

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Agriculture and Food Security

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	10%		20%	
202	Plant Genetic Resources	0%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		5%	
205	Plant Management Systems	20%		20%	
213	Weeds Affecting Plants	15%		0%	
216	Integrated Pest Management Systems	23%		0%	
301	Reproductive Performance of Animals	5%		15%	
302	Nutrient Utilization in Animals	5%		10%	
305	Animal Physiological Processes	2%		10%	
307	Animal Management Systems	0%		5%	
401	Structures, Facilities, and General Purpose Farm Supplies	5%		5%	
405	Drainage and Irrigation Systems and Facilities	0%		5%	
601	Economics of Agricultural Production and Farm Management	5%		0%	
903	Communication, Education, and Information Delivery	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2018	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	10.0	0.0
Actual Paid	3.6	0.0	10.7	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
262090	0	872141	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
223653	0	1046824	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
181898	0	1001339	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Research and outreach continued to assure that best management practices appropriate to Alaska are provided to target audiences. Growing trials provided new directions on the resilience and adaptability of crops as changes in the subarctic and arctic climate occur. Research and Extension programs continued to be revitalized to remain relevant to regional and local agricultural production. Group and one-on-one educational activities with specific sectors of the pest management industry, the agricultural community and the horticultural industry provided individuals and businesses with important information. Increased reliance on the internet and technology enhanced communication with more people, as faculty and staff utilized distance education platforms. Increasing and maintaining partnerships was an important strategy in keeping pest species below threshold levels. Outreach included conferences, workshops, forums, tours and consultations with stakeholders.

2. Brief description of the target audience

The target audiences included producers and consumers, communities, entrepreneurs, agribusinesses, industry leaders, individuals and groups concerned about the quality of the Alaska environment, public resource agencies, public and private resource managers, other faculty and researchers, and undergraduate and graduate students. Others consulted included arborists, farmers, garden and plant associations, public and commercial greenhouses, homeowner associations, landscapers, state and federal park employees, gardeners, museums, military base personnel, boroughs and urban municipalities, pest control operators, property managers, public health organizations, public and private schools, recreational facilities, resorts and hotels, rural residents, youth groups and school districts. Advisors and the target audience included the Alaska Farm Bureau, USDA Natural Resource Conservation Service, the USDA Forest Service, the Alaska Department of Natural Resources, borough governments and Alaska Native corporations.

3. How was eXtension used?

In FY18, faculty and staff answered 68 agriculture and horticulture related questions through eXtension's Ask an Expert interface. Topics included tree and lawn care, pest management, home gardening, fruit crops, flower growth, small and large livestock care and plant and insect identification. Several personnel attended an eXtension webinar on weed management in gardens and landscapes. Agent and educator memberships in eXtension's communities of practice (CoPs) included Citizen Science, Invasive Species, Homepage Authors, Big Data, Innovation Partners and Urban Integrated Pest Management.

V(E). Planned Program (Outputs)

1. Standard output measures

2018	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	10318	184761	2337	9724

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2018
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2018	Extension	Research	Total
Actual	1	2	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Output 1: Faculty will provide agricultural and horticultural workshops, short courses, classes, field days and conferences, including IPM.

Year	Actual
2018	135

Output #2

Output Measure

- Output 2: Faculty will provide agricultural, horticultural and pest management information through one-on-one consultations and consultations with other organizations. Output measure will be contact hours.

Year	Actual
2018	3402

Output #3

Output Measure

- Output 3. Horticultural crop research will concentrate on home and commercial varieties appropriate to Alaska. Publications and presentations are the output measures.

Year	Actual
2018	10

Output #4

Output Measure

- Output 4. Controlled environment horticulture will focus on CEA technology and technology transfer and appropriate crops and best management practices for crop production in specific environments. Output measures will be publications and presentations.

Year	Actual
2018	2

Output #5

Output Measure

- Output 5. Focus will be on best management practices for livestock management and production. Output measures will be publications and presentations.

