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WARSAW

DROUGHT IN THE MERCOSUR REGION

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Introduction

The scientists' estimates indicate that the last interglaciation, which occurred between 116,000 and 129,000 years ago, had temperatures as warm as the current ones. That was one of the hottest periods on Earth in the last 800,000 years, which makes it a useful reference point to validate global climate models and understand how sea level responds to an increasingly warmer climate. A study led by Jeremy S. Hoffman, who led the work at Oregon State University, USA. EEUU and now he is a researcher at the Science Museum of Virginia, USA. EEUU., Collected 104 data of the sea surface temperature during the last interglaciación, that obtained of 83 zones with nuclei of marine sediment. During the last period of interglaciation, the ice sheets in Greenland and Antarctica were smaller than the current ones. The global level of the sea was between six and nine meters above the current and ocean temperatures were the warmest in recent history. However, these estimates show a high level of uncertainty, which makes it difficult to accurately project future warming and its impacts on sea level rise.

The researchers compared the data obtained from the sediment cores with the thermal records published between 1870-1889 and between 1995-2014. The work reveals that, at the beginning of the last interglaciation 129,000 years ago, the global sea surface temperature was already similar to the average of 1870 to 1889. 125,000 years ago it rose from 0.3 to 0.5 °C, and was identical to the average from 1995 to 2014.

In this way the team of researchers found that the average global temperatures of the oceans were warmer half a degree during that period than during pre-industrial times (before 1800) and almost identical to the average temperature of the last twenty years.

The data also shows that the temperatures of the Atlantic Ocean in the northern hemisphere were colder at the beginning of the last interglaciation than in the southern hemisphere. Taken together, these results could help scientists better understand how the oceans will respond to current warming.

Consequently, the effects of climate change have been visible on a global scale since the 1980s: global temperature increase, on land and at sea; sea level rise, and thaw. This has increased the risk of extreme events such as heat waves, drought and floods, which cause serious human and economic losses.

The period from 2011 to 2015 broke a world record for all continents, except for Africa, where it was the second hottest period in its history. During these years, temperatures were 0.57 ° C above the average between 1961 and 1990.

Undoubtedly, the year 2015 - followed by 2014 - was the warmest: temperatures during these months exceeded the reference period (1961-1990) by 0.76 °C. In addition, for the first time global temperatures were 1 ° C higher than the pre-industrial era.

Sea temperatures have also reached an unprecedented level: the average sea surface temperatures in 2015 were the highest, followed by those of 2014. The events of La Niña in 2011 and El Niño in 2015 and 2016 also affected the temperatures in these years without changing the warming trends.

According to the work, glaciers in the mountains, as well as Arctic sea ice, have also continued their decline. Between 2011 and 2015 the average extent of sea ice in the months of September was 4.7 million km², 28% less than the average between 1981 and 2010. However, in Antarctica it has been above these levels during many of the five-year periods. The melting caused by the warming of the oceans globally generates a sea level rise that is accelerating. According to satellite records, from 1993 to present, sea levels have increased by 3 mm per year, compared to the 1990-2010 trend, which was 1.7 mm per year.

All these consequences have caused a wave of extreme events across the planet. USA it broke its record annual maximum temperatures in 2012. Australia did so in 2013. The summer heat waves affected East Asia and Western Europe in 2013, and Argentina in December of the same year.

Experts are concerned about the unusually long events of dry and intense heat seasons in the Amazon basin of Brazil in 2014 and 2015, an area that is considered one of the reference points of the climate system.

In the face of these catastrophic events, farmers in particular, must take preventive measures through economic instruments of risk transfer.

In this research work we have taken timely the catastrophic events that occurred in the Mercosur Region in the first quarter of 2018, the phenomenon of drought in the agricultural sector and the existing economic instruments of risk transfer.

Executive Summary

In this research work on the phenomenon of drought in the agricultural sector in the Mercosur region, we have taken the last climatic events that occurred between the last quarter of 2017 and the first quarter of 2018. We relate the climate phenomenon with economic instruments of risk transfer.

