SPECIAL REPORT www.cropmonitor.org Global Agricultural Monitoring

January 25th, 2021

La Niña 2020/2021 Impacts in Argentina & Brazil

Highlights

- La Niña conditions began in August-September 2020 and are currently forecast to continue from January to March (~95% chance) and then with a possible transition to neutral conditions from April to June (~55% chance).
- Argentina and Brazil are key producers and exporters of maize and soybean, among other crops, and current conditions are affecting the production prospective.
- Argentina's *early-planted* maize has experienced dry conditions while *late-planted* maize is under generally favourable conditions. *Spring and summer-planted* soybeans have suffered a similar fate to maize; however, they have slightly better yield expectations than maize.
- We are a few weeks away from the beginning of critical stages for *late-planted* maize and soybean in Argentina.
- In Brazil, both *spring-planted* maize and soybeans started the season with a delay due to the early dry conditions. Currently, *spring-planted* maize is under mixed conditions while soybeans are under generally favourable conditions.
- Summer-planted maize sowing in Brazil is on schedule and an average planted area total is expected.
- The situation in both Argentina and Brazil is stable, but it remains fragile. If the soil moisture in the coming weeks does not match the growing needs of the crops, yields could be impacted.

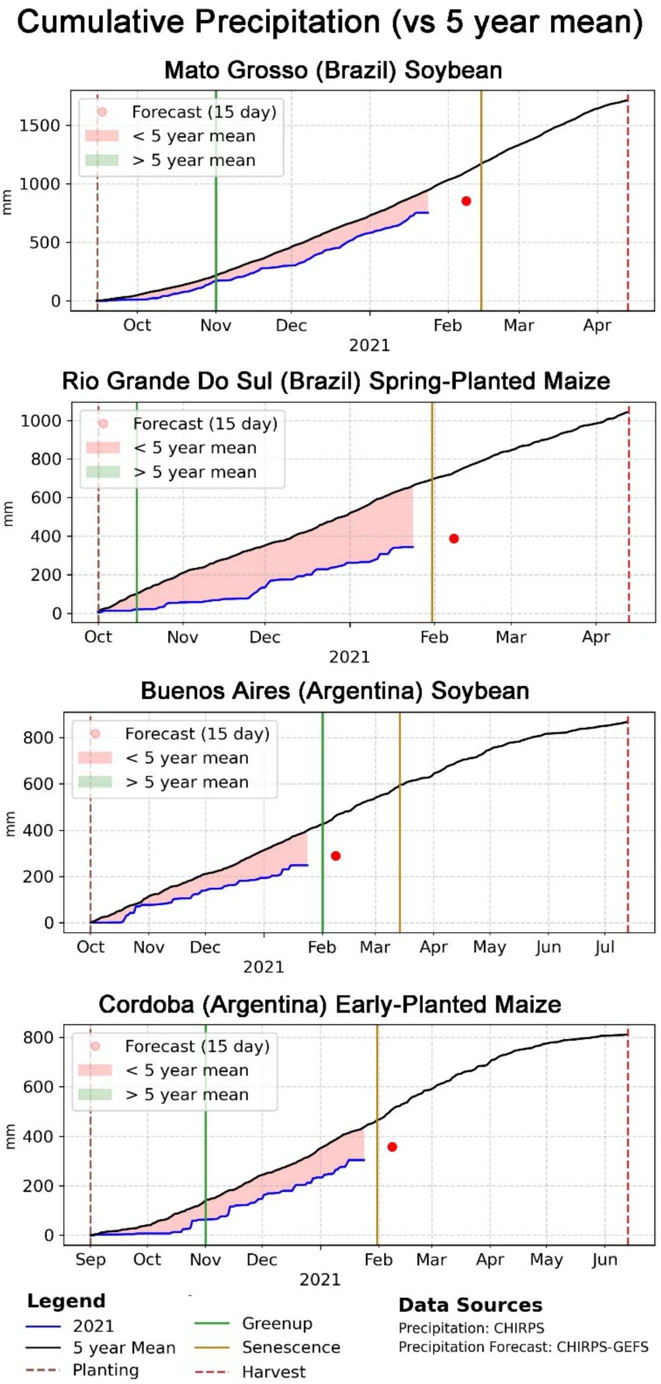

Figure 1: Cumulative precipitation compared to the 5 year mean in select main producing provinces/states of Argentina and Brazil. Rainfall deficits can be seen since the start of the season for all regions. Source: NASA Harvest.

La Niña 2020/2021

Beginning in August-September 2020, the El Niño-Southern Oscillation (ENSO) La Niña phase developed and is currently ongoing. At this time, La Niña conditions are forecast to continue from January to March (~95% chance) and then with a possible transition to neutral conditions during April to June (~55% chance)[1]. During the expected peak period of November-December-January, the current La Niña is forecast to be of moderate strength, based on a three-level system (weak, moderate, strong) using a 3-month running mean of sea surface temperature anomalies[2]. The stronger the event, the larger the changes in weather patterns that typically occur.

In South America, La Niña events can typically bring above-average rainfall across the north of the continent, while below-average rainfall can typically occur further south along the eastern and western coasts. The current La Niña event is exhibiting a similar pattern, with rainfall since September showing areas of above-average rainfall across the northern regions of the continent while areas of below-average rainfall in the central and southern regions (Figure 2).

