

Employment and Salary Base Supported by Cooperative Extension's Pesticide Safety Education Programs

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Abstract

The objective of this study was to evaluate the number of certified commercial pesticide applicator jobs and wages that are supported by Cooperative Extension's pesticide safety education programs (PSEPs) in California, Illinois, Indiana, Iowa, Nebraska, North Carolina, and Texas. The purpose of the analysis was to provide a methodology for PSEPs to use in describing the employment and wage contributions realized from their resource development, distribution, and training efforts for pesticide applicator certification. The economic analysis focused on certified commercial applicators, as defined by federal regulation. The findings from this study of seven states show that the PSEPs directly contributed to 120,543 pesticide applicator jobs with a total salary base of \$3.9 billion.

Keywords: pesticide safety education programs, commercial pesticide applicator, economic analysis, employment, wages

Introduction

The land-grant universities' Cooperative Extension system is the mainstay of training and educational resources for certified commercial pesticide applicators to ensure their initial and ongoing competence (CTAG, 2014). Federal law requires applicator certification for individuals who purchase or use restricted-use pesticides. Additionally, state laws, which are administered by the state lead agency (SLA), further restrict who can apply general-use products. This increases the number of commercial applicators requiring certification and training in the safe, judicious, and legal handling and use of pesticides. The U.S. Environmental Protection Agency (EPA), under *Certification of Pesticide Applicators* (40 CFR Part 171), defines a certified commercial applicator as "a person who uses or supervises the use of any pesticide which is classified for restricted use for any purpose or on any property other than as provided by the definition of private applicator." (A private applicator is defined as someone who produces any agricultural commodity on property owned or rented by himself or herself, or his or her employer.) Furthermore, some people are required by state laws to be certified due to their profession and/or the pesticides they handle. The federal regulation classifies

certified commercial applicators into 11 different categories, including agriculture, right-of-way, urban, and health sectors (EPA, 2013a).

The purpose of pesticide applicator certification requirements and minimum standards is to ensure that restricted pesticides are available to those who protect food, forage, structures, health, water, rights-of-way, and landscapes while preventing unreasonable harm to human health and the environment. By developing resources and offering training events for certified applicators, Pesticide safety education programs (PSEPs) make available important pest-management tools for agricultural, urban, and other business enterprises. Without the certification and training process, restricted-use pesticides would not be available. The certification process sets in place a job type that is recognized by the Bureau of Labor Statistics (BLS).

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) puts the responsibility for applicator training on the Cooperative Extension Service. FIFRA Section 23(c) states, “The administrator shall, in cooperation with the Secretary of Agriculture, use the services of the State Cooperative Extension Services to inform and educate pesticide users about accepted uses and other regulations made under this Act” (EPA, 2013b).

To become a certified applicator, an individual first obtains PSEP training (study) materials from the university (Extension) or SLA. Prospective applicators may attend an initial certification training to prepare themselves for the state commercial applicator certification examinations. PSEPs develop and revise training manuals for the state’s certification categories, which may be expanded beyond the federal categories. To remain certified, applicators must recertify by examination and/or continuing education. PSEPs are a principal provider of recertification training by offering training events, developing curricula for others to deliver, and serving as speakers for training sessions offered by other organizations (CTAG, 2014). Besides the public value of access to pesticides and their safe use, there is economic empowerment for those who achieve applicator certification. This can be measured and expressed by job and wage values.

Growing demands on state and federal governments that allocate scarce public funds have led to an increasing need for Cooperative Extension to demonstrate the economic benefits and impacts of its programs in order to justify its funding. Economic impact studies of Extension programs in Texas, for example, are used to demonstrate economic accountability to key funding sources. These studies represent an increasingly important part of Extension accountability (McCorkle and Anderson, 2008).

