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covid-19 Brief

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Predicting Food Crop Production in Times of Crisis: The Case of Yam in the Democratic Republic of Congo.

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The COVID-19 pandemic has brought disruptions in several areas of national, due to the burden of the disease and also to policies that have been implemented to mitigate its propagation. In the Agricultural sector, the impacts are wide ranging, including on access to markets for crops and inputs or on mobility of farmers and agricultural workers, among others. Being able to assess and quantify the combined effect on countries' food crop production allows various stakeholder group to better plan ahead and respond more effectively. The sooner we can anticipate regarding the impact on food production and supplies, the easier it will be to prevent the pandemic from morphing into a food and nutrition security crisis. More accurate and timely information on food crop production, makes it possible for countries to design targeted policies to protect access to food among the most vulnerable communities.

The challenge of accessing and collecting data during the time of crisis makes it very difficult to obtain accurate and timely information on production systems and thus food supplies in local markets. This can be overcome by make use of remote sensing data. Nowadays, high temporal and spatial resolutions satellite images are publicly available and allow to remotely access a rich set of information related to vegetation and climate data. With the opportunities offered by artificial intelligence, it is possible to machine learning techniques as a framework to learn patterns embedded within datasets and generate information regarding future production outcomes.

We used Artificial Neural Networks and biophysical remotely sensed data to predict Yam production in DRC for 2020 at pixel level (Figure 2) and compared it with 2017 production (Figure 1) [1]. Yam is one of tuber crops which contributes significantly to human food availability in Africa. In West Africa, Yam is one of the main sources of income in addition to have a high cultural value.

According to FAO data, yam production in DRC was about 91.000 metric tons in 2017 [2]. Our model predicts production to reach a little bit more than 92.000 metric tons in 2020, which amounts to an increase of about 2.00% above the 2017 production. Our model allows to examine the spatial distribution of production changes between 2017 [3] and 2020 at pixel level. The two maps Figures 1 and 2 respectively show a slight difference in term of production over the 2017-2020 period. The results also show that 2020 Yam production is higher than the 2017 production for the majority of the areas. Figure 3 compares the predicted 2020 Yam production as a fraction of production in 2017 pixel by pixel (10 km). The biggest changes in production are expected in the Northwest and Southern regions of the country. The area around Kinshasa, were the bulk of the production takes places, shows a lowest level of predicted variation in production.

Figure 1. 2017 Spatially Disaggregated Yam production in The Democratic Republic of Congo; model SPAM 2017; IFPRI 2020