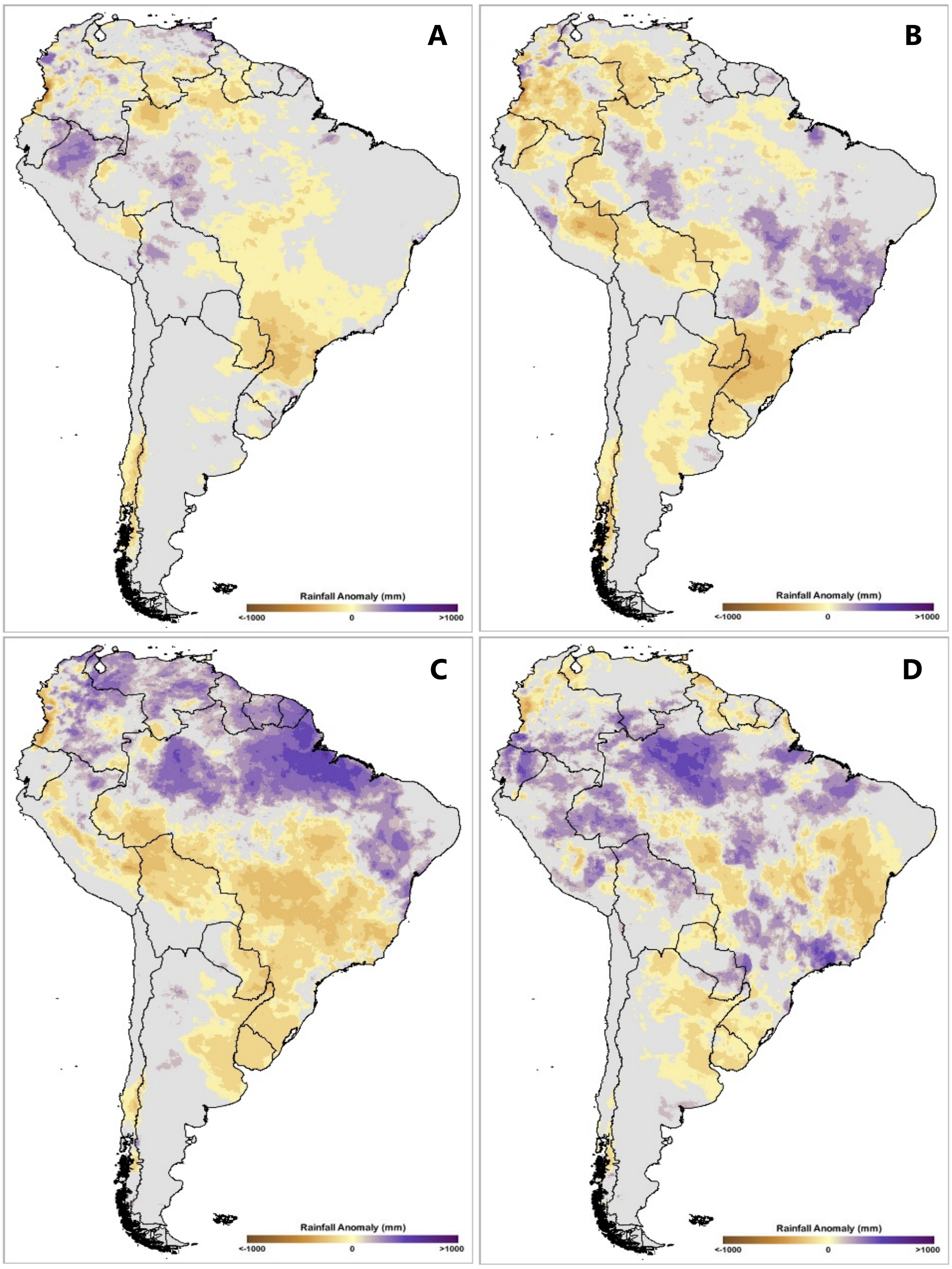

*Figure 2: Monthly rainfall anomalies over South America during the beginning of the 2020-2021 crop season. **A**: **September** anomaly showing early season deficits in parts of central and southern Brazil along with eastern Paraguay. **B**: **October** rainfall deficits primarily in central and eastern Argentina, southern Brazil, eastern Paraguay, and across Uruguay. Above-average rainfall occurred in parts of central and eastern Brazil. **C**: **November** rainfall deficits in central and eastern Argentina, central and southern Brazil, eastern Paraguay, and across Uruguay, **D**: **December** (Preliminary) rainfall deficits in eastern and northern Argentina, northeast and the very south of Brazil, and in southern Uruguay. Additionally, in December there were pockets of above-average rainfall across central Brazil. Anomaly data compares 2020 rainfall amounts to the 1981-2019 CHIRPS average. Data obtained from https://www.chc.ucsb.edu/data/chirps*

One of the main differences between the previous event of La Niña (2017/18) and the current one (2020/21) is the soil moisture at planting. While during the previous event, the soil moisture during planting was relatively adequate, and the drought more intensively affected the development of the crop, however. during this event (2020/21), the soil moisture at planting was already below average. Farmers were able to adapt to the circumstances in some cases, for example shifting from early-planted to late-planted maize, delaying sowing, or leaving some plots without planting (for example those where wheat was severely affected by drought in Argentina, summer-planted soybean was inviable). Compared to maize, soybeans can better adapt to periods of moisture stress and drought. Indeterminate cultivars, in particular, can deal with moisture stress for longer periods and across a range of growth stages. This is because indeterminate soybeans continue to grow during the reproductive stage, compensating for reduced growth in earlier stages due to drought.

Argentina

Maize

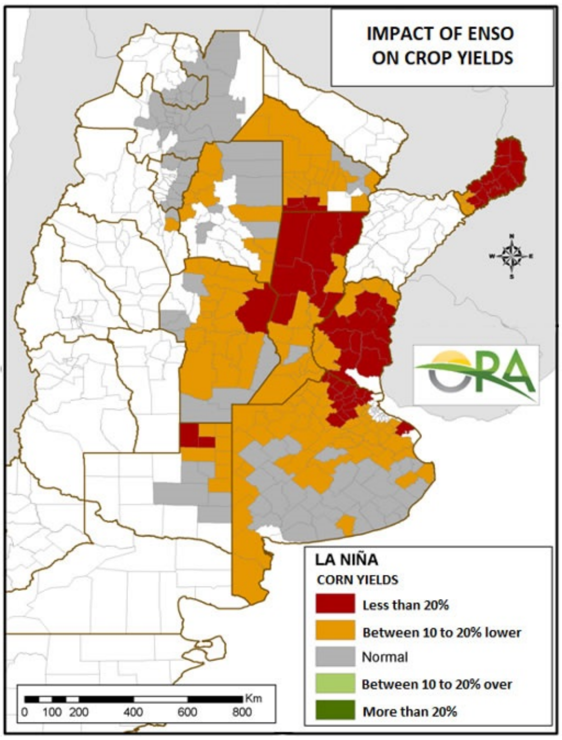

Figure 3: Relationship between the departmental average yields during La Niña seasons (8 events) and the departmental average yields of all the seasons from all the seasons (2000-2020 historical series). Source: ORA, MAGYP.

For maize in Argentina, La Niña events have shown to typically reduce yields across the country (Figure 3). In the south of Buenos Aires and La Pampa, normal yields (±10%) are usual. In the core zone (north of Buenos Aires, South of Santa Fe, and south-east of Córdoba) yields below-average are usual (between 10% and 20% below) and further north there are yields typically drop much lower than the average (more than 20% below) (figure 3).

The spring planting season began with poor soil moisture conditions as rainfall deficits had already accumulated over the winter, negatively impacting winter crops like wheat. This situation also impacted the planting potential for summer-planted soybeans. *Early-planted* maize sowing, which typically occurs between late August and November (Figure 4), was delayed by poor soil moisture conditions and a lack of early rainfall. Because of that, many farmers chose to wait and sow their maize as part of the *late-planted* crop or to instead sow soybeans due to their higher tolerance for drought and lower cost of production. While *early-planted* maize typically represents on average about 60% of the total crop as compared to 40% for *late-planted* maize, this year it represents closer to 50% of the total crop as an adaptation to the potential effects of the La Niña event (Bolsa a Cereales). The possibility of shifting from *early-planted* to *late-planted* in some regions sustained the relatively stable planted area compared to other seasons, especially in Córdoba, northern Santa Fe, La Pampa, and western Buenos Aires. Most of Argentina's maize is sown in the central and north regions of the country (Figure 5).

