

# A Proposal for Public and Private Partnership in Extension

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## Abstract

Public funding for Extension in the United States has been decreasing for many years, but farmers' need for robust information on which to make management decisions has not diminished. The current Extension funding challenges provide motivation to explore a different model for developing and delivering extension. The private sector has partnered with the public sector to fund and conduct agricultural research, but partnering on extension delivery has occurred far less frequently. The fundamental academic strength and established Extension network of the public sector combined with the ability of the private sector to encourage and deliver practical, implementable solutions has the potential to provide measurable benefits to farmers. This paper describes the current Extension climate, presents data from a survey about Extension and industry relationships, presents case studies of successful public- and private-sector extension partnerships, and proposes a framework for evaluating the state of effective partnerships. Synergistic public-private extension efforts could ensure that farmers receive the most current and balanced information available to help with their management decisions.

**Key words:** extension, industry, pest management

*A number of questions are being raised about how the farmer can best be provided with technical agricultural information. Such questions concern the appropriate roles for Extension personnel and representatives of agricultural-related industry and business. (Lawson and Dail 1966)*

When farmers have reliable, current information, they can make agriculturally sound management decisions. This concept gave birth to a public program in 1914 when the Smith-Lever Act created a unique United States Cooperative Extension System that included land-grant universities as state partners with funding from the United States Department of Agriculture (USDA), state, and local sources. The Act recognized that knowledge creation through discoveries is nearly irrelevant if it is not partnered with effective translation of knowledge and information into innovations and solutions, and ultimate delivery to the end users.

Over the course of Extension's history, resources devoted to agriculture have comprised the largest part of Extension expenditures (Huffman and Evenson 1993), helping to promote technology, increase the rate of technology adoption, turn research findings into practices on the farm, and enhance the return on research investments (Wang 2014). The goal of these activities has been to enhance agricultural productivity (Ahearn et al. 2003), and economic estimates of the internal rate of return on Extension investments have been positive and substantial (Evenson 2001, Jin and Huffman 2013, Hurley et al. 2014).

Despite Extension's remarkable contributions, discussions about Extension's current and future roles, and even its fate, are prevalent.

These discussions occur at a time when the scientific, technical, environmental, and informational complexity of agriculture is increasing along with the need to maximize agricultural productivity to feed a growing global population. In this paper, we propose partnerships between public Extension and the private sector to create a framework for translation of knowledge and delivery to end users. We believe that such partnerships could ease many of the challenges faced by the current national Extension system and better serve end users.

## Definitions

Many of the terms used in this paper, such as "public," "private," "industry," and "Extension or extension," may be interpreted in many ways, depending on one's point of view. For clarity, the following definitions of these terms related to the agricultural sector will be used:

- **Public:** Any institution or program funded by taxpayer dollars. The National Institute of Food and Agriculture (NIFA), USDA, other federal and state agencies, state and land-grant universities, and state and local governments are considered public.
- **Private:** Any institution or program not funded by taxpayer dollars.
- **Industry:** Any private company or entity involved with agriculture, including those on the input side, such as pesticide manufacturers, seed companies, seed distributors, fertilizer suppliers, farm machinery manufacturers, or other similar entities, and on

the output side, such as national and state grain, livestock, and commodity organizations, along with food processors. We recognize that the word “industry” encompasses many sectors, but within the scope of this paper, the term refers to agricultural industry.

- Extension: The translation and dissemination of research-based knowledge to farmers regarding practical implementation of agricultural technology or techniques. We recognize that the Extension Service has many stakeholders, but for the purpose of this paper, we focus on services provided to the agricultural sector. We use Extension (with a capital “E”) when we refer to the system or programs funded by taxpayers; we use extension (with a lower-case “e”) when we refer to public–private partnerships to deliver extension programs.

## Changes in Extension Funding

The need for quality and timely information for farmers continues to be critical even as public funding to support translation and delivery of information is decreasing. The “cooperative” part of Cooperative Extension refers to the partnership in funding from federal, state, and local sources. When adjusted for inflation, public funding for Extension grew at the rate of 6.7% per year during the years 1915–1949, but only at 2.39% per year from 1950–1980 (Pardey et al. 2013). Public funding for Extension began to decline after a 65-yr history of growth, decreasing by 0.25% per year from 1980–2006 (Pardey et al. 2013). In 1919, the United States federal government provided 62% of the funds that supported Extension, but by 2006, the federal government provided only 21% of funding for Extension (Pardey et al. 2013).

