

## Goal 1

### Key Theme – New and Value Added Agricultural Products

#### Wyoming

Research results from studies on the profitability of individual production practices as well as crop and livestock systems ultimately influence the sustainability of the agriculture industry. Results from the winter grazing studies indicate that the quality of windrowed and baled hay is similar and animal performance is also similar. The cost per ton of windrowed forage was about half that for hay baled, stored, and fed (\$17.61 vs. \$34.69). First year results from the variable rate application of Telone II for SBCN control on a 40 acre field were encouraging. At the currently recommended rate, a uniform application of Telone II would result in a net return of \$21/acre, with sugar beets priced at \$42/ton. Applying the optimum Telone II rates would increase net returns to \$89/acre. In addition, the variable rate would have saved 141 gallons of product on 40 acres.

#### West Virginia Extension

1. The average value-added increase in income is about \$1,200 per farm or \$116,000 to all producers who participated in the Quality Assurance (QA) feeder cattle program.
2. The calves marketed through the QA program have developed a good reputation for performance and quality. Two QA feeder calf sales and one QA yearling sale were conducted in 1999. Calves marketed in the QA sales are classified into two health and management programs: Gold and Silver.
  - a. The 1999 sales marketed 2,900 "Gold" calves to 45 prospective buyer via the teleauction at a \$5/cwt or \$30 per head advantage over the Silver Program calves
  - b. According to buyer surveys, both health programs have been successful in reducing losses associated to the stress of shipping.
  - c. The QA calves, for the past two years, have returned a \$2 to \$7 per cwt premium over similar calves marketed in the West Virginia Special Graded Feeder Cattle Sales. (Producers in the graded feeder cattle sales are part of the traditional Extension outreach program.)
  - d. The Special Graded Sales marketed 40,000 feeder cattle in 1999 and provided a \$2 to \$4 per cwt advantage over the weekly auction sales.
  - e. The 1999 QA Yearling Sale yielded similar results, with 600 feeder cattle marketed at a \$6 per cwt premium over average USDA prices quoted for the week.

#### Vermont Research

The success of whey protein-based edible films depends on novel application concepts and relevant properties. The project examined the results of using the films as tamper-evident packaging, and tested biodegradability, digestibility, solubility, and thermal properties of the films. The films are thermally sealable with good integrity, thus deemed suitable as tamper-evident packaging. The films are showed biodegradable and digestible. The food and pharmaceutical industry, as well as consumers may benefit from using the new biodegradable

films in product packaging system to minimize the loss due to tampering.

### **Utah Combined Research and Extension**

**Impacts:** Low fat red meat products from lamb, beef, and pork have been developed and are currently at various stages of commercialization. Ultra high temperature milk processing has been developed which extends unrefrigerated milk life up to a year and the product is under commercial production and has been utilized by the U.S. military. Several new varieties of food and feed grains have been developed which are resistant to Utah and Intermountain West diseases and pests. These varieties have been or are being released for commercial production. A process of utilizing *apomixis* (i.e., the ability for hybrids to clone themselves) has been developed and is close to commercialization. This would allow hybrids to be produced from hybrid seed, rather than from the seeds of two or more parents and would greatly reduce the cost and improve the quantity and quality of many foods and feeds. It has been shown the CLA (a product found in dairy products, particularly those obtained from fresh pasture) is effective in reducing various forms of cancer, though work continues in this area. Work in many other areas is continuing.

**Source of Funds:** Hatch Act

### **South Dakota Combined Research and Extension**

“New Corn Gum Product Helps Prevent Erosion” (also relates to Goal 5)

*Brief description of the activity* – Ethanol production is becoming a major industry in South Dakota. Like all other industries, ethanol plants create by-products. These plants use an abundance of energy to remove water from the condensed corn solubles, but they get little return for their product. South Dakota State University scientists have discovered a means to transform these by-products into a product that is profitable and environmentally friendly.

Using the by-products of ethanol production, SDSU researchers have created a corn-based gum product that can be used in different types of applications, replacing other synthetic gums that are imported into the United States.

The new gum product is blended with grass fibers or waste paper pulp and mixed with grass seed, creating a biodegradable grass seed/mulch product. This grass seed & mulch is spread on bare roadsides or torn up construction sites. As the grass begins to grow, the corn-gum mulch decomposes, protecting the soil from erosion without leaving an environmentally hazardous residue.

*Short impact statement* - The new corn-based gum may replace similar imported gums, which are more expensive. The product has an added benefit in that it is completely biodegradable. “This home-grown product wouldn’t cost as much and would add value to South Dakota ethanol. The focus is to try to improve the economics on these corn ethanol plants, primarily the dry mill plants we have in South Dakota,” said Dr. Bill Gibbons of South Dakota State University.

Hatch Act  
Special Research Grants  
Commodity – SD Corn Utilization Council Grant  
State – State Funds

*Scope of impact, identifying which of the following apply to the activities conducted*

- (1) State specific
- (3) Multistate Research

### **South Dakota Combined Research and Extension**

“Wheat and Soybeans Replace Wood Fiberboard” (also relates to Goals 2 & 5)

*Brief description of the activity* – Toxic emissions from adhesives used in wood fiberboard panels can be a major health concern. Wood demand is projected to increase by 50% at a time when the world is already approaching maximum natural wood supply. Faced with an increasing worldwide wood fiber shortage, the construction industry is interested in the production of panel products from renewable agricultural residues. Wheat straw and soybean straw appear to make excellent fiber for those panel products, but have been limited by the available adhesives.

Scientists at South Dakota State University and Iowa State University have developed a soy protein-based adhesive capable of bonding agrifiber without compromising water resistance characteristics. Soybean straw and wheat straw, when bonded with the soy-based adhesive, have mechanical and water resistance properties comparable to wood fiber based panel boards.

*Short impact statement* - The new soy protein-based adhesive provides another panel fiber source to help satisfy increased consumer demand, without creating an additional strain on limited natural wood resources. The new product also creates a new market for soy protein as an adhesive.

Hatch Act  
State – State Funds

*Scope of impact, identifying which of the following apply to the activities conducted*

- (1) State specific
- (3) Multistate Research

### **Oregon Research**

Since 1988, Willamette Valley grass seed growers reduced the number of acres burned by more than 70 percent. At the same time, grass seed crops increased from 332,610 acres in 1988 to 479,800 acres in 2000. This reduction in field burning has occurred without a loss in seed yield or quality, and sales climbed from \$190 million in 1988 to more than \$325 million in 2000. In addition, baling of seed crop residue has created a grass straw export market. In 1999, straw balers and handlers exported approximately 500,000 tons and sold another 50 tons in domestic markets. This new commodity is valued at over \$23 million.

### **New Jersey Combined Research and Extension**

**Activity:** The blueberry industry is one of New Jersey's most important agricultural sectors. Blueberry sales, however, have peaked in recent years and growers are interested in expanding their markets. Given earlier indications of the potential health benefits of the blueberry, a nutraceutical-based value added blueberry product is an appropriate starting point for any exploration of market development opportunities for blueberries. To be effective, the development and marketing of a value added blueberry juice or other blueberry product requires multidisciplinary collaboration by food scientists, economists, and marketing/business development specialists.

Rutgers has designed a multidisciplinary program of research and technology transfer to develop value-added products to revitalize the blueberry industry. Project members, including food scientists, product development people, and economists tackled details ranging from identifying heretofore-unknown antioxidants in blueberries to figuring out what might be the best channels of distribution for new products. Researchers developed four potential products: iced tea, pomace, juice, and sports drink. A food science professor conducted taste tests. Rutgers has created a cooperative company, called Blueberry Health, Inc., to handle marketing of the products; several blueberry growers joined as owners of the company. Rutgers has worked with Blueberry Health, Inc., to plan for marketing the iced tea and pomace, the two most favored products. The next phase is to generate more interest in the product, develop a marketing plan. The program team members are working on convincing New Jersey supermarkets to carry the product as a way of entering the market, and at the national distributors of iced tea as a long-term marketing goal.

**Impact:** The University is developing products that blueberry growers do not have the resources to develop on their own. This summer, "Jersey Blues" iced tea was introduced for sale at approximately 50 farm stands and several county fairs in New Jersey. So far, approximately 1000 cases of the iced tea have been sold. Consumer surveys indicate a 90 to 95 percent acceptance rate of the product. The project team hopes that the success of this project will serve as a model for the University's role in economic development.

**Source of Funding:** State Funds, USDA Rural Business Cooperative Service, New Jersey Blueberry Council, and New Jersey Pinelands Commission

**Scope of Impact:** State Specific

## **Key Theme – Agricultural Profitability**

### **Wyoming**

Research results from studies on the profitability of individual production practices as well as crop and livestock systems ultimately influence the sustainability of the agriculture industry. Results from the winter grazing studies indicate that the quality of windrowed and baled hay is similar and animal performance is also similar. The cost per ton of windrowed forage was about half that for hay baled, stored, and fed (\$17.61 vs. \$34.69). First year results from the variable rate application of Telone II for sugar beet cyst nematode (SBCN) control on a 40 acre field were encouraging. At the currently recommended rate, a uniform application of Telone II would result in a net return of \$21/acre, with sugar beets priced at \$42/ton. Applying the optimum Telone II rates would increase net returns to \$89/acre. In addition, the variable rate would have saved 141 gallons of product on 40 acres.

### **Wyoming**

More than 1,700 producers attended various workshops and clinic regarding agricultural profitability. Evaluations showed that producers increased their knowledge, made correct management decisions, contained their costs, kept current, and evaluated their management options. Two extension bulletins have been published. Five reports concerning applied research were published in the UW Agricultural Experiment Station 2000 Progress Report. Eight issues of the Wyoming Hay Hotline were published. The Hay Hotline web site was updated weekly. Five ranchers are saving \$10 to \$15 per head per wintering season by testing forages and feeding accordingly. Using the training, a rancher was able to sell an unproductive operation and purchase an operation that is sustainable and profitable.

### **Washington Research**

Implementing no-till practices on grain farms increased profits to farmers and reduced health risk to state residents from airborne dust.

By taking collective action to retard the spread of phylloxera, grape growers increased profits and assured a stable supply of product.

By exercising appropriate supply chain management, fruit growers increased profits.

Identifying the cause of likely increases in road damage leads to public policy that can reduce road damage and also assures adequate resources to keep highways maintained. This improves the efficiency of the agricultural marketing chain, thereby increasing prices to growers and decreasing prices to consumers.

(1) Research has lead to a recommendation for bee keepers to reduce their treatment for mites by one treatment per year, which saved \$8.80/hive, times 52,000 hives in Washington equals a saving of \$457,600/year for Washington bee keepers.

### **Virginia Combined Research and Extension**

Graded Feeder Cattle Sales. Owners of feeder cattle – those cattle on feed to prepare them for

slaughter – are often prevented from receiving top dollar for their animals because the relative disadvantage the independent farmers have in relation to the large corporate buyers. Virginia Cooperative Extension sponsors an innovative telemarketing cooperative sales program in which cattle from a number of farms are graded and sold together in load lots (50,000 pounds). This program allowed producers to earn an average of \$40 more per head than they would otherwise have expected.

### **Utah Combined Research and Extension**

**Brief Description:** Onions seems to be the only real cash crop when there is a local market. A producer who wanted to diversify his agricultural production has started to grow 40 acres of onions each year after receiving a suggestion from his county agent. He averages 1000 50 lb. sacks/acre and is paid \$40/sack. A sweet corn producer had production problem in 2000. The county agent evaluated the situation and determined the problem to be drought.

**Impacts:** For onions, gross return per acre is \$4000.00 while costs were approximately \$1000.00/acre. This is a substantial increase over the 4200/acre he would normally get for alfalfa or corn. Over the 6-year period he has grossed about \$720,000.00 on his 40 acres of onions. The corn producer followed the irrigation recommendation and saved several hundred dollars of sweet corn.

**Source of Funding:** Smith Lever, State

**Scope of Impact:** UT

### **Pennsylvania Extension**

Impact/Accomplishment Statement

The result of sharing this information with farmers across the state has impacted the financial and production viability of farm operations in the Commonwealth. Output data indicate that over 27,000 participants took part in programs related to profitability and sustainability of agri-food system enterprises offered by Cooperative Extension across the state of Pennsylvania. Eleven thousand participants demonstrated an increase in their knowledge and skills related to operating profitable and sustainable agri-food businesses. For example, the Union County Agricultural Extension agent worked with local farm leaders, county commissioners and the tax assessor to affect the study and local property tax reform that reduces the property tax on older bank barns based on their non-contributory value to the farms income. Five hundred and forty farms in Union County saved an average of \$140 per farm by reducing the taxes to a 10 percent residual of the buildings value, which resulted in a total savings of over \$75,000 to county farmers.

### **Oregon Research**

The most noticeable outcome of this research activity is witnessed by the rapid decline in acres of grass seed crops annually open burned. For years, Willamette Valley grass seed growers burned their fields after harvest to control diseases, weeds and stimulate new growth. Public debate over field burning essentially ended when the 1991 Oregon Legislature established a

gradual phase down in the amount of acres allowed for open field burning with a final limit established at 65,000 acres. Through on-farm demonstration projects and other educational efforts, growers learned about alternatives to field burning that contributed to a significant reduction in acreage burned while maintaining yield, seed quality, and profitability.

Willamette Valley grass seed growers, in particular, have made significant adjustments in post-harvest residue management since the phase down began. These changes have paralleled research results completed over the last eight years through grants provided by the Oregon Department of Agriculture's Alternatives to Open Field Burning program. Extensive trials in this period demonstrated that non-thermal management of grass seed production is an acceptable replacement for open field burning for the major grass species grown in the Willamette Valley in terms of seed yield and stand life. In addition, research has shown open field burning is still an important management tool, particularly for those species of grass that cannot be profitably produced without thermal sanitation.

Since 1988, Willamette Valley grass seed growers reduced the number of acres burned by more than 70 percent. At the same time, grass seed crops increased from 332,610 acres in 1988 to 479,800 acres in 2000. This reduction in field burning has occurred without a loss in seed yield or quality, and sales climbed from \$190 million in 1988 to more than \$325 million in 2000. In addition, baling of seed crop residue has created a grass straw export market. In 1999, straw balers and handlers exported approximately 500,000 tons and sold another 50 tons in domestic markets. This new commodity is valued at over \$23 million.

## **Oregon Research**

### (2) & (3) Research Impacts and Outcomes

Unlike raspberry, we've shown that trailing blackberry plants take up nitrogen throughout most of the growing season. Our research has changed fertilizer practices on over 5,000 acres of blackberry: growers are now delaying the first N application and many are reducing N rates by as much as 25%.

Our work has shown that foliar feeding of nitrogen is not effective in strawberry. This should save many strawberry growers as much as \$400/acre (= \$1 million/year).

High-density plantings in blueberry have produced 104% greater yield over 7 years of production compared to the traditional 4' in-row spacing. Over 250 acres/year, for the last 3 years, have been planted at 30-36" in Oregon (and a similar acreage/year in Washington) as a result of our findings.

Growers are trellising machine-harvested blueberries after our research showed that trellised fields had 3 to 8% greater recovery of total yield (as much as 1,000 more pounds/acre = \$700). The cost of the \$500/acre trellis is thus paid for in one year.

We have been evaluating cultural/production methods to reduce thorn contamination in machine harvested 'Marion' blackberry. Our preliminary work has shown that a winter "clean-up" with a machine harvester equipped with rotary heads and brushes can reduce thorn contamination of the machine-harvested 'Marion' fruit the following season by 74%. This technique is being further tested this winter. Impact could be more machine-harvested fields (a cost savings of \$0.11/lb. to the grower) and a processing premium advantage of \$0.05/lb (potential impact of \$750,000/year).

A "no prune" system developed in 'Marion' blackberry has produced higher yields as plants are more tolerant to cold stress, reduced pesticide requirements, but must be hand harvested due to potential increased thorn contamination in machine-harvested no-prune systems.

Our work has shown that the hardy kiwifruit initiates flower buds the year prior to fruiting and that initiation is reduced by shade. Thus canopy management in the current season is important to maximize yield the following year.

### **New Mexico Combined Research and Extension**

Agricultural Experiment Station researchers also are researching the effect of undegradable intake protein (UIP) on performance and reproductive activity in Suffolk and whiteface range ewe lambs. The experiments are evaluated different levels of UIP under both farm and range flock conditions.

- a. Impact — As a result of the sheep nutrition research, sheep producers in New Mexico grazing sheep on native ranges do not have to purchase more expensive UIP supplements to maintain acceptable levels of performance.
- b. Source of Federal Funds — Hatch
- c. Scope of Impact — Multi-State Research
  - with states AR, AZ, CA, HI, IA, ID, IL, IN, KS, MI, MN, MO, MT, ND, NE, NV, NV, OH, OK, SD, TX, UT, WA, WI

### **North Dakota Combined Research and Extension**

A demonstration project was conducted to determine the value of feeding producer-owned cattle in North Dakota. With that information, cattle producers from across the state developed the North Dakota Statewide Cattle Feeders Consortium. That group conducted a feasibility study and developed business plans to build large cooperatively owned feedyards. The North Dakota State University Extension Service developed the North Dakota Feedlot School and Advanced Cattle

Feeding Workshops to enhance feedlot management skills and improve knowledge of feeding and marketing.

**Impact** - The NDSU Extension Service showed that it cost up to 3 cents less per pound to finish cattle in North Dakota compared to an out-of-state feedlot. Extension information prompted a group of cattle producers to pool funds and custom feed more than 1,300 head in North Dakota feedlots. With help from Extension specialists and agents, they realized a return of more than 31 percent last year. Another group built a 7,000-head feedyard in Bowman County. Other producers will earn a premium of up to 3 cents per pound for cattle that meet processing specifications of a new local processing company. More than 130 producers attended Extension feedlot schools last year. One participant estimated that better health practices, bunk management and feeding practices cut his cost of gain by up to five cents per pound.

**Source of federal funds:** Smith-Lever

**Scope of Impact:** Multi-state, integrated extension and research: KS, MT, SD, MN, WI. and WY.

### **North Carolina Extension**

- a. Producers and marketers of livestock, poultry, and aquatic species will select, adopt and successfully implement practices or enterprises that will achieve individual and family goals related to profitability and quality of life.
- b. Program accomplishments include increased awareness and knowledge of best management production practices by 28,914 individuals. This total included 487 dairy producers, 9529 beef cattle producers, 2788 hog producers, 9645 horse producers, 1830 sheep or goat producers, 4268 poultry producers, and 367 producers of aquatic species

11,402 producers adopted best management practices that optimized income, including 338 dairy producers, 3553 beef cattle producers, 728 hog producers, 3621 horse producers, 1206 sheep or goat producers, 1854 poultry producers, and 102 producers of aquatic species.

2875 producers applied improved farm financial planning practices and procedures. This included 164 dairy producers, 871 beef cattle producers, 453 hog producers, 614 horse producers, 357 sheep or goat producers, 402 poultry producers, and 14 producers of aquatic species.