Year	Actual
2018	11

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Outcome 1: Increase agronomic crop producers' ability to understand and assess best management practices of crop production. Measure will be number of producers who adopt practices.
2	Outcome 2: Increase livestock producers' ability to understand and assess optimum production practices. Measure will be number of producers.
3	Outcome 3: Increase participants' commercial and home horticulture best management practices. Measure will be number of individuals who adopt better management practices.
4	Outcome 4: Increase the number of adopters of new technology and management practices.
5	Outcome 5: Increase the number of activities that monitor and control invasive species and pests. Measure will be the number of outreach activities and publications.
6	Outcome 6: Demonstrate effective collaboration between research and Extension to resolve agriculture and horticulture issues.
7	Outcome 7: Increase reindeer producers' ability to understand and assess optimum production practices. Measure will be communities consulted.

Outcome #1

1. Outcome Measures

Outcome 1: Increase agronomic crop producers' ability to understand and assess best management practices of crop production. Measure will be number of producers who adopt practices.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	62

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Food security and climate change are serious issues in Alaska. With over 90% of food imported, transportation costs adds considerably to prices. If transportation were interrupted, it is widely acknowledged that Alaska has three days of food on grocery shelves. Thus, it is critical that Alaska is able to produce more local food crops. A challenge to increased production is changes to the landscape due to variations in water and soil temperatures. Growers see the impact of climate on agricultural performance. Planning for crop and animal management is highly influenced by climate predictions. Research and outreach is needed regarding crop adaptability in changing climates.

What has been done

Adapted cultivars of feed barley, hulless barley, red spring wheat, common oat and Polish canola were all compared to standard test varieties. Field experiments were carried out at Palmer and Fairbanks experiment farms. Three plant physiologic growth stages were used along with weather data to measure crop adaptability, emergence, heading/flowering and maturity. Presentations of results were made at workshops for small grain growers in Alaska. Poster presentations were made at national conferences.

Results

The 2018 season was cooler than the long-term average in Fairbanks, and both the Fairbanks and Palmer locations had more precipitation than the long-term average. Average yields for all spring grain and oilseed varieties at both farms were roughly equal to the standard test varieties. The average Fairbanks location yield for feed barley were 1567 lbs/acre and Palmer yields were 2350 lbs/acre. Hulless barley yields were 1687 lbs/acre in Fairbanks and 2033 lbs/acre in Palmer. Hard red spring wheat yields were 1051 lbs/acre in Fairbanks and 2028 lbs/acre in Palmer. Common oat yields were 716 lbs/acre in Fairbanks and 1949 lbs/acre in Palmer. Average yields

for Polish canola were 1669 lbs/acre in Fairbanks and 740 lbs/acre in Palmer. A student completing a master's thesis is using data from this project in DSSAT modeling to predict potential impacts of climate change on wheat growth.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
405	Drainage and Irrigation Systems and Facilities
601	Economics of Agricultural Production and Farm Management

Outcome #2

1. Outcome Measures

Outcome 2: Increase livestock producers' ability to understand and assess optimum production practices. Measure will be number of producers.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	362

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Many Alaskans do not live near easily accessible services. Those involved in farming and ranching have a need for information on how to best monitor the health of their flock and herd so that they can identify problems early, when there will be time for navigating the logistics of getting veterinarian and other expert help in more remote areas. There are also concerns over food security and high costs of living. Livestock raised in Alaska also provides food products for both home and commercial use. There is continued interest in raising chickens for backyard flocks as a source of both meat and eggs.

What has been done

Two agents offered six workshops in five locations around the state related to chickens. One hundred sixty-seven adults and 92 youth learned about livestock topics, including backyard chickens, egg productivity and poultry butchering.

