Transitioning Cereal Systems to Adapt to Climate Change

November 13-14, 2015

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Adapting plant disease management to climate change: Impact network analysis

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Obstacles to integrated pest management adoption in developing countries

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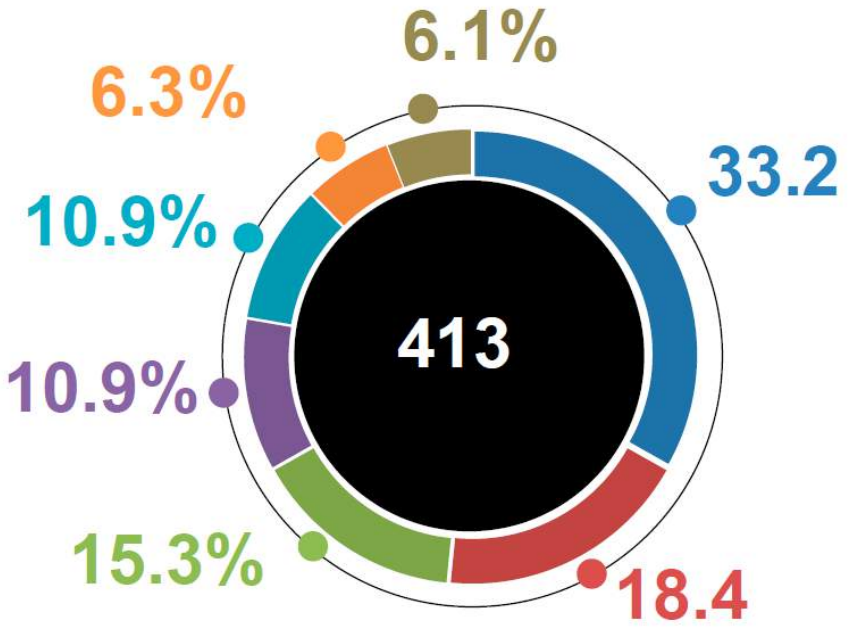
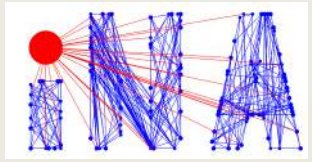
INC	Weak adoption incentives
RCH	Research weaknesses
OUT	Outreach weaknesses
IPM	IPM weaknesses
PST	Pesticide industry interference
FRM	Farmer weaknesses
	Others



Impact network analysis (INA)

- Impact **OF** research products such as information/training, disease resistance, and disease-free seed production technologies
- Impact **ON** spatial ecological processes, such as crop productivity, pest invasions or ecosystem services more broadly
- Impact **THROUGH** communication and decision-making networks, and linked biophysical networks

Impact network analysis



Information or technology

Socioeconomic network

Integration of socioeconomic and biophysical components
Heterogeneity
Phenotypes
Constraints

Outcome: yield, profit, ES, etc.