In the 1970s, federal funding for Extension exceeded that for agricultural research at land-grant universities (Ahearn et al. 2003). By 1980, research funding had exceeded Extension funding, with the portion of state research and development activities funded by the federal government at 33%, compared with 24% for Extension (Ahearn et al. 2003). Because of the decrease in federal spending for Extension, states have become responsible for providing a greater proportion of funds to support Extension activities. In 2000, states provided 49% of Extension funding (Ahearn et al. 2003), and by 2012, overall state funding grew to account for about 80% of the total Extension budget (Wang 2014).

As overall funding for Extension has declined, the number of Extension personnel (represented by full-time equivalents [FTEs]) also has declined. From 1977–1997, overall FTEs, including nonagricultural personnel, declined by 12% (Ahearn et al. 2003). The numbers of county extension agents compared with the numbers of state Extension specialists has shifted over the years, but the trend has been an overall reduction of FTEs (Wang 2014). In 1980, there were 3,714 Extension specialist FTEs, compared with 11,441 county agent FTEs. In 2010, Extension specialist FTEs were up to 3,972, but county agent FTEs decreased considerably to 7,974 (Wang 2014). Approximately 30% of the Extension “footprint” at the county level has been lost over the past 20 yr. Following are just a few examples of reductions in Extension FTEs:

- In Texas, FTEs decreased a total of 9.7% from 2008 to 2013 (Keel 2014).
- In 2009, Iowa State University consolidated its county Extension network from 97 county directors to just 20 regional directors with responsibilities for multiple counties (Patrigo 2011).
- In 1980, Illinois had 100 Extension specialists, but only 30 in 2011 (Patrigo 2011).

- In 2003, legislators in Michigan considered eliminating Extension completely because of a state-funding crisis (McDowell 2004).

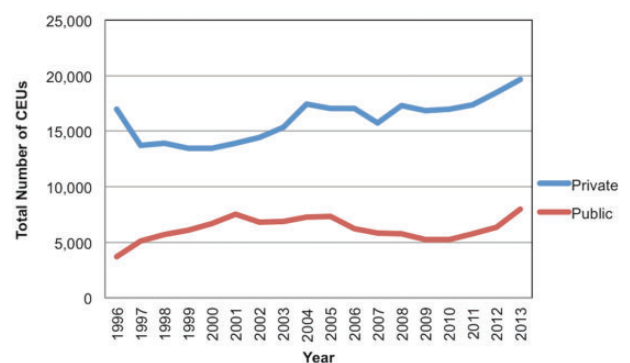
As declines in funding for Extension have continued during the past few decades, articles in the popular press have asked provocative questions in their headlines, such as “Extension, still relevant?” (Patrigo 2011), and “Is Extension an idea whose time has come—and gone?” (McDowell 2004). Such articles question the very fate of agricultural Extension and directly or indirectly question how and where farmers will get information about new science and technologies in the future.

## Where do Farmers get Information?

According to a USDA survey in 1994–1995, 53% of farmers surveyed reported that they obtained information from agricultural retailers, with other sources, such as Extension (15%), private scouting services (16%), and media (16%), being roughly equal as sources of information (Padgett et al. 2000). In the 2012 Iowa Farm and Rural Life Poll (Arbuckle et al. 2012), high percentages of farmers relied on “fertilizer or agricultural chemical dealers” first for information about topics such as fertilizer application (79%), weed management (69%), insect management (58%), and crop disease management (55%). Eighty-one percent of respondents relied on seed dealers first for information about making seed selection decisions.

However, a common factor cited regarding these percentages is that there is no measure of how many private-sector individuals obtain information and training from public Extension. According to Ahearn et al. (2003), “...many agricultural-products companies rely on Extension and the land-grant universities to serve as an objective supplier of information, and as a check on the agribusiness and agricultural media that supply information on agricultural production and marketing options.”

Understanding its role as a primary source of information for farmers, industry has undertaken a more defined educational role, separate from marketing efforts for its latest products, by providing production-related information, e.g., basic pest management and proper use of chemical control (Padgett et al. 2000). For example, the private sector has offered more continuing education credits for certified crop advisors than the public sector since at least 1997 (Fig. 1, data from the American Society of Agronomy). Other examples of industry’s more defined educational role include company Web sites that function very much like Extension Web sites, including basic crop information, pest information, and learning modules. The primary difference between Web sites created by agricultural



**Fig. 1.** Total number of continuing education units offered by the public and private sectors from 1996–2013 for meeting the requirements of the American Society of Agronomy’s Certified Crop Advisor program (data provided by Luther Smith from the Certified Crop Advisor organization).

companies and public Extension Web sites is that company Web sites frequently, but not always, recommend brand products to address the pest problems described.