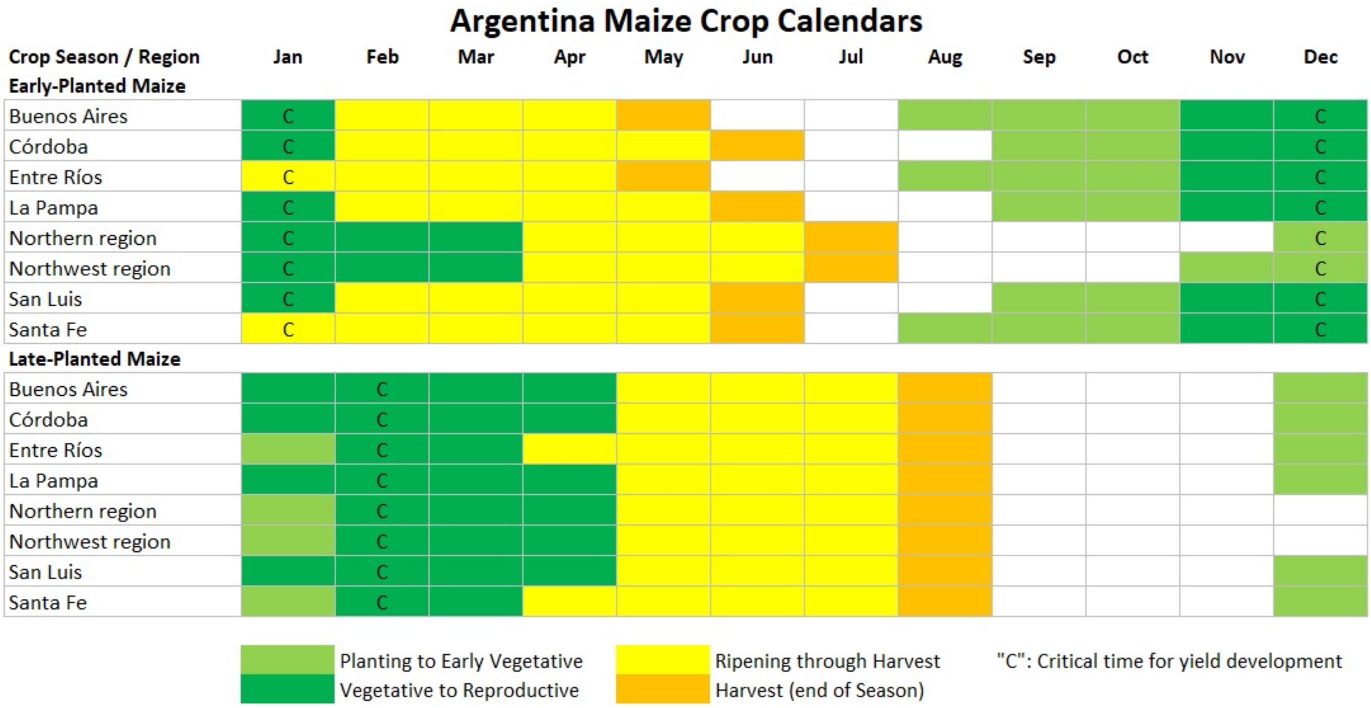

Figure 4: Average cropping season calendars for maize in Argentina by sub-national provinces and regions. North region (Chaco, Formosa, and Santiago Del Estero), Northeast region (Corrientes and Misiones). Source: GEOGLAM.

In **Buenos Aires** (~26% of national production), *early-planted* plots in the northern and western regions have suffered the impact of dry conditions during emergence and early vegetative stages and are currently in critical stages of yield formation. However, recent January rainfall and lower temperatures across most of the province helped to improve conditions. These rains are especially important for those plots that are in early reproductive and grain filling stages. For *late-planted* plots, which are now in different vegetative stages (V3 to V9), these rains will boost their development. Thanks to rainfall in December, conditions in the southeast of the province are excellent.

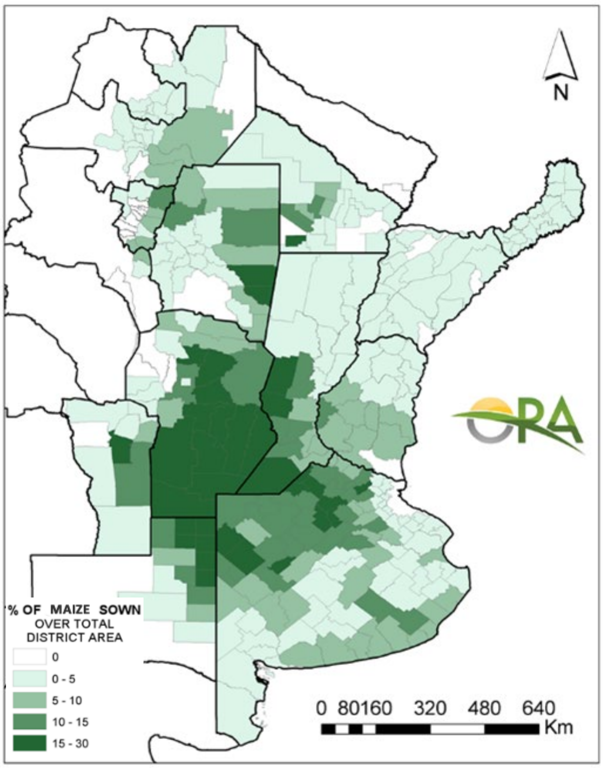

Figure 5: Distribution of maize sowing across Argentina. Source: ORA, MAGYP.

In **Córdoba** (~32% of national production), except for the eastern area, most of the maize planted in this area is *late-planted*. *Early-planted* plots are under mixed conditions entering the flowering stages. Recent rains have improved some plots across the province, most notably in the southeast, north, central, and central east regions. However, further rainfall is needed for continued improvement (figure 6). In the southwest region, *early-planted* plots already show lower development due to the prolonged dry conditions, however, recent rainfall may help to cut the losses and improve conditions for the reproductive stages. *Late-planted* plots across the province show generally favourable conditions as sowing are now wrapping up thanks to the recent rains. February and March precipitation/weather will be key to define *late-planted* maize yields in Cordoba province.

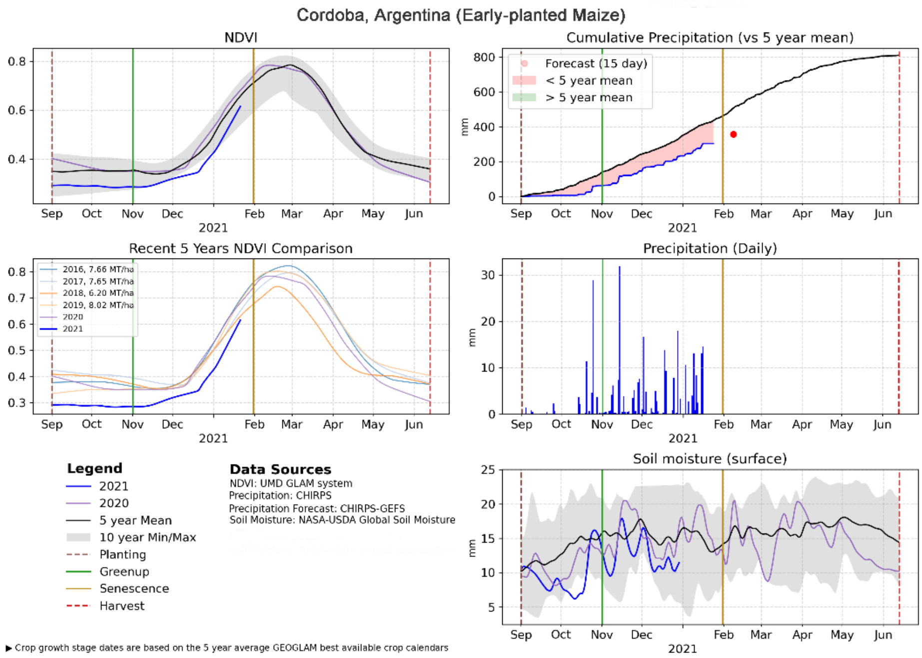

Figure 6: Agro-climatic indicators over early-planted maize in Cordoba, Argentina. Rainfall and soil moisture deficits can be observed across the season along with a delayed start to the season within the normalized difference vegetation index (NDVI). Source: NASA Harvest.

