Hydrological extremes and food security in western Amazon

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Does hydrological variability in western Amazon impact food security ?

Data: Data from enquiries in markets and shops of the little towns along the Solimões River, data from the Peruvian Ministerio de Agricultura y Riego, hydrological data from the Observation Service SO HYBAM "Geodynamical, hydrological and biogeochemical control of erosion/alteration and material transport in the Amazon basin"

Methodology: enquiries, statistical analysis

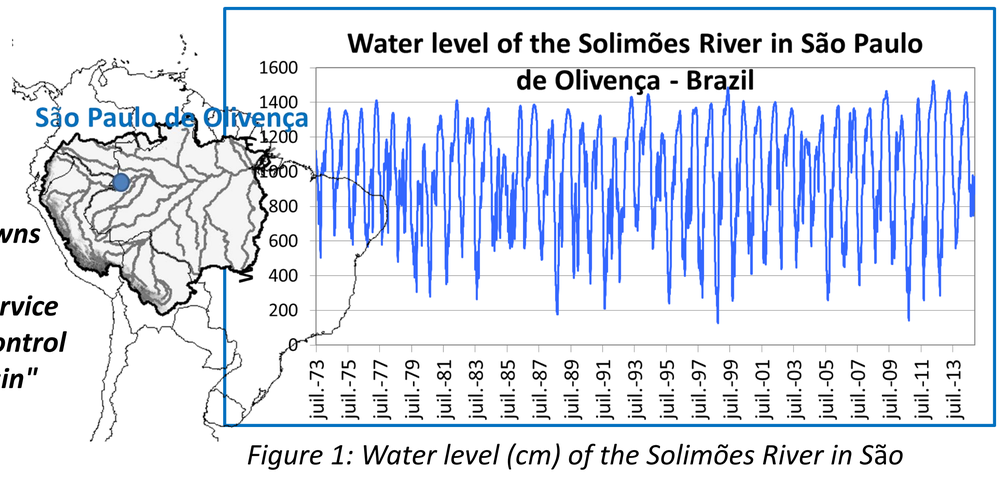

Figure 1: Water level (cm) of the Solimões River in São Paulo de Olivença, Brazilian Amazon. Source: SO-Hybam

1. A very important **seasonal water level variability** is observed in western Amazon (mean range = 9m, Fig. 1). **During the low-water season** (from August to November), agriculture is possible on the banks of the rivers (Fig. 2) and in the flooding plains (Fig. 3), fish is easier to catch in the remaining pools (Fig. 4) and hunting in large territories is more difficult. On the contrary, hunting is easier during the high-water period when the animals are trapped. As a consequence, **the availability and the price of food vary seasonally:**

The prices of local food are lower during the low-water period i.e. during the period of production (Fig. 5), while the price of industrialized products does not change much (not shown)

Fish offer is higher during the low-water period while the **supply of wild meat (**dear, peccary, *paca, .)* **is higher during the high-water period** (Fig. 6)

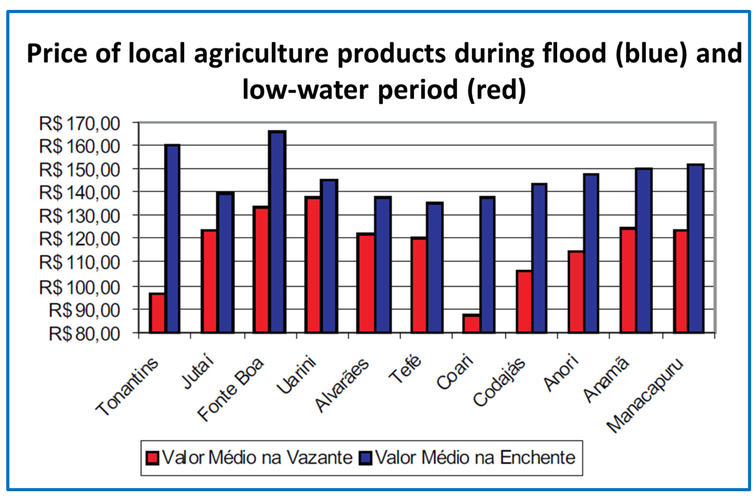

Figure 5: Prices of local products during high-flow (enchente, in reais, in blue) and low-flow (vazante, in reais, in red) in 11 Amazonian cities along the Solimões river in 2006-07. From Moraes and Schor (2010).