Results

The Kenai agent gathered feedback from 103 attendees at livestock judging workshops and a livestock seminar. Across the three events, 97 percent agreed they had gained knowledge and 96 percent agreed they had gained skills.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
305	Animal Physiological Processes

Outcome #3

1. Outcome Measures

Outcome 3: Increase participants' commercial and home horticulture best management practices. Measure will be number of individuals who adopt better management practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	169

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Horticulture is the largest agricultural industry in Alaska, amounting to more than 50 percent of cash receipts for all agricultural crops. Alaska imports most of its food and costs are high, particularly in rural areas. Dependence on imports poses a food security risk if supply lines are interrupted. Teaching more Alaskans research-based methods for gardening or growing crops increases food quality and can lower the risk of food insecurity. Demand for support is on the rise, with the latest agricultural census data showing 990 farms in Alaska in 2017, a 30 percent increase from 2012.

What has been done

Eight workshops in multiple locations, including rural areas, helped inform the public of developments on high tunnels as an option to augment the growing season. Extension trained 130 Master Gardeners. In sum, there were 1793 contacts with the public through gardening workshops including interpreting soil sample reports, seed starting and basic gardening, weed-free forage and pesticide safety trainings, greenhouse design and more.

Results

All of the 39 participants in high tunnel workshops at five different locations indicated they gained both knowledge and skills. All of the 75 participants responding to surveys of three different workshops on gardening and seed starting agreed they gained knowledge, with 96 percent gaining skills. A series of 35 YouTube videos called In the Alaska Garden allowed viewers insights from many local growers. The passive solar video alone has over 28,000 views. On another video, a view commented "we tried soil blocks for the first time this year and I am extremely impressed with the health of the plants." Many viewers showed enthusiasm for the topics through upvotes and compliments such as "another great video" and "liked and favored, cool lumber construction of greenhouse."

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
205	Plant Management Systems
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
401	Structures, Facilities, and General Purpose Farm Supplies
405	Drainage and Irrigation Systems and Facilities
601	Economics of Agricultural Production and Farm Management

Outcome #4

1. Outcome Measures

Outcome 4: Increase the number of adopters of new technology and management practices.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	1167

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

New technologies help everyone in the agriculture field stay up-to-date through information sharing, diagnostics, and other improvements and efficiencies related to growing and managing crops. Alaskans need more opportunities for reporting and identifying crop issues in real-time, sharing observations from experienced growers, and watching demonstrations of best practices for managing animal and plant production. Exposure to new technology and practices increases the possibility Alaskans will adopt such tools.

What has been done

The Alaska Weeds Identification app continued to be offered, with new species added. An agent provided trainings on first detection of invasive species and how to use the Alaska Weeds ID mobile app to identify and report the location of invasive plants. The Grow & Tell app was utilized in conjunction with university variety trials, and invited gardeners to act as citizen scientists and rate the varieties they have grown for taste, yield and reliability. The Kenai agent continued to offer an online soil test calculator that has augmented soil test results reporting, allowing users to estimate soil fertility needs and understand soil amendment scenarios.

Results

The Grow & Tell app has seen 3465 installations on iOS and 536 on Android systems since its launch in 2017. The Alaska Weeds Identification app had 444 new downloads and has seen over 5700 downloads since its launch. Comments include "Nice app, great ID pics." The app is now featured online in the U.S. Climate Resilience Toolkit. Natural Resource Conservation Service offices use the soil calculator for each high tunnel program soil analysis they work on, and in FY18 the tool had 368 unique pageviews.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
216	Integrated Pest Management Systems
903	Communication, Education, and Information Delivery

Outcome #5

1. Outcome Measures

Outcome 5: Increase the number of activities that monitor and control invasive species and pests. Measure will be the number of outreach activities and publications.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	60

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Alaska hosts thousands of visitors every year. The state also imports most of its food and many horticultural products, so it remains vulnerable to imported pests. Retail sales of plant materials contaminated with a variety of pests continue to challenge the state. Invasive weed infestation can reduce land values and agricultural productivity and negatively impact recreation, tourism and subsistence harvesting. Improving citizen, farmer and land manager ability to assess pest management practices is critical.

