7.9	203	5.2
Ukraine	31492	−1.4			23600	4.1	5280	9.3
United Kingdom					14734	1.5		
United States	380182	2.7	9918	6.5	47399	−13.5	109815	0.2

	Maize		Rice		Wheat		Soybean	
	Production (ktons)	% change from 2017	Production (ktons)	% change from 2017	Production (ktons)	% change from 2017	Production (ktons)	% change from 2017
Uzbekistan	568	8.1	391	7.1	5973	−7.3		
Vietnam	5543	1.1	44765	−1.4			89	−10.8
Zambia	2367	−1.1	19	−21.9	167	−15.2	137	−15.5
Major producers	**959614**	**1.8**	**678281**	**0.6**	**629758**	**−3.5**	**302018**	**−0.5**
Others	85766	1.4	66301	0.3	66829	0.5	20610	6.4
Total	**1045379**	**1.8**	**744582**	**0.6**	**696588**	**−3.2**	**322628**	**−0.1**

Note: Although more complex situations do occur in the case of multiple cropping, numbers in black are trend-based while numbers in red generally corresponds to modelled crops that have been harvested or were growing at the time of reporting.

Maize

As for the other crops in table 5.1, the discussion concentrates on actual numbers (those in red) rather than on statistical projections (black). Countries that experienced large production increases include mostly Egypt (+6.4%) and Brazil (+3.1%) , one of the largest global suppliers of the crop (3rd exporter worldwide). The second largest exporter (Argentina) suffered a drop in maize output of 3.8% due to drought in the northern provinces, which affected as well adjoining areas in Uruguay and Brazil.

The spectacular production increase in Kenya (+32.9%) is due to two factors: dry conditions in 2017 and a recent wet spell in the country, which has favoured the early planting and development of long rains maize. Although the abundant precipitation has provided needed soil moisture and may have a lasting effect on crop condition, the final outcome of the "mahindi" season will depend on the development of the ongoing long rains. Rice

A major observation is the generalised drop in rice production in South-East Asia, starting with Cambodia (-2.2%), Indonesia (-1.1%), Thailand (-5.2%) Vietnam (-1.4%). It is not evident what caused the drop, although reduced sunshine may have played a part. The countries also have in common a climate with equatorial tendencies ("all year round wet") and they experienced generally cooler than average temperature during the previous reporting period. Countries further to the north (Bangladesh, India, Myanmar, Philippines) have generally a more marked dry season during the northern hemisphere winter and dry-season irrigation is more common. In the four listed countries rice output increased by 3.2%, 2.6%, 1.5% and 3.8%, respectively.

Argentina produces about twenty times less rice than maize, but the crop is mentioned here because of the poor performance of rice (-15.3%). Argentina faces a historically poor agricultural season as next to rice, maize and soybean performed poorly and will affect the countries export capacity.

Wheat

Good actual satellite data are available for northern hemisphere wheat. Some of the southernmost countries (India, Pakistan, Bangladesh, Nigeria) have reached or completed harvest, while the high latitudes will harvest from early to late summer, depending on location. Thus is also to say that unfavourable crops in the second group may improve if spring (May onwards) precipitation provides moisture that was short during dormancy. Reductions in production exceeding 5% occurred on all continents, and include some of the major global producers such as Canada (-13.0%) and the United States (-13.5%) due to unfavourable weather including poor sunshine, drought and floods and cold waves.

Other major producers such as India, Kazakhstan and Russia suffered a drop in production reaching 6.3%, 12.9% and 7.9%, respectively. It is mostly the poor performance of the large global producers of wheat that are responsible for the global drop of production mentioned above (-3.2%).

Countries with positive outcomes include Bangladesh (+7.7%,), Iran and Turkey (+6.2% and +7.9%, in both countries the first favourable crop after a run of bad or mixed seasons), Belarus, Poland and Romania (+9.7%, +11.9% and +6.5%, respectively), Egypt (+7.0%) where the good wheat crop is to be added to increased maize and rice productions.

Soybean

In the northern hemisphere the crop is still to be planted, so that only Argentina and Brazil can be meaningfully mentioned here. Similar to maize and rice, the Argentinian Soybean crop is down (-8.2%) while, in comparison, Brazil did well (+0.8%).

Major importers and exporters

Table 5.2 shows the performance of the major importers and exporters of maize, rice as paddy, wheat and soybeans according to the data in table 5.1. 14 additional countries are part of the top ten importers or exporters. They are listed in the note to Table 5.2.

Overall, the top 5 importers and the top 10 importers increased their production over 2017. For the top 10 importers, the increased volume of the output varies from 452 kTonnes (Wheat) to 3629 kTonnes for maize. The values are shown with a minus sign as they correspond to reduced demand on the international markets. As a group, their performance was slightly below that of the majority of countries (last line in table 5.1) for maize (+1.4% Vs. +1.8% for the world) and for rice (+0.3% Vs. +0.6%). For wheat and for Soybean (if the northern hemisphere output turns out to be “average”), they did significantly better for wheat (1.3% Vs. -3.2% globally) and for soybean (3.8% Vs. -0.1% globally). As a result, the demand will probably be comparable or slightly above last year’s by a couple of percent representing population growth.

Since the top exporters dominate the production landscape, the percentage change in their output closely follows table 5.1: +1.8% for maize in both the top 10 exporters and the total of all countries, 0.7% Vs 0.6% (top 10 exporters Vs global) for rice and -0.4% Vs. -0.1% for Soybean. Some difficulties may arise with wheat supply if the situation does not improve in the USA and Canada as the projected production deficit of the top 10 exporters reaches just above 17 million tonnes.

