Title: E2E: CRISTAL (CRIticality SpaTial AnaLysis)

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Project Start Date: 07/2012

Project Completion Date: 12/2016

Project Status: Complete

Research Theme: Supply Chains

Participating State(s): Georgia, Virginia, Minnesota

Amount Awarded to Date: $1,668,239

Award Number: 2010-ST-061-FD0001

Abstract: A key requirement for transferring CRISTAL to private food companies is ensuring it has the ability to provide business value to their organizations. Solutions to assessing supply chain risks that can reduce business costs and increase profitability are needed. CRISTAL, as envisioned, would provide value to food companies by providing a standard toolkit and methodology for identifying supply chain risks and prioritizing limited food protection and defense resources towards the most dangerous and reasonably foreseeable risks at a system level. During 2015/16, the primary aims/objectives include: implement transportation hazard analysis, implement data network and supervisory control and data acquisition (SCADA) system risk identification, complete CRISTAL documentation, complete end-user testing of CRISTAL, and refine the interface based on user experience (UX) assessment.

Project Type: Research

End User Engagement:

- DHS Federal Emergency Management Agency
- DHS National Protection & Programs Directorate
- Food and Agriculture Industries
- Food and Drug Administration
- Private Sector Other

Executive Summary (2015): To effectively protect the food system, from both a food defense and a food safety perspective, a systems-based approach is needed. A systems-based approach involves consideration of risks and vulnerabilities throughout an entire food product supply chain through 1) documentation of the complete product line supply chain; 2) criticality assessment of the supply chain; and 3) targeted vulnerability assessment of those supply chain components deemed most critical. The Criticality Spatial Analysis (CRISTAL) software tool provides an easy to use, standalone product for steps 1 and 2 (supply chain documentation and criticality assessment). CRISTAL is intended for use primarily by small and mid-size food companies that may not have the resources to implement a systems based approach to food protection possessed by large food companies have. The CRISTAL project is funded through the Department of Homeland Security E2E initiative and completed its third year of development during 2014/2015. The goal of the CRISTAL project is to develop a user friendly, web-based software product that can be used to document food product line supply chains and to perform criticality assessments on those supply chains. During year 1 of the project, a conceptual model and working prototype were developed in a GIS based system. This prototype allowed the user to build product line supply chains by inputting the locations of supply chain facilities and transportation links among those facilities. The user could also overlay hazards related to geographic location such as flooding or hurricane frequency. During year 2 a criticality scoring algorithm was developed for

CRISTAL. This scoring algorithm allows the user to select from a wide range of hazards, from weather hazards related to a facilityâ€™s location to biological or chemical hazards that might be introduced into a food product at a facility. The criticality scores are applied to every individual facility and transportation link in a supply chain and also to an entire supply chain to allow comparison among multiple product lines. These scores can be used to rank supply chain components for prioritization of facility based vulnerability assessments and allocation of limited mitigation resources. In addition to development of the scoring algorithm, IT requirements needed to transition the tool to the end-user were implemented. These requirements included assessment and implementation of industry best practices for data security, individual access management, and deployment to a cloud-based environment. During year 3 transportation routing capabilities were implemented in CRISTAL. This routing capability will enable assessment of hazards that are specific to transportation such as cargo theft. In addition a data model for import of food product movement data was imported into CRISTAL. This data model will permit integration of food product movement into the CRISTAL scoring algorithm and will facilitate post-event rule-in/rule-out of supply chain components. Data import capabilities were improved in CRISTAL to speed the supply chain building process and end-user testing took place to obtain feedback for CRISTAL improvements.

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