What has been done

Seasonal IPM technicians and permanent staff, with support from faculty, provided community education and technical assistance. Agents and IPM staff had 806 consultations, most of which were requests for plant and insect identification. IPM technicians maintained a reporting web portal where the public submitted digital photos. They also assisted with community weed pulls, camps, Master Gardener classes and the Certified Pesticide Applicator conference. Four YouTube videos on submitting plant and insect samples and managing spruce beetles and invasive cherry trees had a combined 1653 hits.

Results

The Alaska Invasive Species Workshop in October 2017 had 112 participants. Most respondents rated the speakers and knowledge gained as excellent, with 94 percent agreeing they would attend again, and the remaining 5 percent stating it depended on location. Sixty-seven percent of participants said they planned to use information from the conference in their management practices, including public messaging, herbicide application timing, plant identification and adopting survey protocols. Seventy-five percent of the 28 returning attendees who responded reported they have made changes to their practices already, including adoption of monitoring tactics, increased agency collaboration, modification of research designs and changes to timing of herbicide applications.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
213	Weeds Affecting Plants
216	Integrated Pest Management Systems

Outcome #6

1. Outcome Measures

Outcome 6: Demonstrate effective collaboration between research and Extension to resolve agriculture and horticulture issues.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	59

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Variety trials are time-consuming. Seed companies tend to develop their products for the market at-large in the Lower 48. Though varieties described as cold-tolerant may be offered, they are rarely tested in growing seasons as extreme as Alaska's. As a result, Alaskan growers struggle with the trial and error of identifying viable crop varieties in their growing zones, and some tried-and-true varieties are no longer available. Publicly funded variety trials reduce the expense, time and effort gardeners and farmers need to put in to figure out which cultivars will be successful.

What has been done

An Extension agent utilized Experiment Farm facilities to grow and assess cultivars. In 2018, beets, carrots and celery were grown in replicated randomized complete block trials, while Brussels sprouts, beans, corn and watermelon were grown in preliminary trials. Each cultivar was evaluated at least once for plant vigor, susceptibility to bolt, uniformity, and pest and disease resistance. Trials were labeled and viewable at a local botanical garden, where the research team engaged with the public about the plots. Results were published online and disseminated through three workshops to 40 attendees.

Results

The top two yielding corn varieties were Cafe and Sugar Pearl, with at least 1 lb per row foot. Carrot yields were not significantly different, and results for beans were mixed due to vandalism. For celery, Tango OG had the highest yield at 4.9 lbs per row foot and scored 4 out of 5 (high) on both taste and texture. For Brussels sprouts, Hestia was the high-yielding variety with the most uniform growth. For beets, Boro had significantly better uniformity and bolting sensitivity, and

rated highly (4) on taste and texture.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
213	Weeds Affecting Plants
216	Integrated Pest Management Systems
903	Communication, Education, and Information Delivery

Outcome #7

1. Outcome Measures

Outcome 7: Increase reindeer producers' ability to understand and assess optimum production practices. Measure will be communities consulted.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2018	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Remote areas face challenges to economic development and food security. Alaska has the range and forage resources to produce substantial quantities of red meat through reindeer production, but current processing requirements compromise entrepreneurial efforts to bring quality meat to market. The regulations allowing in-state sale of field-slaughtered, non-inspected reindeer meat require carcasses to be immediately frozen. The meat consequently becomes cold shortened, or very tough, lowering its market value.

What has been done

Reindeer program personnel investigated altering current field slaughter methods while monitoring for food safety. Three rural Alaska communities with productive reindeer herds were consulted about their desire to produce and sell field-slaughtered reindeer meat. Researchers

collected and tested reindeer blood samples for disease. A draft uniform field slaughter protocol was reviewed by the state veterinarian. Seven steers were processed at a USDA-approved facility and evaluated for post-slaughter temperature effects.