For PSEPs, accountability measures have included number of participants, program satisfaction, and measures of knowledge or behavior change. Generally, there are few reports of PSEP’s economic impacts (Young and Ramsay, 2011). This can be attributed to the difficulty in quantifying the economic benefits of PSEPs (as well as other types of Extension programs). This article therefore proposes a methodology to enable PSEPs to describe program participants in economic terms, specifically by number of jobs and wages. By incorporating economic terms into the accountability message, PSEPs can

make legislative requests that will resonate better with stakeholders and elected officials at the local, state, and federal levels.

Data from the certified applicator reporting system were used in conjunction with state-level wage data as a way to describe PSEP's clientele in economic terms for each of the seven states included in this study. Employment levels and wage base values are important indicators that are often used to evaluate the health of an economy (AAll, 2003). The purpose of this analysis is to provide a way for PSEPs to describe the economic importance of its programs in order to more effectively secure support from its funding partners. Because this analysis focuses on methodology and includes only seven states (California, Illinois, Indiana, Iowa, Nebraska, North Carolina, and Texas), no inferences are made about other states. This methodology can easily be adapted for other states and updated annually with applicator numbers and wage data.

Methodology

The analysis used two source data files: 1) the Bureau of Labor Statistics state entry-level and experienced-level wage data for pest-management occupations, and 2) the commercial applicator certifications as reported by the Certification Plan and Reporting Database (CPARD; NASDA Research Foundation, 2013). CPARD contains all pesticide applicator certification records for the United States by state, tribe, or federal agency.

The BLS Occupational Employment Statistics (OES) program conducts a semiannual mail survey designed to produce estimates of employment and wages for specific occupations (BLS, 2011). The OES program collects data on wage and salary workers on *nonfarm* establishments to develop employment and wage estimates for about 800 occupations. The estimates are produced by state and industry. BLS issues occupational employment and wage estimates for over 450 industry classifications at the national, regional, state, and (often) metropolitan level. The industry classifications correspond to the three, four, and five-digit North American Industry Classification System industrial groups (North American Industry Classification System, 2011). This is the standard used by federal statistical agencies to classify business establishments for the purposes of collecting, analyzing, and publishing statistical data related to U.S. businesses and the economy (BLS, 2011).

Every six months, the OES program surveys approximately 200,000 establishments across all 50 states. It takes three years to fully collect samples from 1.2 million establishments. The survey covers all full-time and part-time wage and salary workers in nonfarm industries (BLS, 2011).

State-level certified pesticide applicator data are reported annually to CPARD. In 2011, 411,045 certified commercial applicators and 480,079 private applicators were reported. The CPARD "Commercial Applicator Totals by Category" report and "Total Applicators" report for 2011 were retrieved and evaluated. Because estimating an economic value for private applicators would have required its own unique methodology, private applicators were not included in this study.

Data analyzed in this study include the number of applicators who were initially certified, those who were recertified, and the total number of certified commercial applicators with a valid certificate (license). Initially certified applicators are those who have received their certification for the first time (hereafter referred to as “initial applicators”).

Recertification occurs when a certified applicator participates in a training or examination event to maintain his or her certification to comply with state, tribal, territorial, and/or federal regulations. Those holding a valid pesticide certification include those who participated in recertification, those who did not participate that year, and all initial applicators. Within the “Commercial Applicator Totals by Category” report, there are 11 categories based on pest-management sectors assigned by EPA (Table 1). The 11 EPA categories include: 1a) Agriculture, Plant; 1b) Agriculture, Animal; 2) Forest; 3) Ornamental and Turf; 4) Seed Treatment; 5) Aquatic; 6) Right-of-Way; 7) Institutional, Industrial, and Structural; 8) Health; 9) Regulatory; 10) Demonstration and Research; and 11) Other. States assign individual applicators to these categories, even if they have split the federal categories into subcategories (EPA, 2013a).

Table 1. EPA categories for certified commercial applicators.

