Executive summary

- A drought hit north-eastern Argentina and Uruguay in late 2017 and the start of 2018, in the middle of the growing season, causing major damages to agricultural production, particularly soybean and maize.

- The lack of rainfall started in parallel with the vegetative development for the main crops, and lasted until the last stage of the cropping cycle.

- As of April 2018, with the harvest season approaching its end, there is no chance of recovery for the crops. More than 30% of soybean and 25% of maize were lost in Argentina, compared to the previous season. Economic damages may reach around €4.1 billion (5 billion US dollars) over the two countries, with impacts comparable to the regions’ severe drought in 2009.
Geographical context

Central and north-eastern Argentina and Uruguay, in southern South America, have a subtropical to temperate climate, humid all year around. Annual precipitation are abundant across the area, ranging between 1000 and 1600 mm. Annual mean temperatures range between 15 and 20 degrees Celsius, with limited excursion.

There are two important rivers crossing the area, namely the Paraná and Uruguay, whose waters flow from north and mingle in the Rio de la Plata estuary. Together, they drain a massive area (over 3 million km²), making it one of the biggest basins in the world, in both area and discharge. In the region affected by current drought, the Paraná River is particularly important as a waterway, and Rio Uruguay for hydropower.

Plains or lowlands are predominant in the region, hosting highly productive soils that are devoted to large-scale agriculture. Indeed agriculture is a crucial pillar in the economies of Argentina and Uruguay. In particular, Argentina is the world’s number three exporter of soy (or soya bean) and corn (or maize), which together made up 38 per cent of all exports from the country in 2016, and so the economy is especially vulnerable to the effects of extreme weather on agricultural production. During normal years, planting of soy and corn is generally done to take advantage of abundant summer rains in December and January, with harvests between January and April (for corn) and between March and May (for soy).

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**Figure 1**: Physical map of central and northern Argentina and Uruguay.

**Table 1**: Selected country statistics for Argentina and Uruguay.

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Argentina</th>
<th>Uruguay</th>
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<tbody>
<tr>
<td>Population in 2016</td>
<td>43.85 million</td>
<td>3.44 million</td>
</tr>
<tr>
<td>Area (square kilometers)</td>
<td>2,780,400</td>
<td>176,000</td>
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<tr>
<td>Gross domestic product (USD) in 2016</td>
<td>545.9 billion</td>
<td>52.4 billion</td>
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<tr>
<td>GDP per capita (USD) in 2016</td>
<td>12,449.3</td>
<td>15,220.6</td>
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Expected impacts

Recorded impacts of the drought have been primarily on agriculture. The final figure of damages is not available, since as of mid-April the harvest season has not ended. However it is estimated that in Argentina, more than 30% of soybean and 25% of maize were lost, compared to 2017. According to the Bolsa de Comercio de Rosario (Argentina), the economic impact currently is estimated between 3.5 and 4.5 billion US dollars, or more than 0.5% of national GDP, affecting not only the agricultural sector, but the whole economy of the country. The damages are comparable to the severe drought of 2009, when damages were estimated around 4 billion US dollars. Since Argentina is a major grain exporter, prices for grain commodities are expected to rise globally. At the same time, livestock is affected as farmers are selling the surplus animals, not sustainable due to poorer pastures.

In Uruguay, in late February, the government declared the state of agricultural emergency for the three months ahead and across more than half the country. The economic losses due to agricultural drought were estimated in 600 million US dollars for soybean only. On top of agricultural losses, in some locations in the North problems with public water supply were reported and trucks were used to distribute water. Hydroelectric generation was affected too, forcing energy imports from Argentina.

GDO analysis: Risk of Drought Impact for Agriculture (RDRI-Agro)

The indicator RDRI-Agro shows the risk of having impacts from a drought, by taking into account the exposure and socio-economic vulnerability of the area, with particular focus to the agricultural impacts. Formerly known as Likelihood of Drought Impact (LDI), it differs from the latter in that soil moisture anomaly is now included and updated every ten days (dekad).

Figure 2 reports the impact risk class for the first dekad of April and highlights the magnitude of the drought in both intensity and extension. Considering that both Argentina and Uruguay have a fairly good coping capacity, it takes an exceptionally strong event to reach the highest level of risk over such a wide area. The regions most exposed are north-western Uruguay and Argentina provinces of Buenos Aires, Córdoba, Santa Fe, Entre Ríos and La Pampa, for a total

area exposed close to a million square km. This area includes most of the land used for intensive agriculture and most of the population of Argentina (Figure 3).