The first part of the work defines the phenomenon of Drought and the classification of it

Chapter I Republic of Argentina, the last drought climate event occurred between the last quarter of 2017 and the first quarter of 2018 and its relationship with agricultural insurance, index or parametric insurance and Ag Tech technology (Agricultural Technology) applied by company S4.

Chapter II, Federative Republic of Brazil, deals with the phenomenon of La Niña, a climatic phenomenon that is part of a global natural cycle of climate known as El Niño-Oscillation of the South (ENSO).

The region affected by this phenomenon is Rio Grande do Sul, with considerable damage to the agricultural sector. Agricultural insurance is subsidized by the State.

Chapter III Republic of Chile the La Niña phenomenon also affected different communes which are affected by the scarcity of water. Agricultural insurance in this country covers the drought event with co-financing from the State.

Chapter IV Republic of Peru, the phenomenon of drought affected the rice producing area. The catastrophic agricultural insurance is co-financed by the Ministry of Agriculture and Irrigation.

Chapter V Eastern Republic of Uruguay, the La Niña phenomenon has manifested itself causing considerable losses in the harvest with consequences for exports.

In relation to agricultural insurance, the State Insurance Bank approved a policy contract of index insurance that covers extreme events of drought.

Acronyms

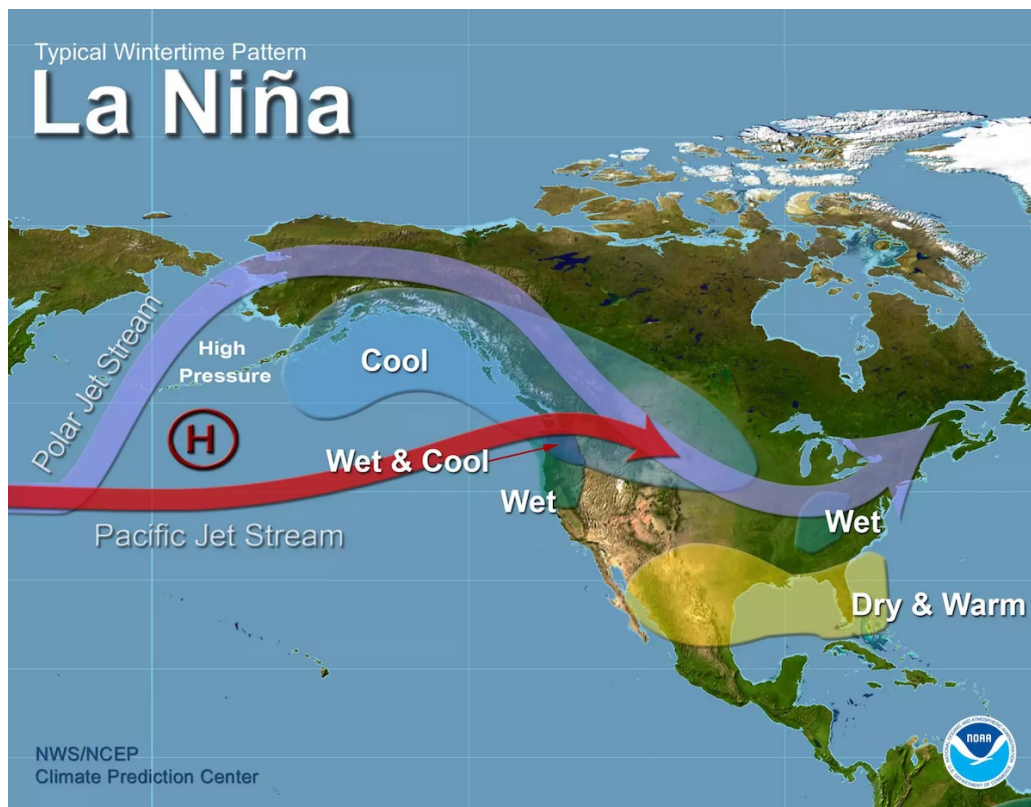
BSE	State Insurance Bank
DGA	General Water Directorate
FOGASA	Guarantee fund for agricultural field and insurance
INIA	National Agricultural Research Institute
SAC	Agricultural Insurance

General considerations

La Niña phenomenon

La Niña is a climatic phenomenon that is part of a global natural cycle of climate known as El Niño-Southern Oscillation (ENSO). This global cycle has two extremes: a warm phase known as El Niño and a cold phase, precisely known as La Niña. When there is a regime of strong trade winds from the west, the equatorial temperatures decrease and the cold phase or La Niña begins. When the intensity of the trade winds decreases, the surface temperatures of the sea increase and the warm phase begins, El Niño.