Table 5.2. Comparison of 2018 and 2017 production of top 5 and top 10 importers and exporters as well as the change in the offer and demand for the top 10 importers and exporters between 2017 and 2018

	Maize		Rice		Wheat		Soybean	
	Prod. (ktons)	% change from 2017	Prod. (ktons)	% change from 2017	Prod. (ktons)	% change from 2017	Prod. (ktons)	% change from 2017
5 top importers	223922	1.9	30603	3.9	28540	2.0	14700	2.8
10 top importers	231078	1.6	301695	0.3	36303	1.3	17406	3.8
Δ demand ktonnes	-3629		-912		-452		-637	
5 top exporters	540054	1.9	270091	0.9	187961	−8.6	271751	−0.8
10 top exporters	604013	1.8	311341	0.7	279354	−5.8	298282	−0.4
Δ offer ktonnes	10548		2103		−17296		−1073	

Note: in addition to the the countries listed in Table 5.2, the following countries belong to the group of major importers and exporters: Algeria, Bolivia, Colombia, Côte d'Ivoire, Iraq, Japan, Malaysia, Netherlands, Paraguay, Republic of Korea, Saudi Arabia, Spain, United Arab Emirates and Uruguay. Their 2017 and 2017 production of the reference crops are trend-based.

5.2 Disaster events

According to a recent report issued earlier this year by the European Academies Science Advisory Council (EACSAC 2018) global floods and extreme rainfall events have increased more than 50% this decade. The increase is more than fourfold compared with 1980. For abnormally high temperature, of which agricultural drought and fires are a usual consequence, the increase over 1980 is more than twofold. Most of the changes can now be clearly assigned to climate change and resulting deep impacts, e.g. on ocean currents.

We also need to mention, according mostly to ReliefWeb, that several Caribbean Islands (Haiti, Dominica, …and even Puerto Rico) are still struggling with the consequences of Hurricanes Irma (September 2017) and especially Maria (September-October 2017) . The damage due to the cyclones is highest in US$ terms in US territories (e.g. 90 billion in Puerto Rico for Maria) because of the high value of lost infrastructure. In terms of long-term deterioration of living conditions, the damage caused by Maria in Dominica, however (1.4 billion US$) is considerably larger.

This section also tends to focus on atmospheric disasters because their impact on food production tends to be larger than the impact of lithospheric disasters such as earthquakes and volcanic eruptions. It remains, however, that the Papua New Guinea 7.5 magnitude earthquake of 25 February needs to mentioned as more that 500,000 people were strongly affected. The tremor was the largest earthquake recorded in the region since a similar event in 1922. Two months after the event, 270,000 people were still in need of assistance across four provinces and close to 45,000 remained displaced. Major problems include water supply as landslides and landslips destroyed many traditional water sources (UNDP 2018).

Disasters by category

Globally, the impact of disasters was relatively limited this reporting period.

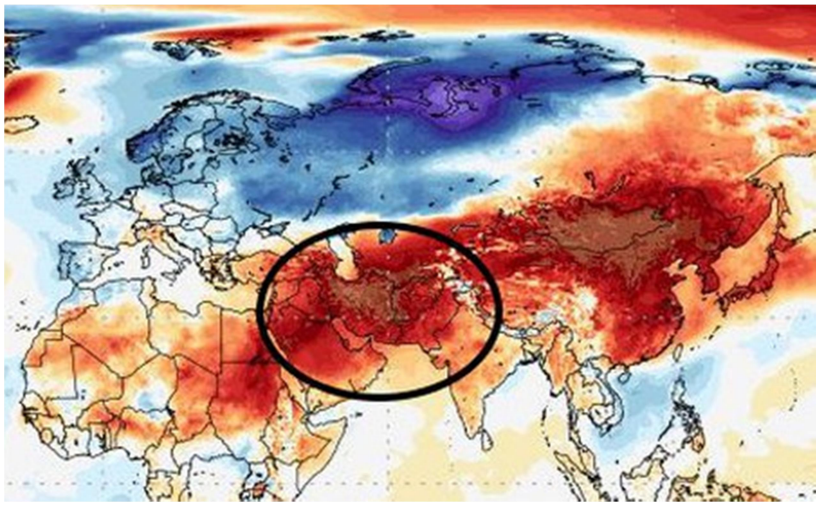
Heat and fire and drought

Drought, that has been affecting parts of Australia for months continued into the current reporting period with the Tathra (New South Wales) bush-fires destroying many homes.

The most serious drought in terms of agricultural impacts, however, occurred from the beginning of 2018 in parts of Latin America, lasting into March and early April. In Uruguay, the most severely affected Departments are Tacuarembó, Salto, Durazno and parts of Artigas, Paysandú, Rivera and Río Negro. Lack of water has considerably reduced available areas for growing crops and raising livestock, and is likely to continue affecting food supply. The National Emergencies System (SINAE) warns that the drought – which is possibly linked to La Niña – might last until the middle of the year or beyond. In Argentina, the State of Entre Rios, which borders Uruguay, was declared agricultural disaster area on for one year, on 27 March.