A total of 2296 volunteers assisted with extension programming. These individuals contributed 19,145 hours of their time, valued at \$191,450. Estimated financial impacts on producer income were \$6,265,110. This included income that resulted from improvements in animal nutrition, breeding practices, marketing, buildings and facilities, and health and general management practices.

### **North Carolina Extension**

Farmers will be assisted in evaluating alternative production practices to ensure continued farm productivity and enterprise profits.

- b. Program accomplishments include the adoption of practices such as field selection, pest management, improved varieties, harvest techniques, and equipment adaptability. The number of producers adopting these practices was 3,446 and 388,290 acres were impacted. The financial impact of adopting these practices was estimated to be \$451,715,400. The 405 volunteers involved contributed 2193 hours, worth \$ 21,930.

### **North Carolina Extension**

- c. Farmers will continue to evaluate recommended or conventional production practices and management systems, integrating them into sustainable farming systems.
- b. Program Accomplishments: 9350 producers adopted best management practices in such area as pest control, tillage, fertilization, labor management, etc, that increased their yields. 17,838 producers increased their awareness and knowledge of production systems. 6,044 producers adopted practices that lowered production costs or kept production costs below income from the farm. 1,161,365 acres were affected. All of this contributed to stabilizing or increasing the number of farms and the crop acreage on 4224 farms and 92,090 acres.

The financial impacts were as follows: Increased profits through adoption of practices such as choice of high yield varieties, tillage, pesticide application timing, improved marketing of \$9,939,682 and reduced costs through improved pest management of \$6,189,800.

A total of 1173 volunteers were involved in programming, contributing a total of 11,769 hours valued at \$ 117,690.

### **North Carolina Extension**

- a. Beef Marketing - A recent comparison by Extension Specialists and Field Faculty of graded sales and weekly auctions held during the same time frame demonstrated a significant increased value associated with selling cattle in larger uniform lots. A comparison of the average weekly auction prices, as reported by the Market News Section of the N.C. Department of Agriculture (and Consumer Services), and graded sale averages for sales held during the same time frame revealed that the graded sales are indeed a good marketing option for commercial beef producers.
- b. Impact - Consignors to this year's graded sales received an additional \$222,000 for their steers and \$200,000 for their heifers, compared to selling in weekly auctions. This average premium does not include the additional savings consignors receive at graded sales through payments based on in-weights versus payments based on out-weights in

weekly auctions. We estimate this difference to be at least 3%, which would amount to an additional sale weight of 17 lbs. (570 lbs. average weight times 3%) at the average per hundredweight price of about \$86.50, or an additional impact of about \$14.70 per head. These savings would add \$230,000 to the receipts of consignors for graded sales held this fall. Combined, the net increase in income for calves sold through graded sales exceeds \$650,000 or \$41.00 per calf. This difference amounts to an average premium of 9% over weekly auction sales.

c. Scope of Impact - State Specific

**Mississippi Combined 1862 Research and Extension**

a. Rice prices were poor in 2000 and producers were faced with dramatically increased fuel prices. Fuel to operate water pumps is a major cost of rice production, so any reduction in this cost benefited farmers.

The Mississippi State University Extension Service held four rice meetings in the Sunflower County area to introduce an alternative method of watering rice fields that saves pumping cost. Both producers and consultants attended the meeting.

b. This alternative method of watering rice fields saves as much as 30 percent in water use, for an average of \$20.36 per acre saved in fuel costs. If each farmer adopted this method, the total savings to the south Delta crop would be \$1.85 million.

c. Smith-Lever funds

d. State-specific

**Mississippi Combined 1862 Research and Extension**

a. Farmers in Sharkey County have routinely applied a combination of Roundup and 2,4-D herbicides to burn down winter weeds on row crop fields and prepare about 100,000 acres for spring planting. These materials cost \$10.20 per acre in 2000.

The Mississippi State University Extension Service advised these farmers to use a banded application of Gramoxone Extra restricted to the tops of the rows rather than their normal burndown herbicide program. This banded application costs farmers about \$3.87 per acre and was done along with the planting, saving an application cost. Farmers used this method on an estimated 5,000 acres of corn in Sharkey County.

b. Sharkey County farmers who followed this recommendation saved \$6.33 per acre on herbicide costs for a total savings of \$31,650 in chemicals alone. An additional application cost on these 5,000 acres would have averaged \$15,000, bringing the total savings to \$46,650 for Sharkey County farmers.

c. Smith-Lever funds

d. State-specific

### **Mississippi Combined Research and Extension**

a. Because of drought, the Mississippi Forestry Commission imposed a statewide burn ban that prevented rice farmers from burning rice straw after harvest. Tillage to dispose of this straw would increase production costs \$8 to \$16 per acre at a time when commodity prices were very low.

Through coordination with Delta Council and the Mississippi Forestry Commission, a procedure was established to allow each county Board of Supervisors to request exemption from the burn ban for a specified time. Each county agent in the rice-growing region was given sample letters to supervisors to request the exemption. These letters also described proposed procedures for burning rice fields.

b. Exemptions were granted in most rice growing counties. Assuming that at least half of the rice acreage was burned after harvest, rice farmers saved \$8 to \$16 per acre, or between \$880,000 and \$1.76 million.

c. Smith-Lever funds

d. State-specific

### **Alabama Combined Research**

**“Statement:** Production of shiitake mushroom using composted poultry litter is an effective way to dispose of the litter and use its nutrients. By increasing the yields of shiitake mushrooms, using various production interventions producers can earn more and shiitake mushroom prices at the market can potentially be lower. Alabama A&M University researchers inoculated three hundred sweetgum logs were by to establish the nutrient supplementation rate and source portion of this research. The nutrient supplements were ammonium sulfate, ammonium chloride, sulphur-coated urea and urea applied at three rates and two times during the life of the logs. The sweetgum logs were inoculated with strain WR46. Supplies and equipment have also been obtained to begin the sawdust block/poultry litter/nutrient supplementation experiments. Three hundred sawdust blocks were formulated using sulphur-coated urea, resin coated urea, composted poultry litter, soy flour and yeast extract at various rates and combinations. Articles on mushrooms are being summarized and web page development progresses.

**Impact:** Although no quantifiable results have been attained yet, the goal of this research is to increase the yields of shiitake. This will increase returns to producers with a minimal increase in inputs. It is anticipated that a 0.1-pound per unit increase in yields could result in a \$400 increase in returns per 100 sawdust blocks. Large commercial producers generally fruit 2,000 to 4,000 blocks per year. The total increase in returns on a 0.1-pound per block increase in production would result in \$8,000 to \$16,000 per year.

**Source of Federal Funds:** Evans-Allen and State Agricultural Experiment Station

**Scope of Impact:** State Specific”

## **Alabama Combined Extension**

### **“Low-Volume Beef Producers Get Bulls**

Beef cattle production is the major source of income for most limited resource farm families in the Alabama Black Belt counties. Traditionally, limited resource beef producers have marketed lightweight calves that have poor carcass quality. These calves took too long to reach the desirable market weight to earn reasonably good prices and profits. The Tuskegee University Cooperative Extension program with assistance from the Natural Resource Conservation Service conducted intensive beef cattle workshops and clinics, concentrating on upgrading herds with performance tested bulls and improving nutritional programs. Health management, parasite control, and pasture and hayfield renovation were also emphasized and demonstrated. During the year, Four producers in Dallas and Perry Counties reduced fertilizer applications by incorporating legume crops in grazing pastures and hayfields. Twenty-two producers in these counties and in Lowndes and Wilcox counties increased weaning weights, some on an average by 142 pounds and market weights by 208 pounds, thereby, increasing their income by \$135.05 per calf. One producer started his own pasture feedlot operation to increase production of beef in a shorter time period.”

## **Hawaii Combined**

- a. Description of activity. Improve field management programs for pests of flowers and foliage by minimizing the use of chemical pesticides and by maximizing the use of biorational and non-chemical control tactics. Develop post-harvest disinfestations treatments, including heat treatment and irradiation that can be integrated with field pest management programs to ensure pest-free flowers and foliage for export. (944H)
- b. Impact/Accomplishment. Three grower/shippers who have implemented hot water treatment for 1 to 2 years (1997-1999) have reduced dollar loss due to quarantine-rejected shipments by 50%, decreased labor requirements and lowered post-harvest insecticidal dip by 80 to 90%. These grower/shippers represent 14% of the floriculture industry and 8% of the export floriculture industry. Two additional grower-shippers who represent a major portion of shipments from Hawaii to California will implement hot water treatment in 2001.
- c. Source of Federal Funds. Hatch.
- d. Scope of Impact. State Specific.

## **Idaho Extension**

Elmore County Extension educator reports that his “Maximizing Grain Yield With Optimal Fertilizer Use” project created greater impact for agriculture profitability and sustainability and again received national recognition. Data obtained from fieldmen and growers show that since

1985 over 1,980,000 lbs. of nitrogen have been saved that otherwise would have been lost to surface and ground water, or by other chemical or physical processes. Last year in cooperation with fieldmen, we reviewed over 300 soil and petiole samples. UI fertility guides and our local data were used to eliminate excess fertilizer. We were able to reduce fertilizer application from 0-28% on sugar beets, potatoes, grain, mint and alfalfa.

## **Indiana Extension**

*Description:* For over 30 years the County Agricultural Extension Educator, along with other area Extension Educators, specialists, local farmers and seed dealers plan, plant, observe and harvest replicated variety plots. In 2000 the plot consisted of 71 yellow corn and 25 white corn varieties replicated 4 times and 80 soybean varieties replicated 3 times. At harvest time, a Plot Breakfast is held to present the results of the corn yields and to look at standing corn and soybean plots as well as to conduct timely educational presentations to help producers keep current on issues and concerns with harvest, handling, storage and marketing of the grain. Since 1996, samples of corn and soybean varieties have also been analyzed for grain composition in order to build data for farmers to more effectively select varieties for specific uses and markets. Corn and soybean plots have been evaluated for insects and diseases as well as observed for standing ability of the plants.

b: *Impact:* A survey of farmers indicate that they have been able to earn as much as \$40 per acre more due to the marketing information presented. Over 200 people attend a Plot Breakfast annually to hear timely agronomic information, grain harvest, drying and handling recommendations and the Ag Marketing Outlook. Attendees have the opportunity to evaluate potential hybrid selections by observing the standing replications with the published yield data. The plot trial demonstrated over 60 bu/ac difference in corn yield and over 25 bu/ac difference in soybean yields. This is \$125 per acre difference in potential return to the producer. White corn data is of particular interest to several producers in southwestern Indiana because of the premium price that it often brings due to its use in the food industry. Over 1,000 copies of the plot results are distributed to the farmers and seed dealers. Due to the uniformity of plots and the replicated procedure, this plot is considered one of the most reliable sources of data. These plots are not the only criteria that farmers use to select hybrids, but is used as a major input into their variety selections. Grain composition analysis for all corn and soybean varieties is also available and is used by farmers and grain merchants to sell specific varieties for an additional 20 to 30 cents per bushel. There are only a few plots that provide composition analysis data.

c. *Source of Federal Funds:* Smith-Lever

d. *Scope of Impact:* State Specific

## **Louisiana 1862 Combined**

**Stakeholder Input**– Soybean and grain producers have indicated at Extension advisory committee meetings, at producer meetings and at grower association meetings that production of these crops is not profitable for the average grower. We instituted a program in 1994 to prove

that profitability is possible if all extension recommendations are followed. This is a three-state program of Louisiana, Arkansas, and Mississippi and is known as the Soybean Research Verification Program. It involves showing growers what will contribute to higher yields and to lower costs. We incorporated the Precision Ag technology into the program in 1998 and continue this aspect to the present. Grant funds from both the state soybean promotion boards and from the United Soybean Board help fund necessary expenses which occur such as increased travel, extra technical help, and equipment. We collaborate with our neighboring states at special planning sessions in the spring, and at regional producer meetings such as the Tri-State Soybean Forum, Southern Soybean Conference, and the Commodity Classic. These meetings are also used as a means of comparing and sharing results and reporting to the stakeholders.

**Impact** – Growers in the program in Louisiana during this reporting period produced 93% more soybeans than the average grower in the state. They produced them at a cost of \$3.95 per bushel, which compares very favorably to the current price of about \$5.26 per bushel. The other cooperating states showed similar trends. These results have been shared at parish field days, statewide and regional grower meetings in the winter, and through publications which every grower receives. Because of the success of the soybean research verification program in Louisiana, the rice growers have funded a similar program. Cotton, hay and sugarcane specialists are also planning to develop research verification programs.

**Source of Funds**– Smith-Lever, grants from the Louisiana Soybean and Grain Research and Promotion Board and the United Soybean Board.

**Scope of Impact**– Much of the work in this program is derived from collaboration with Mississippi and Arkansas. Collaboration with research scientists of the LSU Agricultural Center, and with those from the above two states is responsible for our recommendations to growers. We have regional and state committees to formulate what we ask our growers to do. These committees are multi-discipline in nature and involve both Extension, Research, and USDA personnel. We use regional, technical meetings to train agents and growers on practices associated with the above stated themes. Some of these meetings are: Southern Weed Science Society, Southern Soybean Association, Tri-State Soybean Association, Commodity Classic, and the American Society of Agronomy.

About 25% of efforts are multi-state. Meetings, publications, and recommendations derived from these efforts amount to  $0.25 \times 3.41 \times \$54500 = \$46461$ . Multi-functional efforts amount to 35% of total effort and include agent training, formulation of recommendations, publications, and trouble shooting during growing season. These efforts amount to  $0.35 \times 3.41 \times \$54500 = \$65046$ .

## **Massachusetts Combined**

**Brief Description of Program or Activity:** A number of apple cultivars have been under trial at the University of Massachusetts Horticultural Research Center for several years. The intent of this research has been to identify cultivars particularly suited to Massachusetts climatic conditions and to roadside-stand sales. Information and recommendations have been transmitted

to fruit growers through educational programs, the periodical *Fruit Notes*, the newsletter *Healthy Fruit*, and the website *UMass Fruit Advisor*.

**Short Impact/Accomplishment Statement:**

- Approximately 60 acres of new apple cultivars were planted by commercial orchardists.
- New apple cultivars resulted in increase sales at roadside stands of 20%.

**Source of Funding:** Smith-Lever, RRF NE-183, Massachusetts Fruit Growers Association

**FTEs:** 0.5

**Scope of Impact:** Multistate Integrated Research and Extension (MA, RI, CT, NY, VT, NH, ME)

**Brief Description of Program or Activity:** A number of apple and peach rootstocks have been under trial at the University of Massachusetts Horticultural Research Center and at a few commercial orchards for several years. Particular attention has been paid to rootstocks that provide a reduction in tree size, thus reducing labor required to prune and harvest and reducing the amount of pesticide needed per acre. Also, rootstocks have been selected that are well adapted to our weather conditions and are resistant to normal pest pressures. Information and recommendations have been transmitted to fruit growers through educational programs, the periodical *Fruit Notes*, the newsletter *Healthy Fruit*, and the website *UMass Fruit Advisor*.

**Short Impact/Accomplishment Statement:**

- Approximately 150 acres of new dwarfing apple rootstocks were planted by commercial orchardists.
- Current year's planting, and planting during the previous four years resulted in overall pesticide-use reduction of approximately 10%.
- Current year's planting and planting during the previous four years resulted in approximately a 10% increase in profitability.

**Source of Funding:** Smith-Lever, RRF NC-140, Massachusetts Fruit Growers' Association

**FTEs:** 0.5

**Scope of Impact:** Multistate Integrated Research and Extension (MA, RI, CT, NY, VT, NH, ME)

**Missouri 1862 Extension**

Show-Me Select cattle bring higher prices at market sales. Beef producers are netting greater profits at market through Show-Me Select Replacement Heifers. UO/E faculty work with 78 veterinarians and 235 producers to raise genetically superior animals that bring higher prices and create a reliable source of replacement heifers. At the 2000 Show-Me Select sales, heifers sold on average for \$1,047. The total net impact of the Show-Me Select Program on the state's economy during 1999 was \$6 million.

The Show-Me Buying Cooperative markets more than 300,000 pigs annually. The cooperative's members purchased more than \$25 million in feed annually. By purchasing cooperatively, the members realized an estimated annual feed savings of \$5 million.

The two large-scale dairy operations, representing 2,000 cows, required a total financial investment of \$6.8 million, of which the statewide impact was \$5.2 million. Annual milk sales from these operations were in excess of \$5.2 million. These operations had total input costs in excess of \$4 million, and, when economic multipliers were considered, created approximately 200 new jobs throughout Missouri.

## **Key Theme – Agricultural Competitiveness**

### **West Virginia Research**

Impacts – *in ovo* treatment with chicken growth hormone increased feed efficiency in broilers approximately 5 % with a 20% faster growth rate which occurred mostly in breast and leg muscles.

Feeding trout a high energy (18% fat vs. standard 11%), high protein (48% vs. standard 38%) resulted in a 50% increase in weight gain.

### **Texas 1862 Extension**

#### *B. Impact of Programs*

This program is designed to encourage adoption of research-based IPM practices to manage pests in row crops. IPM programs that encourage field scouting and pest management based upon scientifically established thresholds of insect, weed and disease pests are widely adopted in Texas. In four survey areas in Texas in 1999 (El Paso-Hudspeth, Runnels-Tom Green and Gaines counties), IPM programs are heavily relied upon by large agricultural producers to reduce cost of production, reduce pesticide applications and increase profits in the production of field and tree crops. A brief description of these programs is provided.

El Paso-Hudspeth: In this case study, 83% felt that IPM improved pest control decisions; 48% reduced pesticide applications while only 7% increased them; 52% increased crop yields, with none reporting decreased yields and 48% reported increased profit while none reported decreased profit. Farmers surveyed produced 17,246 acres of cotton and 1905 acres of pecans.

Runnels-Tom Green: Participants in this case study reported that 100% improved pest control decisions by using IPM methods; 58.3 % felt that IPM greatly reduced risks of crop production; 41.7 felt that risks were slightly reduced; 100% frequently checked with the IPM agent for pest management decisions; 66.7 % frequently used the IPM newsletters while the remaining 33.3% only checked the newsletters sometimes.

Gaines: While 100% of the participants in this study employed crop consultants, 44 % also used IPM agent scouting reports to make pest control decisions; 53 % using IPM reported reduced pesticide usage, while only 12% reported increased use; 60% reported increased yields while none reported decreased yields; 62 % reported increased profit while 9% reported decreased profit; 90% reported either frequent or occasional visits with the IPM agent; 100% reported consulting the IPM newsletter either frequently or occasionally and 84% considered the newsletter highly useful.