### Public and Private Sectors Should Collaborate to Strengthen Extension Efforts

The private sector has been outperforming government on agricultural research since the early 1980s (Fig. 2, Schimmelpfennig and Heisey 2009), and the impact of private agricultural research on overall U.S. agricultural productivity is considered significant (Wang et al. 2013). Wang et al. (2013) noted that investments by the public and private sectors in research and development are complementary and not redundant. They stated that public funding in crop research seems to stimulate increased funding by the private sector, perhaps because public research has revealed new areas for potential commercialization.

Complementary research investment provides a model for more cooperation by public and private partners in extension efforts, as well. Although there are numerous examples of the private sector providing funding to support public Extension events, such as field days, we suggest that public-private extension partnerships can evolve into more integrated efforts. Their respective strengths can complement or fill in gaps in expertise, experience, or knowledge.

Public Extension programs have unique strengths. Extension specialists have access to university research before it is published, which allows for rapid sharing of new methods or technology. They also have access to a local network of county or regional Extension offices, with coverage that reaches into all areas within a state. In addition, Extension specialists are generally perceived as purveyors of the most objective information.

The private sector's strengths include an extensive network of regional employees who have direct knowledge of what farmers want for increasing productivity. Industry sales representatives and field scientists cultivate close ties with local farmers and other agricultural professionals. Additionally, private companies devote significant resources toward market research to understand their customers. Market research seeks to determine what customers (e.g., farmers) want, resulting in development of practices and products to meet those needs. Additionally, industry investment in advertising is essentially investment in communicating information about key products and practices. Industry also has the capability to create products that complement management concepts derived from university research. For example, Dow AgroSciences worked closely with researchers at the University of Florida to develop an

innovative termite colony elimination system, known in the market as Sentricon. As described by John Byatt, Assistant Director for Life Sciences (Dow AgroSciences LLC, Indianapolis, IN) in the Office of Technology Licensing at University of Florida, Gainesville (Byatt 2009), "The Sentricon system represents one of University of Florida's most successful technology transfers. This is due not only to the commercial success of the technology, but also due to the good working relationship that has developed between the University and Dow AgroSciences."

Public-private extension partnerships should leverage the strengths of both sectors to develop timely, relevant, and practical extension programs and materials. Evenson (2001) suggested that partnership with the private sector is one of the objectives of Extension: "Extension programs seek two general objectives. The first is to provide technical education services to farmers through demonstrations, lectures, and other media. The second is to function in an interactive fashion with the suppliers of new technology, by providing demand feedback to technology suppliers and technical information to farmers to enable them to better evaluate potentially useful new technology and ultimately to adopt (and adapt) new technology in their production systems." However, these objectives did not explain how public-private partnerships should be forged to be more integrated.

### Survey Regarding Public and Private Extension Partnerships

There are many anecdotes about public-private extension partnerships, but few data. Therefore, we developed a questionnaire to gather background data and to assess opinions about the possibility of public-private partnerships in extension efforts. In addition to asking basic questions about Extension programs and their funding, we wanted to determine whether agricultural Extension at land-grant universities has partnered with private industry, the extent to which there is collaboration between Extension and private industry, the types of collaboration, and the perception of these collaborations. To understand the applicability of our data, we also asked questions about demographic information.

On 6 June and 7 July 2014, we distributed an online survey to 644 agricultural Extension personnel at land-grant universities. We received 212 responses, a 33% response rate. We include details from the survey including questions asked, statistics about responses received, and brief summaries about the responses in Supplemental Material, S1.

The survey had uniform representation from Extension employees throughout the United States and with a range of years of Extension experience. Based on responses, the main challenges indicated for Extension were lack of funding, lack of personnel, lack of appreciation from university administration, lack of training for future Extension personnel, and Extension personnel leaving the public sector for jobs with industry. Although there is speculation about whether private-sector employees are the primary users of Extension services, Extension specialists still believe that farmers and other end users are their primary audience. Extension specialists expressed that although there is private funding for applied research, there is very little funding for delivery of Extension programs. A high percentage of Extension specialists reported partnering with the private sector in some form, and they did not think that partnership with the private sector biases the information they share with their clientele.