The rise of RDrI-Agri values can be detected during the third dekad of December (Figure 4), at the onset of anomalies in both fAPAR and soil moisture (see below). This period corresponds to the beginning of the growth stage for most crops as well (Figure 5).

**Figure 2:** Risk of drought impact (RDrI-Agri) for the period 1 to 10 April 2018.

**Figure 3:** Absolute area of agricultural land and population exposed to the drought, by administrative units and risk classes (RDrI-Agri).
GDO Analytical Report

Drought in Argentina/Uruguay – April 2018
JRC Global Drought Observatory (GDO) and ERCC Analytical Team
24/04/2018

Figure 4: Time series of RDrI-Agri for province of Buenos Aires, as percentage of total area by classes. Other adjacent regions affected show similar patterns, sometimes reaching 100%.

Figure 5: Crop calendar for main crops in Argentina and Uruguay. Source: http://www.fao.org/giews/countrybrief/

GDO analysis: Precipitation

Precipitation includes monthly totals of both rainfall and snow. Across the area, during January-March 2018 only about one third of the average precipitation fell (Figure 6), but for most locations the shortage dates back to October 2017. Despite abundant rainfall during the preceding months, precipitation was below the normal fluctuations for several months, culminating in a water deficit during a crucial stage of the cropping cycle.
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Figure 6: Monthly total precipitation with the long-term monthly averages (1981-2010) for four sample regions: a) Tapalqué, Buenos Aires 36.5 S, 60.5 W; b) La Carlota, Córdoba, 33.5 S, 63.5 W; c) San Genaro, Santa Fe, 32.5 S, 61.5 W; d) Piedras Coloradas, Uruguay, 32.14 S, 57.55 W.

GDO analysis: Standardized Precipitation Index (SPI)

The SPI indicator is used to monitor the occurrence of meteorological drought. The lower (i.e. more negative) the SPI, the more intense is the drought. Figure 7 shows the SPI for March 2018 for an accumulation period of 3 months (i.e. January to March 2018). Despite coming from a period of positive SPI values, due to abundant prior precipitations, the noted sequence of a few months of poor precipitation caused the indicator to fall to very negative values, starting from around October (Figure 8). This inception may not be evident for some locations, where the prior rainfall compensated for dryness in the following one or two months.
Figure 7: SPI for the three-month accumulation period January to March 2018.

Figure 8: SPI for a cumulative period of 3 months near (a) Tapalqué (Buenos Aires, Argentina, 36.5 S, 60.5 W); (b) Leones (Cordoba, Argentina, 32.7 S; 60.5 W). The SPI-3 pattern is similar in adjacent regions, from slightly positive values to progressively negative ones.
GDO analysis: fAPAR Anomaly

The fraction of Absorbed Photosynthetically Active Radiation (fAPAR) represents the fraction of the solar energy absorbed by leaves. fAPAR anomalies, specifically the negative deviations from the long term average over the same period, are a good indicator of drought impacts on vegetation. As Figure 9 shows, a very wide area, which includes crops as well as natural vegetation, is affected by a strong anomaly. This anomaly relates directly to water stress and is clearly identified from the second dekad of February (11th to 20th) onwards, although “red spots” are scattered since late December.

Figure 9: Upper panel: fAPAR anomaly in north-east Argentina and Uruguay for the period 01-04-18 to 10-04-18. Lower panel (from left to right): anomaly in third dekad of January, second dekad of February and first dekad of March.
GDO analysis: Soil Moisture Anomaly

The aim of this indicator is to provide an assessment of the top soil water content, which is a direct measure of drought conditions, specifically the difficulty for plants to extract water from the soil. As shown in Figure 10, the area affected by the soil moisture anomaly overlaps well with the area of fAPAR anomaly. It was first detected in January 2018, expanding to its current levels from February 2018.

Figure 10: Soil moisture anomaly in North-east Argentina and Uruguay for March 2018.
References and media coverage


Information sources

- Global Drought Observatory (GDO), Joint Research Centre of European Commission
- Global Precipitation Climatology Centre (GPCC)
- Bolsa de Comercio de Rosario (Argentina)
- Food and Agriculture Organization

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