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Analysing the cost-effectiveness of early action for food security through forecasting shortages in maize calories; a case study for Ethiopia

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The Ethiopian agricultural system is predominantly formed by smallholder and rainfed farmers. Their local food systems are greatly reliant on seasonal climate variability. Often, droughts and food insecurity are interlinked and can negatively impact local communities. In addition to climate variability, a number of socio-economic factors such as multiple harvest failures, distance to markets and pre-existing inequalities are well known to impact people's access to safe, sufficient and affordable food. Anticipatory action to avoid a situation of food security crisis often requires the understanding of how many people can be potentially affected by a shock and how much financing should be invested.

This study aims to forecast shortages in maize calories, which is defined as the percentage of the population for which not sufficient maize calories are available. Forecast models were developed for agricultural and agro-pastoral livelihood zones in Ethiopia in connection to the unimodal and bimodal rain seasons by using the Fast-and-Frugal Trees Algorithm. To forecast shortage events, five variables were used ranging from socio-economic to physical drivers: 1) soil moisture (Tropical Applications of Meteorology using Satellite data and ground-based observations (TAMSAT)), 2) maize production from the previous season, 3) the Gini index, 4) the main livelihood mode and 5) the travel time to the closest market. The lead time of the model is increased using TAMSAT forecast data to create a wider window for action before harvesting.

The skill of the model with increased lead-time in relation to the cost of the humanitarian intervention was analysed to examine the cost-effectiveness of forecast-based action. Therefore, the cost of acting early (through a scheme of cash transfer) has been compared to ex-post interventions. To assess the cost-effectiveness of the cash transfer, the prices of a basket of goods before and after harvesting are included in the model with the assumption that prices of staple crops increase when there is scarcity (food insecurity). With these results, the study will explore the practicality of implementing the anticipatory action by looking at the implications of model

uncertainty (False Alarms, ‘acting in vain’). Likewise, the possible opportunities and challenges in regards to operationalizing the model will be deliberated. Accordingly, this study hopes to contribute to the use of early warning early action systems by humanitarian agencies in reducing the impacts of natural hazards.