Logic Model for CPPM-ARDP: "Prospective" Resistance Management: Empowering Growers to Partition Chemistry in Space and Time

Situation	**Inputs**	**Outputs**		**Outcomes-Impacts**		
What is the problem/need	*What we invest*	Activities *What we do*	Participation *Who we reach*	Short	Medium	Long
1. Despite resistance management education and cross-commodity cooperation, we still face threats of resistance to key chemistries for whitefly management across crops 2. If current insecticides become ineffective due to resistance, growers will be limited to one product from each of 3 chemical classes and broadly toxic synergized pyrethroids. With few options, rotation of insecticide modes of action is limited and resistance management programs are impaired 3. Pest managers rarely have the insights, communication, or cooperation needed to partition chemistry across ecological space and through time (i.e., knowledge of local use patterns) 4. Surveys to measure stakeholder support of chemical use maps (n=43) have shown 100 percent support 5. Hypotheses for understanding and predicting regional patterns of resistance in relation to chemical use patterns need to be more thoroughly tested.	1. Time and expertise of PIs and 2 Assistants in Extension 2. Resources to hold meetings and trainings, create extension publications, and develop a website 3. APMC pesticide use database as a foundation for maps, sampling plan, and assessment 4. Crop Pest Losses surveys to measure changes in user practices 5. Labor and travel for monitoring pesticide resistance 6. Data from previous work showing spatial relationships between pesticide use and development of resistance in whitefly populations	1. Access APMC pesticide use database to produce corrected section-level chemical use maps by eco-region 2. Develop a password protected website to provide access to pesticide use maps to pest managers. 3. Educate pest managers about resistance management principles and chemical use maps through oral presentations, trainings, and publications 4. Monitor resistance levels in designated zones through field collection of whiteflies and lab bioassays to support hypothesis testing 5. Analyze the relationship between regional patterns of insecticide use and development of resistant whitefly populations 6. Evaluate changes in awareness, knowledge, and practices and impacts of these changes on broad patterns of chemical use	1. Growers 2. PCAs 3. Ag industry representatives 4. Fellow extension scientists 5. Resistance management experts 6. Other agricultural professionals 7. Pesticide applicators	1. Increased availability and access to information on eco-region chemical use to support decision making 2. Increased pest manager knowledge and awareness of chemical use maps and their utility 3. Increased pest manager understanding of the mechanisms of pesticide resistance and reinforcement of basic management principles 4. Greater pest manager understanding and intention of adopting the tactics of partitioning chemistry over space and time 5. Increased scientific knowledge about the spatial relationship of pesticide use and the development of resistance via hypothesis testing **<u>Possible Measures</u>** Document change in knowledge and intention to adopt maps with audience response systems, general and online surveys at website login (Procedures 3a,b,c)	1. Increased subscription to the chemical use map website 2. Increased adoption of chemical use maps to inform decision making in whitefly management, leading to decreased selection pressure and possibly a reduction in whitefly-targeted sprays 3. Increased information on the science of resistance management and stimulation of discussion among resistance management scientists and practitioners **<u>Possible Measures</u>** Measure adoption of new resistance management practices with surveys on chemical use map web-site, at meetings, and online (Proc. 3a, b, c) and qualitatively assess adoption, use and value of maps via stakeholder interactions (Proc. 3e) Measure changes in insecticides applied (individual and aggregated use) using APMC Pesticide Use Database and Crop Pest Losses Surveys (Proc. 3d) Measure & compare individual and group (regional) chemical use and switching of chemistries over space (section-level uses) or time (Y0 v. Y1 v. Y2) by comparing chemical use maps generated from APMC pesticide use data (Proc. 3f, g, h)	1. Group adoption of improved whitefly resistance management practices creates area wide impacts to slow WF resistance development and extended efficacy of key WF insecticides 2. Greater stability of whitefly management and reduced risk of losses across multiple crops 3. Sustained economic benefits to growers 4. Stimulation of development of similar resistance monitoring programs in other regions **<u>Possible Measures</u>** Track long-term group adoption and changes in area-wide chemical use with Crop Pest Losses Surveys & Pesticide Use Database Measure development of resistance through field collection and lab bioassays (proc. 2) and analyze in relation to spatial chemical use (Proc. 3f, g, h) to determine relationship