DRAFT

Proposed Special Issue in Frontiers in Insect Science: Pest-Smart strategies for improved eco-efficiency in agricultural, forestry and communities.

Over the last few decades there has been increasing concern worldwide about the impact of pest management on human health and the environment. One strategy to address these concerns is ecoefficiency. Eco-efficiency is the ratio of costs to benefits of management in agricultural operations, and considers impacts both within and outside of agricultural production. Eco-efficiency underlies a strategy for sustainably optimizing the balance of agricultural production against its negative feedbacks. To improve ecoefficiency in Europe, policymakers have proposed a 50% reduction target for chemical and highly hazardous pesticides by 2030 as part of the EU Food to Fork Strategy. This proposed Sustainable Use Regulation includes measures to ensure that all farmers and other professional pesticide users practice Integrated Pest Management (IPM), in which alternative environmentally methods of pest prevention and control are considered first. It also includes measures to ban pesticides in sensitive areas used by communities. In many parts of the world there is substantial concern about the environmental and human health impacts of pesticides, alongside other issues such as climate mitigation, pollinator protection and conservation of endangered species.

Integrated Pest Management remains one of the most important tools to address these social and environmental issues. Unfortunately, IPM adoption by growers is often low or difficult to measure and IPM definitions or practices vary greatly with crop, region and production systems. Another challenge is that unlike organic or sustainable agriculture, IPM is not a well known concept amongst policymakers and the public. Although there are well funded programs to mitigate climate change, protect pollinators, or save endangered species, the support of IPM is often neglected even though it is a vital component. To address these limitations, we propose the concept of Pest-Smart production strategies to communicate, identify, quantify, track and incentivize eco-efficient Integrated Pest Management (IPM) practices. As an example, IPM and precision agriculture can be harmonized through Pest-Smart management, which identifies and translates relevant data using IPM principles for use in delivering inputs when and where they are required. Overall, Pest-Smart production integrates what is known about pest systems to develop recommendations for maximizing benefit:cost ratios, while expanding the scope of benefits and costs to factors affecting agriculture in the long term, such as the evolution of resistance to pesticides, and impacts affecting ecosystem services or natural enemies of pests. Pest-Smart production is developed to simultaneously optimize pest management and the impacts of management actions, for eco-efficiency of agricultural production. In addition to enabling forward-looking optimization, Pest-Smart production also facilitates comparison of

historical impacts in relevant context, to better understand effects of pest management actions on economics, human health, and local environments.

Research topics on all aspects of increasing Pest-Smart production and eco-efficiency in pest management are invited. Potential contributions include but are not limited to:

a) Identify promising Pest-Smart practices and/or identifying priorities for research, extension and regulation for specific crops or communities. This could include precision agriculture, reduced risk pesticides, cultural practices such as regenerative agriculture or cover crops; GM technologies, biological control, diagnostics, area-wide management, insecticide resistance management, pesticide safety, climate mitigation, life cycle assessment and others;

b) Descriptions of tools to assist farmers, ranchers, foresters and other managers in quantifying impacts and selecting Pest-Smart practices. Tools could include improved thresholds, strategies, smartphone apps, education, training, and decision support systems. In addition, papers that provide an analysis of the determinants of growers decision making and/or farmer behavior;

c) Studies that track implementation and quantify benefits of eco-efficient practices at multiple scales. Studies could include those of economic benefits and costs, worker protection, pollinator protection, ecosystem services, natural enemy conservation, reduced pesticide risk use, school or community IPM, agricultural worker protection, pesticide residues in food and others;

d) Research and data collection methods for quantification, monitoring, and verification of eco-efficient practice. This could include papers that describe programs centered on sustainability and certification of pest management practices; and

e) Research, regulatory, extension or policy papers that propose, evaluate or review mechanisms to improve ecoefficiency in pest management. This could include papers on crop insurance, taxation, production system redesigns, the development or improvement of environmental markets for incentivization of eco-efficiency, cooperative programs, markets or business mechanisms such as certification or sustainability programs.