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covid-19 Brief

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Predicting Food Crop Production in Times of Crisis: The Case of Senegal.

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The COVID-19 pandemic is a global health crisis that is already having devastating effects on the global economy. In addition to the effects of the disease on public health, measures to contain the spread of COVID-19 pose significant risks to food and nutrition security by disrupting the production, distribution and access to food. On the production side, these constraints translate into reduced access to good seeds, fertilizers and pesticides due to disruptions in supply chains; a scarcity of labor and limited access to land due to curfews or restrictions on internal movement. the aim, here, is to prevent this health crisis from triggering a food crisis by providing food crop production forecasts for the current cropping season and at a pixel level to enable proactive and targeted interventions to protect vulnerable communities.

The COVID-19 epidemic has an impact on the ability of statistical authorities to collect and process data in a traditional way due to the risks of contagion associated with it. The AKADEMIYA2063 team of data scientis came up with innovative ways to overcome such barriers by harnessing remote sensing products and machine learning techniques. On the one hand, remote sensing allows to scrutinize features on earth on several wavelengths without the need of a physical presence on the ground, produce larger and better quality data and process them in a much more shorter time span. Machine learning, on the other hand, makes it possible to extract the many hidden features in the vast amount of data to unlock the mechanisms behind the inner workings of very complex systems. Those two techniques have been combined and

Figure 1. 2020 millet predicted production in Senegal - pixels are of size 10km x 10km. Source: Author

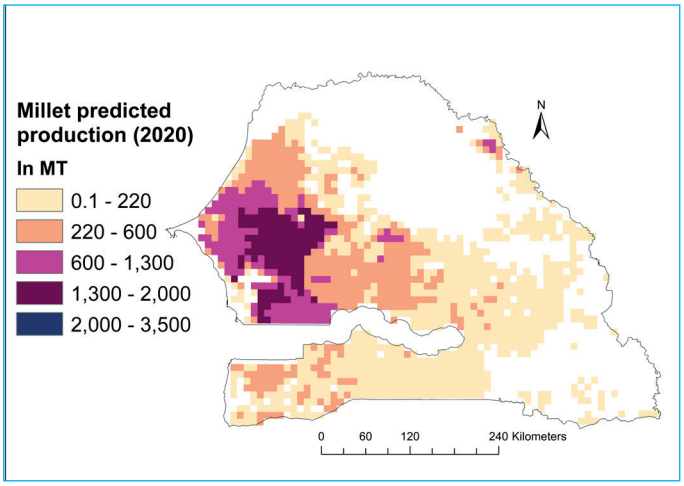
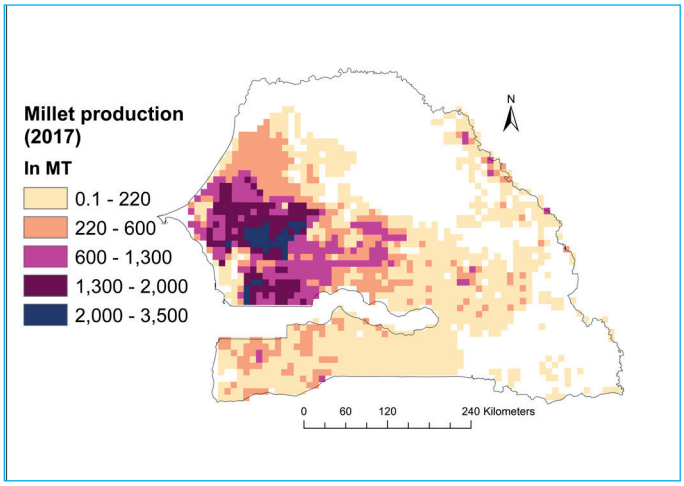


Figure 2. 2017 millet production in Senegal - pixels are of size 10 km x 10km; source: model SPAM 2017; IFPRI 2020



put to use to forecast the quantity and spatial distribution of millet production in Senegal in 2020. More concretely, we apply artificial neural networks (ANN) techniques to biophysical remotely sensed data to predict millet production in Senegal for 2020 at pixel level (Figure 1) and compare it with 2017 production across the country (figure 2). In Senegal, millet is an important staple food crop. It plays an important role for food security as it is drought resistant, vital for rural communities subsistance where soil fertility is poor and rainfall unstable the recent years.