Category Number	Category Name
1a	Agriculture, Plant
1b	Agriculture, Animal
2	Forest
3	Ornamental and Turf
4	Seed Treatment
5	Aquatic
6	Right-of-Way
7	Institutional, Industrial, and Structural
8	Health
9	Regulatory
10	Demonstration and Research
11	Other

For this analysis, the initially certified (initial) and experienced *structural* commercial applicators for each of the seven states were derived from EPA Category 7 - Institutional, Industrial, and Structural. The initial and experienced *all other* commercial applicators for each state included the remaining EPA categories (1a, 1b, 2, 3, 4, 5, 6, 8, 9, 10, and 11).

Given that applicators may hold a certificate in more than one EPA category, the total number of commercial applicators was not the same for both the “Commercial Applicator Totals by Category” and the “Total Applicators” reports. For this reason, the initial and experienced commercial applicator numbers for both the *structural* and *all other* categories were adjusted and normalized to the reported total number of applicators. The number of initial *structural* applicators was adjusted by taking the ratio of total initial applicators in Category 7 to the total number of initial applicators in the

“Commercial Applicator Totals by Category” report, then multiplying by the total initial applicators in the “Total Applicators” report. The result was the number of initial *structural* applicators. The number of experienced *structural* applicators was derived by taking the ratio of commercial applicators holding a valid certificate in Category 7 to the total number of commercial applicators holding a valid certificate in the “Commercial Applicator Totals by Category” report, then multiplying by the total number of applicators in the “Total Applicators” report. From this total, the number of initial *structural* applicators was subtracted. The numbers of *all other* initial and experienced applicators were derived by subtracting the calculated initial and experienced *structural* applicators from the total initial and experienced applicators, respectively.

The next step was to value these employment levels using the 2011 *State Occupational Employment and Wage Estimates* from the BLS. The employment classifications shown in Table 2 were used to value employment levels.

Table 2. Selected BLS occupational employment classifications and definitions.

Classification	Definition
Classification 37	Building and grounds cleaning and maintenance occupations
- Subclassification 37-2021	Pest-control workers
- Subclassification 37-3012	Pesticide handlers, sprayers, and applicators, vegetation

The workforce division for each state publishes estimates of mean salaries for both entry-level and experienced employees by BLS employment classification. These data allowed for a more accurate valuation of pesticide applicator jobs by matching the entry and experienced salaries with the initial and experienced certification dichotomy in the CPARD report. The *structural* commercial applicators were valued using the BLS wages for the Pest-Control Workers category (37-2021). The *all others* applicators (including agriculture) were valued with the Pesticide Handlers, Sprayers, and Applicators, Vegetation category (37-3012). The initial certified commercial applicators were valued using the entry-level wages; the experienced applicators were valued using the experienced wages.

The methodology described above may also be presented algebraically using the terms and variable definitions presented in Table 3 below.

Table 3. Variable definitions for wage base calculations.

Variable	Definition
I_{SCR}	Initial certified commercial applicator total for EPA Category 7 in the “Commercial Applicator Totals by Category” report – CPARD
I_{TCR}	Initial certified commercial applicator total in the “Commercial Applicator Totals by Category” report – CPARD

I_{TAR}	Total number of new (initial) commercial applicators in the “Total Applicators” report – CPARD
AI_{ST}	Adjusted number of initial <i>structural</i> commercial applicators
AI_{AO}	Adjusted number of <i>all other</i> initial commercial applicators
VC_{SCR}	Commercial applicators holding a valid certificate in EPA Category 7 in the “Commercial Applicator Totals by Category” report – CPARD
VC_{TCR}	Commercial applicators holding a valid certificate total in the “Commercial Applicator Totals by Category” Report – CPARD
T_{TAR}	Total commercial applicators in the “Total Applicators” Report – CPARD
AVC_{ST}	Adjusted number of <i>structural</i> commercial applicators holding a valid certificate
AVC_{AO}	Adjusted number of <i>all other</i> commercial applicators holding a valid certificate
AE_{ST}	Adjusted number of experienced <i>structural</i> commercial applicators
AE_{AO}	Adjusted number of <i>all other</i> experienced commercial applicators
W_{IS}	Entry-level wage for initial <i>structural</i> commercial applicators using BLS Pest-Control Workers category
W_{ES}	Experienced-level wage for experienced <i>structural</i> commercial applicators using BLS Pest-Control Workers category
W_{IAO}	Entry-level wage for initial <i>all other</i> commercial applicators using BLS Pesticide Handlers, Sprayers, and Applicators category
W_{EAO}	Experienced-level wage for experienced <i>all other</i> commercial applicators using BLS Pesticide Handlers, Sprayers, and Applicators category
W_{TIS}	Total wages for the adjusted number of initial <i>structural</i> commercial applicators
W_{TES}	Total wages for the adjusted number of experienced <i>structural</i> commercial applicators