Either of these conditions expands and persists over tropical regions for several months and causes notable changes in global temperatures, and especially in global rainfall regimes. These changes occur alternately in periods that vary averaged from five to seven years and there are records of their existence since pre-Hispanic times. The appearance of the La Niña phase in the Mercosur region caused the drought events between the last quarter of 2017 and the first quarter of 2018.



Drought

The drought is a transitory climatological anomaly in which the availability of water is below the usual in a geographical area.

It is one of the oldest documented weather events. There are data that present the phenomenon in the Epic of Gilgamesh and in the biblical story of the arrival of Joseph in ancient Egypt and the migratory exodus of hunter-gatherers in Chile in 9,500 BC.

In the Mercosur Region, in Argentina there was a lack of rainfall in the summer of 1,615 / 1,616, a record of the great need of the city and its water farms for wheat. Between the period 1701 and 1720 it is named as the Big Dry.

The drought is classified as: Meteorological Drought, Agricultural Drought, Hydrological Drought.

Meteorological Drought

The phenomenon occurs over a prolonged period with less rainfall than the average. The meteorological drought usually precedes the other forms of drought.

Agricultural Drought

The phenomenon is not enough to maintain crops, pastures and livestock, it is an agricultural drought.

Hydrological drought

It is defined as the decrease in the availabilities of surface and groundwater in a management system for a given time period, with respect to the average values, which may prevent meeting the water demands one hundred percent.

Chapter I

ARGENTINIAN REPUBLIC

The lack of rainfall impacts on agriculture, producers had to deal in the same agricultural campaign with two extreme phenomena: first the flood until mid-2017, and now the drought, with an abrupt cut in rainfall for four months left to the agricultural campaign with an uncertain end.

The agricultural companies are facing a complex situation, as a result of the phenomenon of drought, during the first three months of the 2018 quarter there will be no agronomically favorable rebounds in the water balance of the fields of the Pampean region.

The Grain Exchange forecast a soybean harvest that would be reduced to 7,000,000 tons and that of corn with a fall of 4,000,000 tons.

Given this perspective we ask ourselves what are the economic instruments that the agricultural producer has? The multi-risk insurance covering hail, excessive rainfall, lack of floor, drought, strong winds, frost and fire are excessively burdensome for the agricultural producer, the government along with insurers are in talks to make changes in insurance regulations.

The policies only cover the actual damage today, so the Superintendency of Insurance must proceed to establish a regulatory framework to create a different policy different from those existing in the market.

The effectiveness of parametric or index insurance depends on the existence of positive correlation between yield losses and the meteorological index, for this reason in homogeneous areas there is less basic risk and index insurance will be a more effective tool to transfer risks .

On the other hand S4, is a AgTech (agricultural technology) that provides the data needed by the decision-making process of the agricultural company. S4 focuses on the development of data analysis for decision-making tools that can both improve agricultural performance and manage risk.

In short, Argentina is with respect to agricultural insurance in a plateau, therefore it will be necessary to offer more modern tools, such as parametric insurance that competing countries are applying, so that based on the technology can also the producer Access, these economic tools have a lower premium and have greater coverage for different claims.



Drought 2018 Province of La Pampa



Chapter II

FEDERATIVE REPUBLIC OF BRAZIL

La Niña is the main responsible for this adverse climate in the Mercosur Region. The phenomenon also affects the Rio Grande do Sul, reducing rainfall in these regions.

According to weather reports, in the coming days the southern region of Brazil will not receive more than 5 millimeters accumulated, a condition that will not change until February 23, with another 5 millimeters, or until day 28, with the same volume of rainfall.

In Brazil, instability and precipitation occur scattered in most states, except in Rio Grande do Sul.