A significant heatwave was reported from parts of Europe but mostly from Asia in March-April, centered over Iran but extending eastward into Pakistan and as far as Japan and westward into north-east Africa. Long term temperature records were broken in many countries, reaching 45.5°C in Pakistan (mostly in Sindh province), 43.8°C in Iraq, 40.2°C in Turkmenistan, 37.2°C in Uzbekistan and 35.3°C in Tajikistan. Thousands are deemed to have died due to heat stress. Some impacts on crops are likely but no early estimates cold be located.

Figure 5.1. "Center" of March-April heatwave



Source: https://mashable.com/2018/04/03/severe-heat-wave-asia-monthly-records/

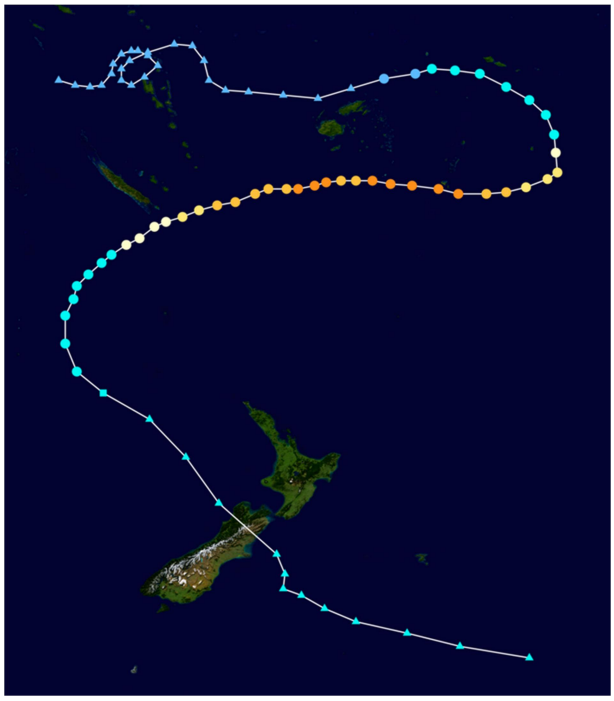
Cold wave

The United Kingdom and Ireland were affected by a late winter cold that lasted from late February to mid-March. Storm Emma, which caused 93 casualties was part of this event which the media nicknamed “the Beast from the East” (Wikipedia 2018).

Cyclones

Between 3 and 22 February an intense tropical cyclone (Gita, Figure 5.2) affected Vanuatu, Fiji, Wallis and Futuna, Samoa, American Samoa, Niue, Tonga, New Caledonia, Queensland and New Zealand causing damage for about 200 million US$. The cyclone brought mostly rainfall, floods and strong winds (230 km/h in Tonga), destroying houses and infrastructure, and most seriously affecting Tonga. Crops were damaged in parts of Fiji but mostly in Tonga (75% of the cyclone’s total losses: 150 million US$). Gita is the most severe cyclone ever recorded in Tonga. In addition to agriculture, the cyclone caused extensive damage to buildings (private and public) and infrastructure (water supply, transport and communication infrastructure). Some 50,000 people were affected.

Figure 5.2. Track of cyclone Gita



At the beginning of February, the precursor of Gita "looped" over Vanuatu and then moved east and back west passing north of Fiji on 8 Feb and south of the island on 11 Feb. It collapsed on 22 Feb south-east of New-Zealand. Source: Wikipedia 2018

Additional cyclones occurred in the Pacific area but did not cause serious damage.

Floods

Significant floods are reported from Europe and Asia, seriously affecting the east of the continent at mid-March, for instance Belarus and the southern part of European Russia (Volgograd Region), as a result of rapid snow thaw and run-off of meltwater into riverbeds. In Russia, 11,550 people were assisted by the Russian Red Cross Society. Still in Russia, at the end of March, floods were reported from the Altai Krai.

The most serious floods are those that occurred in Africa, affecting large areas in the Horn of Africa, starting at the beginning of March heavy rain fell over the centre and south causing floods, flash floods and killing 15 people. In Mandera county, at least 750 homes were swept away and an estimated 4,500 people have been displaced. The above-normal precipitation constitutes an early start to the March to May “long rains” and, in spite of the damage caused, provides badly needed relief after a long period of drought. The same rains also caused concern and some damage in neighbouring Rwanda.

In early April flooding and landslides occurred in Burundi. A week later, heavy rains resulted in flash floods in Somalia creating damage and stressing refugees living under difficult conditions but resulting in few casualties. About 30,000 people were displaced. In Ethiopia flash flood left hundreds of thousands of people in need of immediate humanitarian support in Afar, Oromia and Somali regions. Several villages lost their crops at flowering stage, far too late for replanting. Many people’s houses and livestock have been washed away. Kenya was affected by floods in April too, mostly in the semi-arid eastern parts bordering Somalia. In the south, abundant rain fell over the northern half of Tanzania from mid-April. ,

Floods are ALSO reported from southern African in Botswana at the end of February.

5.3 Mediterranean Agriculture: Features and recent trends

Overview

The Mediterranean Sea covers about 2.5 million km². It is bordered by just under 20 countries and territories[1] and about 3500 islands of various sizes in Europe (EU), Africa (AF) and Asia (AS).