Biophysical network

Garrett, in review

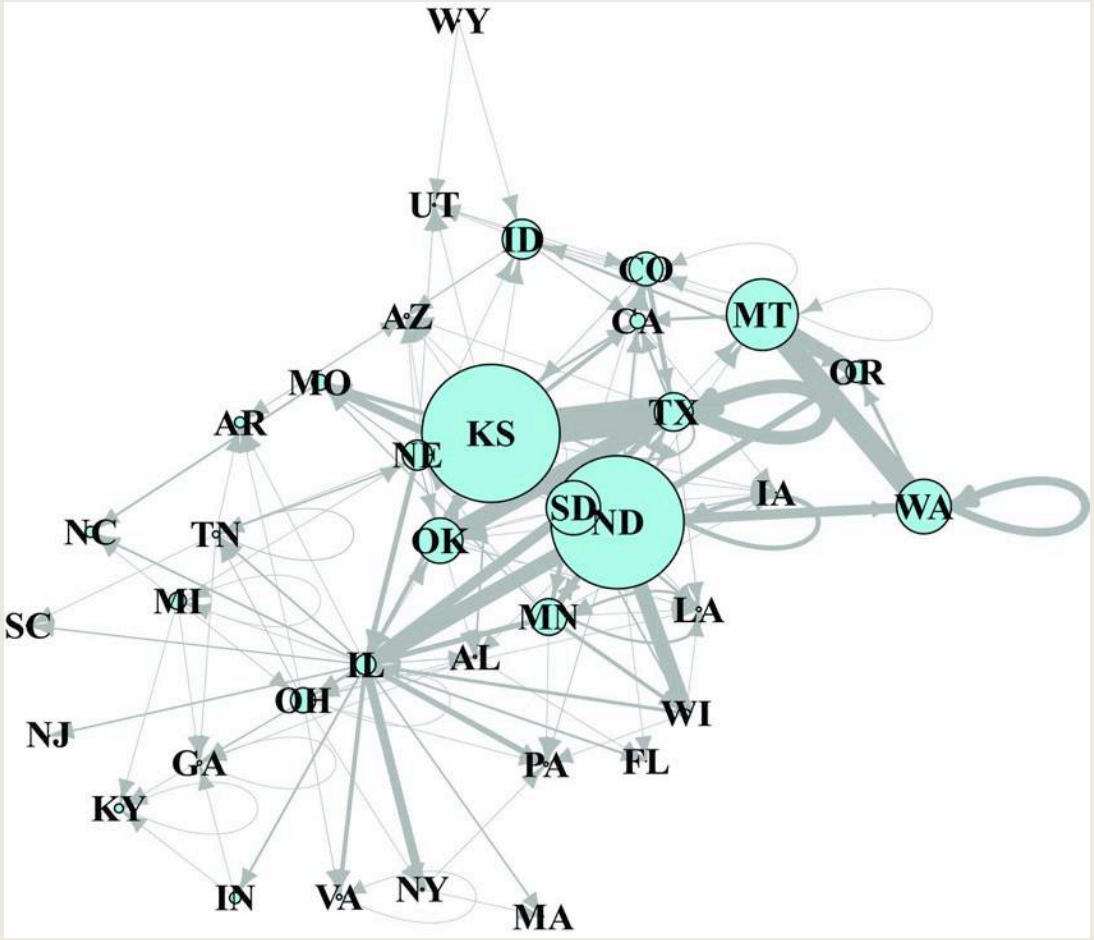
Ecological Networks in Stored Grain: Key Postharvest Nodes for Emerging Pests, Pathogens, and Mycotoxins

JOHN F. HERNANDEZ NOPSA, GREGORY J. DAGLISH, DAVID W. HAGSTRUM, JOHN F. LESLIE, THOMAS W. PHILLIPS, CATERINA SCOGLIO, SARA THOMAS-SHARMA, GIMME H. WALTER, AND KAREN A. GARRETT