Figure 4: Peddler doing a string of pacu, Tabatinga 2014. . Photo: NEPECAB

Figure 2: Rice on the banks of the River Amazonas in San Pablo de Loreto (Peruvian Amazon). September 2014. Photo: NEPECAB

Figure 3: Cassava, maize, watermelon and camu-camu in the inundation plain of Palo Seco (Caballococha, Peruvian Amazon), September 2014. Photo: NEPECAB

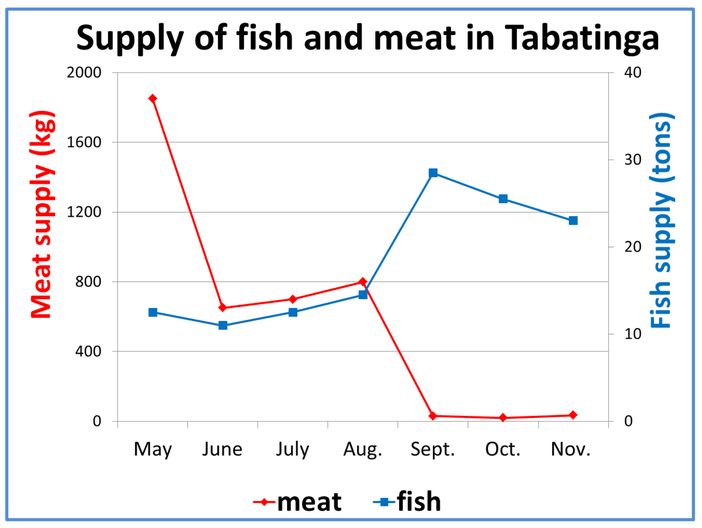

Figure 6: Fish supply (tons) and wild meat sold by 3 dealers (kg) in the market of Tabatinga (Amazonas), from May to November 2014. Source : Pinto (2015)

2. An important **water level interannual variability** produces intense **droughts and flooding** (Fig. 1, Espinoza et al. 2013, for instance).
It may produce **food price peaks** as during the big 2009 and 2012 flooding: the need to import tomato from Tarapoto or from the Peruvian coast made the prices go wild (Fig. 7)
Also, the **structure of the hydrological cycle changes from year to year**.
A rapid filling of the river (type 4, Fig. 8) **speeds up the cassava crop** and brings about the production of farinha (May 2015, Campo Alegre, Brazil).
Does a **brief low-water period** (type 2, Fig. 8) allow or not the ripening of the crop and good yields ?
What is the **impact of a long-lasting low-water season** (type 3, Fig. 8) **on transport** (Fig. 9) **and on food prices** ?

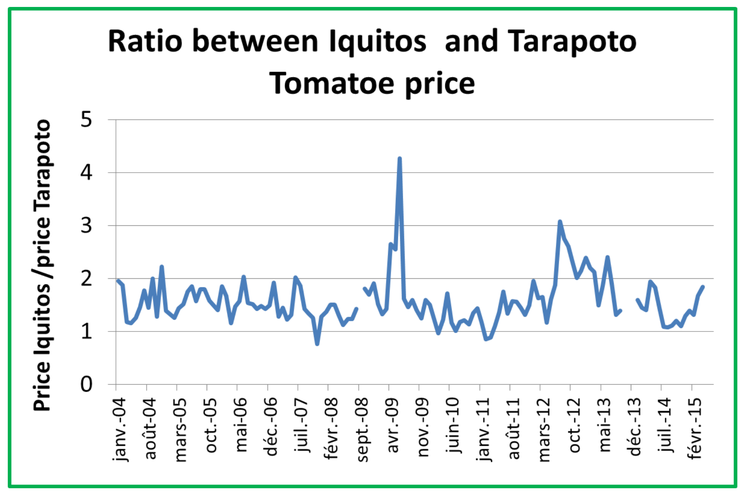

Figure 7: Ratio between the average monthly tomato price in the "minorista" market in Iquitos and in Tarapoto (Peru), 2004-2015. Data : www.minag.gob.pe