The countries of the Mediterranean area have much in common, starting with history. The Ottoman empire englobed all of it at the end of the 17th century, except Italy, the Iberian peninsula and Morocco. At the end of the second century, all of the region was part of the Roman empire, to the extent that the Romans used to call the Mediterranean "Mare nostrum" ("Our sea"). Today, the phrase is often used in the ambit of exchanges and cooperation among Mediterranean nations (Wikipedia 2018a) to stress the commonalities among them. This is also the spirit that led to the foundation of the International Centre for Advanced Mediterranean Agronomic Studies 1962 (CIHEAM 2018), a Mediterranean intergovernmental organisation devoted to the sustainable development of agriculture and fisheries, food and nutrition security and rural and coastal areas. There are several other Mediterranean institutions, such as the Union for the Mediterranean (Wikipedia 2018b) and the Parliamentary Assembly of the Mediterranean (Wikipedia 2018c)

The region is home to about 440 million people (282 million live in rural areas) and the population grew 11% from the early 21st century[2] (16% in rural areas). The current average rate of urbanization (64%) hides a large disparity with the lowest values in Bosnia-Herzegovina (36%) followed by a group of countries close to 50% (Albania, Egypt, Slovenia, Syria) and three countries close to 90% or above (Israel, Lebanon and Malta).

Population age structure varies significantly among countries. The percentage of people younger than 15 years is 14% in Italy and Portugal, but 32% and 37% in Egypt and Syria, respectively. People above 65 years, on the other hand, make up about 20% of the population in Italy and Portugal, but only 4 to 5% in Egypt and Syria. Average values (about 20% in the below 15 group and 12% in the above 65 age class) do occur in Cyprus and Albania. The age structure provides a very straightforward stratification of the Mediterranean countries from "very young" (Syria, Algeria, Tunisia) to "middle-aged" (Lebanon, Israel and most former Yugoslav republics) to "old" (Spain, Croatia, Italy). Refer to Eurostat 2015 for additional information about the Region's age structure. As confirmed by net migration numbers available from the website of the World Bank (2018), the different age pyramids is one of the factors explaining ongoing and future population movements from south and east to north across the Mediterranean.

The share of agriculture in the GDP currently stands at 6.8% (2009-16 average) for the region, a decrease of about 17% since the turn of the century in the region. Agricultural shares of GDP above 10% occur in Albania (22%), Morocco (10%), Egypt (12%) and Algeria (11%). The lowest values (2% and below) are those of Slovenia, Italy, Israel and Malta and the highest is found in Algeria (+17%). The largest decreases were recorded in two islands with sometimes atypical development patterns (Malta -33%, Cyprus -32%) followed by a random mix where Lebanon (-24%) tops the list which has Italy, Israel, Tunisia and Morocco at -11%, -9%, -5% and -1%, respectively.

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[1] Albania* (EU), Algeria* (AF), Bosnia and Herzegovina (EU), Croatia (EU), Cyprus (AS), Egypt* (AF and AS), Greece* (EU), Israel (AS), Italy* (EU), Lebanon* (AS), Libya (AF), Malta* (EU), Morocco* (AF), Occupied Palestinian territory (State of Palestine: Gaza Strip and West Bank, AS), Portugal* (EU), Slovenia (EU), Spain* (EU), Syria (AS), Tunisia* (AF) and Turkey* (AS and EU). CIHEAM members (which also include France) are marked by an asterisk. When the text refers to "the Region" (capital R) the list above is intended. The list is conventional. France was omitted because only the south is Mediterranean. Other countries for instance Macedonia, Serbia, Montenegro, parts of Iran do have a "Mediterranean tendency" (climatically) although they do not border the sea.

[2] The phrase "percent change from the early 21st century" is used repeatedly in this note. It refers to the percent change from the 2001-2008 average (or total) to the average (or total) of the period from 2009 to the most recent data available, which can vary from 2013 to 2016. Similarly, quoted variables correspond to 2009-onwards sums or averages.

Environment and agriculture

It is environment and landscape, however, which constitute the most typical common features across the Mediterranean areas, in particular the semi-arid climate characterised by winter precipitation and summer dryness. Winters tend to be mild and winter crops can grow almost everywhere. Summer crop cultivation is more problematic.

The region has many hill and mountain areas which lead to rather complex climatic and cropping patterns. To some extent, the mosaic of micro-climates is typical of the Mediterranean area. Some of them are unique; for instance, it is not uncommon that bananas and temperate fruits (such as plums and apples) grow together in the highlands of southern Morocco. Steep local environmental gradients and ecological patchiness contribute to the region's diversity and make it relatively safe are in terms of food security.

Figure 5.3. Excess of annual rainfall over annual potential evapotranspiration (mm) over the Mediterranean area. Based on rainfall from Hijmans et al (2005) and PET from Trabucco et al (2009)

