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Brief History of Boll Weevil Eradication in the United States Challenges and Lessons Learned

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The dream of boll weevil eradication probably began in 1892 when cotton producers in the USA discovered what was destroying their crops. Many things were tried while the weevil marched across the south where, in 1922, it found its limit in Virginia. All efforts to control had some, but not lasting, success in eliminating the pest.

The first real steps to look at a solution were taken in the late 1950's when the House and Senate Agriculture Committees asked the

Office of the Secretary of Agriculture to make recommendations to find a solution for the boll weevil problem. This request included research and facility needs, a compilation of status on current research from Federal, State and industry and information on what the Federal emphasis concerning the boll weevil problem should be.

In 1958 a committee consisting of various USDA agencies and the National Cotton Council presented their findings to Congress,

which lead to appropriations to fund cotton research with the goal for developing technologies to initiate boll weevil eradication programs within the United States. To further this effort, the National Cotton Council of America, the national organization for the cotton industry and producers, appointed a committee to look at areas in the Southeast, South and Southwest that could be used to test the program assumptions and technologies.

In the fall of 1969, the committee recommended that a pilot boll weevil eradication experiment be initiated in 1970. Adequate funding was made available from USDA, the 'Cooperative State Research Service' and the 'Cotton Incorporated' representing industry. The experiment began in July 1971. It was centered in Mississippi and was conducted in cooperation with the Departments of Agriculture of Alabama, Louisiana, Mississippi, respective experimental stations, Cooperative Extension Services along with the National Cotton Council, Cotton Incorporated and USDA agencies including the Agricultural Research Service, Animal and Plant Health Inspection Service, the Agriculture Stabilization and Conservation Service, which assisted with identifying cotton field locations, and other co-operative agencies.

The operation began with diapause treatments in the fall. The following spring it was found that the emerging populations were greater than expected due to heavy 1971 populations and a mild winter. The Program tested trap crops treated with aldicarb around the field border rows and then treated all acreage with insecticide twice. Sterile insects were also tested, but were ineffective. This was attributed to dry weather and late-diapause weevil emergence. There were 5 in-season applications and 13 diapause applications. Trap catches in the spring of 1973 revealed low weevil survival. The Experiment ended in August 1973 and was deemed a success to indicate that Boll Weevil Eradication was feasible and ecologically acceptable.

A Technical Advisory Committee had been appointed through the National Cotton Council in 1972. In December of 1973 the Committee recommended to the Secretary of Agriculture that a Boll Weevil Eradication Trial be conducted. The Agriculture Act of 1973 instructed the Secretary to initiate a Program to eliminate boll weevil, pink bollworm and other cotton pests considered feasible for eradication.

Funding was made available for the boll weevil eradication trial to begin in northeast North Carolina with a buffer area in central North Carolina. The trial ended in 1981 and was considered successful both biologically and technically. With the passage of a referendum to expand the Program further as a full eradication effort in 1981, USDA sponsored a 2- year program on boll weevil containment in the original buffer zone in central North Carolina. A referendum is a legally binding vote of registered farmers in a defined area to determine if there is majority support to continue a program. The farmers agree to a fee schedule, one in the spring and the final yearly payment in the fall to cover the cost of a program facilitated by the government.

A positive referendum in 1983 led to the beginning of the expansion of boll weevil eradication from the southeast to California and all states in between. Expansion has had its challenges since grower referendums are necessary since growers bear the bulk of the

costs. As in the Carolinas, grower economic concerns delayed expansion into Georgia and Alabama. The positive referendum in 1987 began the beginning of continued positive grower responses.

This success led to further expansion in Alabama in 1990, 1992 and into the Tennessee River Valley in 1994. There were doubters in these areas when the efforts began in 1987, but they saw the economic benefits quickly and wanted to get on board.

In the West, California control was initiated at the pin-head square stage rather than the diapause-treatment program in 1985. Arizona also started their program in western Arizona adjacent to the California border. These Programs also included the Mexicali and San Luis Rio Colorado areas in the States of Baja and Sonora, Mexico respectively. The California program was managed by the California Department of Food and Agriculture, and the Arizona program by the Arizona Cotton Research and Protection Council of the state of Arizona. The responsibility of management of respective Programs shifted from the USDA, as in the southeast, to state or State Grower Foundations which has been the norm for all states west of Alabama, except for Kansas, which is managed by USDA and the Kansas Department of Agriculture. The Mexican Program areas were managed by USDA and USDA International Services funds. In 1986, the remainder of Arizona was included, along with Sonora, Sonora and Mexico. Mexican producers in these areas did not contribute funding to Program operations. Later expansions in Mexico began in 1988 in the State of Chihuahua and in the Caborca area in Sonora. Growers there, and in the remaining expansions in Mexico, contributed to their 70% cost share.