Nearly 80% of the respondents indicated that private industry funded at least some of their research programs. However, about half (44.8%) of the respondents indicated that industry funded none of their Extension programs. Although the link between applied

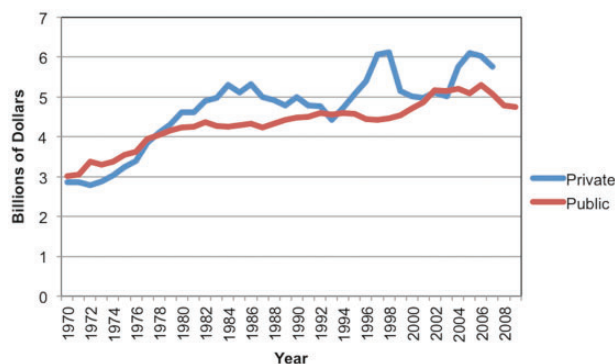


Fig. 2. Agricultural research funding in the public and private sectors from 1970–2009, adjusted for inflation and expressed in 2006 dollars (Schimmelpfennig and Heisey 2009).

research and Extension programs is generally accepted, it is not possible to deduce from these responses whether support for applied research was considered support for Extension programs.

Nearly 81% of respondents indicated they had partnered with industry on extension endeavors, most commonly associated with field days and meetings, e.g., Extension specialists speaking at industry-sponsored field days or meetings, or industry representatives speaking at Extension-sponsored field days or meetings. Specific comments indicated that industry often provides funds or supplies for Extension activities, with no demands or suggestions about content. These responses suggest a relationship between Extension and industry that ultimately benefits clientele, but they do not necessarily represent intentional collaboration to codevelop extension programs.

Of 208 respondents, nearly 80% indicated that they do not think that partnership with industry biases their Extension information. However, 12% responded that such partnerships bias their information, and about 9% indicated that they do not partner with industry. Comments associated with this question focused on maintaining professional integrity, the mutual value from industry–Extension partnerships, and some concern about public perception.

By and large, the results from our survey suggest that partnerships between Extension and agricultural industry are common, and that the partnerships are beneficial for end users. However, most of the partnerships tend to involve sponsorships and invitations to give presentations, attributes that can be measured as partitioned, administrative, and additive (see Table 1 for details). Results from our survey suggest that the door for partnerships is open, but there is room to recommend more collaborative and synergistic efforts between public Extension and industry to educate agricultural clientele. We present a new model for such partnerships in the table that follows.

### Criteria for Evaluating Public–Private Extension Partnerships

The survey data show that public–private collaborations related to extension are common, with >80% of respondents reporting at least some form of public–private collaboration. However, the extent of the collaborations has varied from applied research that is communicated to farmers to superficial collaboration such as private financial support for a field day. We propose that extension endeavors can be enhanced

when public–private partnerships are synergistic, and we have developed criteria to evaluate the state of these partnerships (Table 1).

An effective partnership between the public and private sectors must be trusting so that the most effective and practical information is delivered to farmers. We identified six attributes of high-quality partnerships and the current state compared with the proposed state of these relationships. We also developed analysis questions to help determine the current state of such partnerships. For ease in comparing various partnerships, we provide a suggested method for quantifying the level of each attribute, using a range from 1 to 4 to describe each level. An effective collaboration between both sectors will incorporate higher states of partnership within the six key attributes of cohesiveness, depth of engagement, trust, motive, sustainability, and type of learning. These criteria can be used as a tool to self-check the state of extension partnerships. We also provide analysis questions to determine the current state of such partnerships. A key feature of a truly synergistic partnership is that both cooperators bring their strengths to the extension endeavor and challenge each other to make direct contributions. In other words, by working together, the end result is greater than the sum of the separate parts had the two parties worked separately to address the same issue or opportunity.

### Case Studies

As examples of how the criteria in Table 1 can be used, we present two case studies of public–private extension partnerships and evaluate the state of each by using the rating system, with respect to the extant knowledge at the time the case studies represent. The two case studies were considered successful partnerships, but in the context of the criteria in Table 1, it is apparent that there was room for improvement to obtain higher scores for all attributes.