In **Santa Fe** (~11% of national production), recent uneven rainfall across the province came too late for many *early-planted* plots (the majority of maize planted in the province), however, it will help some crops that are in the grain filling stages. Yields are expected to be below-average. *Late-planted* plots are under generally favourable conditions in the vegetative stage.

In **Entre Ríos** (~4% of national production), most *early-planted* plots are in the grain filling stage. Despite recent rainfall, it came too late or uneven for many plots, reducing yield expectations. *Late-planted* plots are under generally favourable conditions in the vegetative stage.

In **La Pampa** (~3% of national production), *early and late-planted* crops are under generally favourable conditions as recent rainfall has improved soil moisture across the province except for a small region in the north-west.

In **Northern** Argentina (~20% of national production), recent rainfall ended a long period of continuous dryness and high temperatures. This is expected to have a very positive impact on *late-planted* plots. Despite conditions generally improved, there are some places (north-east of Santiago del Estero and west of Chaco) where soil moisture deficits persist.

Despite the adverse climatic scenario for summer crop's season, the vast majority of producers supported the intention of planting corn, which would only register a slight decrease of -3.1% compared to last year and is expected to reach 6.3 million hectares, the second largest sown area in the last 20 years (Bolsa a Cereales). Relatively good margins were the main driver of this scenario, but also the fact that many plots were fallowing with residual herbicides which made soybean planting not feasible unless the soil got enough rains (which did not happen in this context). However, a large part of the already sown area does not have sub-surface soil moisture (figure 7), and this implies a significant risk since there are no reserves deep in the soils to sustain crops' growth and development in case necessary rains did not arrive during critical yield development periods for *early-planted* maize or in the upcoming critical period for *late-planted* maize (figure 4).

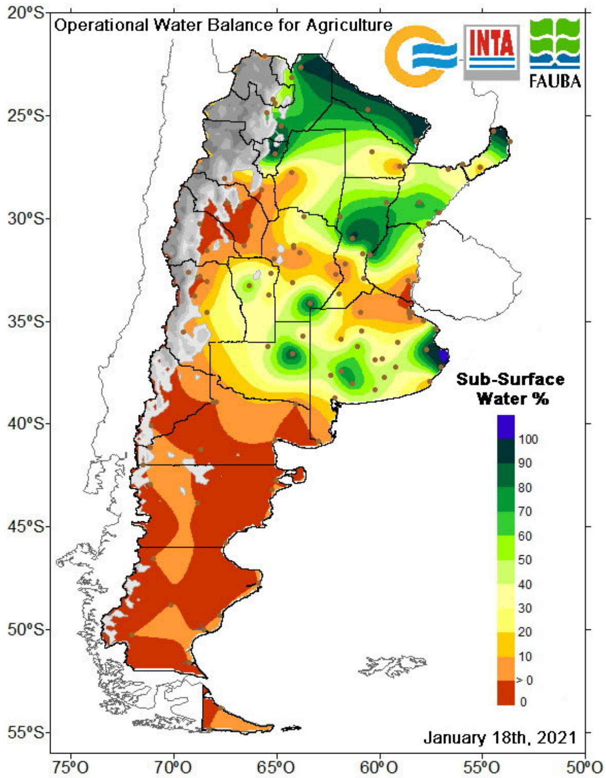

Figure 7: Argentina sub-surface water percent as of January 18th, 2021. Source: SMN, INTA, and FAUBA

Soybeans

For *spring and summer-planted* soybeans in Argentina, La Niña events have shown to typically reduce yields across the country in slightly different ways (Figure 8a + b). For spring-planted soybeans (larger crop), the departments of Buenos Aires, Santa Fe, Córdoba, La Pampa, and Entre Ríos are divided between average and below-average yields. The region with much lower yields is located in the north of Santa Fe and southeast of Santiago del Estero. For summer-planted soybeans (smaller crop), most of the departments are divided between average and well below-average yields. In the north (Chaco and agricultural region of the NOA) there are more departments with average yields. It is important to bear in mind that due to the ongoing water scarcity that also negatively affected wheat in some regions, the summer-planted soybean area was reduced compared to previous seasons, due to lack of water moisture.