In 1994, Texas initiated their eradication program in the Southern Rolling Plains zone under the management of the Texas Boll Weevil Eradication Foundation. Currently, boll weevils in 15 of the 16 zones are eradicated. The remaining zones, the Lower Rio Grande Valley, along with the State of Tamaulipas, Mexico continue their efforts to eliminate the weevil.

In the mid 1990's through the early 2000's, boll weevil eradication programs were established in all states and have completed their active Program activities. All are in the post-eradication phase, monitoring reduced trap lines to detect any migration or other introduction of boll weevils into their respective States or zones.

Steps for a Successful Eradication Program

The most important steps for a successful boll weevil eradication program are listed below:

- Close cooperation and collaboration between industry, government, growers, researches and appropriate universities
- Enabling legislation
- Dedicated leadership at the local, state and federal levels
- A detailed plan of action to establish procedures and goals
- Inclusive training for all field employees conducting the operations
- Commitment to short and long term goals

- Post eradication strategy

Challenges

There are some challenges that are uncontrollable, but most challenges have solutions that can be provided by operational controls:

- Weather—wind/rain cannot be controlled but usually have short term affects. A big exception here is the Lower Rio Grande Valley and Tamaulipas Programs where spring winds have serious impacts on spraying conditions and schedules. Timely treatments, especially at pin head square are the foundation of boll weevil eradication success.
- Undetected cotton fields- sometimes fields are planted after maps have been prepared or were missed during the mapping process. Undetected fields create an insectary that can eventually overwhelm program operations.
- Volunteer cotton (Cotton that grows like weeds in unplanted areas) - this is the great devil to the program. This can occur on field edges or road shoulders as cottonseeds are dropped on the ground and germinate. Program personnel must be vigilant to detect this situation quickly. Harder to find and the most problematic are volunteer plants that result from improper plow down and sprouting plants in over-cropped fields (fields that have been planted to a successive crop, such as corn, without first ensuring that all cotton has been destroyed). It is extremely difficult to see cotton plants in rows of an alternate crop and “roguing” such plants (removing them by hand one at a time) can be difficult. Another problem is that your options may be limited in what should be sprayed and how many times you can spray the crop. Undetected insectary is yet another more serious problem.
- Public reaction to Program Operations.

Technology

The basic tools and concepts utilized at the beginning of boll weevil eradication, for the most part, remain the same but have been improved. The concepts of ‘map, trap and treat’ are still the foundation of an eradication program. Traps and chemicals remain vital tools to detect and fight the boll weevil.

- Traps: The trap is the detection tool that is critical to locating boll weevil populations. It has evolved from a handmade flimsy drink cup base and stamped-screen tool to a snap-together durable tool that may be used for more than one season.
- Lure: The pheromone dispenser has evolved from an impregnated cigarette filter, functional for maybe 7 days to the current dispensers that are effective for 14 days to 30 days.
- Chemical: Malathion remains the pesticide of choice. It is highly effective with low mammalian toxicity, 5-7 day effective residual and, while some mid-season resistance has been observed, research over the years indicate that this resistance is not passed on to the next generations.

- Data Collection: This is one area that has improved greatly. All data is collected and recorded in the field using computers rather than hand recording and transcription. The Texas eradication program records all information in the field using tablets, and this data can be remotely transmitted to a headquarters location. This process has improved reporting and reaction times so necessary to a successful program operation.

Lessons Learned

- Strong local, state, national, research and industry leadership is critical to sustain Program goals and success.
- Training needs to be inclusive and timely, aimed to when it can be applied as immediately as possible.
- Ultra-low-Volume (ULV) malathion is the chemical of choice
- Timely treatments are critical
- Undetected fields and volunteer cotton prolongs the program and increases costs
- Crop destruction immediately following harvest reduces food source for diapausing weevils and reduces survival.
- Grower cost incentives for early plow-down saves program costs in the short term
- Debrief at the end of each season to find best practices and solutions to problem areas.

Conclusion

Boll weevil eradication is no longer a dream but a reality. The concepts are simple but it requires patience and commitment, not only by program operation people but especially by producers, industry and government.

In the U.S, the producers have been required to bear a majority of the program costs, and this has been the major contribution to the success of the eradication effort. Grower support has kept their respective programs on course to completion, taking only a few years to reach their goal. After eradication is achieved, grower costs are significantly reduced.

Boll weevil eradication is not for the faint of heart. It's hard work and will never be completely over once achieved because a surveillance operation will be necessary to ensure re-infestation doesn't occur. It's much cheaper than fighting the pest year after year.

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