Title: Land use, insecticide application, and the economic value of natural enemies in cotton: First evidence from smallholder agriculture in the north China plain

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Bio sketch: Wei Zhang is a research fellow in the Environment and Production Technology Division at the International Food Policy Research Institute (IFPRI), based in Washington DC. Her research focuses on using socio-economic survey and experimental games to understand incentives and cooperative behavior in natural resource management and valuing and modeling ecosystem services (ES) for sustainable agricultural development and poverty reduction. A Chinese national, Wei joined IFPRI in November 2008 as a postdoc fellow. Prior to that, Wei worked as a consultant on Payment for Environmental Services at the Environment Department of the World Bank. Wei earned a Ph.D. in Agricultural, Food, and Resource Economics at Michigan State University. She has a Master’s degree in Community Development and Applied Economics from University of Vermont and a BA degree in International Economics from Renmin University in China. She currently works on projects in Nigeria, Nepal, Cambodia, Vietnam and China.

Abstract:
This presentation reports results from a recent IFPRI project on the provision and value of biological pest control ecosystem services in smallholder agriculture in the North China Plain, a major grain and cotton production region in China. We used a unique dataset collected from household survey, insect sampling in farmers’ cotton fields, and detailed assessment of land uses in the landscapes surrounding the cotton fields. The field work was carried out in the growing season of 2011 in Hebei province.

Studies conducted in the USA and Europe have shown that diverse landscapes in general support greater natural enemy abundance. No quantitative evidence on the relationship between land use diversity and natural enemies has been reported from developing countries, where fields and farms are much smaller than in modernized agriculture in the west, and where insecticide use is often high and indiscriminate. We examine the effects of land use diversity at the landscape scale and farmers’ insecticide application on natural enemies of aphids in cotton production. Our results show that, in the NCP where farms are small and landscape is dominated by a few crops, Shannon or Simpson land use diversity index is not a good indicator for explaining the relationship between land use and densities of aphid natural enemies. Instead, the types and proportions of cropland habitat mattered. Landscapes with more maize and grassland have higher ladybeetle populations in cotton fields. Farmers’ pest management practices such as the amount and timing of insecticide use significantly affect ladybeetle densities.

Despite large potential benefits from biological control to mitigate crop loss from pests, little empirical evidence at farm level is available to justify economic value of using the biological control of pests. We study farmers’ insecticide use behavior and estimate economic value of biological control by natural enemies of crop pests in cotton fields. The results show that ladybeetles provide significant economic benefits to farmers who have never been aware of this. We also provide compelling evidence of the excessive use of broad-spectrum insecticides by farmers that undermines farmers’ cotton profitability.
These results imply that there is a need to recognize the potential positive role of cropland use in pest management and call for more judicious insecticide use strategies by smallholder farmers in the North China Plain. Additionally, there is potential to move forward a new ecosystem-based-direction of farming even under a small farms dominated crop system.