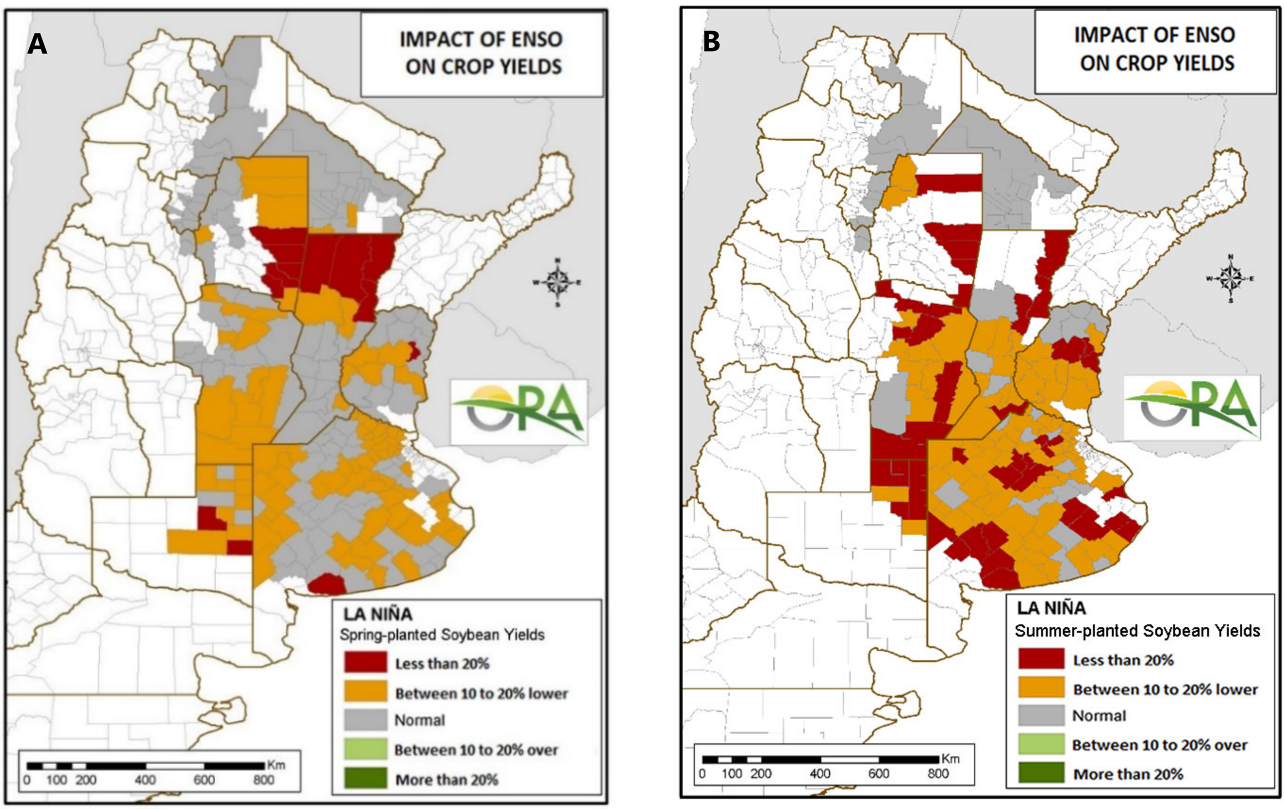

*Figure 8: Relationship between the departmental average yields during La Niña seasons (8 events) and the departmental average yields from all the seasons (2000-2020 historical series). **A**: Spring-planted soybeans and **B**: Summer-planted soybeans. Source: ORA, MAGYP.*

This season in Argentina, *spring-planted* soybean sowing, which typically occurs between October and January (Figure 9), had average to near-average surface soil moisture levels. Rainfall deficits then began accumulating as the crop developed up to the vegetative stages and also affecting sub-surface soil moisture (figure 7). *Summer-planted soybeans*, which are typically sown starting in late November and December, experienced slight soil moisture deficits at sowing. *Spring-planted soybeans* typically represent about 70% of the total crop as compared to 30% for *summer-planted soybeans*, which is in line with sowings this year (Bolsa a Cereales). The majority of Argentina's soybeans is sown in central regions of the country (Figure 8). Recent rainfall in January has benefited both crops. Some of the regions where wheat was negatively affected with low soil moisture and where summer-planted soybean would be typically planted were left unplanted because of the dry conditions.

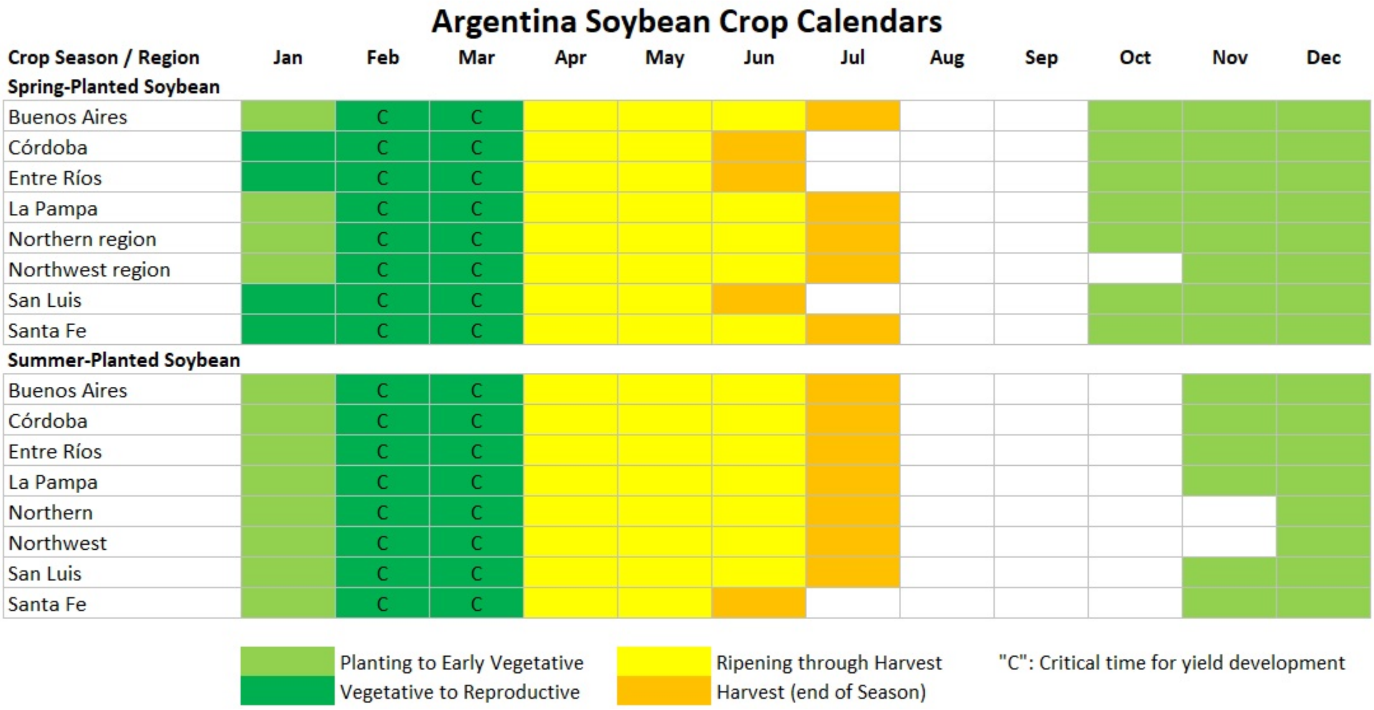

Figure 9: Average cropping season calendars for soybeans in Argentina by sub-national provinces and regions. North region (Chaco, Formosa, and Santiago Del Estero), Northeast region (Corrientes and Misiones).

In **Buenos Aires** (~30% of national production), spring-planted crops were sown in fields with adequate surface soil moisture, however, little rainfall since then has slowed crop development (figure10), affecting sub-surface soil moisture levels (figure 7). Rains in late December and more recently in January have helped to cut yield losses. Some places in the northwest and central region of the province still have below-average water reserves. The recent rains have also allowed for the completion of summer-planted crop sowing and the emergence of those crops that were initially sown in dryer soils.