W_{TIAO}	Total wages for the total number of initial <i>all other</i> commercial applicators
W_{TEAO}	Total wages for the adjusted number of experienced <i>all other</i> commercial applicators
W_{TI}	Total wages for the adjusted number of initial commercial applicators
W_{TE}	Total wages for the adjusted number of experienced commercial applicators
W_{TA}	Total wages for the adjusted number of commercial applicators

Algebraic equations:

- 1) $AI_{ST} = (I_{SCR} \div I_{TCR}) \times I_{TAR}$
 - 2) $AVC_{ST} = (VC_{SCR} \div VC_{TCR}) \times T_{TAR}$
 - 3) $AVC_{AO} = T_{TAR} - AVC_{ST}$
 - 4) $AI_{AO} = I_{TAR} - AI_{ST}$
 - 5) $AE_{ST} = AVC_{ST} - AI_{ST}$
 - 6) $AE_{AO} = AVC_{AO} - AI_{AO}$
 - 7) $W_{TIS} = W_{IS} \times AI_{ST}$
 - 8) $W_{TES} = W_{ES} \times AE_{ST}$
 - 9) $W_{TIAO} = W_{IAO} \times AI_{AO}$
 - 10) $W_{TEAO} = W_{EAO} \times AE_{AO}$
 - 11) $W_{TE} = \sum(W_{TIS} + W_{TEAO})$
 - 12) $W_{TI} = \sum(W_{TIS} + W_{TIAO})$
 - 13) $W_{TA} = \sum(W_{TE} + W_{TI})$
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To further illustrate the use of this methodology, the following calculations are presented using the numbers from CPARD and BLS for California from the “Results” section below:

3,569	Total initial commercial applicators (I_{TCR})
1,855	Total initial <i>structural</i> commercial applicators (I_{SCR})
3,292	Total new applicators (I_{TAR})
52,427	Total commercial applicators holding a valid certificate (VC_{TCR})
18,467	Total <i>structural</i> commercial applicators holding a valid certificate in EPA Category 7 (VC_{SCR})
34,790	Total commercial applicators (T_{TAR})
\$28,529	Entry-level wage for initial <i>structural</i> commercial applicators (W_{IS})
\$35,735	Experienced-level wage for experienced <i>structural</i> commercial applicators (W_{ES})
\$26,612	Entry-level wage for initial <i>all other</i> commercial applicators (W_{IAO})
\$35,870	Experienced-level wage for experienced <i>all other</i> commercial applicators (W_{EAO})

These calculations correspond to the numbered (1-13) algebraic equations on the previous page. Please note that, when applicable, all results have been rounded up to the nearest whole number.

1. $(1,855 \div 3,569) \times 3,292 = \underline{1,711}$ adjusted initial *structural* commercial applicators (AI_{ST})
2. $3,292 - 1,711 = \underline{1,581}$ adjusted initial *all other* commercial applicators (AI_{AO})
3. $(18,467 \div 52,427) \times 34,790 = \underline{12,255}$ adjusted total *structural* commercial applicators holding a valid certificate (AVC_{ST})
4. $34,790 - 12,255 = \underline{22,535}$ adjusted total *all other* commercial applicators holding a valid certificate (AVC_{AO})
5. $12,255 - 1,711 = \underline{10,544}$ adjusted experienced *structural* commercial applicators (AE_{ST})