### Insecticide Resistance Management (IRM) for Diamondback Moth: Successful University and Industry Collaborations

Insecticide resistance management (IRM) is a common subject for collaboration between industry and Extension (Savinelli et al. 2007). As one of the most important pests of cruciferous crops worldwide, the diamondback moth, *Plutella xylostella* (Figs. 3a and

**Table 1.** Criteria to evaluate the state of public–private partnerships on extension endeavors

Attribute of partnership	Current state	Proposed state	Analysis question
Cohesiveness	Partitioned (1 2) <sup>a</sup>	Integrated (3 4) <sup>a</sup>	Do partnerships involve highly integrated activities, or are activities separated along defined, traditional lines?
Depth of engagement	Administrative (1 2)	Substantive (3 4)	Do partnerships involve the parties sharing only administrative duties, or do they allow for strong engagement on decisions regarding substantive duties, such as content planning and delivery?
Trust	Mistrustful (1 2)	Trustful (3 4)	Do partners trust one another with shared responsibilities and participate in respectful dialogue and discussions?
Motive	Reactive (1 2)	Proactive (3 4)	Do partnerships usually occur in response to unforeseen issues or emergencies that force the parties to collaborate, or does proactive planning occur to assess and meet the needs of shared clientele?
Sustainability	Tactical (1 2)	Strategic (3 4)	Do partnerships mainly concern themselves with short-term, low-return needs, or do they consider the long-term impact of their collaborative activities?
Type of learning	Additive (1 2)	Synergistic (3 4)	Do partnerships result in synergistic learning among shared clientele, or is the learning additive and sometimes relatively unrelated?

<sup>a</sup>The numbers represent a relative scale for quantifying the extent of each attribute in a collaboration. A higher number indicates closer alignment with the proposed state for the collaboration.



b), has been the focus of significant collaboration between universities and industry.

The diamondback moth is a highly mobile, cosmopolitan pest of many crops, including fruits, vegetables, grains, and tobacco. In tropical and subtropical regions, populations of this species complete up to 25 continuous generations per year, and insecticides to control the larvae are applied frequently. Consequently, the diamondback moth has developed resistance to at least 76 different control compounds (Whalon et al. 2008). In 2012, global costs to control diamondback moth were estimated at US\$4–5 billion (Zalucki et al. 2012).

Despite the history of insecticide resistance with this pest, problems have persisted. The need for basic communication about known practices to reduce, and even reverse, resistance is a key component of any insecticide management program for diamondback moth. The following example demonstrates a meaningful public-private collaboration to address IRM for diamondback moth.

In Hawaii, crucifers, which are in high demand, are grown in continuous sequential plantings on adjacent farms, and diamondback moths move freely among the plantings and farms. When one planting of crucifers is sprayed with an insecticide to control diamondback moth larvae, surviving diamondback moths complete development, then disperse and lay eggs on nearby plantings and farms. As a result, populations of diamondback moths have developed resistance to many insecticides.

In 1997, the active ingredient spinosad (Dow AgroSciences LLC, Indianapolis, IN) was registered and introduced in the United States, and crucifer growers quickly adopted its use because of its demonstrated efficacy (Fig. 4). Intensive and exclusive use of spinosad resulted in control failures, followed by confirmed resistance to spinosad in diamondback moth populations, representing yet another insecticide-introduction and insecticide-resistance cycle for growers.

To respond to this situation, personnel with Dow AgroSciences and Extension staff with the University of Hawaii agreed to collaborate to address this recurring problem. First, growers were encouraged to stop using spinosad on crucifers, and Dow AgroSciences removed crucifers from spinosad labels in Hawaii for 18 mo. Employees from the University of Hawaii and from Dow AgroSciences collaborated to develop educational programs and materials that were delivered jointly initially, but primarily by university Extension personnel. The recurring problem with insecticide resistance and the principles of insecticide resistance management were explained, and an area-wide “window” approach to insecticide applications was implemented. Most importantly, this issue illustrated how the actions of one grower could affect an entire production system, resulting in peer pressure for all to comply. Meetings with growers, with nearly 100% participation were common, substantiating the credibility and goodwill the Extension service had built over the years. Monthly mailings, posters at chemical