Results

Samples sent to the University of Illinois Meat Science Lab were evaluated for moisture and lipid content, cooking loss, tenderness and other attributes. There was no significant difference in tenderness between the 16-hour and 7-day chilled and stored sample conditions. Meat from reindeer chilled for 16 hours after slaughter was found to be significantly tenderer than meat frozen immediately after slaughter. Subsequently, 16 reindeer were field slaughtered using the researcher-developed protocol, with carcass temperature held at a constant 7C for 16 hours, then swabbed for aerobic bacteria after 25 hours. All samples tested negative for pathogenic bacteria, suggesting reindeer can be slaughtered hygienically in the field and allowed to undergo complete rigor before freezing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
305	Animal Physiological Processes
601	Economics of Agricultural Production and Farm Management

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Alaska continues to be severely impacted by the falling price of crude oil. The state provides a significant portion of the university's funds, and the university has experienced several consecutive years of reductions. About 40 percent of SNRE funding comes from the state. Between 2014 and 2017, the university system's budget dropped from \$378 million to \$325 million, resulting in 50 discontinued or suspended academic degree and certificate programs and 933 fewer faculty and staff. In FY18, the budget was further reduced to \$317 million. SNRE, in particular, has faced difficulties with the combination of budget cuts and fixed-cost increases restricting hiring for vacant positions. In FY18, key agriculture personnel departed. The Delta district lost administrative support, and an associate professor of range management retired. One of the Experiment Farms experienced director turnover. The merger between AFES and CES has helped maintain research and service, but both units have heavy workloads as we try to keep our productivity high in challenging times.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

The Kenai agriculture agent surveyed 399 participants in 19 classes in FY18 to assess changes in knowledge and skills on topics including seed starting, high tunnels, livestock judging, lawn care, produce safety and soil health. Ninety-eight percent of the participants indicated they had gained knowledge and 96 percent gained skills from the classes. In six classes behavior was assessed, with 96 percent of 56 participants able to apply new skills.

Twelve participants completed a survey about the gardening workshops and YouTube videos offered by a Fairbanks agent. All participants rated their experience as good or excellent. Results of retrospective pre-post questions indicated gains in average knowledge regarding how to save money by gardening, how to garden successfully in Alaska, and choosing the right vegetable and flower varieties. After the workshop, 83 percent agreed they felt confident in applying the skills learned. Respondents indicated they planned to apply learned skills by making data-informed decisions and trying new varieties, group planting and production timing.

The Alaska Invasive Species Workshop in October 2017 had 112 participants, with 54 responding to a post-conference Qualtrics survey. Most respondents rated the speakers and knowledge gained as excellent, with 94 percent agreeing they would attend again, and the remaining 5 percent stating it depended on location. Sixty-seven percent of participants said they planned to use information from the conference in their management practices, including public messaging, herbicide application timing, plant identification and adopting survey protocols. Seventy-five percent of the 28 returning attendees who responded reported they have made changes to their practices already, including adoption of monitoring tactics, increased agency collaboration, modification of research designs and changes to timing of herbicide applications.

To inform Integrated Pest Management (IPM) efforts regarding the peony industry, a survey was conducted of local growers who had attended outreach events in the past three years. Responses were gathered from 20 individuals, 18 of whom had attended events such as peony farm tours, a peony growers conference or peony consultations with Integrated Pest Management technicians. Nineteen respondents indicated they considered themselves a "peony producer." Seventeen respondents said participation in those events improved their awareness of insect pests affecting peonies. Fifteen said they gained new skills for pest recognition and management, and 10 changed their attitudes about peony pests. Sixteen respondents planned adopt one or more of the practices learned, and 15 felt their experience would help them increase their networking with other producers.

Key Items of Evaluation

Extension brought research to the public and increased stakeholder knowledge and skills on a variety of agriculture and horticulture topics. Stakeholder groups such as pesticide applicators, agricultural educators, farmers, and home gardeners are using better practices.