### **Texas 1862 Extension**

One very effective educational effort involving many state and Federal agencies has been the reduction of MDLs (Maximum Daily Load) of atrazine in surface waters. Atrazine is an inexpensive, highly effective and widely used corn herbicide. In two locations, atrazine detections exceeded MDLs, causing concern on the part of water system managers and farmers

alike. Persistent pollution of surface waters would have caused the label cancellation of this valuable tool, costing Texas farmers over \$45 million annually due to yield decline and additional cost of alternative herbicides according to the National Agricultural Pesticide Impact Assessment Program. When the Marlin City Lake and the Aquilla Reservoir were discovered to have excess levels of this herbicide, TAEX formed a task force along with the Texas Natural Resources Conservation Commission and the Texas State Soil and Water Conservation Board and the US EPA. This group met with farmers, representatives of the companies selling the herbicide, city officials and others to develop a program to allow farmers to continue to use the herbicide but to reduce off site movement. After intensive educational efforts on BMPs (Best Management Practices) for the use of atrazine, water quality with respect to atrazine has significantly improved in both reservoirs, special treatment measures for water have been prevented, and a valuable herbicide has for the time being been retained by Texas corn farmers, saving approximately \$45 million per year in production costs and lost yield revenue.

### **Texas 1862 Extension**

#### *B. Impact of Programs*

One thousand six hundred seventy producers from 10 states have participated in the Texas A&M Ranch to Rail program to learn more about how their calf crop fits the needs of the beef industry and what creates value in beef marketing. They learned that they could increase their net return per head by \$67 through retained ownership. They also learned that an effective health management vaccination program at the ranch of origin reduced bovine respiratory disease at the feedyard to reduce production costs by \$90 per head.

The database on the 15,000 entries in Ranch to Rail revealed that administration of specific viral vaccines, the timing of their administration and the days weaned prior to marketing greatly impact production efficiency and carcass quality. The outcome of this result led to development of the Value Added Calf Vaccination Management program (VAC). The four largest cattle marketing organizations in the state have adopted the VAC guidelines and have special feeder calf sales that have resulted in increased values for ranches in excess of \$70 per head due to industry demands for healthier cattle.

### **Tennessee Combined Research and Extension**

#### **Title:**

The Marketing Club Network

#### **Description:**

The University of Tennessee Agricultural Extension Service in 8 west Tennessee counties has participated in the activities of the Marketing Club Network. The Marketing Club Network is jointly sponsored by the Extension Services in 9 states, Mississippi Farm Bureau, and Agrimark. On a monthly basis, these locations participate in a marketing conference call with nationally known and top cotton and grain analyst. In the past year, over 100 farmers in this 8 county have attended.

#### **Impact:**

Participating Network farmers have learned about the market outlook and marketing strategies that have had the potential to increase their net income. Survey results indicate that 76% of those attending have used the information presented at the Marketing Club Network Conference Calls. Twenty-five responded that, in using the information, they gained \$302,500 over what they normally would have done. This is an average of \$12,100 per farm.

**Funding Source:**

Smith-Lever, State and Private agribusiness funds

**Scope:**

Multistate Extension

**South Dakota Combined Research and Extension**

*Output:* The program “Matching Cattle to Markets” demonstrated to cattlemen the effect of their marketing choices, measured in dollars and cents. The goal of the program was to improve producers ability to evaluate live animals and improve their marketing skills.

*Outcome:* This is a multi-state effort between South Dakota and Minnesota. Since the completion of the program, producers have used the grid system of marketing, sorting livestock for cutability and quality.

*Impact:* Producers report earning more money from their cattle when using the system. One producer reported increased profits of an average of \$1.05 per pound, or \$718 for the animal. Another producer reported \$705 in premiums and \$512 in discounts. Overall, 39 percent of the producers changed their cattle marketing program.

**Oregon Research**

Umatilla Russet, a new potato cultivar, was released in 1999. Nearly 3400 acres of Umatilla Russet seed was produced in the U.S. (3176 acres) and Canada (206 acres) during the 2000 growing season. Umatilla Russet yields an average of 21% more U.S. No. 1s than Russet Burbank under approximately the same fertilizer regime, has 10% less hollow heart/brown center than Russet Burbank and is immune to net necrosis, a tuber flesh blemish caused by leafroll virus infection. Seed of Umatilla Russet is currently selling at a \$2.00/cwt premium to Russet Burbank, or a \$2.4 million gross increase in seed sales (\$259,000 for Oregon in 2001). Available seed can plant 60,000 acres during the 2001-growing season, replacing Russet Burbank acreage. Yield increases, one less pesticide application per year and internal quality improvements would result in additional gross sales increase of \$27.0 million over Russet Burbank (\$3.4 million for Oregon in 2001).

**Oregon Extension**

OSU Extension specialists, working with the Oregon Seed Council and the Oregon Department of Agriculture, introduced China to high-quality Oregon cool-season turf and forage grass seed varieties. Establishing species adaptation trials and management workshops around China has helped prove that Oregon grass seed is suitable in many regions of the country for erosion control and environmental enhancement. As a result, Oregon grass seed exports to China have

increased nearly 19-fold from 338,500 pounds in 1994 to 6.4 million pounds in 1999. In 5 to 10 years, the Oregon Seed Council says exports could approach 100 million pounds.

Impact - \$3 million per year in Oregon

Source of Federal Funds – Smith-Lever 3b&c

Scope of Impact – Multistate Integrated research and Extension

### **New York Combined Research and Extension Cornell Plant Breeders Develop Disease-Resistant Birdsfoot Trefoil Variety**

Many New York farmers must grow hay and pasture crops on poorly drained or shallow soils. Birdsfoot trefoil provides a productive forage legume that helps farmers remain competitive. Fusarium wilt is the most devastating trefoil disease, killing stands as early as in the seeding year. This disease is spreading and has hurt the competitive position of New York farmers. All current varieties of birdsfoot trefoil are susceptible.

Cornell breeders and plant pathologists have developed 'Pardee' birdsfoot trefoil with high forage yield and strong resistance to Fusarium wilt. On a 0 (no disease symptoms) to 5 (dead plant) basis, Pardee rated 2.45 compared to 4.64 with Norcen, a very popular variety during the last 20 years. In the first production year of an experiment, Pardee yielded 4.49 tons/acre of dry matter forage compared to Norcen's 2.31 tons/acre.

Pardee trefoil will help more than 10,000 New York farmers with thin or poorly drained soils to maintain their competitiveness. Pardee will be particularly helpful to growers on small farms in hilly areas of New York, who have limited choice of productive crops. For some, the loss of trefoil from Fusarium wilt threatens their economic survival. Birdsfoot trefoil is included in seedings on about 200,000 acres in New York, producing more than \$10 million of hay annually. The Pardee variety will remove the Fusarium wilt threat to help maintain the competitiveness of New York farmers. Seed will be available to growers in 2002.

### **New Mexico Combined Research and Extension**

NMSU plant breeders are developing low pungency onion cultivars in successive maturity groups to facilitate a continuous supply of mild onions from late May through mid-August. Two low pungency, yellow onion cultivars (NuMex Freedom and NuMex Arthur) were released in 2000.

- d. Further development and release of high-yielding, high-quality, well-adapted, bolting-resistant, disease-resistant, short-, intermediate-, and long-day onion open-pollinated and hybrid varieties with varying maturities, pungency levels, and scale colors will support industry growth in New Mexico.
- e. Source of federal funds — Hatch

f. Scope of Impact — State Specific

**Nebraska Research**

**Impact Statement: Wheat Breeding Payoffs**

*(Relates to Goal 1, Output Indicators 1 and 2, and Outcome Indicator 1)*

**Issue: (Who cares and why?)**

To be competitive, Nebraska growers need wheat varieties that are top performers in milling and baking as well as in the field, yet few commercial seed companies breed wheat for this region.

**What has been done?**

University of Nebraska and USDA-Agricultural Research Service scientists based in Lincoln, Neb., collaborate on wheat research and breeding to develop improved varieties that are widely grown throughout Nebraska and beyond. NU's wheat breeding program focuses on improving both agronomic and end use characteristics. The result is higher-yielding varieties with the grain quality demanded by millers, bakers and, ultimately, consumers. In statewide variety trials, researchers compared three recent and widely grown NU varieties — Alliance, Arapahoe and Windstar — to Scout 66, the first great modern wheat variety from Nebraska, which was released in the 1960s and is a longtime industry standard. The three new NU varieties yielded 19 percent more than Scout.

**Impact:**

NU-developed hard red winter wheat varieties are planted on roughly three-fourths of Nebraska's wheat acres. These improved varieties have boosted Nebraska's annual yields by 12 million bushels since the 1960s. They're worth approximately \$31 million to \$37 million annually to Nebraska producers based on increased yield alone. These improvements are good for consumers, too. Nebraska wheat growers can feed nearly 5 million more Americans a year than they did on the same acreage in the 1960s.

**Funding:**

USDA-Agricultural Research Service  
Nebraska Wheat Board  
Hatch Act  
NU Agricultural Research Division

**Summary:**

Varieties developed through the University of Nebraska's wheat breeding program provide Nebraska growers with improved wheats that perform well in the field and offer the quality characteristics millers and bakers demand. Nebraska-developed hard red winter wheat varieties are planted on roughly three-fourths of the state's wheat acres. These varieties have increased Nebraska's annual yields by 19 percent compared with the 1960s. These improved varieties are worth roughly \$31 million to \$37 million annually to Nebraska producers based on increased yield alone. Consumers benefit, too. Yield improvement in these varieties mean Nebraska wheat growers can feed nearly 5 million more Americans a year than they did on the same acreage in

the 1960s.

### **North Carolina Extension**

Crop farmers, farm organizations, and agribusiness's will become knowledgeable of local and global market factors and develop strategies to cope with or take advantage of these factors to maximize farm profits.

Program Accomplishments: 5,089 program participants increased their awareness and knowledge of the impacts of global market trends and trade policies. 662 participants adopted practices associated with new products. 831 participants adopted practices that impacted marketing successes.

Estimated financial impacts included \$2,719,003 in increased profitability through adoption of local and global marketing strategies and \$224,860 increased profits through adoption and marketing of new products. 78 volunteers were involved and contributed 327 hours valued at \$ 3,270.

### **Mississippi Combined 1862 Research and Extension**

a. Making a profit in farming is especially difficult when markets are down, but farmers in the southeast have some assistance in this area through the efforts of the Marketing Club Network.

The Mississippi State University Extension Service originally offered small marketing clubs where participants marketed the products of hypothetical farms, learning the process without any risk. Later, they partnered with two other groups to offer marketing training to farmers in 10 southeastern states. Between 600 and 800 farmers participate in monthly teleconferences at 65 to 80 locations to hear marketing information without spending much time traveling. The one-hour conference calls are held two business days after the supply-and-demand report is published each month.

b. The teleconferences get this information to farmers two weeks to a month sooner than they could get it anywhere else, and farmers can ask questions of the speakers. Participating farmers have reported increased income from \$500 to \$150,000 because of good marketing decisions they made based on information learned in the network.

c. Smith-Lever funds

d. State-specific

### **Hawaii Combined**

a. Description of activity. To improve the viability of Maui County's diversified agricultural industry by increasing efficiency and productivity of the farming system. Develop

and maintain an integrated approach for the management of disease and insect pests affecting edible crops. Increase grower involvement in resolving problems facing industry (e.g., marketing, water, transportation, etc.). Increase efficiency in the delivery and dissemination of research-based information. (21-030)

b. Impact/Accomplishments. As a result of the field trials, 20 taro growers learned how to better manage the taro leaf blight by using disease resistant taro varieties. The growers like the P1, P5, P7, P8, P10, and P20 taro varieties, which they have adopted. The P7 variety is especially prized for poi processing. During the months of December through March when the taro leaf blight is severe, the use of the Palauan taro varieties have allowed the Keanae growers to harvest approximately 90% of the taro leaves for luau sales as compared to less than 25% recovery for the industry standard variety Bunlong. These growers can now also harvest the leaves from poi taro paddies. The use of the Palauan taro varieties has also reduced the growing time by several months. In Keanae, growers are now able to harvest the Palauan taro within 6 to 9 months as compared to the 9 to 14 months required for the industry standard Maui Lehua Variety.

d. Source of Federal Funds. Smith-Lever 3 (b) and (c).

e. Scope of Impact. State Specific.

### **Maine Extension**

***Garden Pro*** is a four-day, 20-hour “train the trainer” program conducted by UMCE for garden center employees. The program’s primary goal is to educate the garden center industry, using the premise that the best way to compete in a market dominated by mass marketers is to offer service and information in addition to a product. Participants learned that educating consumers is a great service which will bring repeat business. Users of the 1998 Garden Pro Answer Book reported that its use increased their personal sales an average of \$1,357 during the 1999 season, resulting in a total of \$230,175 in additional garden center sales in Maine.

***Scope of Impact: State Specific***

## **Key Theme - Plant genomics**

### **Wisconsin Research**

The issue: Some consumers and countries want to buy corn that does not contain non-corn genes. However, farmers who want to grow corn destined for those markets have difficulty ensuring that their corn does not contain genes from genetically engineered corn. In 2000 approximately 30 percent of U.S. corn acreage was planted to varieties that were altered to contain genes not native to corn. All current hybrid corn varieties readily cross-fertilize and wind can spread corn pollen for several hundred feet. Therefore, when farmers plant corn that has not been genetically engineered it may be pollinated by genetically altered hybrids in an adjoining field; therefore, the crop may contain genes from genetically altered varieties when it is harvested.

What's been done: A UW-Madison corn geneticist has discovered a genetic barrier in teosinte, a Mexican relative of corn. The barrier is encoded in a cluster of genes. The gene cluster allows teosinte to retain its genetic identity by keeping it from acquiring genes from cultivated corn. The gene-barrier technology is the subject of a provisional patent application by the Wisconsin Alumni Research Foundation and is being licensed to a number of companies. The genetic barrier is being transferred to hybrid corn using traditional breeding methods. Seed should be available for testing in 2002 and commercial quantities of seed may be available to farmers in 2003.

The impact: Commercially available hybrid corn with the barrier would allow farmers to grow corn that would not become cross-pollinated with genetically engineered corn. Farmers who grow such hybrid corn could compete effectively in markets that exclude genetically engineered grain.

### **Wisconsin Research**

What's been done: Animal geneticist Brian Kirkpatrick is identifying genes that increase the incidence of double ovulation and twinning in cattle. He has now confirmed that there is a gene on cattle chromosome 19 that affects twinning and has strong evidence for genes with similar effects on two other chromosomes. He is developing new DNA tests that will allow producers to develop herds with a high or low frequency of twinning. Kirkpatrick also publishes a newsletter for those who desire more twin calves and his group has cooperated with producers to start a public breed registry for cattle with a high frequency of twinning.

The impact: With proper management beef producers are finding that twins can be an advantage. Beef cattle that consistently produces twins could lower production costs by 20 percent or more. Producers can use the initial test to check for one of the key genes that controls twinning. Both beef and dairy producers could use DNA tests to develop herds that produce more -- or fewer -- twin calves.

### **Washington Research**

1. Identification and introduction of traits for Cephalosporium resistance in winter wheat varieties are reducing the quantities of pesticides required in crop production and improve quality and yield.
2. Rhizoctonia-resistant spring wheat varieties are improving crop productivity and economic return, reducing our dependence on pesticides and improving crop performance under

reduced tillage conditions. Zak was released as the Wawawai replacement and is expected to become the primary spring wheat in commercial production in the region within 3 years

3. Transgenic barley grains will be able to convert barley from a low to high energy feed source for feed grains.

4. New genetic knowledge of barley will enable researchers to release new varieties in two years for improved productivity and quality traits.

5. Improved hop varieties with greater yield potential will enable growers to become more competitive.

6. Newly released varieties of pea, lentil, chickpea, sugar beets, and beans have enabled growers to maintain or increase production and while improving quality for economic advantage while reducing their cost of production.

### **Tennessee Combined Research and Extension**

#### **Title:**

Germplasm development and cellular and molecular genetics of forage grasses

#### **Description:**

The University of Tennessee has developed a new orchardgrass variety that has high yield and much higher persistence under high grazing pressure and drought conditions than 'Benchmark', the current most grown commercial variety. The UT variety has been approved for release and given the name 'Persist'.

#### **Impact:**

Bovine producers will have an alternative cool-season grass to tall fescue. It should be especially attractive for dairy farmers and to farmers who wish to produce hay in addition to grazing. Orchardgrass is considered to be more palatable and have higher nutritional value than tall fescue.

#### **Funding Source:**

Hatch and State

#### **Scope:**

State specific

## **Key Theme - Animal Genomics**

### **North Carolina Extension**

- a. The development of improved genetic selections of livestock not only can result in improved production characteristics such as faster growth rates and better feed efficiencies, but can also enhance the animal's disease resistance and improve nutritional quality of the finished meat product. Under the NC On-Farm Performance Testing Program, nearly 17,000 head of swine were evaluated. This program currently provides genetic improvement to over 70,000 commercial sows producing approximately 1.2 million pigs annually.
- b. Impact - Phenotypic changes created by improved genetic selections indicate an additional reduction of 2 days to reach 250 pounds with 0.05 inches less fat in breeding animals that are selected to provide replacements in commercial production. If only a 1-day improvement is observed in bringing the animal to market, total annual costs of production are reduced by \$0.17/head or \$204,000.
- c. Scope of Impact - State Specific

### **Iowa Combined**

#### Description of activity

Activities have been directed towards comprehensive research, education and technology transfer to enhance the genetic ability of agriculturally important animals for the efficient and sustainable production of food for human consumption. Research efforts have focused on the use of quantitative methods for the genetic evaluation of breeding stock, the use of molecular genetic methods for identifying genes responsible for important traits in livestock and for improving the understanding of the genetic control of these traits. This research has included the integration of these technologies into effective selection programs for the genetic improvement of livestock populations. Extension efforts have focused on working with the stakeholders in the livestock industry, including producer organizations, individual producers, and the livestock genetics companies, to transfer and implement research results in practical genetic improvement programs. Research, education and extension efforts have focused on the main agricultural livestock species of dairy cattle, beef cattle, poultry, and swine. Expertise has been used to assist genetic programs for other important animal populations, such as seeing-eye dogs and to work with model species like the mouse.

1. Impact/accomplishment -  
The impact of the STAGES program on the swine purebred seedstock producers in the NSR has shown annual genetic trend changes for each of the four purebred breeds: Duroc, Hampshire, Landrace and Yorkshire. The annual genetic improvements realized over the last five years in litter size, litter weight, growth rate and percent lean that has been accomplished by these purebred populations accounts for over \$100 million in additional profits for their commercial customers.”

## **Key Theme - Animal health**

### **Wisconsin Research**

The issue: EMCV (Encephalomyocarditis virus) kills many animal species in zoos and research institutions. There are nearly 100 species of animals -- everything from monkeys to elephants -- that may encounter this lethal virus. Mice transmit the virus to other animals that deliberately or accidentally eat them. There is no effective way to treat animals infected with EMCV.