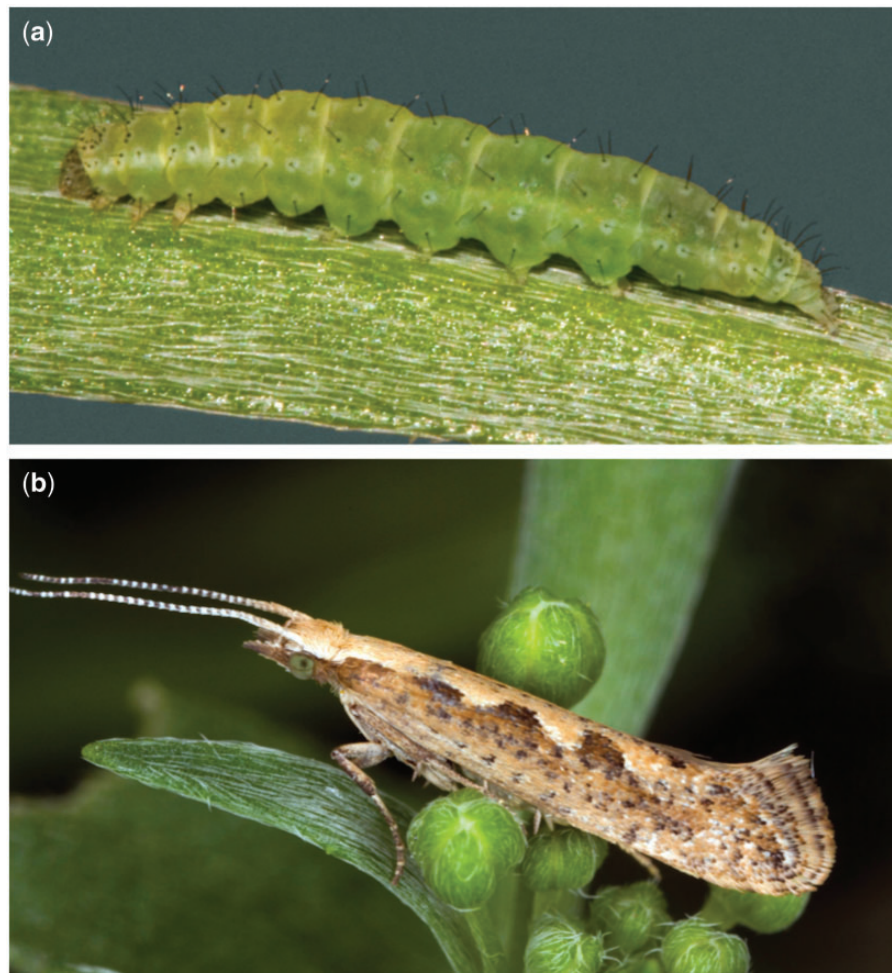


Fig. 3. Diamondback moth larva (a) and adult (b). Photos courtesy of David Cappaert, Michigan State University, Bugwood.org.



**Fig. 4.** Cabbage treated with spinosad (top) and not treated (bottom), which was injured by diamondback moth.

distributors' businesses, and on-farm calls by county agents reinforced the program.

After 18 mo of not using spinosad, susceptibility to spinosad in diamondback moth populations returned. Concurrently, two new active ingredients—emamectin benzoate (introduced by Syngenta, Basel, Switzerland) and indoxacarb (introduced by E. I. du Pont de Nemours and Company, Wilmington, DE)—with modes of action different from the mode of action of spinosad, were made available. These new modes of action enabled implementation of a highly integrated insecticide rotation scheme, which included sprays of formulated *Bacillus thuringiensis*, emamectin benzoate, indoxacarb, and spinosad. The rationale of this approach was to expose diamondback moth populations to only one mode of action for brief “windows” of time. Through intensive educational efforts by both the

University of Hawaii Extension and Dow AgroSciences personnel, growers were able to resume growing crucifers without devastating losses as a result of insecticide resistance among diamondback moth populations. Although coordination of this program was challenging, the probability of its success was enhanced by the trusting collaboration between university Extension and agricultural industry participants, as well as the eager cooperation of the growers who realized the need for a coordinated approach to insecticide use. The success of the program continues today with ongoing education about the importance of IRM to retain the efficacy of insecticides.

When we examined this case study based on the evaluation criteria in [Table 1](#), we were able to rate the state of the collaboration ([Table 2](#)). For example, we rated cohesiveness “2” because the collaboration was partitioned. Dow AgroSciences removed the insecticide from the





Fig. 5. An untreated pasture (left) adjacent to a pasture treated for control of weeds and shrubs (right).

Table 2. Evaluation of case study 1

Attribute of partnership	Traditional state	Proposed state
Cohesiveness	Partitioned 1 <u>2</u> <sup>a</sup>	Integrated 3 4
Depth of engagement	Administrative 1 <u>2</u>	Substantive 3 4
Trust	Mistrustful 1 2	Trustful 3 <u>4</u>
Motive	Reactive <u>1</u> 2	Proactive 3 4
Sustainability	Tactical 1 2	Strategic <u>3</u> 4
Type of learning	Additive 1 2	Synergistic <u>3</u> 4

<sup>a</sup>The underlined numbers indicate the value we assigned to each attribute for the case study.