The damage caused by the drought in some municipalities of Rio Grande do Sul already exceeds the \$ 60 million Reals, according to the Technical Assistance and Rural Extension Company (Emater). But the problems are not only in the crops. The population has also suffered the lack of rain.

In the city of Cristal, in the south of the state, the first to decree the emergency situation due to lack of rain, more than 50 artesian wells were opened by the municipality, to prevent the inhabitants of the rural area from running out of water until to drink.

As for the agricultural insurance existing in the insurance market, it is the program that has a differential subsidy per crop that can go from 30 to 70%. This program is supported by some States that additionally subsidize the premium, so that the farmer can pay in some cases only 25% of the value of the premium. The insurance is oriented to agriculture, livestock, forestry and aquaculture.

- Insurance + Subsidy. The Ministry of Agriculture pays a part of the cost of insurance to the producer.
- Who can access? Every producer, individual or legal entity that produces any species included in the program.
- How is it contracted? Through the insurers accredited to operate in the program.

Swiss Re Corporate Solutions announced that it had issued the first parametric insurance policy for climate indices in the country, favoring the Xingu Agricultural. The policy covers soybean, corn and cotton farms operated by Xingu Agricultural in Mato Grosso, Minas Gerais and Bahia, states that suffered severe drought last year.

Climate index insurance is aimed at sectors of the economy that have income and operating costs directly impacted by unexpected variations in climate, as is the case of large agribusiness players, affected by the regime of rain, wind, sun and temperature , as well as companies generating electricity by renewable source. Swiss Re Corporate Solutions that, together with Xingu, developed a policy adapted to the production areas to mitigate the risk of productivity losses that occasionally can occur due to the drought. It is, therefore, a different model to the traditional, which is based on the occurrence of an event.

Swiss Re Corporate Solutions offers comprehensive and innovative risk transfer solutions to corporate clients, seeking to meet the broad and complex needs of national and multinational companies around the world. In Brazil, it intensified its operations in 2011, with the acquisition of a national insurer specialized in Guarantees and Rural Insurance. Since then, it has expanded its operation in the country, becoming a multi-line insurer. Currently, in the portfolios of Rural Insurance, Guarantees, Patrimonial, Transport, Engineering, Energy and Civil Liability and presents a great differential in the attention to claims.



Drought Rio Grande do Sul

Chapter III

THE REPUBLIC OF CHILE

The La Niña phenomenon also affects several communes in Chile during this period of the year. In total there are 61 municipalities in the country damaged by water shortages, in which 2,617,934 inhabitants live, that is, 14.89% of the Chilean population. The damaged communes are currently listed in the decrees in force shortage of the General Directorate of Water (DGA). Among these are the communes of San Antonio, Concón, La Ligua, Zapallar, La Calera, Talca, La Serena, Coquimbo, Melipilla, San Felipe, Santa Maria, Catemu, Panquehue and Los Andes. The region is affected by the dryness of wells, springs and underground layers, in addition to the rainfall deficit. The case of Hijuelas in the Valparaíso Region, has a shortage of water that has been extended for more than a month, due to lack of water resources in the channels. The drought has affected local farmers, many of whom have seen their crops lost. The general director of Aguas de Valparaíso, Gonzalo Peña, explained that "the third and fourth sections of the Aconcagua (which provides them with water) have been affected because the first and second sections, which are those that are upstream, have with sufficient water resources.

The interior valleys of Valparaíso and Coquimbo have faced a tremendous and long drought, which also affects small-scale mining and hydro-energy production. The hydrological basins have been depressed. The irrigation channels of the provinces of Quillota and Marga Marga are practically dry, and can no longer supply the avocados, fruits and vegetables that characterize the area.

The decree of the Ministry of the Interior establishes a tax relief for artisanal miners, ease of payment of fines for not using water rights for small farmers and simplification of contracts that the Hydraulic Works Directorate must carry out to attend people and goods affected by a drought that subsists to date.

Agricultural insurance covers crops of cereals, vegetables, legumes, industrial crops, greenhouses (tomatoes) and seedbeds, in the event of losses in production due to:

Drought (only in dry land).

Harmful rain

Frost.

Hailstorm.

Nevada.