What's been done: To develop a vaccine for EMCV, UW-Madison virologists have removed part of the genetic code from Mengo virus, a closely related virus that also is typically lethal to mice. This change made the genetically altered Mengo virus incapable of causing disease. Tests with baboons, macaques, domestic swine and mice showed that inoculating them with the genetically engineered Mengo virus protected them against EMCV. The research created a live-virus vaccine that protects animals from EMCV. The scientists also have shown that they can add selected genes from other disease-causing microbes to the genetically modified Mengo virus, thus transforming it into a vaccine against other animal diseases.

The impact: The genetically engineered Mengo virus has been used to control an outbreak of EMCV in a colony of primates. Also, it has been tested on 24 species in zoos in New Orleans and Miami. Those tests indicated that there were no complications from the vaccinations. Blood tests indicated that the vaccinations would likely protect primates and many other animals from EMCV. Similar vaccines may one day be used in humans as well as animals. The scientists believe such vaccines would be many times safer than polio vaccines.

### **Virginia Combined Research and Extension**

Swine Pleuropneumonia Vaccine. Swine pleuropneumonia is a serious bacterial respiratory disease affecting pigs. Its high morbidity and mortality causes millions of dollars in production losses in the industry. VAES Researchers with the Virginia-Maryland Regional College of Veterinary Medicine have created a genetically altered live vaccine for swine pleuropneumonia that confers excellent immunity in pigs with minimal side effects. The vaccine has recently received final approval from the U.S. Department of Agriculture, and is now being marketed commercially as an agent to prevent pneumonia in pigs. In doing so, it has become the first avirulent live vaccine ever approved for preventing bacterial respiratory disease in animals.

### **South Dakota Combined Research and Extension**

“Nitrate Testing Saves Cattle” (also relates to Goals 2, 4, 5)

*Brief description of the activity* – During a drought, nitrates become concentrated in forages. Highly toxic nitrate levels during periods of drought can cause the death of cattle.

The SDSU Cooperative Extension Service offered educational programs on the risks of nitrate poisoning. As a result, livestock producers in six counties submitted 60 forage samples to be tested for toxic nitrate levels. Eight samples showed very toxic nitrate levels, and 17 samples were potentially toxic. The remaining 35 forage samples were safe for consumption.

*Short impact statement* - Livestock producers protected nearly a million dollars worth of cattle from nitrate poisoning with just \$800 in nitrate forage testing.

Smith-Lever 3 (b) & (c)  
State – State Funds

*Scope of impact, identifying which of the following apply to the activities conducted*

- (1) State specific
- (4) Integrated Research and Extension

### **Mississippi Combined 1862 Research and Extension**

a. The trematode parasite disease in channel catfish caused significant losses on several fish farms in 2000, with the number of cases more than double that of the previous year. White pelicans are the likely cause of late season parasite problems as they infect snails that live in catfish ponds.

When summer populations of white pelicans were spotted in the Delta, Mississippi State University publicized this fact and distributed updated information on the trematode and recommended actions. Farmers immediately treated 400 to 500 acres of ponds to reduce snail populations in ponds visited by the pelicans.

b. A quick response helped producers avoid estimated losses of 10 percent of fingerlings and foodfish production on over 300 acres. With an estimated loss avoidance of \$250 per acre, the value of the program was around \$75,000.

c. Smith-Lever funds (amounts and FTE not available)

d. State-specific

### **Mississippi Combined 1862 Research and Extension**

a. Fescue is often used as forage for cattle, horses, sheep and other ruminants, but much of it is infested with a fungus for which no treatment has been found. The fungus causes reduced adult weight gains, depletion of hair, rougher coats, elevated body temperatures, lower weaning weights in calves and a depressed immune system, and raises body temperatures which decreases reproductive rates.

For two years, Mississippi Agricultural and Forestry Experiment Station animal scientists have sprayed both fungus-free and fungus-infested tall fescue with an extract from seaweed and have observed results in trials. Spraying fescue with seaweed extract may help overcome some problems related to using infected fescue as forage.

b. Losses to fescue fungus are estimated to be \$6 million annually in Mississippi. This extract has produced steers with increased resistance to diseases and better weight increase. The improved immunity appears to be long lasting. Adding this extract to cattle diets or feeding them fungus-infested fescue treated with the seaweed extract has another unexpected benefit. Steaks and roasts from these cattle have an increased shelf life of one day over cuts from untreated cattle.

- c. Hatch funds
- d. State-specific

**Mississippi Combined 1862 Research and Extension**

a. A calf is born without the necessary antibodies to resist viral and bacterial infections which can cause high mortality rates within the first week of life. It is critical for the survival and subsequent growth of the newborn calf that it acquire passive immunity from receiving colostrum, the first milk a cow provides after giving birth that contains immunoglobulins necessary to protect calves from infections.

Recently completed research at the Mississippi Agricultural and Forestry Experiment Station confirmed that immunity levels of newborn dairy calves tube-fed colostrum at birth were higher than those that nursed their mothers. Ensuring that a newborn calf has sufficient levels of colostrum for the immunity needed to survive is extremely important as acquiring this immunity within the first few hours of birth almost ensures the calf's survival.

b. Calves that were allowed to nurse their mothers had consistently lower immunity levels than the calves that were fed a gallon of colostrum. University officials promoted this practice extensively across the state, and today most producers are using this technique, with a subsequent decrease in calf deaths.

- c. Hatch funds
- d. State-specific

## **Key Theme - Plant Production**

### **Washington Research**

Molecular techniques, genome mapping, and access to unique germplasm have allowed plant breeders to develop wheat, barley, peas, lentil, chickpea, sugar beet, hop, and turf varieties with better quality, and more resistance to diseases and insects.

Knowledge of plant genome information and fundamental biochemical and physiological traits have allowed scientists to identify and preserve valuable germplasm and to develop end use qualities for local, international, and niche markets.

Fundamental knowledge of ecological principles has permitted weed scientists to better understand how weeds interact in the soil environment and with crops to develop economically-based weed control strategies that are more compatible with the environment and the consuming public.

New plant varieties have increased production, reduced cost of pesticide inputs, diversified the cropping system, and increased access to new markets for cereals, food legumes, hops, alternative agronomic crops, and turf.

Discoveries of new techniques in molecular biology, genetics, and advanced marker techniques have allowed our scientists to speed up the time for release of new varieties, to detect disease-causing genes, and to develop varieties with new end-use qualities.

Alternative crops in combination with reduced tillage practices have increased the efficiency of crop production through reduced fertilizer and pesticide inputs.

### **Vermont Research**

Cultivar selection is a crucial decision for orchardists as it affects an orchard's competitiveness and profitability for many years. The ability of new apple cultivars to withstand fluctuating fall and spring temperatures is an important factor that needs to be considered in cultivar selections. This project analyzed the ability of four cultivars to withstand late spring freezes. A method of hardiness determination was developed. Results indicated that 'Honeycrisp' and 'Pristine' cultivars tolerate late spring freezes better than 'Ginger Gold' or 'Golden Delicious.' 'Honeycrisp' is being planted throughout the state because of its high fruit quality. The results from this study indicate that it is well adapted to survive Vermont's climate.

### **Virginia Combined Research and Extension**

Virginia Cooperative Extension peanut leaf spot advisories saved growers approximately \$39 per acre or \$3 million across 75,000 acres of peanuts grown in southeast Virginia. Sclerotinia blight advisories improved the efficiency of fungicide sprays. Frost advisories enabled growers to avoid frost damage to peanuts, which can reduce crop value by more than 50% at the farm gate. Soil temperature reports made the planting of crops more timely, and heat unit reports for peanuts made harvesting more timely.

## **Tennessee Combined Research and Extension**

### **Impact:**

From a survey of soybean producers, 80 percent have made changes in their variety selection based on information received from the UT Agricultural Extension Service. One hundred percent of soybean farmers surveyed said that they had increased their knowledge about the use of Roundup Ready soybean varieties from the UT Extension Service. Sixty percent of the 2000 crop year is believed to have been planted to Roundup Ready varieties. The use of Roundup Ready soybean varieties can reduce weed control cost by \$5 to \$7.50 per acre. This would result in an out of pocket herbicide savings between \$3.3 million to \$4.95 million dollars for Tennessee soybean producers.

In the standard group V Roundup Ready variety test there was a 5 bushel difference between the top 4 varieties and the bottom 4 varieties. If 60 percent of the 1.1 million acres were planted to the top four high yielding transgenic varieties and there is a yield increase of 5 bushels/acre, then Extension has helped to increase the soybean yield by 3,300,000 bushels. If the increase in bushels is multiplied by the LDP price of \$5.26 per bushel, there was an estimated increase in value of \$17,358,000 for soybean producers.

### **Funding Source:**

Smith-Lever and State

### **Scope:**

State Specific

## **Tennessee Combined Research and Extension**

### **Impact:**

Bt corn hybrids were grown on about 25 percent of the corn acreage in Tennessee in crop year 2000. This was an increase of 5 percent over the previous year. In UT research, Bt corn hybrids have produced an average of 10 bushels or more corn per acre than non Bt hybrids. Corn used for grain was grown on 590,000 acres. If 25 percent of this is Bt corn or 147,500 acres times 10 bushels per acre equals an additional 1,475,000 bushels. At \$2.00 per bushel the use of Bt corn gives an additional \$2,950,000 dollars to Tennessee corn producers.

### **Funding Source:**

Smith-Lever and State

### **Scope:**

State Specific

## **Tennessee Combined Research and Extension**

### **Title:**

Cotton Seedling Disease Control Program

### **Description:**

Tennessee cotton producers are losing 8-10 percent of their potential yield to seedling diseases. Research and demonstrations have been conducted to show producers that seedling disease can be controlled.

**Impact:**

Seedling disease control practices have reduced losses to only about five percent statewide. This amounts to an average increase of \$20.00/acre or \$12 million savings statewide.

**Funding Source:**

Smith-Lever, State and grants from Cotton Incorporated and chemical companies.

**Tennessee Combined Research and Extension**

**Title:**

Wheat Disease Control Program

**Description:**

Tennessee wheat producers lose 10 percent of their crop annually to diseases. Research and demonstrations have shown a 10 bushels/acre increase when foliar fungicides are used along with other cultural practices. Producers were encouraged to use these practices.

**Impact:**

About 75-80 percent of producers now use resistant varieties and/or foliar fungicides. This has increased yields by approximately 10 bushels per acre for those using these practices, giving an increase of \$12 million annually.

**Funding Source:**

Hatch, Smith-Lever, State and chemical company grants.

**Scope:**

Integrated Research and Extension

**South Dakota Combined Research and Extension**

*Output:* Crop cultivars, germ plasm and inbred lines developed and released for soybean, spring wheat, winter wheat, flax, and white corn. A landmark accomplishment, described in detail as a Key Theme, was SDSU's release of the first public soybean cultivar with a private transgenic trait (Roundup Ready). Commenting on this accomplishment, U.S. Senate Minority Leader Tom Daschle (D-S.D.) said the partnership between SDSU and Monsanto should be a model for future collaborative efforts between public institutions and private industry.

*Outcome:* The SDSU crop breeding program provides varieties adapted to South Dakota growing conditions. In the case of soybeans, SDSU has combined adapted varieties with transgenic traits that growers want. This is the only source of soybeans with this transgenic trait developed specifically for South Dakota.

*Impact:* Certified seed growers produced 50,000 units (50 lbs. Per unit) of 1091RR and will be available for producers during the 2001 season.

## **Oregon Extension**

Helping make dryland crops economically and environmentally sustainable

OSU Extension specialists and agents are helping Columbia Basin farmers conserve soil and improve economic returns by delivering educational programs on new cropping strategies. Basin growers have traditionally used a winter wheat/summer fallow rotation for grain production. Extension educators are introducing annual cropping systems that help reduce soil erosion, increase organic matter in the soil and, ultimately, earn higher net income for farmers.

Impact - \$3 million per year in Oregon

Source of Federal Funds – Smith-Lever 3b&c

Scope of Impact – Multistate Integrated Research and Extension

## **New York Combined Research and Extension**

### **Winter Raspberry Production**

Farmers in New York face a number of constraints, including a short growing season for their crops. Consumers wanting to eat locally face very limited choices during the winter months. Producing high-value crops off-season can offer new marketing opportunities for growers.

We have developed methods of producing fresh, local raspberries during the winter utilizing greenhouses that might otherwise sit empty during the colder months. Raspberries are grown in pots outdoors, then when their chilling requirement has been fulfilled, they are brought inside a relatively cool greenhouse. Our research team has developed a system for growing and fruiting raspberry plants under relatively cool temperatures. The system requires temperature and humidity control, plant manipulation, and uses bumble bees and predatory mites for pollination and pest control. The quality of the raspberry fruit is superb, and yields are quite high. Retail prices range from \$3.00 - 6.00 per half-pint (6 ounces), making them one of the most valuable of all agricultural products produced in New York State.

At least 5 growers in New York State are now producing winter raspberries commercially, as are many others throughout the Northeast and Midwest. In addition, we have a list of chefs who are interested in purchasing these raspberries once they become available for sale. Currently, growers are selling all they can produce at their farm markets.

## **Montana Research**

Activity. Improving monitoring techniques and cultural controls for the management of insect pests of small grains, forages and oilseeds.

Impact/Accomplishments. Activities focused on the impact of early cutting and raking of forages as alternatives to pesticide control of the alfalfa weevil. This research demonstrated that early cutting, an important cultural control, can be improved by addition of a raking step to the harvest process. As a result, a savings up to \$15 per acre was calculated for alfalfa hay production due to decreased pesticide need for alfalfa weevil control. With 1.7 million acres of harvestable alfalfa hay in the state, if this technique saves an insecticide application on 10% of the total acres, a savings of \$2 million can be realized.

Source of Funding. Hatch funds, Smith Lever, state matching

Scope of Impact. Multistate integrated research and extension with WY

MONB00704 'Dryland Cropping Practices' is entering into the fifth year of air drill opener evaluation assisting growers in the selection of openers appropriate to specific production needs. Selection and purchase of an inadequate opener type not only results in average direct cash loss of \$5,000 per mistake, but wheat yield differences associated with openers can amount to as much as 25 percent. Economic impact potential is very significant. If only a 10 percent yield advantage was gained by equipping air drills with more appropriate openers, and such improvement was made on air drills involved with only 10 percent of Montana's air-drill-sown wheat (approximately 3.7 million acres total) which at 30 bushel per acre and \$3.50 per bushel average yield and price respectively, would result in an average gross return increase of \$3.9 million.

Wheat stem sawfly causes up to \$30 million in crop losses annually. Project MONB00853 'Field Crop Production' cooperated with researchers at M.S.U. Bozeman on the selection, evaluation and release of two sawfly resistant winter wheat cultivars 'Vanguard' and 'Rampart'. The demand for Vanguard and Rampart seed in 1997 was exceptionally high. These two varieties will have a major impact on reducing losses due to sawfly.

### **Mississippi Combined 1862 Research and Extension**

a. The Mississippi State University Extension Service's Cotton 2000 Planning Budgets indicate growers normally spend \$35.27 on cotton herbicides per acre. Many cotton growers exceed this amount, with some spending more than \$65 an acre to control weeds.

Many cotton growers are interested in using Roundup Ready technology to cut cotton production costs and apply less pesticides in the environment. The Extension Service planted a demonstration plot of Roundup Ready cotton to help growers evaluate the effectiveness and efficiency of a Roundup-enhanced herbicide program. Costs of this system were compared to Extension budget guidelines.

b. The Roundup Ready-enhanced cotton herbicide program demonstrated effective weed control in the field and cost \$7.02 per acre less than budget. In Sharkey County where this demonstration was held, potential savings to cotton growers is estimated at \$500,000 on their 70,000 acres. There is the added benefit of reduced environmental impact because of fewer pesticides used.

c. Smith-Lever funds

d. State-specific

**Mississippi Combined 1862 Research and Extension**

a. Cotton defoliation is a crop management technique critical to maximizing crop yield and quality. Recent research indicates that improper timing of defoliation can reduce yield by 200 pounds of lint per acre or more. Quality can also suffer. Sharkey, Issaquena and Humphreys counties have about 160,000 acres of cotton, so it is important that these farmers know proper cotton defoliation techniques.

The Mississippi State University Extension Service conducted two cotton defoliation seminars in August for these farmers. University cotton specialists taught 75 farmers proper techniques which they then used on their fields.

b. These growers represented 100,000 to 125,000 acres of cotton. With an estimated area yield of 750 pounds of lint per acre, these growers harvested about 84 million pounds of cotton. Conservatively estimating this cotton's quality was \$.03 better than improperly defoliated cotton, this information was worth at least \$2.52 million to these farmers.

c. Smith-Lever funds

d. Multistate Extension

**Mississippi Combined 1862 Research and Extension**

a. The SMART program (Soybean Management Applying Research and Technology) has been helping improve Mississippi soybean yields since it began in 1992. Bolivar County soybean producers have been involved in the program each year.

The SMART program helps growers make decisions on all their fields and lets other growers see how the SMART fields are managed. Growers harvest higher yields through help with irrigation timing, insect monitoring and fungicide applications. Bolivar County had four growers enrolled in the SMART program in the 2000 crop year, all with irrigated fields. About 40 percent of the county's soybean acreage is irrigated, and the county has been very dry for the past two years.

b. These soybean fields in the SMART program averaged 58 bushels per acre, which was eight bushels more per acre than irrigated fields not in the program averaged. If the county could average eight more bushels per acre on its 92,000 irrigated soybean acres, yields would increase by 736,000 bushels and profits by \$3.6 million.

c. Smith-Lever funds

d. State-specific

**Mississippi Combined 1862 Research and Extension**

a. In key rice producing areas of the Mississippi Delta, water weevils can cause serious economic loss if left uncontrolled. The Environmental Protection Agency phased out the use of Furadan for rice water weevil control and since no insecticides are labeled for control of the rice water weevil larvae, the adult weevil must be controlled prior to oviposition.

Mississippi State University's Extension Service compared various insecticides to determine the degree of control they gave over key insect pests of rice. Economic thresholds of adult water weevils were established to determine when to treat the fields.

b. Data showed several alternative insecticides gave effective control of rice water weevils and stink bugs. Seed treatment with Icon or application of a foliar insecticide provided excellent rice water weevil control and increased yields an average 300 pounds per acre for an additional \$23 per acre. Assuming 40 percent of the acreage was treated, rice grower income increased \$2.9 million using this new treatment.

c. Smith-Lever funds

d. State-specific

### **Alaska Research**

“Impact: Results from applied studies are presented each year to the joint SAES/CES sponsored Potato and Vegetable Growers Conference to 60 to 70 percent of the statewide potato and vegetable growers. These presentations over the past 10 years have established recommended varieties of potatoes and head lettuce grown by Alaska producers as well as providing production practices information. The value of production over that same period has increased over 50 percent for potatoes and 35 percent for lettuce. The success of the late blight treatment and monitoring project has brought the industry from the brink of serious devastation to complete control with essentially no use of pesticide in 2000.