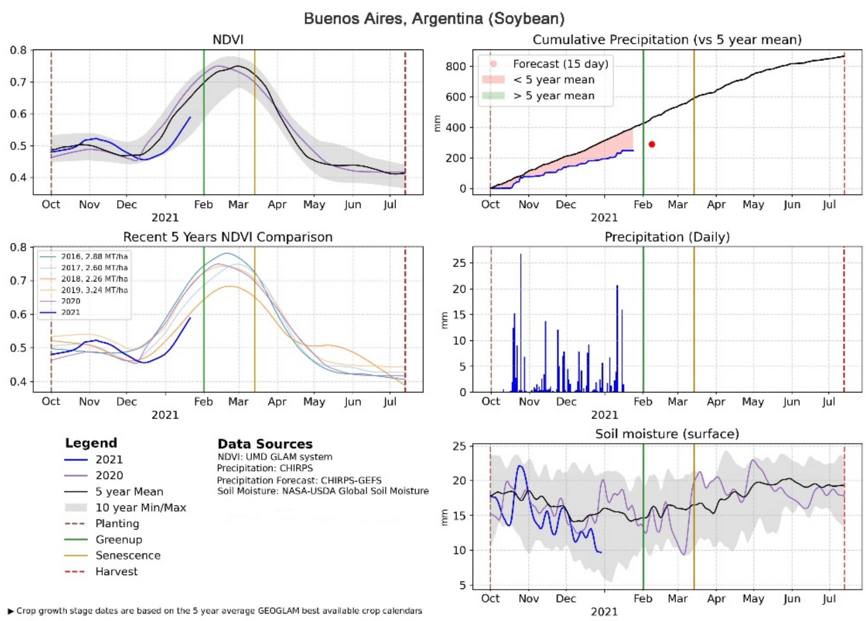

Figure 10: Agro-climatic indicators over spring-planted soybean areas in Buenos Aires, Argentina. Rainfall and soil moisture deficits can be observed across the season along with a delayed start to the season within the normalized difference vegetation index (NDVI). Source: NASA Harvest.

In **Córdoba** (~26% of national production), spring-planted crops have been affected by prolonged dry conditions and high temperatures. Recent rains have unfortunately only provided a limited improvement. The central-east and southwest were most affected by hot and dry conditions. Conversely, sowing of the summer-planted crop is wrapping up and under generally favourable conditions due to the recent rains.

In **Santa Fe** (~16% of national production), conditions are generally favourable for spring-planted crops despite earlier dry conditions as recent rainfall has helped to improve the situation. Summer-planted crops are also under generally favourable conditions as recent rainfall has improved topsoil moisture conditions, but in-depth soil moisture is not yet assured.

In **Entre Ríos** (~6% of national production), recent rainfall has improved soil moisture conditions. Spring-planted crops are under are generally favourable conditions. The sowing of summer-planted crops is almost complete thanks to the recently improved soil moisture.

In **La Pampa** (~2% of national production), prolonged hot and dry conditions have reduced the development of spring-planted crops in the north of the province. Crop conditions have only partially improved with the recent rains. However, summer-planted crops show favourable conditions across the province.

In **Northern** Argentina (~20% of national production), the sowing of summer-planted crops is wrapping up under favourable conditions. With recent rainfall, emerged plots have recovered after a long period of hot and dry conditions, most of them show favourable conditions.

For soybeans, the rains during spring and up to this point in this summer have remained below historical averages, however, their favourable time and spatial distribution maintained the necessary surface soil moisture to advance with sowing. Similar to maize, large areas still lack sub-surface soil moisture (Figure 7), which presents a significant risk if further rains do not arrive, especially during the upcoming critical yield development period (figure 4). In figure 11, the impacts of past La Niña events can be observed on spring and summer-planted soybean national yields.

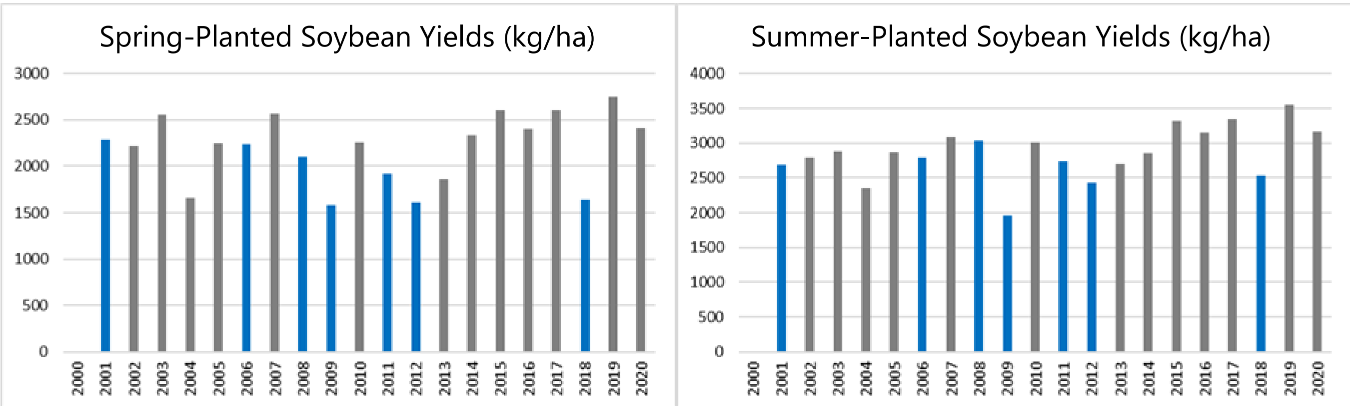

Figure 11: Soybean yields (kg/ha) at the national level for spring-planted (left) and summer-planted (right) crops. Years with La Niña events are highlighted in blue for comparison. Source: MAGYP

Brazil

Spring-Planted Maize

In Brazil, the spring-planted maize (smaller season) began under the already present La Niña conditions. For Maize, most sowing typically occurs during the October through November period depending on the region (Figure 13). However, this season sowing was delayed in most regions due to a lack of rainfall, pushing sowing into November for the South region and into December for the remaining regions.

In the **North** and **Northeast** regions, which accounts for about 25% of spring-planted maize production, the sown area estimate is reduced by 6.5% compared to last season due to the reduced rainfall. Conversely, in the **Minas Gerais** (Southeast region), the sown area estimate is 1.6% above last season.

In the main producing **South** region (38% of spring-planted maize production) as seen in figure 12, **Paraná** received December rains that helped crop development, especially those crops that had already reached the vegetative stage. However, in western **Santa Catarina**, the drought between August and October affected the yield of the crops, which are now being harvested for silage. For those crops that were sown between October and November, recent rains have helped to boost estimates on yields closer to average levels. In **Rio Grande do Sul**, rainfall has been irregular and insufficient all over the state during the spring months (September through November). As a result, crops that were sown early in the spring are underdeveloped with small ears and with less and lower grain weights. However, near the end of the spring and beginning of the summer rains normalized and the water stress was reduced. December yield estimates for **Rio Grande do Sul** are 11.1 % lower than last year, leading to an estimated reduction of 9.3% in production.

