# Extended Abstract
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| Paper Title | The Effects of Rising Prices on Corn Production in Western African Countries |
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**Abstract prepared for presentation at the 97th Annual Conference of the Agricultural Economics Society, The University of Warwick, United Kingdom**

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| **Abstract** | ***200 words max*** |
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| The intensification of the Russo-Ukrainian war started in February 2022 has generated a dramatic increase in the price of several goods. In particular, energy, gas and oil have been the most interested by this spike in prices, followed by several agricultural commodities. Fertilizers, whose production is energy intensive and/or directly dependent from oil derivatives, have also experienced a sharp increase in prices. This has risen concerns for food insecure countries, particularly in Africa, since, besides a lower possibility to purchase food commodities on the international market, they will likely decrease their own production due to a lower utilization of fertilizers. Quantifying this potential decrease in agricultural production is important in order to fully assess their vulnerability in terms of food security. The present paper tries to accomplish this task by forecasting the change in maize production in 2022 and 2023 compared to 2021 in seven Western African countries. We find an overall decline in maize production of 10% circa in both years with a strong heterogeneity among countries. Trivial users of fertilizers, such as Niger, experience a very modest decline in production (less than 2%) whereas others, such as Benin and Togo, have a double digit decline: approximately 13% the former and 32% the latter. | |



| **Keywords** | Crop models, Food security, Maize yields, Western Africa, Yields forecast. |
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| **JEL Code** | Q12, Q17, Q18.<br>see: www.aeaweb.org/jel/guide/jel.php?class=Q) |


| **Introduction** | ***100 – 250 words*** |
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| With the recrudescence of the Russo--Ukrainian war, there has been a spike in the international prices of several commodities, in particular of energy and agricultural products. The ban to Russian exports and the decrease in Ukrainian agricultural production are believed to be serious threads to food safety for several vulnerable countries that depend on food imports from at least one of the nations in conflict. The situation is made even worst since food insecure countries not only will find more difficult to purchase agricultural commodities on the international market, but they will likely decrease their own production as well. In fact, the price of fertilizers, strongly correlated with the price of energy commodities, is expected to grow steeply in 2022 and to decline only mildly in 2023. Food insecure countries, which already have scarce levels of fertilization, may easily further reduce the use of this agricultural input, thus reducing their yields. | |

The present paper tries to estimate the effect of the fertilizers price increase on the production of maize in seven Western African countries, all the users of the CFA franc except for Guinea Bissau: Benin, Burkina Faso, Côte d'Ivoire, Mali, Niger, Senegal and Togo.

**Methodology** ***100 – 250 words***

In order to estimate the effects of rising prices on corn production, we follow a multi-steps procedure. First of all, response curves to nitrogen fertilization and irrigation in maize production are estimated for all seven countries at regional and national level. Responses are computed using the crop model EU-rotate_N, duly parameterized on local data.

Second, the decline in fertilizers demand is estimated through the use of the fertilizers own price elasticity and the elasticity to output (maize) price. Elasticities are estimated using a set of nationally representative datasets, the *Enquête Harmonisée sur le Conditions de Vie des Ménages* (EHCVM), a household survey with a strong focus on agriculture.

Finally, through the response curves to fertilization and the forecasted levels of fertilizers application, yields are estimated for the years 2022 and 2023 and compared with the yields of 2021. The simulation is performed on the EHCVM data, so that results can be generalized at country level.

**Results** ***100 – 250 words***

Our analysis shows that the impact of the prices peak on maize production in the examined countries is strongly diversified and, overall, not excessively dramatic. When considering all countries together, in fact, the overall maize production in 2022 results to be almost 10% lower than in 2021. The level of 2022 remains substantially equal in 2023, since price changes are very modest.

When considering each country separately, it is possible to observe a great heterogeneity in the impact of the increase in prices. Togo and Benin are the countries with the largest decrease in maize yields: -32% and -13%, respectively. Niger, Mali and Côte d'Ivoire, instead, are far less impacted, with declines in production that are below 5%. In general, the lower is the starting level of fertilizers use of a country, the lower is the impact due to the increase in the price of this input.

**Discussion and Conclusion** ***100 – 250 words***

In countries already facing problems of food security and generally having more than 30% of the population under the absolute poverty line, a 10% decrease in an important food crop such as maize is a serious issue. However, it is lower than the 20% decrease in food production estimated for the whole African continent from other sources. Furthermore, other cereals mainly produced for self-consumption such as millet and sorghum are generally cultivated using less quantities of fertilizers, thus their yields may experience a significantly lower contraction. The same applies for other non-cereals food crops: beans, yams and potatoes.

For certain countries, however, the impact is much more serious, with a peak decline of more than 30% of the 2021 production in Senegal. One positive aspect is that the most affected countries are the ones with higher starting levels of fertilization. Since per-capita income is generally positively correlated with the per-hectare quantity of

applied fertilizers, we can conclude that the poorest countries are generally less affected by the decline in maize production.