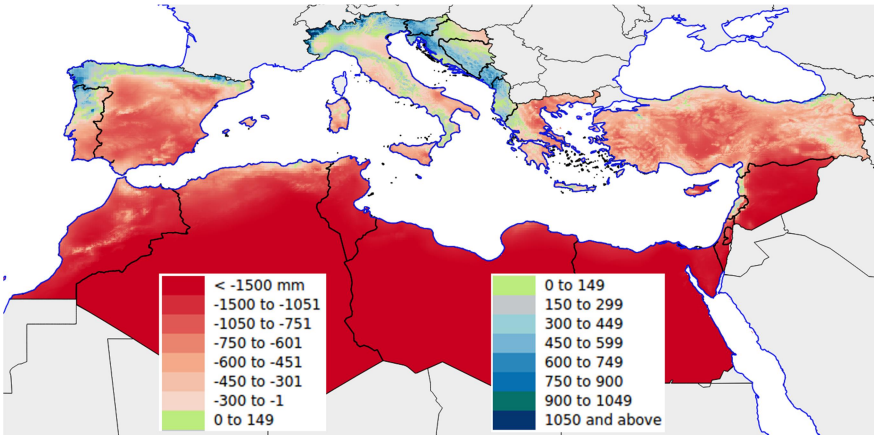
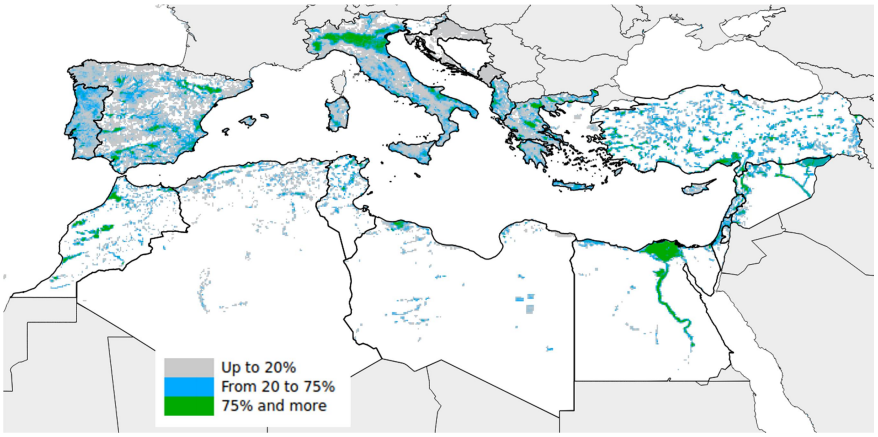


Figure 5.4. Irrigated areas x over the Mediterranean basin. Values are expressed in % of pixel area. Based on data from GMIA 2016



Paradoxically, irrigation plays a limited role in the region, with about 13 million Ha of irrigated land, which is about 6.0% of the total agricultural land (216 million Ha). The percentage of irrigated land remained stable since the first years of the century, i.e. both total agricultural land and irrigated land dropped by about the same percentage (2.2% and 2.3%, respectively). With the exception of Egypt, where virtually all land is irrigated, the percentages of irrigated land are close to 20% or above in Albania (17.4%), Italy (18.3%), Cyprus and Malta (21.3% and 34%). The average mentioned above (6%) essentially results from most values being close to 10% (Turkey, 13.5%) with very low irrigation percentages is some countries, e.g. Bosnia and Herzegovina.

It is likely that, in the near future, irrigation will become more common in the Region. As repeatedly mentioned in the previous CropWatch bulletins[3] , the Mediterranean area appears to be undergoing a relative aridification that affects the whole Basin (Figure 5.5). This may be a general "weakness" of Mediterranean climates as long-term drought is observed as well in other areas with Mediterranean climates, such as California, parts of Southern Africa and Australia.

Figure 5.5. A near-empty water reservoir in Cyprus in 2016. Source: Guardian 2016

According to data available in FAOSTAT, the region undergoes a marked warming: 2001-8 winter temperature (DJF) exceeded the 1951-80 reference values by 0.8°C. For 2009-16, the change is 1.1°C in Winter and a rather significant 1.7°C in summer (JJA). In winter, the largest changes occur in the north-east and east (Slovenia, Syria and Turkey) while summer heat-waves seem to have become the norm (e.g. +2.0°C and more in Bosnia, Croatia).

The Mediterranean crops "package"

The Mediterranean area and the near east are among the main centres of origins of cultivated crops (Daminia et al 1998). About 85 crops are of "Mediterranean" and "near-eastern" origin and are often treated as a category of plants that tend to grow in the same areas (Patterson and Josling 2005); they constitute the "Mediterranean plant package" and are at the basis of the "Mediterranean diet[4]", with cereals, typical fruits and herbs. Plants that originated in the Mediterranean and Near-East include wheat, rye, oats, and barley, as well as many forage plants (including legumes) but mostly vegetables and fruits, not to mention other typical products such as cheese. In fact, Patterson and Josling consider the following among the typical "Mediterranean" plants of major economic importance: olives, tree nuts (e.g. pistachios, almonds, hazelnuts) , grapes and wine, tomatoes and citrus. Olive trees and oil, the most typical markers of the Mediterranean package are often used to define the region.

Table 1 illustrates some recent changes that have occurred in the production and trade in the region. For many commodities, the percent change in export values by far exceeds the change in production, indicating the increased focus of the region on exports and the high value of Mediterranean products.

[3] In August 2016, a special feature was devoted to drought in Morocco (CropWatch, 2016).
[4] Not all ingredients typical of the "modern" Mediterranean diet are of Mediterranean origin, e.g. tomatoes.

Table 5.3. percent change from the early 21st century of some production and export statistics in the Mediterranean region

Product	Production	Value of exports	Exported Product
Cereals	3.8	73.8	
Barley	−4.2	−17.5	
Potatoes	15.1	43.8	
Soybeans	43.4	446	
Vegetables	10.7	63.4	
Sugar beet	−3.9	114.6	Sugar
Sugar cane	−5.7		
Citrus	17.3	61.2	Orange
			Tangerine
			Clementine
		74.3	Other citrus
Grapes	0.1	60.9	Grapes
		87.7	Grape juice
Whole hazelnuts	−8.8	36.33	Shelled hazelnuts
Pistachios	40.4	141.3	
Olives	11.8	24.2	olive oil
Tomato	8.4	40.54	Tomato juice
		54.74	Tomatoes as fruit

The production of some traditional and popular crops in the Mediterranean region, such as barley (mostly grown as winter crop in north Africa and the Middle East; Algeria is the major producer with 1.4 million tons) and sugar crops have been decreasing. In the case of sugar, it is probably the EC Common Agricultural Policy (CAP[5]) and stagnating prices during the first decade of the century that have reduced the appeal of growing sugar crops. In fact, after a peak in 2012, sugar prices have been low again. For soybean, for instance, prices varied between 400 US$ and 1000 US$ per ton between 2001 and 2008, but reached 1800 US$ per ton in 2013, resulting in high average values between 2009 and 2016 (Trading economics website). A large fraction of the listed trade actually regards exports to the European Union by southern Mediterranean countries.