6. $22,535 - 1,581 = \underline{20,954}$ adjusted experienced *all other* commercial applicators (AE_{AO})
7. $1,711 \times \$28,529 = \underline{\$48,813,119}$ total wages for initial *structural* commercial applicators (W_{TIS})
8. $10,544 \times \$35,735 = \underline{\$376,789,840}$ total wages for experienced *structural* commercial applicators (W_{TES})
9. $1,581 \times \$26,612 = \underline{\$42,073,572}$ total wages for initial *all other* commercial applicators (W_{TIAO})
10. $20,954 \times \$35,870 = \underline{\$751,619,980}$ total wages for experienced *all other* commercial applicators (W_{TEAO})
11. $\$48,813,119 + \$42,073,572 = \underline{\$90,886,691}$ total wages for initial commercial applicators (W_{TI})
12. $\$376,789,840 + \$751,619,980 = \underline{\$1,128,409,820}$ total wages for experienced commercial applicators (W_{TE})
13. $\$90,886,691 + \$1,128,409,820 = \underline{1,219,296,511}$ total wages for commercial applicators (W_{TA})

Results

The results of this seven-state analysis using 2011 BLS and CPARD data focus on the number of pest-management-related jobs and wages directly supported by PSEP-sponsored training events and pesticide safety education resources developed for applicators and other trainers. “Directly supported” is inferred because pesticide applicators are required by law to be certified in order to maintain their jobs. PSEPs are the cornerstone provider of training in the safe, judicious, and legal use of pesticides. PSEPs also partner with public and private organizations to meet outreach needs. Results of this analysis are summarized below for each of the seven states.

California: In the *structural* category, there were 1,711 initial applicators certified and 10,544 experienced applicators (Table 4). For the *all other* category, California certified 1,581 initial and 20,954 experienced applicators. The total number of commercial pesticide applicators in 2011 was 34,790. The PSEP directly supported 34,790 commercial pest-management jobs with an estimated annual salary base of \$1.2 billion.

Table 4. Jobs and wage base for the California Pesticide Safety Education Program, 2011.¹

California Commercial Pesticide Applicators			
	Structural	All Other	Total
Initial certified applicators	1,711	1,581	3,292
Entry-level wage	\$28,529	\$26,612	
Entry-level wage base	\$48,813,119	\$42,073,572	\$90,886,691
Experienced commercial applicators	10,544	20,954	31,498
Experienced-level wage	\$35,735	\$35,870	
Experienced wage base	\$376,789,840	\$751,619,980	\$1,128,409,820
Total wage base	\$425,602,959	\$793,693,552	\$1,219,296,511
Total number of valid certificates	12,255	22,535	34,790

¹State of California Employment Development Department, 2011.

Illinois: In the *structural* category, there were 236 initial applicators certified and 2,805 experienced applicators (Table 5). For the *all other* category, Illinois certified 2,418 initial and 9,133 experienced applicators. The total number of commercial pesticide applicators in 2011 was 14,592. The PSEP directly supported 14,592 commercial pest-management jobs with an estimated annual salary base of \$400 million.

Table 5. Jobs and wage base for the Illinois Pesticide Safety Education Program, 2011.¹

Illinois Commercial Pesticide Applicators			
	Structural	All Other	Total
Initial certified applicators	236	2,418	2,654
Entry-level wage	\$20,360	\$21,040	
Entry-level wage base	\$4,804,960	\$50,874,720	\$55,679,680
Experienced commercial applicators	2,805	9,133	11,938
Experienced-level wage	\$27,360	\$29,360	
Experienced wage base	\$76,744,800	\$268,144,880	\$344,889,680
Total wage base	\$81,549,760	\$319,019,600	\$400,569,360
Total number of valid certificates	3,041	11,551	14,592

¹Illinois Department of Employment Security, 2011.

Indiana: In the *structural* category, there were 402 initial applicators certified and 1,509 experienced applicators (Table 6). For the *all other* category, Indiana certified 1,307 initial and 5,536 experienced applicators. The total number of commercial pesticide applicators in 2011 was 8,754. The PSEP directly supported 8,754 commercial pest-management jobs with an estimated annual salary base of \$253 million.

