

## **Global Patterns of Crop Production Losses Associated with Droughts from 1983 to 2009** Wonsik Kim, Toshichika Iizumi, and Motoki Nishimori (Institute for Agro-Environmental Sciences, NARO, Japan)

## In Order for Vitality of International Agendas

- Drought has kept receiving attention as a key climate extreme causing food production losses and associated food price spikes (IPCC 2012, Dai et. al. 2011, Esper et. al. 2017).
- A study based on historical records reported that droughts reduced global crop production by 10% during 1964-2007 (Lesk et. al. 2016), and studies derived from global climate models predicted that drought would be intensified in major breadbaskets of wheat and maize (Seneviratne et. al. 2012)
- Global demand for food in 2050 is anticipated to double due to population growth, dietary change, and bioenergy use (Davies et. al. 2009, Tilman et. al. 2011), and yield improvement with annual rate of 2.4% is necessary to meet the demand without land clearing (Ray et. al. 2013). However, the reported recent increase in yield for key crops - maize, rice, soy, and wheat - is far lower than that rate as 1.6%(FAO 2017).
- For various international agendas (UN 2018, FAO 2017, FAO 2015, IPCC 2012) are challenging to fulfill global food security under these unfavorable conditions, it is vital for the agendas if a global overview of when, where, and how much drought damages take place, and how much technological improvements take advantage to increase resilience of droughts.

## How to Estimate Global Yield Loss by Droughts

- We estimated drought-induced yield loss for maize, rice, soy and wheat in 1983-2009 using empirical relationships between yield anomaly  $\Omega$  (Iizumi et al., 2014) and drought magnitude Z (McKee, 1993, Weedon et al., 2014) in accordance with particular annual precipitation regimes.
- Linear regression model for the yield loss *Y*



1983–2009. The circle and the tail denote the median and the standard deviation, respectively.



# **Droughts Struck Three Fourths of Global Crop Areas for Last Decades**



national producer prices of staple crops and the national agriculture gross domestic product in 2005 were originated from FAO (Accessed 19 July 2017), and The World Bank (Accessed 28 September 2017), respectively. The red cross data was based on CRED (Accessed 19 July 2017).