John Hernandez Nopsa

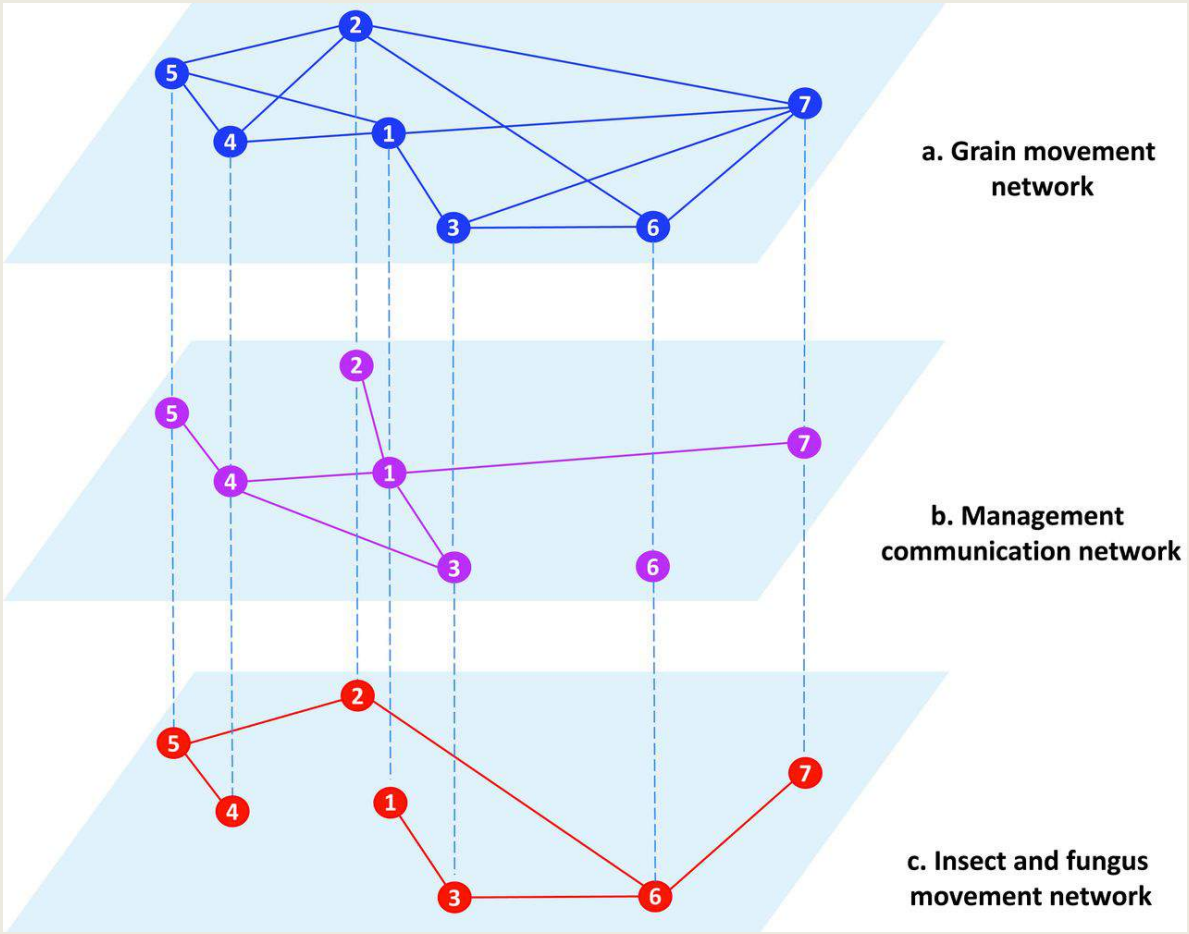
BioScience

Wheat rail movement in US 2006-2010



John F. Hernandez Nopsa et al. BioScience 2015;biosci.biv122

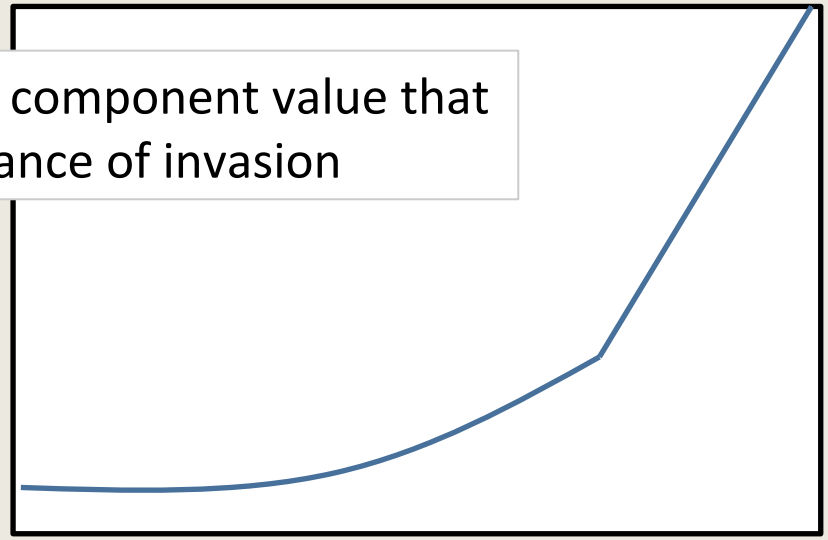
Multilayer network in stored grain system



John F. Hernandez Nopsa et al. BioScience 2015;biosci.biv122

BioScience

Evaluating the sustainability and resilience of an impact network where weather conduciveness to invasion varies with time and may have a trend toward greater conduciveness



For example, the probability a land manager adopts a new management strategy, given awareness of it

The lag time in responding to important weather events will help to determine the magnitude of response needed for resilience

Evaluating and improving systems

- Impact network analysis is a framework being developed in the Garrett Lab
  - Many other approaches are possible: key point being to evaluate adaptation strategies in fuller system context
- We are pursuing new work in impact network analysis to integrate wheat breeding and seed distribution networks
- The effects of insurance in plant disease management are another important area

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