Table 6. Jobs and wage base for the Indiana Pesticide Safety Education Program, 2011.¹

Indiana Commercial Pesticide Applicators			
	Structural	All Other	Total
Initial certified applicators	402	1,307	1,709
Entry-level wage	\$24,835	\$24,669	
Entry-level wage base	\$9,983,670	\$32,242,383	\$42,226,053
Experienced commercial applicators	1,509	5,536	7,045
Experienced-level wage	\$30,222	\$29,994	
Experienced wage base	\$45,604,998	\$166,046,784	\$211,651,782
Total wage base	\$55,588,668	\$198,289,167	\$253,877,835
Total number of valid certificates	1,911	6,843	8,754

¹Indiana Department of Workforce Development, 2011.

Iowa: In the *structural* category, there were 245 initial applicators certified and 1,388 experienced applicators (Table 7). For the *all other* category, Iowa certified 1,481 initial and 10,640 experienced applicators. The total number of commercial pesticide applicators in 2011 was 13,754. The PSEP directly supported 13,754 commercial pest-management jobs with an estimated annual salary base of \$392 million.

Table 7. Jobs and wage base for the Iowa Pesticide Safety Education Program, 2011.¹

Iowa Commercial Pesticide Applicators			
	Structural	All Other	Total
Initial certified applicators	245	1,481	1,726
Entry-level wage	\$25,039	\$21,455	
Entry-level wage base	\$6,134,555	\$31,774,855	\$37,909,410
Experienced commercial applicators	1,388	10,640	12,028
Experienced-level wage	\$34,238	\$28,905	
Experienced wage base	\$47,522,344	\$307,549,200	\$355,071,544
Total wage base	\$53,656,899	\$339,324,055	\$392,980,954
Total number of valid certificates	1,633	12,121	13,754

¹Iowa Workforce Development, 2011.

Nebraska: In the *structural* category, there were 186 initial applicators certified and 1,258 experienced applicators (Table 8). For the *all other* category, Nebraska certified 1,048 initial and 7,290 experienced applicators. The total number of commercial pesticide applicators in 2011 was 9,782. The PSEP directly supported 9,782 commercial pest-management jobs with an estimated annual salary base of \$329 million.

Table 8. Jobs and wage base for the Nebraska Pesticide Safety Education Program, 2011.¹

Nebraska Commercial Pesticide Applicators			
	Structural	All Other	Total
Initial certified applicators	186	1,048	1,234
Entry-level wage	\$23,300	\$22,250	
Entry-level wage base	\$4,333,800	\$23,318,000	\$27,651,800
Experienced commercial applicators	1,258	7,290	8,548
Experienced-level wage	\$35,735	\$35,175	
Experienced wage base	\$44,954,630	\$256,425,750	\$301,380,380
Total wage base	\$49,288,430	\$279,743,750	\$329,032,180
Total number of valid certificates	1,444	8,338	9,782

¹Nebraska Department of Labor, 2011.

North Carolina: In the *structural* category, there were 262 initial applicators certified and 2,749 experienced applicators (Table 9). For the *all other* category, North Carolina certified 1,110 initial and 16,126 experienced applicators. The total number of commercial pesticide applicators in 2011 was 20,247. The PSEP directly supported 20,247 commercial pest-management jobs with an estimated annual salary base of \$614 million.

Table 9. Jobs and wage base for the North Carolina Pesticide Safety Education Program, 2011.¹

North Carolina Commercial Pesticide Applicators			
	Structural	All Other	Total
Initial certified applicators	262	1,110	1,372
Entry-level wage	\$21,589	\$22,573	
Entry-level wage base	\$5,656,318	\$25,056,030	\$30,712,348
Experienced commercial applicators	2,749	16,126	18,875
Experienced-level wage	\$30,063	\$31,079	
Experienced wage base	\$82,643,187	\$501,179,954	\$583,823,141
Total wage base	\$88,299,505	\$526,235,984	\$614,535,489
Total number of valid certificates	3,011	17,236	20,247

¹North Carolina Occupational Employment Statistics Unit, 2011.