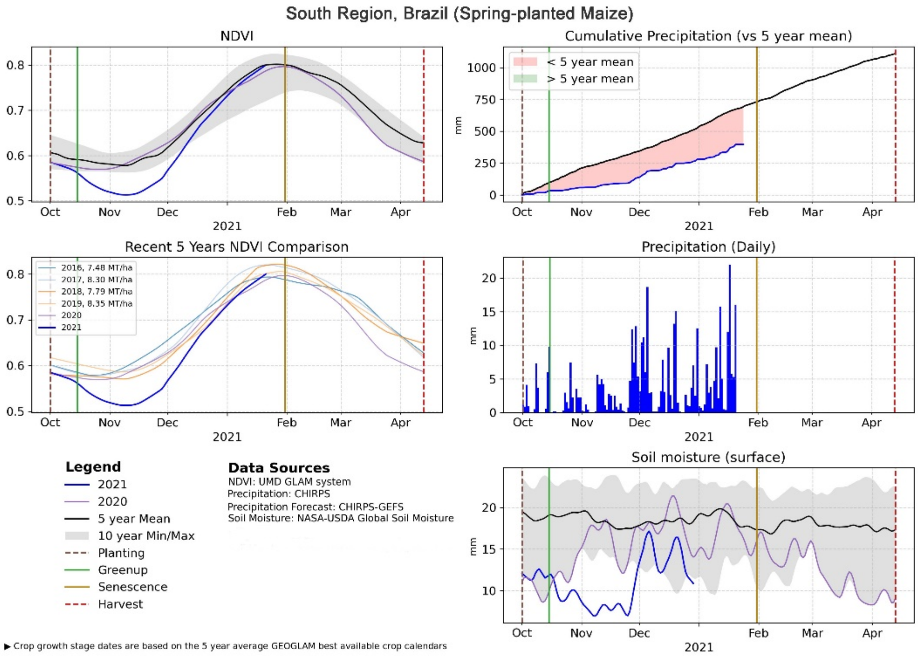

Figure 12: Agro-climatic indicators over early-planted maize areas in the South region of Brazil. Rainfall and soil moisture deficits can be observed across the season along with a slight delayed start to the season within the normalized difference vegetation index (NDVI). Source: NASA Harvest.

Despite the delayed start of the season due to dry conditions, the return of rains in December has helped a good portion of the crop to stabilize. Overall, spring-planted maize is currently under mixed conditions. In table 1, regional yield estimates from Conab for the 2020/21 spring-planted maize show below-average yields in the South and North regions, around average yields in the Southeast region, and above-average yields in the Northeast and Center-West regions.

Brazil Maize and Soybean Crop Calendars

Crop Season / Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spring-Planted Maize												
Northeast	C											C
Central-West	C											C
Southeast	C											C
South	C											C
Soybeans												
North	C	C										
Northeast	C	C										
Central-West	C	C										
Southeast	C	C										
South	C	C										
Summer-Planted Maize												
Central-West			C	C								
Southeast			C	C								
South			C	C								

Planting to Early Vegetative — Vegetative to Reproductive — Ripening through Harvest — Harvest (end of Season) — "C": Critical time for yield development

Figure 13: Average cropping season calendars for maize and soybeans in Brazil by sub-national regions. North (Acre, Amapá, Amazonas, Pará, Rondônia, Roraima, and Tocantins), Northeast (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande Do Norte, and Sergipe), Central-West (Distrito Federal, Goiás, Mato Grosso, and Mato Grosso Do Sul), Southeast (Espirito Santo, Minas Gerais, Rio De Janeiro, and São Paulo), and South (Paraná, Rio Grande Do Sul, and Santa Catarina).

Soybeans

In Brazil, the soybean season also began under the La Niña conditions. In many regions, sowing was delayed and pushed past their normal sowing periods, see Figure 13, into December.

In the **North** and **Northeast** regions, which account for about 13% of soybean production, sowing was delayed and is currently entering the final stages now that the climate has normalized. With earlier dry conditions some of the crops had to be replanted. However, the regions are now presenting good crop development. The only area of concern is in southern **Pará**, where dry conditions during sowing may have affected the crop.

In the **Center-West** region, which accounts for about 45% of soybean production, sowing is complete. In **Mato Grosso**, sowing was completed in the second half of December with some areas requiring to be replanted due to the poor distribution of rainfall, especially in September and October. Rainfall, unfortunately, remains below ideal levels and may affect potential yields as most crops are in the pod formation or grain-filling stages (figure 14). In **Mato Grosso do Sul**, sowing is complete and under favourable conditions with only 1% of the area needing replanting due to earlier dry conditions. In **Goiás**, there was some earlier irregular rainfall and some cases of water stress during the vegetative stage of the crops. However, the crops are now recovering due to the good rainfall during December, leading to a yield estimate similar to the last season.

In the **South** region, which accounts for about 35% of soybean production, sowing was delayed due to the dry conditions in November. However, with continuing rainfall in December sowing and crop development progressed. In **Paraná**, the main cultivars are indeterminate growth ones and the December rains allowed for the resumption of crop development after the earlier water stress. In **Santa Catarina**, despite the initial sowing delay, 96% of the expected area has been sown. Conditions are favourable and yields are expected to be 5% above last season. In **Rio Grande do Sul**, there were rains all over the state in December, leading to the advance of sowing. Only a small portion of the crop needed replanting. Last season, 65% was sowed in November and 25% in December, as compared to this season where 45% was sown in November and 48% in December.

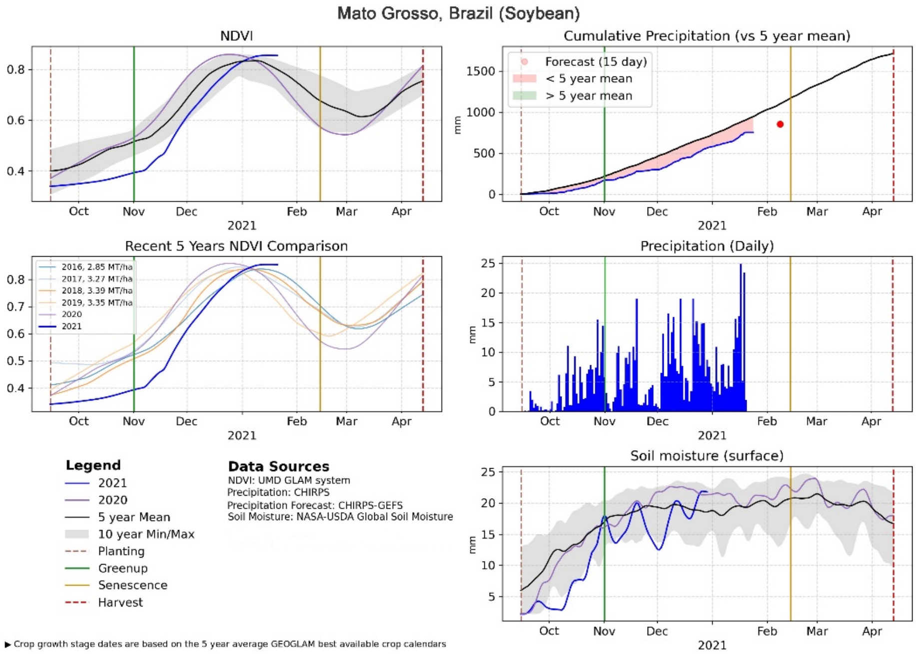

Figure 14: Agro-climatic indicators over soybean areas in the Mato Gross, Brazil. Rainfall and soil moisture deficits can be observed across the season along with a delayed start to the season within the normalized difference vegetation index (NDVI). Source: NASA Harvest.

