

Vulnerability Risk Index of Agricultural Production in the Brazilian Semi-arid.

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Introduction: Weather and environmental conditions in Semi-Arid regions all over the world can seriously affect agricultural production. The Brazilian Semi-Arid region is **considered as one of the worlds'** most populated semi-arid regions. The rural population is almost 40% of the total population and depends mostly on rainfed agriculture for their subsistence. Its vulnerability is increased by climatic variability, water deficiency, low adaptation capacity and poverty. To understand how to increase the resilience and reducing the vulnerability of communities to agricultural production risk it is necessary to understanding, which are the main components of crop production vulnerability and which regions are and will be most at risk. The purpose of this study is therefore to assess the vulnerability of agricultural production in Semi-Arid of Brazil and indentify sub-regions of Brazilian Semi-Arid, e.g. hotspots, where public policies could be applied to reduce current and future risks.

Methodology: In this work Bean and Maize Crop Yields are looked at. They represent the most cultivated crops in Brazilian Semi-Arid and we asses its vulnerability to Enviromental (Soil, Number of days with a water deficit and Precipitation) conditions. The data was provided by official institutions from Brazil such as IBGE, PROCLIMA/INPE. Bivariate and Panel regression statisticals analysis were applied to assess the components which contribute to vulnerabilty and could be used as appropriate indicators to each sub-region. The data time-serie used covers the years from 2005 to 2012.

Results and Conclusions: It was found that the Soil Textural Class and Number of days with a water deficit (NDWD) represented the most satisfactory variables for crop production vulnerability. It was possible to identify at least 24% of all cities as vulnerable in terms of crop production as consequence of the effects of soil and number of dry days. In a further analysis, we considered three different approaches to evaluate these indicators, range of crop production, decrease in crop production, and stress thresholds to crop production. The first one used the difference in NDWD between highest and lowest crop yields. Using this approach we identified 68% of the cities are vulnerable in terms of crop production. In the second approach, we used only the minimum crop yield for each city and the correspondent dry days for that year which happened the minimum crop yield. Considering this approach we found that 54% of the cities are vulnerable. In the third approach, we considered only the cases when the city presented 10 dry days or more. Using this analysis we find that 77% of the cities in Brazilian Semi-Arid are vulnerable according to dry days and Soil Textural Class. Numbers of days with water deficit and the soil textural class are appropriate variable to detect the vulnerability of agricultural production and can be used within an indicator system. All three approaches are showing a different answer to the specific question of crop production vulnerabilty. As the NDWD is essentially a random process, we also determined the risk of each sub-region to fall below given threshold levels of crop production and range.