In the case of barley, an important source of straw used as cattle feed, the crop has often been replaced by winter wheat while other sources of feed (e.g. soybeans) are used more frequently. The production of coarse grains, which include mostly maize (and some barley) in the region, has undergone a modest increase of 2.3%. The region has four significant producers of maize (million tonnes), two in the north (Italy 8.1, Spain 4.2), one in the east (Turkey 5.2) and only one in the south (Egypt 7.7)

The typical Mediterranean commodities from citrus to tomatoes are doing well, and are frequently seen as a natural way to reduce production risk through increased diversification. It is stressed that the listed

[5] For a general overview of the CAP's effect on the Mediterranean countries, refer to Cakmak 2013 and De Castro and di Mambro 2013

products are just some of the very typical ones. There are dozens more that all occupy niche markets and remain in high demand, including for instance herbs and spices (e.g. peppers and saffron) , and products such as dates (+124.9% export value) or figs (+11.6%) and many other dried fruits. Dried fruits have relatively long shell-lives using traditional technology. They can be produced at low cost thanks to the dry climate in unsophisticated environments and provide small-scale farmers with regular and dependable income. Even tomatoes are traditionally dried in many areas.

Exports of fresh fruits are also increasing, although they are more difficult to handle, due to cost of storage and food safety risks. This results in situations where the qualitatively different micro-productions continue to thrive while the production of the basic sources of calories (especially wheat) cannot keep pace with growing demand in much of the Near East and North Africa, basically because of shortage of land (Zdruli and Lamaddalena, 2014). The countries seriously affected by the land gap include mainly Egypt, Turkey and Tunisia (Mediterra 2008). As a result, many Mediterranean countries are now net importers of food (Hallam and Balbi 2012). In the words of Marty et al (2016) "the demand for agricultural products increased six fold from 1961 to 2011 in the Middle-east and north-Africa region, as a result of the population's growth combined with a pronounced nutritional transition, the domestic supply rised only fourfold, partly due to the region's severely limited land and water resources.

Nevertheless, FAO 2015 report stresses that there is a general shift towards high-value exports in developing countries, as indeed observed in several Mediterranean developing countries, which somehow conterbalances the unfavourable situation of wheat.

The values in the table hide large disparities among countries, including for instance large decreases in potato production in some countries that used to be part of Yugoslavia (Croatia -53%); others report production increases (Albania +133%, Morocco +21% and Algeria +133%). Soybean has difficulties establishing itself in the area and sizeable amounts are produced only in Turkey (125 thousand tonnes), Croatia (150 thousand tonnes) and Italy which lead the producers in the region with 720 thousand tonnes.

Olives, tomatoes, grapes and citrus

All countries in the region produce olives, which is a mainstay of agriculture for most of them (Figure 5.6 (A)). By far the largest producer is Spain (6.5 million tonnes), followed by Italy (2.8), Greece (2.3), Turkey (1.6) and Morocco (1.3) . Cultivated areas remain stable or increase everywhere, especially in former Yugoslavia (Bosnia and Herzegovina +120%, Croatia +40%) and in north-west Africa (Algeria +49%, Morocco +69%). Production tends to decrease in some areas due the neglect or preference for other crops, but mostly due the combined effect of drought and disease, in particular the bacteria Xylella fastidiosa in Italy where production dropped 21% (Figure 5.6(B)). Yields are down in more than 50% of the Mediterranean countries.

The four major tomato producers with an output in excess of 4 million tonnes include Spain (4.4 million tonnes), Italy (6.6 million tonnes), Egypt (8.5 million tonnes) and Turkey (11.5 million tonnes) are followed by four countries in the range of 1 million tonnes (Portugal, Morocco, Tunisia and Greece). Production is up everywhere, sometimes significantly so (Tunisia +34%, Portugal +39%) while drops occurred in Greece (-27%) and in Italy (-8%). This refers to industrial tomato production; it is stressed, however, that tomato is an extremely popular crop in the Mediterranean region and that actual output from countless home gardens is not included. As a result, the total production of 39.0 million tonnes underestimates actual output by at least a factor 2.

Figure 5.6. (A) Olive trees are very long lived and often become huge and spectacularly beautiful. Two 6000 years old olive trees growing in Bechealeh in northern Lebanon. They are part of a group of 16 nicknamed "the sisters" (Sisters 2018); (B) An olive tree infected by Xylella fastidiosa in southern Italy (New York Times 2018)

The largest areas cultivated in grapes are those of Spain (just under 1 million Ha), followed by Italy (715 thousand hectares) and Turkey (466 thousand hectares). Remaining countries, with the exception of Portugal (179 thousand hectares) are all below 100 thousand hectares. Grapes are mostly used for wine production and, in the European Union, it is subject to complex policy measures under the Common Agricultural Policy. Like olives and, to some extent tomatoes and citrus, quality of grapes is often a more important factor than the volume. Like olives, grapes are also one of the crops that potentially generate much income per Ha, especially as table grapes. In the Mediterranean context, few crops outperform grapes in terms of income, except some nuts (hazelnuts, pistachios) and some orchard fruits. Yet, the area dropped 12% since the beginning of the century, while production stagnated. Areas increased essentially in countries where wine production is marginal or illegal (Algeria, Egypt, Israel and Bosnia Herzegovina, +6.2 to +18.9%). Three of them (Egypt +13.4%, Bosnia Herzegovina +38.7% and Algeria +78%) are also among the countries where production increased. Others include Morocco (+16.4%), Tunisia (+21.6%) and Albania (+70.4%).