Despite the delayed start of the season due to dry conditions and in a few remaining areas of dryness, soybeans are currently under favourable conditions thanks in part to the crop being more drought-resistant than maize and plenty of rains in December. Regional yield estimates from Conab for the 2020/21 soybean season are estimated to be above the 5-year averages and similar to above the 2019/20 season yields in most cases (Table 1).

La Niña Classification:			Strong	Moderate					Weak	Weak				
Region	Crop	% of Crop Season Production	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	5 Year Average	2020/21 (Estimated)*
South	Soybean	35%	3.124	2.037	3.038	2.792	3.145	3.047	3.582	3.446	3.272	2.920	**3.254**	3.471
South	Spring-planted Maize	38%	6.373	4.897	6.624	6.746	7.412	7.403	8.169	7.453	8.161	6.926	**7.622**	6.234
Southeast	Soybean	7%	2.824	2.899	3.086	2.530	2.784	3.262	3.467	3.707	3.350	3.675	**3.492**	3.637
Southeast	Spring-planted Maize	28%	5.508	5.942	6.067	5.194	5.436	6.079	6.295	6.465	5.917	6.130	**6.177**	6.210
Center-West	Soybean	45%	3.137	3.036	2.981	3.005	3.008	2.948	3.333	3.540	3.419	3.648	**3.378**	3.527
Center-West	Spring-planted Maize	9%	7.547	7.697	7.679	7.544	6.930	7.636	8.060	8.012	7.650	8.168	**7.905**	8.332
Northeast	Soybean	8%	3.213	2.880	2.193	2.557	2.852	1.774	3.115	3.647	3.312	3.521	**3.074**	3.532
Northeast	Spring-planted Maize	21%	1.906	1.713	1.639	2.248	2.165	1.537	2.469	2.889	4.015	4.736	**3.129**	4.493
North	Soybean	5%	3.063	3.027	2.952	2.877	2.976	2.423	3.061	3.112	3.092	3.270	**2.991**	3.227
North	Spring-planted Maize	4%	2.594	2.668	2.880	2.845	3.239	3.142	3.194	3.302	3.186	3.446	**3.254**	3.191

Table 1: Brazil soybean and maize yields (metric tons per hectare) by region for the last 10 years along with the average of the most recent 5 years. Those years with a La Niña event are highlighted in blue and the recorded strength of the event is indicated at the top. Estimated yields for the 2020/21 season were made on December 22nd, 2020. Source: Conab

Summer-Planted Maize

Sowing of summer-planted maize (larger season) typically occurs in January and February (Figure 12) and is currently on schedule with an average total sown area expected.

Climatic Forecasts

With much of the crops in Argentina and Brazil in a stable but fragile condition, the rainfall levels over the next while will be vital for maintaining yields. Based upon the Experimental Subseasonal Forecasts (SubX) for the next 30-days starting from January 21st, figure 15, average rainfall is expected over much of Argentina's main crop growing areas with some above-average rainfall in Corrientes, Entre Ríos, Chaco, and Formosa. In Brazil, rainfall is forecast to be above-average across Rio Grande Do Sul, Santa Catarina, Parana, and southern Mato Grosso Do Sul. However, below-average precipitation is forecast across Bahia, Goiás, Minas Gerais, Piauí, Tocantins, southern Maranhão, northern São Paulo, and central and western Mato Grosso.

In the longer-term seasonal outlook for February through April, there is a fair probability of rainfall being below-average across much of Argentina. Additionally, below-average rainfall is probable in Brazil across much of the Central-West region, Southeast region, and the Northeast Region. The North region stands at having a probability of continued above-average rainfall.

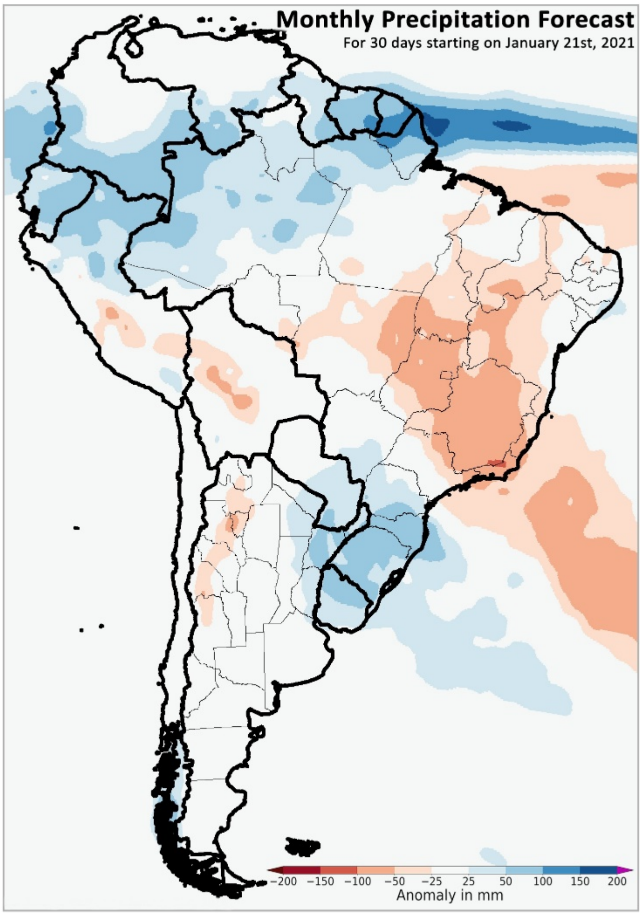

Figure 15: Multimodel mean subseasonal forecast of global rainfall anomaly for the 30-days starting from January 21st, 2021 showing areas of above or below-average rainfall. The image shows the average of four Subseasonal Experiment (SubX) model forecasts from that day. The anomaly is based on the 1999 to 2016 model average. Skill assessments of SubX can be accessed [here](). Source: UCSB Climate Hazards Center

Endnotes

The ongoing weather situation of La Niña comes into the picture during a year where global stocks are in a tighter position compared to last year, while demand for maize and soybeans is strong. Other factors are bringing uncertainty in the maize and soybean markets, such as export policies in the case of Argentina, and logistical issues in both Argentina and Brazil.

To date, in Argentina, *early-planted* maize began to go through critical stages of yield development starting in mid-December and potential yield losses are expected due to the poor condition of the crops in key regions of the center and south areas of Santa Fe and northern areas of Buenos Aires. Additionally, we are a few weeks away from the beginning of critical stages of yield development for *late-planted* maize and soybean, with adverse weather conditions expected for the coming weeks and months. Weather conditions are going to define yield in most of the Argentinean productive areas.

The crop situation in both Argentina and Brazil is stable but fragile if the soil moisture in the coming weeks does not match the growing needs of the crops. We will continue to monitor the situation in the coming Crop Monitor reports for AMIS.

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[1] El Niño-Southern Oscillation (ENSO) Diagnostic Discussion from the Climate Prediction Center (CPC)/NCEP/NWS and the International Research Institute for Climate and Society. Issued 14 January 2021 https://www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/index.shtml

[2] ENSO Forecast Probability Strengths. www.cpc.ncep.noaa.gov/products/analysis_monitoring/enso_advisory/strengths/

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