The state participates in the co-financing of the premiums without assuming the risk, 50% of the premium plus US \$ 45 per policy and all with a ceiling of US \$ 1.6150 per farmer per season.



Drought in Hijuelas –Chile

Chapter IV

REPUBLIC OF PERU

The rice producers of the Chancay Lambayeque valley suffer from the absence of rain in the Sierra de Cajamarca and lack of water to irrigate the 40,000 hectares of rice that were installed this season.

The flow of the Chancay river and the level of the Tinajones reservoir continue to drop. The first reaches 24 cubic meters for agricultural use and the second of 98 million.

The farmers did not respect the area that had to be planted, 30 thousand hectares.

Peru has Catastrophic Agricultural Insurance whose coverage is as follows:

Drought It is the insufficient availability of water, caused by a meteorological factor, that affects the production area and the insured crop, causing losses in its production.

Flooding It is the effect of a sheet of water on the unit of insurable risk caused by overflows of lakes, rivers, reservoirs or channels directly attributable to excessive rains and that affects the insured crop causing losses in its production.

Huayco or Sliding It is the displacement of earth and stones by a slope originated by excess of rains in zones of hillside that affects the assured crop causing losses in its production.

Extreme temperatures It is the air temperature, maximum or minimum, that is critical for each of the phases of vegetative development of the insured crop and affects it causing losses in its production.

Hail It is the atmospheric precipitation of water in solid state that affects the insured crop causing losses in its production.

Strong Wind It is a violent movement of air that by its intensity, persistence and duration causes, by direct action or by dragging solid and natural particles of soil, losses in the production of the insured crop.

The catastrophic agricultural insurance is co-financed by the Ministry of Agriculture and Irrigation. Co-financing schemes are approved through ministerial resolutions for each agricultural campaign.

The Agricultural Insurance (SAC) is a form of insurance policy that is aimed at small and medium-sized agricultural producers. This acts through private insurance companies, who

execute the policy in case of loss of the insured hectares. For this, the available funds of the Guarantee Fund for the Field and the Agricultural Insurance (FOGASA) are available.

The purpose of this economic instrument is to protect the rural population most vulnerable to natural catastrophes and weather effects on productive assets, such as crops and animals, which are their only means of living and generating income.



Drought in rice field – Peru

Chapter V

ORIENTAL REPUBLIC OF URUGUAY

The drought in recent months has had the same effect in Uruguay as in Argentina and caused the expectations of agricultural production in the two countries to be reduced for this campaign.

The lack of rain will generate losses in the harvest with consequences for exports this year. The first local projections estimate a decrease of the harvest of 1.55 million tons compared to the previous harvest. The climate phenomenon would cause some US \$ 600 million less external sales this year.

Due to the drought and the water deficit, it is estimated that the yield of soybeans will be reduced at least in a floor of about 1,000 kg per hectare (ha), which will imply a loss of about US \$ 200 million-, while livestock could lose a floor of 100 thousand calves, which implies a damage that is another US \$ 100 million.

The State Insurance Bank (BSE) approved in 2016 an insurance index that covers extreme events of drought in soybean crops. It is possible that in the future it will be applied to other areas of agriculture. In relation to the index on drought there are indicators that the bank takes into account that are public, by which is based on the percentage of water available in the soil, according to the information released by the National Institute of Agricultural Research (INIA). This type of insurance seeks to cover risks of drought, which when they occur affect large areas.



Drought in Uruguay

Conclusion

In recent years, the Mercosur Region has been exposed to large losses caused mainly by severe adverse weather events.

The shortage of measuring stations to evaluate the frequency of adverse phenomena in vast regions and the systemic characteristic of extreme weather events such as the drought, are some of the causes that have contributed to the absence of the development of coverage or insurance for the agricultural sector .

In this research work, we treat the phenomenon of drought because of the La Niña phase in the countries of the Mercosur Region, in Argentina the index or parametric insurance have not yet been fully installed in the insurance market.

On the other hand, in Brazil, Chile, Peru and Uruguay, before this new trend of the international market of agricultural insurance based on index is implemented with the co-financing of the state.

In summary, we can affirm that index insurance is low cost, does not require individual expertise. The implementation of these coverages requires government agreements accompanied by the private insurance sector.

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