market and contributed information to the extension program, but the program was delivered primarily by Extension personnel. We rated depth of engagement “2.” The partnership was primarily administrative; Dow AgroSciences removed the product from the market, and Extension personnel planned and delivered the content. In terms of evaluating trust, we rated the relationship “4.” Each party relied on the other to contribute their respective parts of the project, and both followed through. In terms of motive, the collaboration rated “1” because this extension program was primarily reactive to a pressing problem. In terms of sustainability, this partnership was initiated to address a one-time problem, but there has been an ongoing effort to prevent future resistance, so we rated it “3.” We applied a rating of “3” to type of learning because the efforts and activities by both parties were aligned to support one another, each making the activities of the other more effective. We judged that as a direct result of the two parties working together, the outcomes in both learning and practice were more successful than had the two parties worked independently.

Overall, the collaboration received 15 out of the possible 24 points assigned to measurable attributes, demonstrating that even a public–private collaboration with a successful outcome has room for improvement in terms of the state of the collaboration.

Although this case study demonstrates the measured success of public and private partnerships to address a problem, such collaborative efforts also should influence accountability. According to Anthony Shelton, Cornell University, “IRAC [Insecticide Resistance Action Committee] may promote an IRM strategy, but will their on-the-ground sales reps respect this and not sell products? Will growers respect this strategy? If anything, history has shown it will be difficult to do so if multiple small-scale growers, typical of vegetable production, have access to these products. The bottom line is that farmers are the ones that can make or break an insecticide, so a major focus should be on their education.”

In this example, university Extension and industry reacted to an existing problem. Ideally, future collaborations will be proactive to prevent resistance, rather than being reactive to address a problem that has already occurred.

### Range and Pasture Heritage Tours: An Integrated Industry and Extension Learning Event

In 2011–2012, ranchers in Texas faced several significant factors affecting forage production. The historical drought of 2011, coupled with the high cost of corn feedstocks and high market prices for beef led to intense interest in brush and weed management. High-yielding forage production became a more important focus for ranchers. In addition, new brush and weed control products, Sendero herbicide (active ingredients clopyralid and aminopyralid) and GrazonNext (Dow AgroSciences LLC, Indianapolis, IN). HL herbicide (active ingredients aminopyralid and 2,4-D), were being introduced by Dow AgroSciences into the market to support forage production (Fig. 5).

Responding to the needs of their constituents, Texas AgriLife Extension, Texas AgriLife Research, and Dow AgroSciences partnered with Natural Resources Conservation Services (NRCS), Grazing Lands Conservation Initiative, and local large ranches to develop and deliver a series of learning events called the “Range and Pasture Heritage Tour”. The learning events were conducted at three towns in Texas (Abilene, Childress, and Kingsville) where >350 attendees representing millions of acres in Texas, Oklahoma, and New Mexico participated in plot tours, field demonstrations, equipment training, workshops, and classrooms designed to educate



**Fig. 6.** Extension materials provided by Texas-AgriLife were made available and highlighted by Dow AgroSciences during the “Range and Pasture Heritage Tours” in Texas, 2011–2012.

ranchers about the multiple forage production issues that challenged the ranching industry (Fig. 6).

Each partner in the endeavor provided specific capabilities to ensure a highly successful and engaging educational event. The herbicide expertise, communication capabilities, and financial capacity of Dow AgroSciences, with the scientific rigor and support of Texas AgriLife Extension and Research, and the community relationships of NRCS and the Grazing Lands Conservation Initiative, produced an innovative event that positively influenced a large cohort of constituents.

Evaluating this case study by using the criteria in Table 1, we rated the state of the collaboration as 20 of the 24 possible points assigned to measurable attributes (Table 3). Traditional partnerships for such ventures usually involve only financial support with product marketing from industry and content planning mostly by public agencies. This endeavor, however, included content planning and delivery by both private and public stakeholders and resource commitments from both parties. Content delivery did not follow traditional lines, with industry and Extension presenters providing information about both product-related and nonproduct-related topics. Thus, cohesiveness and depth of engagement both received “3.” A high level of trust existed between Dow AgroSciences and its Extension partners, with Extension partners discussing nonDow AgroSciences products and nonchemical treatment options. Extension partners and Dow AgroSciences stakeholders engaged in respectful and constructive dialogue with the goal of ensuring that participants were exposed to a wide variety of options for their range and pasture needs. The trust between these groups was directly related to many years of experience working together in this same field of study. The attribute of trust received “4.” The proactive nature of the event and its goal for long-term customer impact earned this partnership “3” for motive and sustainability. And type of learning earned “4,” highly synergistic. Attendees left the field