Citrus cultivation (area) recently increased 9.8% in the Region; production increased to 24.3 million tonnes, up 17% compared with the first years of the century. Areas increased from Turkey to Morocco (between +15% and +35%), and in Croatia. Three of the four major producers (output larger than 3 million tonnes) increased their output (Spain +6.6%, Egypt +21.7% and Turkey +15.2%) while Italy suffered an 8.3% reduction.

Organic agriculture

There is a large increase in demand for organic food production. While production may be riskier, the benefits accrued along the food chain are larger than for "chemical" crops. The statistics about organic production have been assembled by FAO for about 15 years but numbers remain imprecise because organic standards themselves, certification and reporting requirements of organic production may vary from country to country. The Mediterranean currently has 10 to 15 million hectares of organic agricultural areas, an increase of 17% between the years 2001-2008 and 2009-2016. The area includes all agricultural land uses, including pastures and concentrates in Greece, Turkey and Italy.

Livestock

The Region currently counts about 190 million sheep and goats (about 75% are sheep) , 45 million of pigs and the same number of large ruminants (cattle and buffaloes). Camels are less than 1 million and farm birds number 1.4 billions. All have increased their numbers between 3% and 4% since 2001, with chickens and camels growing 16% and 19%, respectively. The largest countries have the largest herds and numbers of bird and pigs, with a clear "leader" for every type of animal: 13 millions for cattle in Turkey, with Spain,

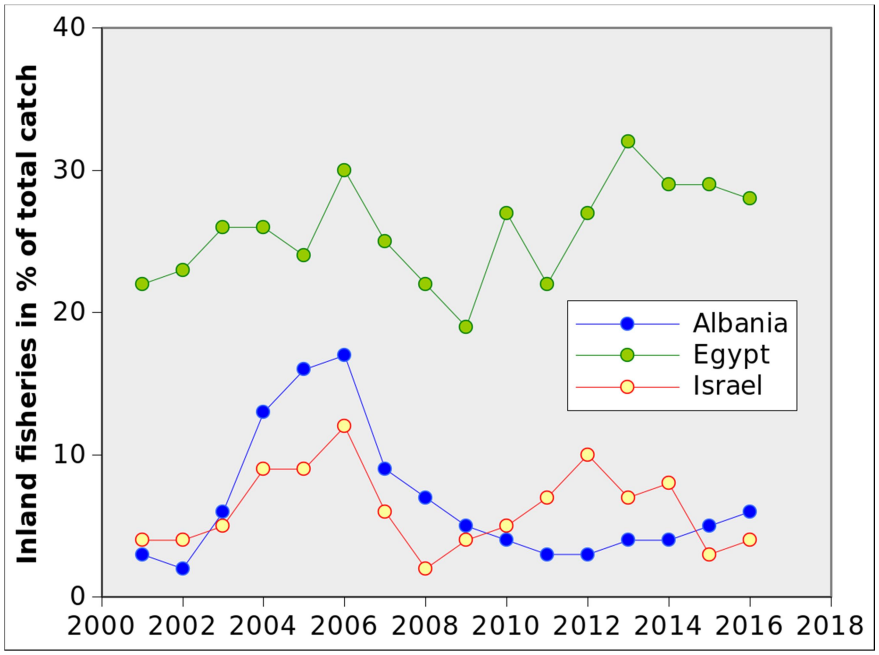
Italy and Egypt at 6, 6 and 5 millions, respectively; 270 million chickens in Turkey and 181 millions in Morocco; 27 million pigs in Spain, followed by 9 millions only in Italy; Turkey leads the flock of sheep and goats (34 million heads) followed by Algeria and Morocco (30 million and 24 million, respectively).

The regions uncontested animal production leader is Turkey and recent growth rates of the sector indicate that Turkey will consolidate its position for beef cattle (+22.2% since the turn of the century), sheep and goats (+5.5%). Chicken numbers underwent a slight decrease (-2.5%) and pigs fell 32.6%. Countries with significant animal production increases include Algeria (cattle +19.5%), Lebanon and Albania (both up more than 60% for chickens), Albania and Syria for pigs (+160% and +47.8%, respectively). Small ruminants are up 36% in Algeria.

Fisheries

The section above stressed the relative increase in high value exports in the Mediterranean region. One of those high-value products is fish. Based on the average 2014-16 catch, Morocco and Spain dominate the fishing industry in the Mediterranean area with productions reaching about 1.4 million tonnes and 0.9 million tonnes, respectively. They are followed by Turkey (278 thousand tonnes), Portugal (166 thousand tonnes) and Italy (130 thousand tonnes) and, decreasing from 95 thousand tonnes to 25 thousand tonnes by Tunisia, Algeria, Egypt, Croatia, Greece and Libya. Other countries are all below 5 thousand tonnes.