Source of Federal Funds: Hatch General

Scope of Impacts: Alaska Specific”

### **Indiana Research**

*Description:* To avoid significant losses from plant diseases, muskmelon and watermelon farmers typically spray protective fungicides once a week for two months during rapid vine growth, fruit development and melon harvest, regardless of actual weather-related disease threat. Purdue researchers have developed the MELCAST disease warning system, which enables farmers to reduce the frequency of their fungicide applications. MELCAST uses hourly weather data to index each day's favorability for disease development. When the environmental favorability index, or EFI, reaches a predetermined threshold, a spray is advised. Instead of

spraying every seven days, regardless of a disease threat, fungicides are applied at prescribed EFI intervals.

2. *Impact:* On farms using the MELCAST system for a period of 4 years, two to three fewer sprays were applied per season, with no increase in disease risk. This represents at least a 25%, or approximately 10-ton reduction, in chemical fungicide applications and translates into a savings of nearly \$250,000 for Southwestern Indiana farmers in a single year. This system is being tested in other states.
3. *Source of Federal Funds:* Hatch
4. *Scope of Impact:* Indiana

## **Key Theme - Biotechnology**

### **Washington Research**

The discovery of the *FAD2* gene is the basis of new cultivars of high oleate soybeans grown nationwide by DuPont Co.

### **South Dakota Combined Research and Extension**

“Landmark Agreement Makes Roundup Ready Genes Available in South Dakota Public Soybean Varieties” (also relates to Goals 2,3,4,5)

*Brief description of the activity* - South Dakota soybean acres have nearly doubled since 1995, and now exceed corn as the state’s largest crop. During 2000, 68% of the South Dakota soybean acreage was planted with Roundup Ready soybean varieties. None of these varieties were developed by public institutions, and were developed for use in other states and growing conditions. South Dakota State University and Monsanto entered into a landmark agreement to jointly develop and market public soybean cultivars that contain Monsanto’s Roundup Ready technology. The public Roundup Ready varieties will be marketed by the South Dakota Crop Improvement Association under the new brand name SoDak Genetics. All future transgenic varieties from the South Dakota Agricultural Experiment Station will be marketed under this brand name.

*Short impact statement* - The agreement between SDSU and Monsanto is the first of its kind. Previously, private industry has not entrusted its technology to a public institution. SDSU and Monsanto are working together to incorporate Roundup Ready technology in other crops, such as spring wheat. This program is in initial stages and varieties will not be available for several years.

Since 1996, South Dakota soybean producers have increasingly used Roundup Ready varieties. Use of this technology has been so important to producers that they have been willing to use varieties that are not specifically developed for South Dakota’s growing conditions. As a result of this agreement, SDSU will develop Roundup Ready soybean varieties specifically for South Dakota and the northern Great Plains.

Hatch Act

Commodity – SD Soybean Research and Promotion Council, SD Crop Improvement Association

State – State Funds

*Scope of impact, identifying which of the following apply to the activities conducted*

State specific

Integrated Research and Extension

### **Pennsylvania Research**

**Brief Description:** This Pennsylvania research project has focused on the improvement of cacao through the development of new propagation systems, which would help to advance breeding programs and provide clonal material for farmers. At present, breeding methods are the rate-limiting step in cacao improvement. The first objective of this project was to develop a somatic embryogenesis technique for cloning cacao plants; plants developed through methods developed in this project are now in field tests in St. Lucia. A second objective was to develop a genetic transformation system for cacao, which would also facilitate the production of disease and insect resistant plants (approximately 40 percent of the world crop is lost annually to disease). Such a transformation system was developed, and experimental plants are being grown in quarantine greenhouses for evaluation now. This crop is grown in tropical countries, and an important objective of this project is technology transfer, particularly of the techniques to clone cacao plants, to developing nations. The goal is to contribute to sustainable, economically viable agriculture and to ensure a high-quality product for the U.S. and Pennsylvania market.

**Impact/Accomplishment Statement:** The world's first transformation system for cacao has been developed and used to create experimental plants that are being evaluated under strict quarantine conditions. With further refinement and proper safety evaluation, this system will permit the development of disease and insect resistant cacao genotypes, which will lead to more sustainable cocoa production. The significant improvements to the technique for cloning cacao plants broke through a research bottleneck that was preventing rapid testing of new cacao varieties in multiple locations.

The identification of improved cacao varieties (particularly, but not limited to, disease and insect resistance) must be followed by rapid dissemination of plant material to the farmers who will benefit. The cloning technique also addresses this aspect of the process, in that it is possible to generate as many as 4,000 new plants from a single cacao flower. This would make it possible to rapidly multiply a new variety from one plant to enough plants to distribute to farmers.

This tropical crop is of great importance to Pennsylvania, producing 1.2 billion pounds of chocolate per year, worth \$5 billion per year in the retail market. In addition, it requires about 1.3 million pounds of milk per day, approximately 12 percent of Pennsylvania milk production. However, this industry is entirely dependent upon a predictable, high quality, low cost supply of cocoa from developing nations. The transfer of the technologies developed in this project are an important component of ensuring this supply by providing farmers in those developing countries with a crop that can be grown in a more sustainable fashion. This technology transfer has been accomplished through a variety of means, including a somatic embryogenesis protocol book, distributed free upon request, and workshops in Brazil and Costa Rica, attended by scientists from seven countries. Nearly every major cocoa research laboratory around the world, including at least two private companies, are now using the cloning techniques developed by researchers in this project.

**Sources of Funding:** Hatch Act and State appropriated funds. This planned program also leveraged the appropriated funds by receiving gifts from American Cocoa Research Institute to support research and outreach on cacao plant propagation techniques.

**Scope of Impact:** Multistate Research - FL and MD; and International Research and Outreach

## **New York Combined Research and Extension Fundamental Research Leads to Harpin, a New Biopesticide**

Writers of grant proposals and administrators often defend fundamental research on plant disease as the key to future disease control strategies. Cornell Plant Pathology seems to have substantiated this supposition with its fundamental research that resulted in the discovery of harpin and its striking beneficial effects on plants. A new biopesticide, Messenger™, was granted registration by the United States Environmental Protection Agency (EPA) in April 2000, for use on food and fiber crops, trees, turf and ornamentals. The active ingredient in Messenger™ is the protein harpin, which was discovered during fundamental research on the cause of fire blight, an often-devastating disease of pear, apple and related plants. The Cornell Research Foundation licensed the harpin technology to Eden Bioscience Corporation, of Bothell, Washington. The company developed and registered Messenger™ as a commercial product based on fundamental discoveries made at Cornell and in their own facilities. Further Cornell discoveries figured in many of the developments, and several former Cornell scientists currently hold key technical positions at Eden Bioscience.

The harpin technology is based on a new class of nontoxic naturally occurring proteins produced by plant pathogenic bacteria. When plants are treated with isolated harpin proteins, the plants' natural defense systems are triggered and simultaneously certain plant growth systems are activated. Thus, when applied to crops, harpin increases resistance to pathogens and pests and results in more biomass, due to increased photosynthesis, nutrient uptake and root development. Ultimately, crop yield and quality are enhanced.

EPA approved Messenger as a biochemical pesticide for disease management and yield enhancement in over 40 crops. The Agency concluded that: "Human health risks posed by Harpin are expected to be minimal to nonexistent," that "Harpin is not expected to cause any harm to the environment," and that "...it [harpin] has the potential to be an important human health and environmental risk reduction tool." It is currently registered in 47 states; registration in New York State is pending.

Harpin technology is a new and fundamentally different approach to crop production. As compared to the use of conventional pesticides, the use of harpin negates virtually all human health and environmental concerns. The naturally occurring nontoxic harpin proteins harness and stimulate the innate defense and growth systems to achieve desirable plant productivity effects. As such harpin has potential for use in IPM, sustainable and conventional agriculture programs.

## **New Jersey Combined Research and Extension**

**Activity:** Of 250,000 plant species living on Earth, only a small fraction have been fully analyzed for potential benefit to human health. Yet, until now, the methods for discovering novel, biologically active chemicals from plants have been based on crude extraction techniques and primitive hunter-gatherer approaches.

A plant science professor at Rutgers' Biotechnology Center for Agriculture and the Environment has developed a novel, cost-effective and environmentally safe technology for removing

biologically active compounds from plants. This technology has led to an extensive collection of lead compounds against various therapeutic targets. A set of related technologies that allow efficient production and recovery of valuable recombinant proteins from plants has also been developed and patented. The promising compounds and technologies are first patented by Rutgers and then licensed to a spin-off company.

**Impact:** This drug and nutraceutical discovery program focuses on important diseases, including cancer and diabetes and various viral, bacterial and fungal infections. Compounds and technologies licensed by the spin-off company allow its corporate customer to skip the costly research phase and jump right into product development. As of January 2000, the company had signed four agreements with four companies, and was negotiating with 30 other companies and organizations. New Jersey agriculture is also in a good position to benefit from this activity. Many of the company's nutraceutical products are derived from plants that are or can be grown by local producers. The company is working directly with the New Jersey Farm Bureau to position greenhouse growers and other farmers to benefit from the emerging market. In some cases, even the extraction of a compound could be subcontracted. This company is one of 10 spin-off companies launched from Cook College and the New Jersey Agricultural Experiment Station in the past five years. These enterprises create jobs, contribute to economic development, and ensure that new knowledge is useful to society.

**Source of Funds:** Hatch, State Funds, New Jersey Commission on Science and Technology, and Private Grant

**Scope of Impact:** State Specific

#### **North Carolina Extension**

- a. The objective of Performance Goal 3 is to increase the understanding and appreciation of citizens about biotechnology and its use, benefits, and risks associated with the production of genetically engineered crop plants. To achieve this goal Extension specialists and field faculty provided educational materials and training through conferences, workshops, scientific meetings, radio and television shows, the Worldwide WEB, magazines, newsletters, Extension bulletins, and local, state, and national newspapers.
- b. Impact - Approximately 35,000 citizens increased their awareness and understanding of the safety, uses, and benefits of crop production through genetically engineered crop plants. Moreover, nearly 3,300 farmers adopted biotechnological applications to crop production by utilizing genetically engineered crop plants that were applied over 400,595 acres of North Carolina crop land. Cost savings associated with using genetically engineered crop plants were estimated at \$7.5 million in optimized profits and \$2.2 million in reduced pesticide use from planting more pest resistant crops developed by genetic engineering.
- c. Scope of Impact - State Specific

## **Key Theme - Tropical Agriculture**

### **Virgin Islands Research**

- b. Impact - Three newly introduced minor tropical fruits have had highly successful field performance trials. These are Wax Jambu, *Syzygium samarangense* from Malaysia, Black Sapote *Diospyros dignya* and Egg Fruit, *Pouteria campechiana* both from Central America. These fruits and their potential production have been demonstrated at field days, workshops and seminars. Local farmers have shown considerable interest and begun to introduce them into their fruit orchards. Two newly introduced tetraploid hybrid bananas -FmA 02 and FmA 03 and a plantain FmA 21 -all from Honduras have produced yields in excess of traditional cultivars while maintaining good resistance to soil diseases and nematodes. These cultivars have also been demonstrated at workshops, field days and seminars and have had great impact on local farmer throughout the V.I. This interest is clearly indicated by the great demand for planting material of these crops from the field collections at AES.

### **Puerto Rico Research**

- a. Impact - Several promising Spanish lime genotypes have been identified in the collection of 34 genotypes at Juana Díaz; these could result in improved production and consumption of this minor fruit. Higher yielding cultivars of banana ('Yamgambi') and cassava (C.M. 3311) identified in this research can increase profits for farmers; also, the mite tolerance observed in cassava accession C.M. 3311 could reduce pesticide usage. Information gained from germplasm evaluation can be used by researchers and farmers to improve agricultural production.

Source of Federal Funds - Hatch funds: **\$385,132.00** (under project S-9, known locally as H-94). FTE: 4.9.

Scope of Impact: State Specific PR

## **Key Theme - Aquaculture**

### **Virgin Islands Research**

- b. Impact - Experiments showed that greenwater tank culture increases production of tilapia by 25-30 times over that of standard dug ponds, confirming that greenwater tank culture is a practical method for raising fish in water-limited areas. A commercial-sized growout tank (50,000 gallons) is being constructed at AES to evaluate construction techniques using a combination of local and imported materials. Two vegetables farmers (one on St. Croix and one in St. John) are waiting the results of the construction and the production evaluation before having similar tanks constructed on their farms. A series of production experiments has refined the technology of greenwater and clearwater for fingerling production and has made large amounts of fingerlings available for sale to the public. The importation of breeding net enclosures (hapas) from Thailand, at 10% of the U.S. cost, with better quality materials and more size availability, has greatly improved breeding efficiency and tilapia seed production. Our marketable fish are being sold to a HACCP-approved processing plant where fillets are being produced and sold in an effort to determine market size and price structure.

### **Mississippi Combined 1862 Research and Extension**

- a. Producers need a reliable, economical source of catfish fingerlings to maintain catfish production. Poor egg handling practices and lack of egg treatment can reduce egg hatching and fry survival rates below 50 percent, disrupting fingerling supplies and elevating prices.

The Mississippi State University Extension Service held a catfish hatchery management workshop in March and made numerous site visits during the operating season. Solutions were found for five hatcheries with severe problems, and two cases of egg mishandling were resolved. Fifteen hatcheries were advised to improve egg treatment to reduce losses from bacteria and overcrowding.

- b. Those attending the workshop produce about 553 million fry, and estimated they would be able to produce 11 million more fry and 4.3 million more fingerlings using the knowledge gained. The value of these two products would represent \$60,500 and \$215,000 respectively at current market prices. Prescribed egg treatments reduced losses at three hatcheries by 10 to 20 percent. Improved egg handling at two other facilities increased the survival rate by nearly 30 percent, meaning an additional 10 million fry were produced valued at \$50,000.

- c. Smith-Lever funds

- d. State-specific

## **Key Theme - Agronomy Crop Production**

### **Utah Combined Research and Extension**

**Brief Description:** In May 2000 there were several nights of extremely cold weather in parts of Utah. Wheat producers were concerned that their crop had been severely damaged by the frost and asked Utah State University Extension to help them decide whether to green chop the wheat and make silage or let it go to harvest. The county agent examined immature kernels from several locations in each suspect field and was able to determine under microscope evaluations that some fields had not been frozen.

**Impacts:** Three wheat farmers, who received advice from the county agent and did not chop their wheat, harvested 3,722 tons of wheat at the end of the season. The farmers had contracted their winter wheat with a future price that was \$.95 more than the market price at harvest. These three farmers made \$289,572.00 on wheat that they might have green chopped if they had not received appropriate advice from their Extension agent. In addition to this amount, they forward contracted the wheat based on Extension advice at a future's workshop and made an additional \$70,718.00

**Source of Funds:** Smith Lever, State

**Impacts:** UT

## **Key Theme - Gardening and Ornamental Horticulture**

### **Utah Combined Research and Extension**

**Brief Description:** Many home owners grow fruit trees to provide fresh fruit for their families, for canning, and for their own enjoyment. Without proper pruning these trees become less productive and vigorous. In one county 110 home owners with 385 fruit trees learned to prune trees from an Extension demonstration class. The average cost of hiring a tree professionally pruned is \$435/tree.

**Impacts:** The home owners saved \$13,475.00 by learning to prune their own trees.

**Source of Funds:** Smith Lever, State

**Impacts:** UT

### **Utah Combined Research and Extension**

**Brief Description:** An added expense for many homeowners is the design of their landscape. A well designed landscape can add 30% to the value of a home. A three-week landscape design class was taught to help homeowners develop and design a basic landscape.

**Impacts:** Thirty individuals participated in the program and estimated that they saved over \$33,000.00 by doing their own landscape design.

**Source of Funds:** Smith Lever, State

**Impacts:** UT

### **Oklahoma Extension**

#### **Impact(s):**

The service from the Master Gardener volunteer program has proven to be a highly popular means of extending the knowledge of the Oklahoma State University Cooperative Extension Service to the residents of Oklahoma. Through the innovative program, Extension has reached out to more people and groups. At the same time, the program has significantly affected professional staff's use of time. Survey responses from twelve of the participating counties show a range of 10 - 25% of the educators' time is spent coordinating the program. However, the experiences of the established county programs indicates that the program eventually frees the agents time for other program opportunities. The Oklahoma Master Gardener program has begun to demonstrate clearly that volunteers can serve as excellent educators at the local level in consumer horticulture.

The Oklahoma Master Gardener Program continues to grow across the state and 1998 brought on a record number of volunteer hours. Approximately 290 new Master Gardeners were trained during the 98-99 training season. Close to 835 active Master Gardeners volunteered their time across the state, contributing nearly 39,300 hours of volunteer service (over a 100% increase over last year's hours!) and reaching over 93,800 Oklahomans. This translates to over a half million dollars in

service that was donated by volunteers (wage rate of \$14.30/hour was used, which includes a 12% estimate of fringe benefits. This hourly rate is the assigned wage for nonagricultural workers in 1998 as published in the *Economic Report of the President* (1998 edition). This information was supplied by the Independent Sector, an organization that “serves as a national forum to encourage giving, volunteering and not-for-profit initiative.”

**Funding Sources:** Smith-Lever; State

**Scope of Impact:** State Specific

### **New Jersey Combined Research and Extension**

**Activity:** There are approximately five hundred fifty greenhouse operations in New Jersey producing over 100 million dollars in ornamental crops annually. Despite New Jersey’s small size, it ranks eleventh in the United States in floriculture production. A survey was conducted by RCE of Camden County in 1996 to assess grower needs. Results indicated that crop health issues were significant in limiting crop quality. To remain competitive, growers must reduce losses due to infectious diseases, arthropod pests and poor cultural practices.

A comprehensive multi-method Extension education program was implemented to address this issue. A Greenhouse Transplant program was conducted at the annual NJ Vegetable Growers Conference. Agents also organized the Central Jersey Bedding Plant Conference. In addition, abstracts and lectures on IPM and plant life were presented at professional meetings. A multistate monthly newsletter was published in cooperation with Cornell Cooperative Extension entitled, "Northeast IPM Notes". Twelve issues were sent to 30 greenhouse growers and Extension professionals in New Jersey, New York, and other states in the region.

**Impact:** Based on formal evaluation data, program activities resulted in adoption of recommended production practices for at least 14 million square feet or 25% of New Jersey’s total production space. Attendees, at the Central New Jersey Bedding Plant meeting, who completed evaluations (56 of 75 attendees), represented impact on approximately 3,000,000 square feet with a production value of at least 30 million dollars. 100% indicated that information learned at the meeting was useful to very useful and 94% indicate information will improve pest management practices. More specifically 98% learned about new pesticides; 86% learned about pesticide alternatives; 91% improved pest identification skills; 93% learned how to improve pesticide application. Subscribers to the Northeast Greenhouse IPM Notes were surveyed and 25% of growers receiving the newsletter responded and indicated: Information resulted in adoption of IPM practices on 1,921,900 square feet of controlled environment greenhouse space and fifty six acres of outdoor flower crops representing a total crop value of approximately 20 million dollars. 100% indicated IPM Notes is useful and improved their pest management practices. Specifically growers learned about pesticide alternatives (96%), new pesticides (94%) and they improved pest identification skills (83%). Growers also reduced pesticide use (68%). Some reported reduced pest management costs (60%) and some increased profits (38%). Other impacts included improved pesticide applicator safety (68%) and helpful in training employees (40%). The Northeast Greenhouse IPM Notes was a National Finalist for the AT&T Communications Award (team newsletter category).

