Using the Russia-Ukraine Conflict as a Predictor for Future Food Supply and Distribution Interruptions

The Politics Behind Food Crises: A Case Study of the 1980's Ethiopian Famine

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.
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Introduction

World leaders and humanitarian actors have taken on the challenge of addressing global food supply and distribution chain problems in an effort to decrease the number of people around the world that are impacted by hunger and famine (United Nations, n.d.). My team and I will utilize the conflict in Ukraine and its known effects on the global food supply and distribution chain to create a model which will help predict how future conflict may impact the health of the global food network. Furthermore, I will investigate the role that internal political factors in various countries, such as decisions to enact export controls, contribute to reductions in the global food supply alongside of more frequently studied topics including climate change and other technical factors. This will be done through an Actor Network Theory (ANT) based sociotechnical study on the causes of the 1980's protracted famine in Ethiopia. It is critical that the technical model that this prospectus proposes incorporates the actions of the non-technical actors discussed in the sociotechnical section into its formula. This will help ensure that predictions derived from the model are more accurate and take into account the variety of compounding factors that exist in food supply chain crises. An analysis of these crises requires consideration of both technical and social aspects because they are sociotechnical in nature and have economic, technical, and political factors which compound to create the effects felt by an interruption in food supply. In what follows, I elaborate a technical project that functions to help understand and predict the effects that conflict will have on the global food supply and distribution chain, in addition to a Science, Technology, and Society (STS) project that examines the political factors which contribute to interruptions in supply.

Technical Problem Frame

In March 2022, Russia invaded Ukraine – a major supplier of basic food stocks like grain and cooking oil – cutting off its ability to contribute to the global food supply (Bankova, Dutta, & Ovaska, 2022). Additionally, Russia itself is one of the world's largest grain suppliers, and it has significantly curtailed its export amounts in the months since the conflict began (Reidy, 2022). Estimates place the combined global share of the Ukrainian and Russian supply of grain and sunflower (cooking) oil at 20 percent and 72 percent, respectfully (Strubenhoff, 2022). Currently, real-time measures to understand the effects of conflict in Ukraine on the food supplies for countries that rely on food stock imports are very general. For example, in response to the blockade of Ukrainian ports, the World Food Programme director could only say that Russian actions "would result in famine and destabilization" and decrease his organizations ability to provide food through its assistance program (Green, 2022). Specific effects can only be measured after the fact by tracking exactly how much supply has been affected and how the prices of these goods in different countries change. For example, we now know that the price of cooking oilseed has increased by 138 percent and grain by 70 percent, globally (Bankova, Dutta, & Ovaska, 2022). This contributes to an overall 23 percent increase in food prices worldwide (United States Institute for Peace, 2022). The inability to accurately and precisely predict the effect that action in Ukraine will have on the prices and supply of food makes it extremely difficult for global systems like the UN or humanitarian organizations like the World Food Programme to prepare an effective response to the food supply and distribution chain challenges that the conflict in Ukraine – and global conflict in general – poses. It also leaves entire regions susceptible to unexpected shockwaves in the food supply chain that can affect the prices and

supply of goods because long term and large-scale effects of the Ukraine conflict are not understood.

This prospectus proposes a technical work that first includes a research project oriented around understanding how the various compounding factors of the Russia-Ukraine crisis affect the health of the global food supply and distribution chain. These factors include climate change, energy shortages, COVID-19, the war itself, and the internal politics of stakeholder countries. Employing techniques like data analytics and predictive modeling to better understand the continued effects that the Russia-Ukraine conflict has and will continue to have around the world, this research will result in a model that can be utilized to better understand when, where, and how food networks will be impacted in the case of future conflict. Concepts pertinent to Systems Engineering like root-cause analysis will allow for a multifactor approach to understand what actions in Ukraine caused the effects seen on the global food supply and distribution chain, and also what factors compounded to make the crisis worse. Other concepts like data visualization and modeling will be utilized once the system is fully understood to then generate hypotheses about future effects on the food supply and distribution chain due to global conflict. This model will be built by datasets compiled from UN Comtrade, the Food and Agriculture Organization (FAO), and other sources. The data exploration and analysis will be conducted on two programs: Minitab and R. The final model will be developed and tested in R.