Our model predicts a production level of 512,623 tons for 2020 compared to 579,104.6 tons in 2017. The production levels for 2017 were obtained by aggregating MapSpam millet production for that year at a national level (IFPRI 2020.). The model was built using FAO production data, which therefore are the best comparator to evaluate the accuracy of our forecast. Our predicted level of production shows a decrease of nearly 12 percent, although still within the range of average annual production for the sector.

Figure 3 compares - at a pixel level - the actual 2017 and predicted 2020 millet production levels. The map shows the quantity of millet production in 2020 as a ratio of millet production in 2017 for the same pixel. While on average, millet production is lower in 2020, it is clear form the map that the national average hides marked disparities at the disaggregated level. Indeed, the pixel-level map shows variations in predicted 2020 production ranging from half to five times the level of production in 2017. Most of the decline is anticipated in areas around the groundnut basin, shown by the orange and yellow colors. The increase in production is located primarily in areas towards the North and more importantly in the East and Southern parts of the millet growing zones.

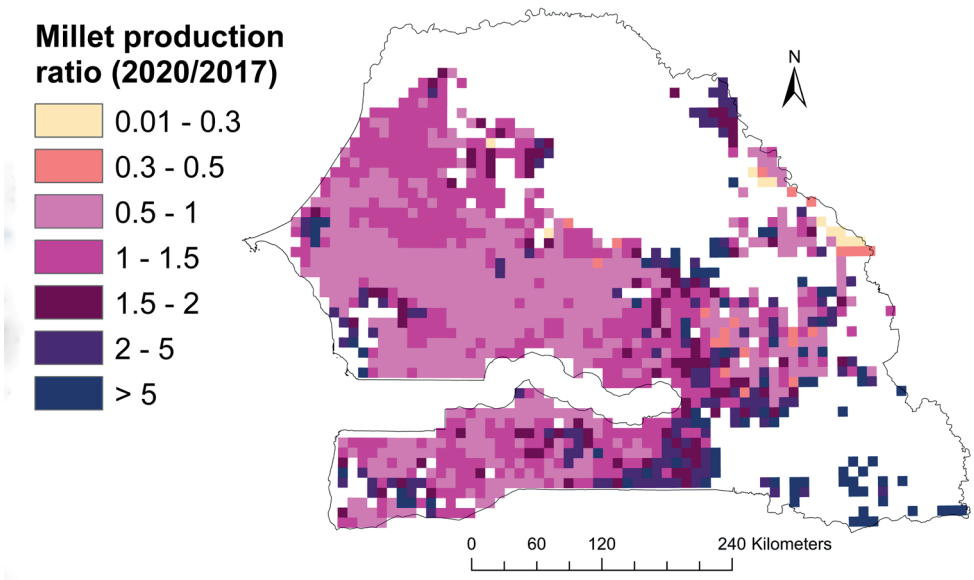
This spatial disaggregation of production forecast presented here has the advantage of paying due attention to the geographic diversity within production areas and of allowing the issues of policies and interventions on food and nutrition security to be addressed in a more targeted fashion. This also allows for an early identification of options for policy and intervention programs to protect and restore productive capacities at the community level.

Reference

International Food Policy Research Institute. 2020. "Spatially-Disaggregated Crop Production Statistics Data in Africa South of the Saharan for 2017", https://doi.org/10.7910/DVN/FSSKBW, Harvard Dataverse, V1.

Note: *The boundaries and names shown, and the designations used on maps do not imply official endorsement or acceptance by AKADEMIYA2063.*

Figure 3. Ratio map between Millet 2020 and 2017 production in Senegal. Pixels are of size 10 km x 10km.



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