Direct assistance in recognition and management of growing media problem at an Atlantic County farm saved 150,000 tomato and pepper transplants worth \$15,000 dollars.

**Source of Funding:** Smith-Lever 3(b) & (c), State Funds and Camden County Board of Chosen Freeholders

**Scope of Impact:** State Specific

## **Key Theme - Risk Management**

### **Texas 1862 Extension**

*Master Marketer:* Master Marketer graduates agree to share what they have learned with others in their respective counties through small marketing club study groups. This volunteer aspect greatly multiplies the educational impact of the program. Over seventy marketing clubs have been started—helping to extend risk management education to producers across the state.

In surveys conducted two years after their completing the in-depth Master Marketer workshops, producers estimated on average that their annual incomes had improved over \$25,000 as a result of improved marketing and risk management practices. For the almost 100 producers that participated in 1999, the aggregate annual impact would approach \$2.5 million in added income!

### **Nevada Combined Research and Extension**

Cooperative Extension developed a yearlong Risk Management program that teaches futures and options techniques to ranchers. Ranchers negotiate futures and options through the CME to avoid the ups and downs of industry prices. The hands-on class involves participation in monthly marketing meetings, futures and options exercises and a consigned cattle experiment. After negotiating several trading exercises, ranchers consign some of their cattle to group ownership and compete for real. The 2000 class of 48 participants consigned 160 cattle to the program. They made and implemented decisions as a group and shared in the rewards. A feedlot tour in the summer gave the participants a chance to view their collective finished product.

**IMPACT:** Class participants learn how to avoid the pitfalls of the market and save their ranches. Participants who have implemented futures and options management on their ranches have experienced an average net income of an additional \$18,000 per year as a result of the program. One participant saved \$70,000 through Risk Management techniques.

Source of Funds: Smith-Lever & State Matching Funds

Scope of Impact: State Specific, Integrated Research & Extension

### **New Jersey Combined Research and Extension**

**Activity:** The New Jersey Farm Management Program addressed a clear and pressing need for superior management, marketing, financial and investment skills and served as a framework and support base to address the critical issue of farm viability. Agricultural Agents developed the *Garden State Agricultural Re-Engineering Initiative* program provides agricultural producers with the opportunity to (1) conduct in-depth financial analyses of their farming operations, (2) take a deliberate and knowledgeable approach to risk management, and (3) participate in regularly scheduled advisory team meetings.

The program offers:

- Training in the use of Finpack, the most comprehensive farm financial planning and analysis software available
- Crisis-intervention strategies for financially distressed farms
- Small group workshops and/or one on-one consultations on a continually scheduled basis
- Unlimited access to computers
- Flexibility to meet individual needs
- Complete confidentiality

Sixty-eight participants representing forty-one agricultural businesses operating in 10 New Jersey counties completed one of the nine 3 day workshops.

**Impact:** Program participants have developed roughly 300 individual commodity budgets in addition to their balance sheets and cash flow plans. Producers have conducted complete analyses of their farm's financial situation, which has enabled them to plan for the future. Databases have been developed that are used for benchmarks for costs of production, rates of return, and financial performance standards. Other positive outcomes or impacts of the program have been to increase understanding of financial terms, improve understanding of the interrelationships among financial statements, and also to decrease anxiety associated with computer usage.

Many participants expressed interest in purchasing the software utilized by the program, and several producers purchased computers for home-farm usage. A number of farm families utilized the program's output (an organized set of financial statements) to successfully solicit loans. Several farms underwent expansion plans based on an analysis of alternatives provided during the workshops or during follow-up visits. Forty-one agricultural businesses have been involved representing the following commodities: dairy, vegetables, grain/hay, fruit, nursery, and livestock. Analyses of participant data have revealed significant improvements for local producers being more efficient and saving dollars.

**Source of Funding:** Smith-Lever 3(b) & (c) and State Funds

**Scope of Impact:** State Specific

## **Key Theme - Rangeland/Pasture Management**

### **Texas 1890 Extension**

- b. Impact - Eight hundred and nine producers indicated a gain in knowledge concerning forage species used for hay, season and growth stage at which to harvest, and form in which it is fed; kinds of pastures and their uses. Four hundred and forty producers were in attendance at educational meetings, field days and workshops; and 183 mass media articles, programs, and features were prepared in support of this initiative. Forty-two result demonstrations were implemented, 12 farm tours plus one symposium and three clinics were conducted. Combined, 488 producers indicated new knowledge gained about best management practices and their application to their particular operations. Two hundred and eighty-nine participants reported adopting at least one practice not formally used.

## **Key Theme - Small Farm Viability**

### **Tennessee Combined Research and Extension**

Small Farms Assistance (SFA) program specialists provided technical assistance to approximately 450 small and limited resource farmers in 14 counties. The assistance through this program has helped several farmers to seek private banking and/or government loans to finance their struggling farm operations, re-evaluate their farm operations and make decisions about continuing in farming or seeking off-farm employment. One SFA success story is the formation of Northern Tennessee Farmers Association (NTFA). The NTFA submitted a proposal in collaboration with Small Farms Assistance (SFA) Program and the local Natural Resources Conservation Service (NRCS) officials and received monies for the construction of a greenhouse. This greenhouse is used to produce tobacco seedlings for members of the association and to experiment with alternative crops. The overall cost of production for tobacco farmers was reduced almost 60 percent or an average of \$187.50 per acre. Similar efforts are underway to form Small Farmers Associations in Middle and Western Tennessee.

#### **Funding Source:**

Smith-Lever and State

#### **Scope of Impact:**

State Specific

### **South Carolina Combined 1890 Research and Extension**

The 1890 Agricultural Extension specialist developed a comprehensive program to assure viability of small farmers in the state. The program was to assist farmers in obtaining management training in the areas of controlled breeding, pasture management, herd health and nutrition, improve blood-line, livestock production, establish pastured poultry as an alternative farming enterprise, and increase farm profitability. The Heifer Project International (HPI) Meat Goat, Beef Cattle, and Pastured Poultry Projects were three components of the program efforts to make small farms viable in the state. Each project was conducted, at different intervals, to allow farmers to take advantage of all three programs. The programs were presented via workshops and demonstration field trips to expose and promote the concepts.

Cooperating Institutions and Organizations: School of Agribusiness, 1890 Research and Cooperative Extension at South Carolina State University, SC Department of Agriculture, Clemson University Cooperative Extension, USDA-FSA, USDA-Rural Development, and participating small-scale farmers.

- b. Impact** - It was reported that a total of 269 small farmers participated in such endeavors throughout the fiscal year 2000, where 135 (50.2%) Black farmers and 134 (49.8%) White farmers were served. Of this number, 165 (61.3%) indicated that they increased their knowledge base and 68 (25.3%) of 165 adopted the practices to use continually upon their farm.
- c. Source of Federal Funds** - USDA Office of Outreach, (\$155,014)  
(Section 447180)

**d. Scope of Impact - South Carolina**

**North Carolina Extension**

- a. Limited resource producers and marketers of livestock, poultry, and aquatic species will select, adopt and successfully implement practices or enterprises that will achieve individual and family goals related to profitability and quality of life
- b. Program Accomplishments: 604 limited resource producers increased their awareness and knowledge of best management production practices. 335 producers adopted best management practices that optimized income. 86 producers adopted improved farm financial planning practices and procedures. Estimated financial impacts on producer income were \$135,763. This included income that resulted from improvements in animal nutrition, breeding practices, marketing, buildings and facilities, and health and general management practices.

**North Carolina Extension**

- a. Part-time and limited resource farmers will increase the sustainability of their farms through crop diversification, intensive management practices, water and nutrient management, and expanded markets.
- b. Program Accomplishments: 912 producers adopted best management practices such as nutrient management, etc. on 70,577 acres. 2,095 producers increased their awareness and knowledge of marketing options and 549 started to use multiple markets. 1,255 producers increased their awareness and knowledge of irrigation and management systems. 569 were helped to stay in farming through the adoption of sustainability practices. 347 producers adopted new crops, which affected 5,068 acres. The projected increase in profits through diversification of crops is \$1,622,331. 253 volunteers contributed 3,987 hours of time, which was valued at \$39,870.

**North Carolina Extension**

- a. Limited resource farmers will use an integrated, systems approach to implement alternative agricultural opportunities and enterprises.
- b. Program Accomplishments: 1,426 producers were interested in this approach, 1,361 gained knowledge about alternative production and market practices, and 446 tried alternative enterprises, methods, and practices. Outside funding support was obtained in the amount \$52,602. 276 volunteers were involved. They contributed 1,149 hours of their time valued at \$11,490.

**Arkansas 1890 Combined**

Situation - The major performance goal of this program is to increase the acreage and the number of small and limited resource farmers who produce vegetable crops as an alternative to row crop enterprises.

The basic idea behind diversified/alternative agriculture is to halt the rapid decline of small farmers. These farmers can no longer make a profitable living by farming from traditional row crops, threatening the viability and stability of the rural economy.

The Extension Horticulture Specialist developed a comprehensive program to inform and educate farmers about the economic advantages of growing vegetables as an alternative to row crops such as rice, soybeans and cotton. Production meetings, conferences and agriculture expositions were organized to inform and teach vegetable production methods. Visual aids were used to demonstrate new emerging technology for vegetable crops. In addition, collaboration with alternative crops marketing personnel helped farmers access markets with attractive prices. Five local newspapers carry monthly horticulture production articles developed by the specialist. Demonstration trials were set up at different locations in the state to identify and evaluate different varieties of seeds with potential to enhance yield and provide better economic returns. Seven sweet potato varieties, eight okra varieties, and twenty peas varieties were tested. Cultural practices commonly used by the small farmers were followed. These results will be used to define selection criteria for determining variety with desirable yield, superior quality, and/or adaptability to Arkansas' weather conditions.

Impact(s) - The program started in June of 2000 is in its infancy, however, some positive results have been realized at this point. Acreage in vegetable production has increased significantly especially in the Southern regions of the state. Attendance at meetings has increased from less than 10 per meeting to more than 100 in some cases. Newspapers in five counties publish vegetable crops news and provide information to more than ten thousand subscribers. The average yield of sweet potato variety (Beauregard) was increased by 36% when planted at an in-row spacing of 9 inches. The "Excel" and "Louisiana Purple Hull" (Quick pick) pea varieties were very adaptable to Arkansas weather. The okra data indicated that the variety, "North and South" had higher yield and more stress tolerance than the commonly grown Clemson Spineless variety. Numerous phone calls have been received from individuals asking production questions or about what they read in Extension leaflets or newspaper articles. Also, more producer cooperatives have been formed and some cooperatives have secured contracts to produce fresh vegetables for major grocery warehouses.

## **Key Theme - Plant Germplasm**

### **Puerto Rico Research**

- e. Impact - Several promising Spanish lime genotypes have been identified in the collection of 34 genotypes at Juana Díaz; these could result in improved production and consumption of this minor fruit. Higher yielding cultivars of banana ('Yamgambi') and cassava (C.M. 3311) identified in this research can increase profits for farmers; also, the mite tolerance observed in cassava accession C.M. 3311 could reduce pesticide usage. Information gained from germplasm evaluation can be used by researchers and farmers to improve agricultural production.

Source of Federal Funds - Hatch funds: **\$385,132.00** (under project S-9, known locally as H-94). FTE: 4.9.

Scope of Impact: State Specific PR

### **Oklahoma 1862 Research**

Impact – The OAES has had a long history of cultivar and germplasm development of numerous agronomic and horticultural commodity crops to meet state, regional, national, and international needs. During this reporting period, the OAES released its first hard white winter wheat variety, 'Intrada' that has excellent international market opportunities. This new release represents a "new crop" opportunity for wheat producers in western and panhandle counties of Oklahoma and the western high plains of Texas and Kansas. White wheat must be kept identity preserved throughout the entire production and marketing cycle to prevent contamination of the traditionally grown hard red winter wheat in the area. Consequently, new production and marketing opportunities for farmers and grain elevators have been provided with the release of the "new crop". Grain yield of this cultivar is superior to other white wheat varieties that are currently available from other state programs and similar to most hard red winter wheat varieties currently in production. Maturity and dormancy is intermediate while reaction to wheat soil borne mosaic is mixed. It is moderately susceptible to tan spot and leaf rust during the early stages of growth but shows an intermediate reaction in adult plants. Tolerance to soil acidity is moderate, plant height is medium-short, kernel hardness is acceptable, grain protein is adequate, and kernel size is uniform. The cultivar has a medium-short mixing time, good mixing tolerance, and excellent loaf volume and texture. OAES, Kansas Agricultural Experiment Station, and USDA-ARS developed this variety cooperatively. It was jointly released by OAES and USDA-ARS. Additionally during this reporting period, a new improved forage-type bermudagrass, 'Midland-99'; a new seeded turf bermudagrass, OKS95-1; a virginia peanut, 'Jupiter'; a new hard red winter wheat variety, 'Ok101', six new wheat germplasm lines that carry leaf rust and soil borne mosaic resistance designated as OAES-1 through OAES-6; and five new alfalfa germplasms with plant breeder designations have been released.

Source of Federal Funds – Hatch

Scope of Impact – Multi-state Research with:

### **New Mexico Combined Research and Extension**

New Mexico Agricultural Experiment Station scientists have developed various drought- and disease-resistant cultivars for alfalfa, cotton, onion, and chile pepper. The alfalfa germplasm NM-9D11A-AN3 was released during June 2000. This germplasm is drought tolerant and possesses high levels of resistance to anthracnose. A DNA-marker-based linkage map is being developed in tetraploid alfalfa. Conventional pedigree breeding procedures are used to improve Acala 1517 cotton germplasm for agronomic, fiber, and pest resistance traits. DNA markers, primarily SSRs, are being explored for marker-assisted selection for important fiber quality traits. These DNA markers are especially useful in wide crosses where tagging novel alleles from the exotic germplasm. Two onion cultivars, NuMex Chaco and NuMex Snowball were released. NuMex cultivars were screened for resistance to Fusarium basal rot using a seedling screening procedure. Promising breeding lines and released cultivars were compared commercial cultivars and experimental lines using variety trials. Hybrid and open-pollinated cultivars were compared for plant characteristics, disease resistance, bolting resistance, bulb yield, and bulb quality. Significant progress was made in the genetic improvement of chile (*Capsicum*) germplasm and cultivars for New Mexico. A total of 176 breeding lines were evaluated in the field for early maturity, high fruit set with desirable fruit size, easy destemming and pungency. DNA was bulked for non-pungent and pungent individuals. Progress in developing cytoplasmic male-sterility breeding lines was obtained.

**Impact:** In 2000, NM growers produced approximately 100,000 bales of Acala 1517 cotton. The new cultivar Acala 1517-99 has demonstrated a 7% yield advantage over other cultivars. This translates into a net gain of 3 million dollars annually for NM growers. All 1517 cotton received approximately ten cents per pound quality premium relative to other cotton. That is over 5 million dollar additional value for Acala 1517 cotton over other types of cotton. Onion cultivars developed by our program will be used by growers in New Mexico and surrounding states. Public and private breeding programs will use the germplasm released from our program and the information gained by our program to develop onion cultivars.

Source of Federal Funds — Hatch

Scope of Impact — Multi-State Research

- with States AL, AK, AZ, CA, CO, FL, GA, ID, LA, MS, MT, NC, OK, OR, TX, UT, WA, WY

### **New Jersey Combined Research and Extension**

**Activity:** The New Jersey turfgrass breeding and evaluation program is world renown. During the past year we have made significant progress in finding new sources of resistance to a new serious disease of perennial ryegrass called gray leaf spot. In trials this past fall we identified nine different sources of resistance to this disease. This is the first report of any resistance to this disease in this species. This fall we increased these resistant populations for wider evaluation work and increase. We continue to make significant progress in population improvement work on tall fescue, three fine fescue species, crested hairgrass, tufted hairgrass, creeping, velvet and

colonial bentgrass. All of these turfgrasses with improved disease resistance should require less pesticide usage and reduced overall maintenance costs. We are creating 2500 new hybrid Kentucky blue grasses per year in an effort to discover 10-20 new improved apomictic hybrids with improved persistence and seed yielding ability. We are also making a large effort each year to collect new germplasm sources to integrate into the breeding program. These collections are being made from those areas of the world where the cool-season turfgrasses originated. The new sources of gray leaf spot resistance were mainly from these collection efforts. We are making approximately 1000 collections per year in the 13 different turf species.

**Impact:** There are currently approximately 195 turfgrass varieties currently licensed to 24 different seed companies and being marketed commercially. These varieties generated approximately \$3.1 million in royalties to Rutgers University during 2000. In the past year alone, we were involved in the development of over 40 agreements with private seed companies to develop improved turfgrass varieties. There were over 15 varieties that were named and released this past year from the program. In the National Turfgrass Evaluation Trials this past year varieties derived from the Rutgers breeding program represented over 90 percent of the top 20 performing varieties in perennial ryegrass, tall fescue, the three fine fescue species and the top Kentucky bluegrass variety.

**Source of Funding:** Hatch, State Funds, and Private

**Scope of Impact:** Integrated Research and Extension

## **Nebraska Research**

### **Impact Statement: Nuplains White Wheat**

*(Relates to Goal 1, Output Indicator 1, and Outcome Indicator 1)*

#### **Issue: (Who cares and why?)**

Nebraska producers need every edge to successfully compete in growing global markets. Development of the first hard white winter wheat designed for Nebraska's growing conditions should provide such an edge.

#### **What has been done?**

A team of USDA-Agricultural Research Service and University of Nebraska scientists developed the new variety called Nuplains. It is expected to be available for farmers to plant in fall 2000. Hard white wheat flour is primarily used to produce whole wheat bread, flat breads (tortillas and pitas) and Asian noodles, a large and expanding market. Nuplains is the most winter hardy white wheat available and also may provide a new planting option for wheat growers in other High Plains states. White wheat is new to Nebraska so a committee representing the state's wheat growers, NU's Institute of Agriculture and Natural Resources and state agencies is educating growers, elevator operators and others about white wheat production, handling and potential markets.

#### **Impact:**

Hard white wheat offers Nebraska wheat growers a chance to diversify their production and tap a new market. Asia imports 400 million bushels of white wheat annually from Australia and elsewhere. Nuplains should give Nebraska a chance to vie for part of this huge and rapidly growing market. Nebraska produced nearly 85 million bushels of hard red winter wheat in 1998 and typically exports half its production.