Science, Technology, & Society (STS) Problem Frame

It is critical for everyone from global leaders and humanitarians to food scientists and farmers to understand the factors that affect the global food supply network when international

conflict occurs. In the 1980's a devastating famine struck Ethiopia. This famine was catalyzed by recurring drought and failed harvests but was perpetuated by regional conflict in Ethiopia and the government's response to it. The international response was ineffective as humanitarian aid was only allowed by the Ethiopian government to certain groups and was often used as political capital instead of flowing to the people who needed it most (Plaut, 2022). The result was deadly; an estimated one million Ethiopian lives were lost to starvation (Reid, 2022).

Currently, the World Food Programme estimates that 345 million people are experiencing acute food insecurity, which is an increase in 210 million over the past two years (United Nations, n.d.). This is in addition to the nearly 50 million people that the WFP is tracking who are teetering on the edge of famine (United Nations, n.d.). Furthermore, the prices of basic food commodities like wheat, maize, and rice have increased by 18 percent, 27 percent, and 10 percent in the last year, respectively (World Bank Group, 2022). Without proper understanding of the factors that are causing these trends, the international response will, again, be ineffective and lives will be lost.

Current analysis methods for why hunger levels are increasing focus heavily on the technical aspects of food production like the economy, soil type, and especially our planet's climate (Jagtap et. all, 2022) (Godfray et. all, 2010). However, very rarely do experts include analysis of other human factors, like the internal politics of countries in their studies. The thesis to be developed in the research outlined by this Prospectus proposes that the inclusion of human factors into the study of food supply networks will increase the understanding of where to deploy resources in the effort to reduce global food insecurity more effectively. To validate the claims in my thesis, I will show that internal political actions in a country – like for example, the decision to halt exports of a certain good or to focus on growing certain crops and not others – can have

measurable impacts on the global food supply that are similar to those created by climate change and other more technical factors. Using the case study of the protracted famine in Ethiopia, I will demonstrate how the rare occurrence of an analysis that factors in both technical and socio-technical factors like the political and social environment that a crisis exists in, can lead to a richer and more accurate understanding of a food crisis. In the protracted Ethiopian famine analysis, authors Fatemeh Taheri and Hossein Azadi claim that while the decrease in food supply and crop production in Ethiopia was linked to drought, climate change, and changes in agricultural land use, it was the reaction of Ethiopian society and political leaders that drove the nation into extended famine (Taheri & Azadi, 2018). These political actors spotlighted by Taheri and Azadi functioned as network builders and cultivated an environment designed to strengthen their position in the 1980's regional conflicts of Ethiopia, creating opportunities ripe for the continuation of famine and war.

This directly relates to the current crisis caused by the Russia-Ukraine conflict. Writers have examined the impact of political and social factors in previous food crises but have not yet extended this concept to the Russia-Ukraine crisis. The socio-technical project that this section proposes does just that. My analysis will draw on the Science, Technology, and Society (STS) framework of Actor-Network Theory, a concept that analyses the influence that various actors, both human and non-human, have over the process and network that exists to achieve a particular goal. This network and its goal are established by "network builders" who advance the network's agenda. Specifically, I will utilize the Actor Network Theory component of Heterogeneous Engineering (Cressman, 2009) which emphasizes the importance of understanding how all elements of a particular network like economics, politics, and the social combined to cause the extended famine in Ethiopia. This same analysis will be applied to the food supply chain

problems evident in the Russia-Ukraine crisis which should be analyzed by organizations and governments around the world. Furthermore, I will argue that the food supply chain network builders are each country's respective decision maker on international food policy, whose primary goal is to provide food for their citizens. Those deciding when and where to buy and sell food shape the availability of food for millions of citizens around the world. It is these decisions that must be included in a food supply analysis to ensure complete understating of the system.

Conclusion

This prospectus outlined a two-part project centered around the global food supply and distribution chain crisis resulting from the conflict between Russia and Ukraine. First, a technical project was proposed that utilizes data from various sources to create a model in R that will help predict the effect on food supply due to future conflict. Second, a sociotechnical project based on an analysis of the protracted famine in Ethiopia was discussed that serves to emphasize the importance of understanding all the factors that impact a particular network, including political, social, and economic. This sociotechnical analysis will help generate insights about which factors evident in the Ukraine crisis to include in the model that is proposed in this prospectus. These two projects combine to help address the shared goal of many global leaders and humanitarians – minimize the number of people around the world that are impacted by hunger and famine caused by global conflict.

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