**Table 3.** Evaluation of case study 2

Attribute of partnership	Traditional state	Proposed state
Cohesiveness	Partitioned 1 2	Integrated <u>3</u> <sup>a</sup> 4
Depth of engagement	Administrative 1 2	Substantive <u>3</u> 4
Trust	Mistrustful 1 2	Trustful 3 <u>4</u>
Motive	Reactive 1 2	Proactive <u>3</u> 4
Sustainability	Tactical 1 2	Strategic <u>3</u> 4
Type of learning	Additive 1 2	Synergistic 3 <u>4</u>

<sup>a</sup>The underlined numbers indicate the value we assigned to each attribute for the case study.

day understanding how they could manage their brush and weed problems using a large toolbox of both chemical and nonchemical methods. In addition, they participated in discussions about the impact of drought, fire, cattle prices, and other factors on their operations.

### Is There a Viable Future for Integrated Public–Private Extension Collaborations?

There is skepticism about the private sector’s interest in participating in extension activities. For example, from Ahearn et al. (2003): “Educational information with a public good nature, such as information that enhances environmental quality and food safety, is likely to be undersupplied by the private sector. The public good



nature of information makes it difficult to place a value on it.” However, we believe that the needs of customers and the desire for public good are not mutually exclusive. As demonstrated in two of the examples of collaboration, an individual company selling a crop protection product is dependent on competing products to ensure survival of its own product. Without a variety of products with different modes of action, populations of target organisms often develop insecticide resistance, which renders specific products ineffective. Groups such as IRAC, which include all major pesticide companies as members, would not exist without acknowledgement of the need for cooperation.

Our criteria (Table 1) for evaluating the state of public–private extension partnerships offers one possible set of measures for public and private collaborators to evaluate the strengths and limitations of their partnerships, with the understanding that other models may evolve. The measurements beneath our designation of the “current state” of public–private partnerships (Table 1) suggest a nonintegrated approach. Although nonintegrated approaches may yield positive educational results in the short term, they often focus on past mistakes, rather than on educating for the future. We envision an integrated, substantive, trustful, proactive, strategic collaboration between Extension and agricultural industry that could produce a synergistic outcome, i.e., improved delivery of information to growers than either entity can provide on their own. High-scoring partnerships according to the evaluation may provide one solution for our current environment of reduced levels of public funding for Extension and to meet the escalating need for farmers to have access to reliable information and education.

A key component of the collaborations is that both partners must provide equally strong contributions to result in synergistic learning. There might be concern that partnerships between Extension and industry could result in decreased funding for Extension, but we believe the converse is true, i.e., that partnerships could sustain public investment in Extension because the benefits of the synergy created by the partnerships can be promoted.

Continued increases in agricultural productivity will be necessary to keep up with increases in global population. Past investments in agricultural research and Extension are known to have contributed to increases in agricultural productivity. All of us involved in educating farmers are committed to “science serving the needs of the growing world,” and we believe strongly that industry and Extension should work together in a more integrated fashion to develop extension programs, the need for which has never been greater. A complementary public–private approach to extension activities should foster efficiencies in delivery of information and learning opportunities, with optimum use of resources and expertise. A complementary approach also should lead to improved impacts of extension efforts, reducing the inefficiencies associated with duplicative or contradictory efforts.

We have provided one possible mechanism by which the state of public–private extension programs can be measured. However, it’s up to both parties to determine how public–private partnerships can be sanctioned, initiated, administered, and evaluated. Top leaders in industry and Extension support the concept of more collaboration. Rajan Gajaria, Global Leader for Latin America and North America for Dow AgroSciences, offered this insight: “Dow AgroSciences has a deep respect for Extension and values their partnership in meeting the needs of our growing world. I believe a closer partnership between Extension and private industry would greatly benefit our end-use customers. I encourage both our Extension and industry colleagues to explore a more synergistic relationship when developing extension programs for our end users.” Sonny Ramaswamy,

Director of the National Institute of Food and Agriculture, observed: “The complexities of addressing our nation’s nutritional security in the context of the abiotic and biotic constraints, including climate change, diminishing land and water resources, environmental degradation, pests, and changing incomes and diets, will require that the research and extension community convenes the intellectual and monetary resources of the public and private sectors.”

The ultimate goal of our proposal for synergistic public–private extension efforts is to ensure that farmers receive the most current and balanced information available to help with their management decisions. We believe that our proposal is one possibility for addressing the issue.

## Supplementary Data

Supplementary data are available at *Journal of Integrated Pest Management* online.

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