**Funding:**

Nebraska Wheat Board, USDA-Agricultural Research Service,  
NU Agricultural Research Division, Hatch Act

**Summary:**

The first hard white winter wheat adapted to Nebraska's growing conditions will be available for planting in fall 2000. This new variety, called Nuplains, gives Nebraska wheat growers the chance to compete in new markets. Hard white wheat is used for whole wheat breads, tortillas, pitas and Asian noodles, a growing market. University of Nebraska and USDA-Agricultural Research Service scientists, with financial assistance from the Nebraska Wheat Board, developed Nuplains, the most winter-hardy white wheat available. A committee of representatives from the Institute of Agriculture and Natural Resources, wheat producers and state agencies is educating growers, elevator operators and other about white wheat production, handling and potential markets.

**North Dakota Combined Research and Extension**

The NDSU Agricultural Experiment Station has breeding and research programs in most of these crops with the goal of releasing new varieties. Germplasm from these research programs is shared with public and private breeders worldwide. In sunflower and sugar beet, which are also major crops, germplasm is released by the USDA for use by private and public breeding programs. USDA scientists provide basic genetic information and in some cases develop and provide germplasm to assist breeding programs. In some crops, USDA coordinates regional trials that allow the plant breeder to determine the adaptability of his genetic material across a wide range of environments outside North Dakota. The plant breeders, which are located in the Department of Plant Sciences, cooperate extensively with their counterparts in the Departments of Plant Pathology, Cereal Science and the research extension centers in varietal development and genetic research. Crosses made by the breeder are evaluated for agronomic characteristics by the breeder, quality characteristics by cereal scientists, and disease resistance by plant pathologists. Based on the information provided, the breeder then makes a decision on which material to discard and what it moves forward in the program. The extension service has a major role in educating the producers about new varieties.

**Impact** - Genetically improved varieties that possess improved agronomic performance and quality have a major impact on the state and region. Varieties that have increased yield and improved disease resistance and quality provides producers with the opportunity to increase their economic potential through wider accessibility to markets and improved prices. The genetic improvement of major crops for successful crop production requires research effort by the scientist and subsequent dissemination of the knowledge and education to the producer, product

purchaser, and the end use of the finished product by extension personnel. Extension efforts are directed at the state, county, national, and international levels.

Several new and improved crop varieties were developed and released using conventional methods of plant breeding. Some of these varieties have increased yield due to improved disease resistance, especially head, kernel, and leaf disease resistance while others that have been released have improved agronomic and quality factors (for example, greater test weight, kernel size, higher protein (wheat), improved milling extraction percentage, lower protein (barley for malting purposes), increased fiber levels in oat for human consumption, specific oat varieties for race horses, hullless oats for improved livestock feeding efficiency, etc.

In 2000 varieties released by NDSU had an annual economic impact based on increased yield alone of about \$110M annually. About 90 percent of the economic impact was from the spring wheat variety 'Alsen'. Alsen is the first HRSW variety which combines high quality and good agronomic characteristics with Type II resistance to Fusarium Head Blight (FHB). The variety will also have an impact in South Dakota, Minnesota, and to a lesser extent, Montana. Almost 40,000 bushels were increased and available to producers in North and South Dakota and Minnesota. If the variety is approved for production in Canada, where it is well adapted, it will also have a significant economic impact there.

Other varieties were released for use by oat, durum, dry edible bean, six-rowed barley, and soybean producers. The acceptance of the two-rowed barley 'Conlon' as a malting variety will have a major impact on barley production in central and western North Dakota. The benefits will also be felt in South Dakota to a lesser extent. The recent release of several high quality and high yielding durum varieties has had a major impact in northwestern North Dakota and northeastern Montana. The education of producers about the strengths and weaknesses of new varieties is a primary function of the extension service. A typical crop variety lasts 5-6 years, at which time it is probably replaced by another that possesses improved agronomic characteristics and yield. If the variety finds a niche area or market, it can last much longer. As a result, there is a continual need for programs to provide producers the option to select those varieties from public and private breeding programs that best fit their needs.

**Source of federal funds:** Smith-Lever and Hatch

**Scope of impact:** Multi-state Integrated Research and Extension: SD, MN, MT

## **Colorado Research**

### **Key Themes: Plant Production Efficiency, Plant Germplasm, Plant Health**

Short Description - The basic objective of the Colorado potato-breeding program is to develop new potato cultivars with increased yield, improved quality, resistance to diseases and pests, and tolerance to environmental stresses.

Impact - Release notices for the cultivars Keystone Russet (AC83064-1) and the Silverton Russet (AC83064-6) were completed in 2000. Release notices are in preparation for Cherry Red

(DT6063-1R), Fremont Russet (CO85026-4), and Durango Red (CO86218-2). BC0894-2, a chipper with international export potential, will be recommended for release and naming in 2001. Plant Variety Protection is pending for Russet Norkotah Selections 3 and 8. It is estimated that the value of the 1999 fall potato crop in Colorado was increased by \$10-12 million due to improved yield and quality associated with new potato cultivars and clonal selections of established cultivars.

Source of Federal Funds – Hatch Act funds

Scope of Impact – State Specific

## **Minnesota Research**

### Description

In the early 1970's, Minnesota AES researchers were the first to regenerate complete corn plants from cells in tissue culture. This procedure has allowed the genetic engineering of corn. The technology also was quickly adopted to achieve the regeneration of other cereals and, in addition to the applied aspects, has led to new and powerful means of testing the behavior and functioning of plant genes that carry special importance. Ongoing research strives to identify transgenic plants which best serve food producers and consumers.

Germplasm research on several important crops such as soybeans, barley, wheat, sweet corn and potatoes is yielding important results. For example, one of the most important diseases of soybean is the cyst nematode. Recently, it became clear that one gene, *rhg1*, is especially important in resistance. Research has characterized this gene, pinpointed its location on the soybean map, and developed tools to isolate it by positional cloning. In the process, researchers identified resistance genes elsewhere in the soybean genome. In another project, researchers are developing the molecular genetic tools for enhancing resistance to Fusarium head blight in wheat and barley.

Research is exploring new breeding methods to accelerate potato varietal development time while maintaining yield and quality. This includes exploiting useful genes found among the wild relatives of potato.

Evaluation of Bt sweet corn for performance on both target and non-target species is helping ensure sound environmental stewardship.

### 2. Impact

Transgenic corn growers have already begun to reap significantly higher yields. It is estimated that the insect-resistant corn can result in a 10 to 20 percent yield improvement. Research may increase the lysine content of current corn hybrids through genetic engineering by 50 to 100 percent, increasing its nutritional value and reducing the cost of adding lysine to livestock feed. The improved nutritional value of high lysine corn could increase the feeding value of corn by 5 to 10 cents per bushel. In the U.S. this could amount to \$70 million annually to farmers producing corn or raising hogs or poultry.

A study of past economic benefits for Minnesota farmers from barley variety research documented \$48 million in additional income over a ten-year period from two University of Minnesota barley varieties (Morex and Robust.) Economic analysis of 20 years of costs (research, extension) compared with benefits (farmers, malters, brewers) showed a benefit: cost ratio of 277 to 1, or an annual return of about 85 percent. When looked at on a regional basis the gain was even more, where aggregate benefits totaled almost \$300 million. The latest variety release, Lacey, could potentially enhance farmers yields by 10 to 15 percent.

Studies have documented the efficacy of Bt sweet corn against European corn borer and corn earworm. These studies confirm, without the use of conventional insecticide, a very high level of insect control (98 to 100 percent in Minnesota) and high levels of marketability (usually more than 90 percent) for processing sweet corn. Research also showed minimal negative effects of Bt sweet corn on beneficial predator species.

Soybeans occupied approximately 2.0 million hectares in Minnesota in 1000 with an average yield of about 2.7 Mg/ha. Publicly developed cultivars were grown on 10 to 15 percent of the soybean hectareage. Several cultivars developed by the Minnesota Agricultural Experiment Station are grown widely. Recently released Minnesota cultivars contributed about \$16,000,000 extra income in 2000 compared with yield of older cultivars.

Experiment Station Projects: MIN-22-015, MIN-21-019, MIN-22-G06, MIN-05-026, MIN-13-022, MIN-13-022, MIN-13-032, MIN-13-030, MIN-13-027

<http://www.extension.umn.edu/mnimpacts/impact.asp?projectID=19>

<http://www.extension.umn.edu/mnimpacts/impact.asp?projectID=407>

3. Funding: Hatch and State

d. Scope of Impact: (3) Multistate Research (FL, HI, ID, IL, IN, MN, NY, OH, OR, PA, WI)

## **Key Theme - Animal Production Efficiency**

### **Puerto Rico Research**

Impact - The utilization of 10,000 (1/3 of bull calves produced by the local dairy industry) purebred or crossbred Holstein bull calves for beef would increase local beef production by 15% (6,270,000 lbs of beef with a cash value of \$6.6 million) and reduce beef imports, resulting in the infusion of \$6.6 million into the local economy that would otherwise be used to purchase beef from other countries.

In commercial cow-calf operations income is determined by the number of calves produced and their weaning weights. The first step to increase income in the beef cow enterprise is to improve the reproductive efficiency of the herd.

Source of Federal Funds - Hatch funds: Under project H-375, **\$89,730.00** and project H-380, **\$67,585.00**. *FTE: For H-375, 0.7. and H-380, 0.5.*

Scope of Impact: State Specific PR.

### **Oklahoma 1862 Extension**

An ongoing extension program was developed to provide cow/calf producers the information and tools needed to evaluate nutrition programs and reduce costs. A decision-making tool was developed in the form of a computer software package and complete educational material package called OSU Cowculator. The package included the software, slide set with suggested text, and a fact sheet. A web site was maintained to educate producers on the use and availability of uncommon and often under-priced feeds. Applied research was conducted to investigate ways to take advantage of these under-priced feeds in beef production. An educational packet, complete with slides and handout was developed to assist producers in the use of byproduct feeds, particularly during periods of drought.

#### **Impact(s):**

More than 2,500 versions of Cowculator have been distributed. In addition, nine land-grant institutions are using the software in their beef production courses. Use of under-priced feed commodities has increased nearly twofold in Oklahoma in the past three years. Part of this dramatic increase has been caused by changes in market conditions and extreme drought in some parts of the state. Many producers have been able to use the Cowculator to survive and even make a good profit in an otherwise severe production and economic situation. Estimated total impact is more than \$5 million.

**Funding Sources:** Smith-Lever; State

i.

**Scope of Impact:** Integrated Research and Extension

### **Oklahoma 1862 Extension**

Initially, this program was a joint effort with the OSU Veterinary Hospital to train local Veterinarians in proper procedures to conduct Ram Breeding Soundness exams. Breeding Soundness Examination “Clinics” were held statewide, at local Veterinary clinics to assist local Veterinarians in performing the BSE’s. This effort allowed on the job training of local Veterinarians by OSU Vet Hospital Veterinarians on proper BSE Techniques. Since 1996, local Veterinarians, County Extension personnel and the OSU Sheep Specialist conduct the annual BSE Clinics.

**Impact:**

Approximately 750 rams are evaluated annually. With increases in lambing percentages, decreases in open ewes and an increase in the ewe to ram ratio. It is estimated that the Ram Breeding Soundness Examination program have increased the profitability of Oklahoma sheep flocks by approximately \$250,000 annually.

**Funding:** Smith-Lever, State

**Scope of Impact:** State Specific

**Nevada Combined Research and Extension**

4. In order to improve wool production, Rambouillet ewes were crossed with pure Merino rams imported from Australia. Over the past 10 years crosses and back-crosses between mixed lambs and pure Merino rams has resulted in approximately 50% of the 1000 ewe flock are approaching purebred Australian Merino status, a known high quality wool producing breed. 41 Australian Medium Woolled Merino X Rambouillet ram lambs were used to evaluate the effect of the breeding program on carcass measurement, closely trimmed primal cut percentages, chemical analysis of rib chop and wool production traits. Lambs were slaughtered at 32 kg, 45 kg, or 54 kg. Carcass measurements were not significantly ( $P > .1000$ ) affected at any slaughter weight with the exception of flank streaking score ( $P = .0186$ ) at 54 kg. Closely trimmed primal cut percentages were not significantly ( $P > .1000$ ) affected by the program at 45 kg. At 54 kg the program significantly enhanced percent shank, rib and breast and kidney ( $P = .0035, .0485, .0006$ , respectively). Chemical composition of rib chops were not significantly ( $P > .3000$ ) altered by the program. Clean wool produced and fiber diameter were significantly ( $P = .0121$ , and  $.0240$ , respectively) improved by the breeding program.

**IMPACT:** By taking advantage of the breeding program being developed on University of Nevada's research ranches producers are able to add value to their sheep production system. Evidence of the effectiveness of this research program is clear. By improving genetic stocks, University of Nevada's Merino X Rambouillet hybrid flocks are producing a 90% cleaner wool than the national average and a 15% improvement over indigenous Australian flocks. Lamb production has also improved significantly through our breeding program. Ewes are averaging 25% more pounds of lamb per ewe over the western U.S. average and almost double the pounds of lamb per ewe when compared to Australian Merino flocks. To improve the quality of sheep production nationally, the first annual ram sale hosted buyers from five states, with over 200 producers, researchers, and educators visiting the research ranch in 1999. All of the results

generated through these breeding trials will be published via the WWW in the near future, allowing producer not in attendance the chance to learn more about what is going on at the University of Nevada research facilities.

Source of Funds: Hatch  
NAES State Funds

Scope of Impact: State Specific

### **New Mexico Combined Research and Extension**

Many management practices can increase output and return. Few producers use all proven practices. A major concern of producers and consumers is production of a safe and wholesome human food supply, dictating an increased need for quality assurance programs. Extension and the New Mexico cattle industry participated in phase I of the Beef Quality Assurance Program in the past. Both cattle and sheep producers evaluated production costs and returns and incorporated production practices that would maximize dollar return. New Mexico has different cultural groups who have unique production problems. These include the numerous Indian cultures across the state and the Hispanic cultures of North-central New Mexico.

Impacts -As a result of these programs, 1000 livestock producers benefited economically by increasing their net incomes and furthering their chances for survival in livestock-related businesses; 500 minor species owners increased the welfare and, where appropriate, increased income due to educational efforts and programs.

Source of Federal Funding -Smith Lever 3(b)(c)

Scope of Impact -Multistate Extension (TX)

### **Nebraska Extension**

Cooperative Extension conducts an annual Feedlot Roundtable targeting livestock feeders and the allied industry representatives. Roundtable topics presented and discussed included factors influencing beef quality and tenderness, forces influencing markets and beef trade, presence and control of food borne pathogens, and updates on feedlot health, nutrition and management. Speakers and panel members included representatives of all sectors of the industry, including producers, packers, USDA staff and research scientists, Cattlemen's Associations and numerous land grant institutions.

Impact - during the last three annual meetings, the feedlot roundtable had an average attendance of 160 with producers and allied industry persons attending from Nebraska and all adjoining states. Producers attending represented nearly 750,000 head annually. The range in size of feedlot operations represented was from less than 500 head to over 75,000 head. In a survey of participants, producers indicated an economic impact to their operation after attending the roundtable averaged approximately \$4.00/head with an estimated total impact of \$2.8 million.

Allied industry persons had an influence over 3 million head of cattle annually. These persons indicated the roundtable had an economic impact for producers of \$6.47/head or a total estimated impact of \$19.8 million. Economic impact is based upon improvements in production efficiency, animal health, and carcass quality.

Scope of Impact - State Specific

### **Mississippi Combined 1862 Research and Extension**

a. Cattle producers often turn over ownership of their cattle too soon, sacrificing dollars they could earn if they kept the cattle longer.

Recently, the Mississippi State University Extension Service started emphasizing the importance of retained ownership and value-added options for producers. Through the Mississippi Stocker Calf Program, the Farm to Feedlot program and short courses, Extension specialists are educating producers on the advantages of retaining ownership of calves through their sale for slaughter.

b. Extension specialists demonstrated that through the Stocker Calf Program, producers can increase their profits by up to \$53 a head by retaining ownership through the stocker phase. The Farm to Feedlot program showed that by retaining ownership until the sale of cattle for slaughter, producers can earn \$77 more a head. This program provided \$2.5 million more income for retained ownership calves.

c. Smith-Lever

d. State-specific

### **Alabama Combined Research**

**Statement:** Goat production is becoming a fast growing industry in Alabama. This has thus raised the need for efficient production methods. Cottonseed, a by-product of a major crop in Alabama and the southeast is an inexpensive source of protein and energy that can be incorporated in animal feed for goats. Research at Tuskegee University is determining the effect of feeding whole cottonseed on growth, blood parameters and reproductive performance of goats.

**Impact:** Research results thus far have shown that incorporating whole cottonseeds up to 15% in the diets of goats increased feed use efficiency and can reduce production costs up to 25%. This percent amount of cottonseed in the diets of goats has no adverse effect on the reproductive performance of the male goats.

**Sources of Federal Funds:** Evans-Allen

**Scope of Impact:** State Specific”

### **Georgia Combined**

Poultry scientists have developed and conducted comprehensive workshops and seminars to assure poultry production efficiencies in Georgia. The poultry ventilation and heating workshops, the hatchery/breeder workshops, the Georgia Poultry Conference, the Deep South Poultry Conference, and the Southeastern Egg Producers Forum seminar programs have provided information to poultry company personnel throughout Georgia and surrounding states. County Extension Grower Meetings have provided information to poultry growers across the state. Cooperating Institutions/Organizations: The Georgia Poultry Federation, the Georgia Egg Association, and Georgia Poultry Companies.

### **Impact**

Over 1,000 poultry company personnel have attended specialized workshop and seminar programs in Georgia related to production efficiencies. Evaluations of these programs have ranged from 4.0 to 4.5 on a 5 point scale. Participation by poultry specialists in county extension programs reach over 1,000 growers annually. As a result of these programs, poultry integrators and growers are utilizing state of the art ventilation, cooling, and heating systems in their production facilities. In addition, integrators and growers are adopting and utilizing best management practices for breeder flocks including feeding, lighting, and breeder male management programs. Poultry hatchery operators have implemented new sanitation methods to improve hatchability and reduce chick contamination.

**Source of Federal Funds** - Smith-Lever.

### **Scope of Impact**

**Multi-State Extension** with Alabama, Tennessee, and Florida: Workshops related to poultry house ventilation, hatchery operation, and breeder flock management have been conducted cooperatively with Alabama. Educational conferences and seminar programs relating to broiler and commercial egg production have been conducted cooperatively with Tennessee and Florida. The Deep South Poultry Conference and the Southeastern Egg Producers Forum programs have developed strategic educational alliances with Florida. Approximately .3 scientist EFT and .2 clerical EFT were required.