Figure 5.7. relative share of inland fisheries among the three main Mediterranean freshwater fish producers



Inland fisheries play a minor part in most Mediterranean countries (Figure 5.7), among others because of limited water availability. The only countries where they play a part include Greece (about 1% of the total catch) and Turkey (about 2%) but mainly Israel (between 2 and 10%), Albania (currently at 6% but at 17% ten years ago) and, naturally, Egypt where a stable contribution of Nile fish reaches about 30% of the total catch.

Summary

Due to semi-arid climate with winter rainfall and other factors, there is a marked homogeneity of farming across the Mediterranean region, which has been affected probably more than other areas by global

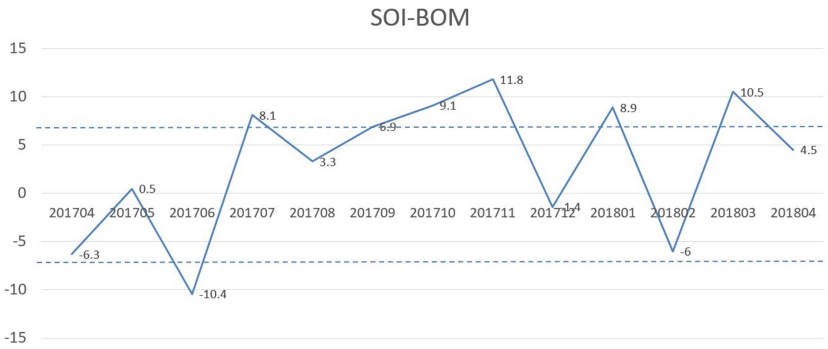
warming. One commonality is the "Mediterranean package" of crops, especially fruits and vegetables, of which many originated in the area. Typical products include olives, citrus, tomatoes and grapes and constitute the mainstay of smallholder and industrial farmer's income. They are all high-value crops and the region has successfully developed their exports. Productions are growing as demand changes (e.g. in organic food) but also as the region diversifies exports, for instance table grapes and grape juice instead of wine. Next to the success of typical Mediterranean exports, the region cannot keep pace with the demand for some basic foods: cereal production grew 4% while population increased 11% since the beginning of the century. The production of chickens outpaced population growth (+16%) but other meat production increases are comparable to the modest increase in cereals. In terms of livestock, Turkey clearly dominates the Mediterranean production landscape for almost all products. Current trends indicate that the country will maintain or consolidate its position while at the same time the agricultural import dependence of the Middle-East and North Africa region is likely to continue to rise through 2050 (Marty et al 2016).

5.4 Update on El Niño

El Nino conditions have been neutral across the Pacific Ocean during the first quarter of 2018. Figure 5.8 illustrates the behavior of the standard Southern Oscillation Index (SOI) of the Australian Bureau of Meteorology (BOM) from April 2017 to April 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 -1.4 in December to +8.9 in January, decreased to -6.0 in February, then jumped to +10.5 in March and decreased again to +4.5 in April. The overall fluctuation of SOI between +7.0 and -7.0 indicates that neither El Niño nor La Niña appeared in the tropical Pacific Ocean. Australian BOM reports a neutral state at current stage and from a global point of view. CropWatch will keep on monitoring its condition.

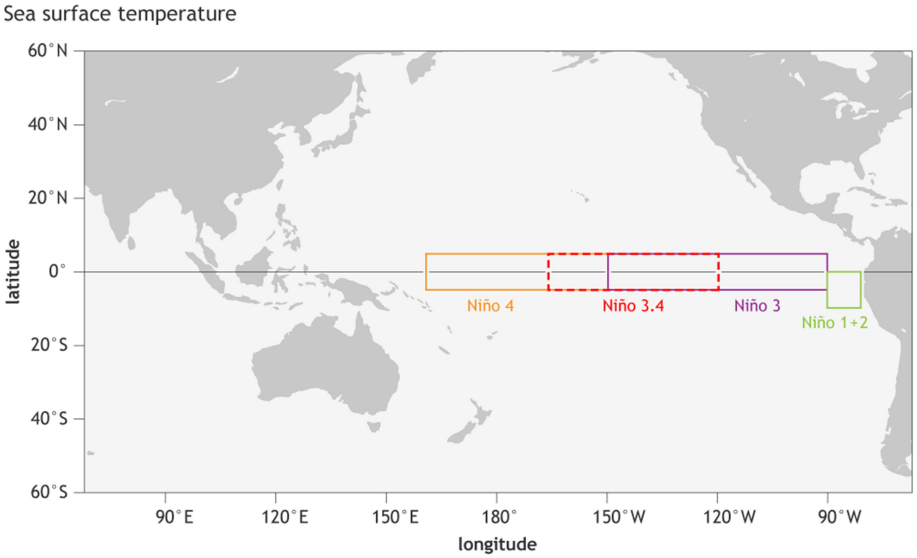
Figure 5.8. Monthly SOI-BOM time series from April 2017 to April 2018



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

The sea surface temperature anomalies in April, 2018 for NINO3, NINO3.4 and NINO4 regions are −0.2°C, −0.3°C, and +0.1°C in sequence, slightly cooler than 1961-1990 average according to BOM (see Figure 5.9-5.10). Both of BOM and NOAA posit that the cool sea surface temperature indicates that El Nino conditions are neutral during the southern autumn, and will probably continue into the following winter (N. hemisphere summer).

Figure 5.9. Map of NINO Region



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

April 2018 sea surface temperature departure from the 1961-1990 average.