Texas: In the *structural* category, there were 466 initial applicators certified and 5,946 experienced applicators (Table 10). For the *all other* category, Texas certified 1,205 initial and 11,007 experienced applicators. The total number of commercial pesticide applicators in 2011 was 18,624. The PSEP directly supported 18,624 commercial pest-management jobs with an estimated annual salary base of \$698 million.

Table 10. Jobs and wage base for the Texas Pesticide Safety Education Program, 2011.¹

Texas Commercial Pesticide Applicators			
	Structural	All Other	Total
Initial certified applicators	466	1,205	1,671
Entry-level wage	\$21,967	\$20,900	
Entry-level wage base	\$10,236,622	\$25,184,500	\$35,421,122
Experienced commercial applicators	5,946	11,007	16,953
Experienced-level wage	\$41,193	\$37,986	
Experienced wage base	\$244,933,578	\$418,111,902	\$663,045,480
Total wage base	\$255,170,200	\$443,296,402	\$698,466,602
Total number of valid certificates	6,412	12,212	18,624

¹Texas Workforce Commission, 2011.

There is another segment of the pesticide applicator community that warrants attention – a group of pesticide applicators that are not certified. These applicators work under the direct supervision of a certified applicator and, in some states, require training and/or testing. For example, Texas is a state that certifies apprentices and technicians. However, these individuals are not counted in CPARD because they are not certified applicators. This segment of applicators adds significantly to the jobs and wage base. In Texas, there were 6,888 apprentices and technicians in 2011 with an annual wage base of \$90.7 million. This brought the grand total to 25,512 commercial applicators, apprentices, and technicians. Thus, the PSEP directly supported 25,512 commercial pest-management jobs with an estimated annual salary base of \$789 million.

Table 11. Economic value of Texas Pesticide Safety Education Program for commercial pest management, 2011.¹

Texas Commercial Pesticide Applicators			
	Structural	All Other	Total
Initial certified applicators	466	1,205	1,671
Entry-level wage	\$21,967	\$20,900	
Entry-level wage base	\$10,236,622	\$25,184,500	\$35,421,122
Experienced commercial applicators	5,946	11,007	16,953
Experienced-level wage	\$41,193	\$37,986	
Experienced wage base	\$244,933,578	\$418,111,902	\$663,045,480
Apprentices and technicians (noncertified)	6,888		6,888
Wage level	\$13,180		
Wage base	\$90,783,840		\$90,783,840
Total wage base	\$255,170,200	\$443,296,402	\$789,250,442
Total number of valid certificates	6,412	12,212	25,512

¹Texas Workforce Commission, 2011.

An important point regarding this economic analysis is that it includes only initial and experienced commercial applicators. It does not include any private applicators for the seven states. Nationally, there are nearly as many private applicators as there are commercial applicators. Thus, the economic value of the pesticide safety education program could be significantly higher with the addition of private applicators. Unfortunately, BLS does not collect this data.

Summary

Pesticide safety education programs are among the most important and vital certification training offered by the Cooperative Extension Service. PSEP’s goal is to educate applicators in the safe and judicious handling and use of pesticides. Certification allows applicators to purchase and/or use pesticides to protect food, forage, structures, health, water, rights-of-way, and landscapes. Certification of applicators is achieved in partnership with federal, tribal, territorial, and state regulatory partners and other enterprises that rely on the resources PSEPs offer. In addition to that critical role, these data show the economic value of PSEP certification training through the total jobs and wages of those who use its materials and services. The findings from this study of seven selected states show that PSEPs directly support 120,543 pesticide applicator jobs with a total salary base of \$3.9 billion. The methodology proved an effective means to calculate economic value. CPARD could be modified to include the calculations for each state for commercial applicators based on input of each state’s BLS data.