Figure 9: Transport of food, Leticia , Colombia

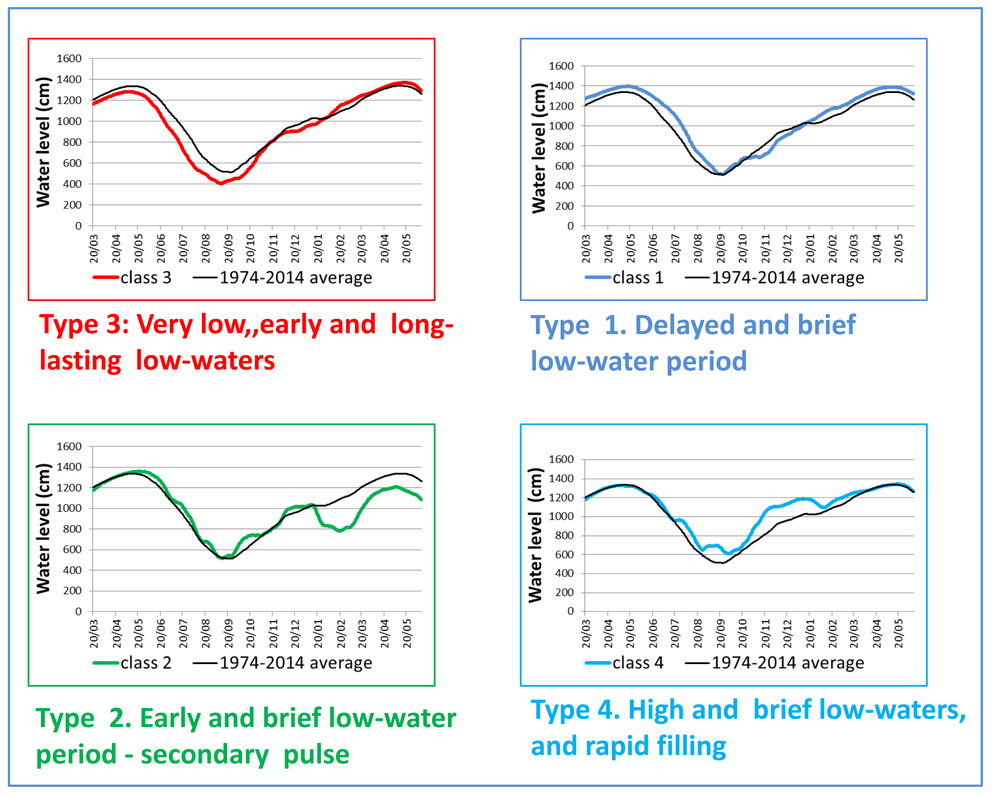

Figure 8: Typology of the low-water period in São Paulo de Olivença. Result of a Hierarchical Ascendant Classification on daily water level values. Types are compared to the average 1974-2014 cycle. Data: SO-Hybam

<u>Conclusion</u>: During the low-water season, agriculture products and fish are abundant and inexpensive while wild meat is not available.

<u>Perspective</u>: How does <u>hydrological interannual variability</u> in western Amazon impacts food security ? How people deal with it ? How will it impact food security under climate change ?

<u>Réferences:</u>

Espinoza, J.C., Ronchail, J., Frappart, F., Lavado, W., Santini,W., Guyot J.L. 2013. The major floods in the Amazonas River and tributaries (Western Amazon basin) during the 1970 - 2012 period: A focus on the 2012 flood. J. Hydrometeor. doi:10.1175/JHM-D-12-0100.1. 10.1175/JHM-D-12-0100.1

Moraes A. and Schor T., 2010. Redes, rios e a cesta basica regionalizada np Amazonas, Brasil. Acta geografica, 7, 79-89.

Pinto M. 2015. A caça e a pesca na beira de Tabatinga: um estudo do mercado de recursos naturais na triplicefrontiera Brasil-Colombia-Peru. Mestrado, UFAM, 194p