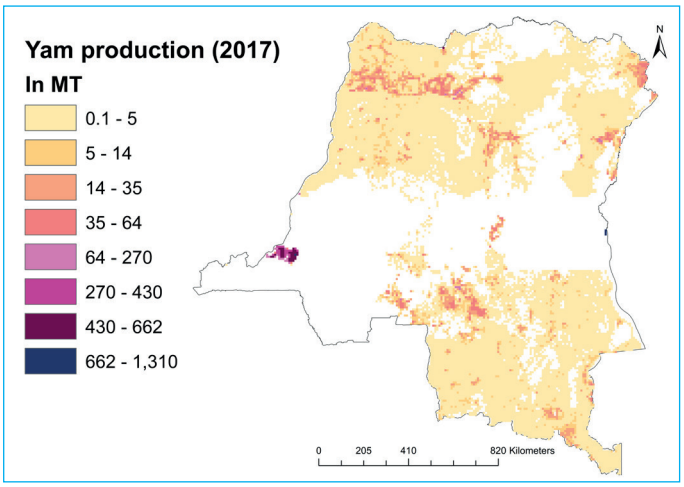


Figure 2. 2020 (predicted) of Yam production in The Democratic Republic of Congo

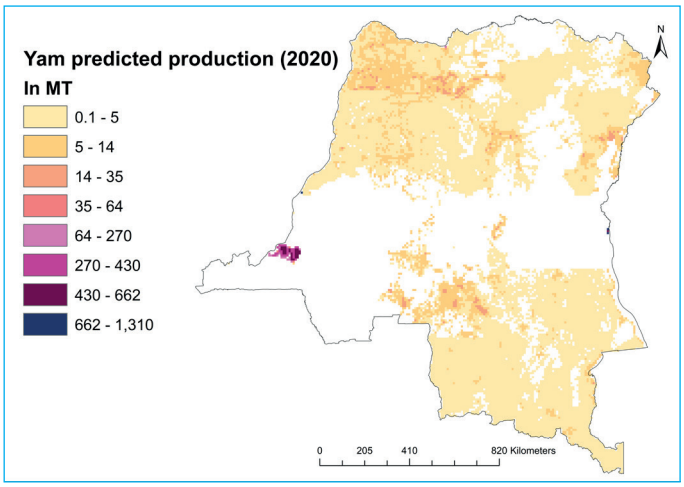
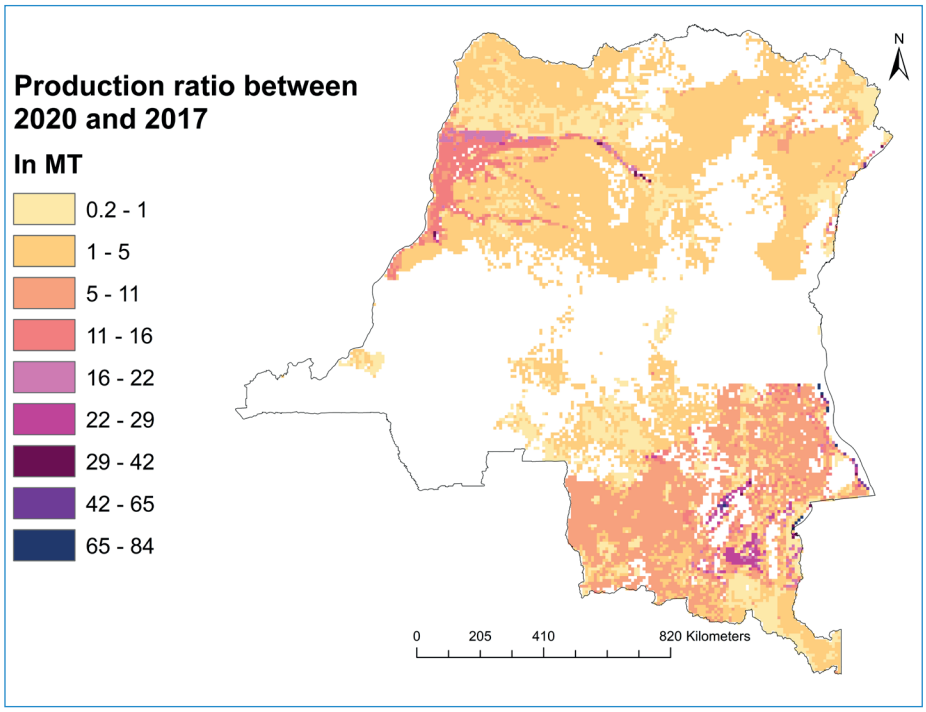


Figure 3. 2020 (predicted) and 2017 (MAPSPAM) ratio of Yam production in The Democratic Republic of Congo. Ratio below unity means production reduction in 2020 compared to 2017 and, 2020 Yam production increase otherwise.



The greater spatial differentiation makes it possible to devise more targeted policies for increased impact in terms of protecting the most vulnerable communities in areas where the sharpest decrease in production may be expected. In addition, better forecasting of food crop production in the context of possible widespread disruption of productions systems is a good starting point to identify where attention could be needed to assess the impacts of COVID-19 on local food supply. This will be the next focus of our analysis.

Background documents

1. Racine Ly, Khadim Dia. 2020. Application of Remote Sensing and Machine Learning for Crop Production Forecasting During Crises. Covid-19 Bulletin No. 4, August. Kigali. AKADEMIYA2063.
2. FAOSTAT Data (http://www.fao.org/faostat/en/#data/QC)
3. 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.*

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