This analysis also does not include the broader economic impacts that stem from the spending (multiplier) of these salaries. Moreover, the employment and salary values do not reflect the total economic value of PSEPs because they exclude the economic benefits associated with private pesticide applicators.

As an acknowledged source of expertise and advice, PSEPs in many (if not most) states also conduct outreach to noncertified applicators and the public. All of these services yield economic, environmental, and public health benefits – which enhance productivity and economic well-being.

The employment and wage benefits attributed to PSEPs are one important value for stakeholders to recognize when evaluating the program’s importance. Another value is the economic gain realized from the use of pesticides by those who are properly certified. This significant benefit has been attributed to PSEPs (Young and Ramsey, 2011). Lastly, any assessment of the overall value of PSEPs to the public must include the proper use of pesticides.

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References

American Association of Individual Investors (AAII). August 2003. The top 10 economic indicators: What to watch and why. *American Association of Individual Investors Journal*, pp. 14-17.

Bureau of Labor Statistics (BLS). 2011. Occupational Employment Statistics (OES) Program, Washington, D.C. Online: <http://www.bls.gov/oes/home.htm>

Certification and Training Assessment Group (CTAG). 2014. Pesticide applicator certification and training. Online: <http://ctaginfo.org>

Code of Federal Regulations (CFR). 2013. Title 40, Part 171. Certification of pesticide applicators. Online: http://cfr.regstoday.com/40cfr171.aspx#40_CFR_171p4

Illinois Department of Employment Security. 2011. 2011 occupational wages. Online: <http://www.ides.illinois.gov/IDESFormsandPublications/2011WageData.pdf>

Indiana Department of Workforce Development. 2011. 2011 occupational employment survey job wages. Online: http://www.hoosierdata.in.gov/dpage.asp?id=24&view_number=4&menu_level=smenu3&panel_number=2

Iowa Workforce Development, Labor Force and Occupational Analysis Bureau. 2011. 2011 occupational wages. Online: <http://iwin.iwd.state.ia.us/iowa/OlmisZine?zineid=00000012>

McCorkle, D. A., and Anderson, D. P. 2008. An approach to addressing the economic accountability challenge. *Journal of Higher Education Outreach and Engagement* 12(3): 139.

National Association of State Departments of Agriculture Research Foundation (NASDARF). 2011. Environmental Protection Agency (EPA) Cooperative Agreement, Certification Plan and Reporting Database (CPARD). Washington State University: Pullman. Online: <http://cpard.wsu.edu/>

Nebraska Department of Labor, Office of Labor Market Information. 2011. 2011 occupational wages. Online: <http://neblswages.nwd.ne.gov/eds.php?compare=5&page=0&PHPSESSID=7d49591ae851bb1194a5f72e0362d965>

North American Industry Classification System, United States Census Bureau. 2011. Online: <http://www.census.gov/eos/www/naics/>

North Carolina Occupational Employment Statistics Unit. 2011. Labor Market Information Division of the Employment Security Commission of North Carolina. 2011

occupational wages and employment in North Carolina. Online:
<http://eslmi23.esc.state.nc.us/oeswage/>

State of California Employment Development Department. 2011. 2011 occupational wages. Online:
<http://www.labormarketinfo.edd.ca.gov/cgi/dataanalysis/areaselection.asp?tablename=oeswage>

Texas Workforce Commission, Labor Market Information Division. 2011. 2011 wages by profession data. Online:
<http://www.tracer2.com/cgi/dataAnalysis/AreaSelection.asp?tableName=Oeswage>

U.S. Environmental Protection Agency (EPA). 2013a. Categories of commercial applicator certification. Online:
<http://www.epa.gov/oppfead1/safety/applicators/privcomm.htm>

———. 2013b. Overview of Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Online: <http://www.epa.gov/oecaagct/lfra.html>

Young, D., and Ramsay, C. 2011. What is the value of Extension training for certified pesticide applicators? *Journal of Pesticide Safety Education* 13: 14-23.