### **Kentucky Combined**

One key to increasing profitability in a beef cattle operation is to improve the development of replacement heifers. Producers in several regions in Kentucky have begun to enhance profitability of their operations by marketing properly developed commercial heifers. In 2000, approximately 1500 heifers were marketed in 6 promoted sales in Kentucky. All heifers in these sales were developed under guidelines established by the University of Kentucky Extension. Heifers in these sales averaged approximately \$940 and sale averages ranged from \$850-\$1065. Producers in these sales likely increased their profitability by \$100-250 per head. Thus, the economic impact of heifer development sales in Kentucky this year was approximately \$1.41 million and profitability on these operations likely increased about \$300,000. Most sales are expecting to expand greatly in coming years.

Source of Federal Funds: Smith-Lever  
Scope of Impact: State-Specific

## **Key Theme - Urban Gardening**

### **Oregon Extension**

#### **Gardening that raises awareness and makes a difference**

Home gardening enthusiasts throughout the state can always get a friendly answer to their gardening questions thanks to the Extension Master Gardener program. In FY 00, the state's 3,093 Master Gardeners shared their expertise with 272,671 contacts in 26 of Oregon's 36 counties, making it the most popular program in the OSU Extension Service. Graduated Master Gardeners volunteer to teach new classes, providing services to Oregonians worth an estimated \$1.8 million annually.

Source of Federal Funds – Smith-Lever 3b&c

Scope of Impact – State Specific

## **Key Theme - Invasive Species**

### **Oklahoma 1862 Extension**

An Oklahoma IPM musk thistle control program was developed in the early nineties and has been implemented statewide through cooperative efforts of researchers, extension personnel, and landowners. This integrated program focuses on: 1) increasing public awareness of the problem, 2) development of educational information, 3) demonstrating various control options, and 4) introducing new biological control agents. Numerous demonstration and educational meetings have been conducted. Extension Educators and landowners collected 71,000 musk thistle head weevils in four northeastern counties in the Spring of 2000, and released them on 142 new sites in 20 counties. In all 250,000 musk thistle head weevils were released by this program. In addition, they collected 13,600 rosette weevils and released them on 22 new sites in Oklahoma. Five demonstrations were established in 1999-2000 in eastern Oklahoma. About 120 landowners attended tours of the demonstrations in spring of 2000. They saw results of chemical and biological control; plus signed up for release of weevils on their land. Two fact sheets were published in 2000, one on "Integrated Control of Musk Thistle" and one on "Thistle Identification".

### **Impact:**

Landowners in NE Oklahoma have noted from 80% to 95 % decrease in number of musk thistle plants in areas where they are using an integrated approach that includes use of the musk thistle weevils. However, some landowners just became concerned about controlling musk thistle after the 1998 "Thistle Law". Significant cost saving is possible when musk thistle weevils are integrated into musk thistle management systems. Spraying of pastures could be phased out after a couple of years and no annual border spraying would be required. Cost associated with an integrated approach using weevils would be \$1,600 for spraying and \$200 associated with trips to collect 500 weevils. For many of the producers participating, Extension Educators have collected weevils and provided them at no cost. Cost of controlling musk thistles for 10 years using an integrated approach with weevils would be \$1,800 or less. This represents an average savings of at least \$3,400 per producer over the first 10 years while at the same time significantly reducing the amount of herbicides broadcast on the land. By making landowners aware of damaging effects of musk thistle, it is expected that they will become more involved in control and preventing spread of all invasive weeds.

**Funding:** Smith Lever; State

**Scope of Impact:** State Specific

### **Connecticut New Haven Research**

(9) forest health monitoring programs will detect emerging insect and plant diseases that may affect nursery-grown plants. **Themes: Invasive species, Plant health, Ornamental/ green agriculture**

*Results:* A new wood-boring insect pest, the small Japanese cedar longhorned beetle (*Callidiellum rufipenne*), was discovered in Connecticut. This insect is native to Japan, Korea,

Taiwan, and eastern China, but there were previous records of its presence at numerous ports in the United States and in North Carolina. It is unknown how *C. rufipenne* entered Connecticut. Station scientists are working with the USDA Animal and Plant Health Inspection Service to determine if the pest moved from northwestern United States or Canada to Connecticut to meet long-term critical issues of stakeholders.

*Callidiellum rufipenne* invades the branches of arborvitae, junipers, and cedar trees and was previously thought to be a borer of only dead or stressed trees. However, *C. rufipenne* larvae were detected by Station scientists in living arborvitae branches brought by a citizen to a diagnostic laboratory at the Station during FY 1999. Subsequent annual state surveys of 200 nurseries and examinations of about 27,000 trees on state and private lands in FY 1999 and 2000 revealed infestations in nurseries and on homeowners' properties in at least 28 towns (4 counties) in southern Connecticut and in Massachusetts, New Jersey, New York, and Rhode Island. A statewide quarantine was placed on infested nursery stock, which was destroyed by burning. At the request of stakeholders, a research project was started to determine if insecticides could control the adult beetle.

**Impact:** the pest population was reduced by chemical control on a homeowner's property. An arborist (an Hispanic male who owns his own company) worked along with Station scientists to develop a control strategy and to apply a permethrin-formulated insecticide (Astro). Fact sheets and news releases informed other stakeholders within and outside Connecticut and state and federal regulatory officials of potential infestations of *C. rufipenne* and efforts to contain or eradicate this pest.

**Sources of funds:** Hatch, McIntire Stennis, and state.

**Scope of impact:** multistate (CT, MA, NJ, NY, RI).

**Controlling The Smaller Japanese Cedar Longhorn Beetle.** *Callidiellum rufipenne* is an exotic wood-boring insect that attacks arborvitae, junipers, and cedar trees. Native to Japan, Korea, Taiwan, and eastern China, this insect was found infesting live arborvitae in Connecticut and poses a serious threat to the nursery industry in Connecticut and other states. Scientists at The Connecticut Agricultural Experiment Station have determined the geographic distribution of the insect in Connecticut and other northeastern states and have developed a control method by using a permethrin-formulated insecticide that kills adult beetles.

### **Connecticut New Haven Research**

(10) laboratory and field experiments on chemical control of soil-inhabiting beetle larvae in container-grown nursery stock will reveal a more cost-effective and efficient method of treating nursery stock for national and international shipments. **Themes: Agricultural competitiveness, Agricultural profitability, Invasive species, Ornamental / green agriculture, Plant health, Small farm viability**

**Results:** Black vine weevil, Japanese beetle, and oriental beetle are major pests in container-grown nursery crops and turf. The presence of larvae in pots can lead to rejection of plant shipments by importing states. Stakeholders requested assistance from Station scientists to meet intermediate critical issues. Of the 22 insecticide treatments tested at a cooperating nursery in a multistate integrated research/extension program, pre-plant potting mix incorporation of bifenthrin at 5 to 25 parts per million gave 100% control of all these target pests.

**Impact:** a concentration of bifenthrin at 5 parts per million still remained effective and was most economical. **Impact:** in turf (multistate NE-187 integrated activity), an insect growth regulator

(halofenozide) was found to be selectively toxic to Japanese beetle and oriental beetle. Control of European chafer was less effective. Asiatic garden beetle survival improved in the presence of this insecticide, however.

**Sources of funds:** Hatch and state.

**Scope of impact:** multistate integrated research (CT, FL, MA, MD, ME, NJ, NY, PA, RI) and extension.

**New Method Of Controlling Japanese Beetles.** A scientist at The Connecticut Agricultural Experiment Station found that pre-plant potting mix incorporation of bifenthrin at 5 to 25 parts per million was an acceptable control method for Japanese beetles. This method was accepted in August, 1998 by the National Plant Board to certify treated plants as being free of Japanese beetle. Many growers are now adopting the use of the 0.2% granular formulation of bifenthrin to protect their container-grown nursery stock from root weevils and white grubs. Homeowners and lawn care companies are being encouraged to identify white grubs in turf to prevent ineffective applications of halofenozide.

## **Key Theme - Agricultural Communications**

### **Ohio Combined Research and Extension**

**Description of Activity** - Team electronic newsletters and fact sheets/bulletins through appropriate e-mail list serves and Web sites have been identified by Ohio clientele as preferred option to more traditional extension educational meetings. Many of OSU Extension's commodity-focused teams provided weekly/monthly electronic newsletters and research updates which have been evaluated for their economic impact. OSU Extension team members developed educational newsletter summaries following weekly tele-conferences titled: *Amazin' Graze*, *Buckeye Yard and Garden Line (BYGL)*, *Crop Observation and Recommendation Network (CORN)*, *Grain Marketing Research and Innovative Strategies (GRAINS)*, *Pesticide Update (PEP TALK)*, *Pork Pointers*, *Vet-Net*, *Vineyard Vantage* and the Watershed Network's *Buckeye Basins*. We have listed all newsletters on our OSU Extension *Ohioline* Web site, as well as many of our team's individual Web sites for easier access by our stakeholders/producer clientele.

**Impact** - Newsletter surveys have indicated that agronomic crop producers saved over \$4.5 million dollars in chemicals used from implementing management practices presented in the *CORN* newsletter and over \$1.5 million from utilizing marketing tips found in our *GRAINS* newsletter. The OSU Extension beef team Web site, released in May 1997, had more than 6,200 hits during May, 2000. Recently, the Web site was named the number 1 Web site for livestock information by a public opinion survey conducted in Spring, 2000. The *Buckeye Yard and Garden Line (BYGL)*, started in 1990, continues to be a key electronic educational tool developed by the OSU Extension Nursery Landscape and Turf Team for county Extension offices, the commercial green industry, and the gardening public. In the 2000 *BYGL* Evaluation Survey, 185 respondents indicated that *BYGL* saved their businesses over \$115,000. Over 46% of the respondents indicated that the *BYGL* changed their pest management practices. Through newsletters, media and other sources, respondents indicated that *BYGL* reached over 600,000 people in 2000. *Buckeye Yard and Garden onLine*, the web version of *BYGL* averaged over 5,000 hits per month during the growing season. This version of *BYGL* is linked to thousands of plant and plant pest images and over 23,000 fact sheets from throughout the U.S. via links to the OSU Horticulture and Crop Science in *Virtual Perspective* Web site. In addition, *BYGL* is used throughout Ohio at universities as part of the curriculum for undergraduate horticultural courses.

**Source of Federal Funds** - Smith-Lever 3b&c

**Scope of Impact** - State Specific

## **Key Theme - GIS/GPS**

### **New Jersey Combined Research and Extension**

**Activity:** Extension agricultural agents and specialists have developed and implemented Rutgers site-specific precision management of agriculture and natural resources programs brings new technologies and time specific information to farmers and others by deploying Geographic Information System (GIS), Global Positioning System (GPS), and Remote Sensing (RS) precision agriculture tools. In addition, other high technology tools are used for field mapping, analysis crop stress, and watershed monitoring. The focus has been on Integrated Crop Management (ICM) and Integrated Pest Management (IPM) providing farmers with timely information to improve efficiently.

**Impact:** Field and forage crops ICM was practiced on over one hundred fifty fields with boundaries mapped and entered into GIS and sampled using the presidedress nitrogen quick test (PSNT). Recommendations for nitrogen fertilizer, based on the results of PSNT, saved producers approximately \$45,000 compared to traditional fertilizer practices. An additional \$10,000 was saved on decreased insecticide spraying through the use of site-specific scouting practices for alfalfa weevil.

Since 1997 cranberry growers have benefited from Color Infrared (CIR) aerial photography that has been used successfully to identify areas of beds with poor drainage and those that have extensive weed populations. The photography also documented areas with the presence of fungal diseases such as Fairy ring and Phytophthora root, which are not visible from the surface. Previous treatment recommendations for diseases required application of fungicides to areas larger than affected sites. For material alone, treatment usually costs \$10,000 per acre of treated area. The use of remote sensing in detecting the specific location and extent of these diseases enables growers to target areas for treatment, thereby decreases the amount of fungicide applied and lowers costs.

By accessing maps at the RCE web site, farmers, researchers and others are able to receive critical pest information in as little as one day after the actual sampling period. This technology is used to control European corn borer (ECB) and corn earworm (CEW), highly destructive pests of New Jersey vegetable crops including sweet corn, lettuce, snap and lima beans, and peppers. New Jersey growers apply approximately \$862,800 of insecticides annually for control of these pests. It is now as easy as glancing at a map to determine how to treat host crops and monitor pest in a fine geographical region. Mapping technology has also been used effectively on parasite control in the equine industry.

**Source of Funding:** Smith-Lever 3(b) & (c), State Funds, Private Grant, and USDA Special Grant

**Scope of Impact:** State Specific

## **Key Theme - Plant Health**

### **North Carolina Research**

North Carolina peanut farmers used to protect their crops from a disease called leafspot by spraying fungicide at regular intervals on a predetermined schedule. Such spraying can be costly and sometimes unnecessary. Faculty in the College of Agriculture and Life Sciences at North Carolina State University came up with a better way of controlling leafspot. The disease infects crops only under certain weather conditions. By monitoring the weather, specialists were able to predict when the disease was likely to infect crops. Using this information, farmers spray only when disease outbreaks are likely.

Impact - Using the leafspot advisory, farmers can cut their fungicide use dramatically. Approximately 75 percent of North Carolina peanut growers now use the advisory to determine when to apply fungicide. Depending on the weather in a given year, North Carolina farmers save from \$1 million to \$2 million in fungicide costs. Similar pest outbreak prediction systems have been developed for and are being tested on other crops across the Southeastern United States. At the same time, advances in computer hardware and software are making it easier for farmers to get this information. And advances in weather forecasting promise to make the information yet more useful by enabling pest outbreak predictions days from an actual outbreak.

Source of Funds - Hatch, State and Smith-Lever

Scope of Impact - Regional

**Key Theme - Diversified/Alternative Agriculture**

**North Carolina Extension**

- a. Farmers will be assisted in investigating innovative agricultural opportunities and exploring marketing options to ensure continued farm productivity and enterprise profits.
- b. Performance measures include 807 producers who adopted new market options . 3429 producers gained an increased awareness and knowledge of alternative production systems. A total of 93,778 acres were affected. The increase in profitability through the adoption of new marketing options was estimated to be \$2,713,345.

## **Key Theme - Innovative Farming Techniques**

### **Florida Combined**

A major effort in our extension and research program has been in the area of conservation tillage of all major row crops (corn, peanut, cotton, soybean) grown in the Southeast. Erosion problems, both water and wind, are a real concern on the erodible sands of the Coastal Plains when intensive tillage is practiced. Most of the research in the southeast shows significant yield increases if the compaction layer is broken, which is a layer from 6-14 inches deep. This layer is normally broken through deep plowing or ripping. When soils are loosened then deep and heavy rain occurs, several tons of topsoil are lost leaving unproductive soil where the topsoil was lost and at the bottom where sand accumulated. Many of these fields have deep gullies that are hard to get equipment across. Over the past 10-15 years equipment was adapted for "strip till" planting that is no-till plus in-row sub soiling. We were able to develop management practices and then publications from data collected from research and demonstration plots. With the event of Roundup Ready crops and other new products, the main concerns of no-till or strip-till planting of crops were eliminated. Until 1993, no more than about 5% of the growers in the southeast were using strip tillage to plant their crops. At that time, cotton acreage was beginning to increase dramatically. The measurable goal was to increase the use of conservation tillage or strip till planting from 5% of the acreage to 50% of the acreage in 5 years.

#### **b. Impact/Accomplishment Statement**

Because we had extensive data on strip till cotton management practices and were noted as leaders in this area, we teamed up with industry (especially Monsanto and KMC, but many others), Natural Resource Conservation Service, and other organizations to promote strip tillage, use of cover crops, and other practices associated with conservation tillage. Several state and regional meetings were held during the winter of 1993 to target cotton growers. In 1994 and 1995 several growers who had switched to strip tillage were on these programs telling about their successes and problems. The number of acres switching to conservation tillage increased dramatically, going from about 5% in 1993 to as much as 70% by 2000. Farmers found out that they could save soil, oil, and toil and decrease overall cost of production. Long-term sustainability is insured by saving our natural resources and short-term profits of \$22 to \$55 per acre have been realized by the change from conventional tillage to conservation tillage practices on cotton. With Florida and the southeast producing about 2.1 million acres, a 15-fold increase in conservation tillage usage by farmers has resulted between \$15.8 and \$34.6 million savings to growers in the southeast region alone. During the past two years (1998-2000), we have concentrated on showing the advantages of strip till planted peanuts. Peanuts have had the most intensive tillage operations of any of the southern row crops. Many university faculty also recommended turning land prior to planting peanuts to bury plant litter that might harbor disease. Years of teaching necessity of deep tillage had to be overcome. We again were part of the team that worked with the conversion of cotton to conservation tillage. Our research over the last several years has shown reduced disease pressure, less virus pressure and generally equivalent yields with strip-tilled peanuts planted into a small grain cover crop. Florida Extension had about 20 years of experience from our programs to draw on to put together a total management package for conservation till-planted peanuts. *David Wright*

**c. Source of Federal Funds:** Smith-Lever

**d. Scope:** Multi-State Extension  
AL, GA

## **Key Theme - Grazing**

### **Indiana Research**

*Description:* Purdue researchers conducted research on the potential merits of using variations in a rotational livestock stocking system. Most cow-calf producers currently use one large pasture with no rotation (continuous stocking). There is a question as to the benefits of subdividing a pasture into numerous paddocks for rotational stocking. They conducted research at two sites and found that an 8-paddock system produced 0.47 ton of hay per acre during the grazing season and 40 more grazing days in the autumn. Forage consumption by the cattle was not limited on any of the paddock systems.

*Impact:* Value of the hay produced and extra grazing days in the autumn with an 8-paddock system is, conservatively estimated to result in a return of \$25 more per cow.

c. *Source of Federal Funds:* Hatch

d. *Scope of Impact:* Multistate

## **Key Theme - New Uses for Agricultural Products**

### **Minnesota Research**

#### Description

Research on new uses for agricultural products includes studies of using distillers' dried grains as a promising protein/fat supplement to the homegrown grains and forages fed to dairy cattle. It also includes bioengineering studies of the development and use of extrusion cast films/sheets from agricultural materials.

Packaging films/sheets constitute a sizable portion of our municipal solid waste and their inherent non-biodegradability is a major source of pollution. In the U.S. alone, over 1 billion pounds of petroleum-based plastics are used for this purpose. Similar amounts are being used in Europe. Research into the use of natural polymers from agricultural products offers not only a new use for such products, but important environmental benefits. It is expected that approximately 50 percent of the synthetic polyester could be replaced with natural polymers leading to a significant value addition. These blends would serve as an alternative to pure petroleum-based polymers.

To promote new uses for alfalfa in the containment or removal of environmental contaminants, research has focused on selecting alfalfa for tolerance to manure or wastewater application during the growing season. Selection for mowing tolerance in alfalfa is being studied to evaluate plants in both an intensive mowing or lawn situation.

#### 5. Impact

Research has found that the crude protein of distillers' dried grain ranged from 24 percent to 35 percent, with 10 percent average fat content. As a result of using this as feed, some farmers have saved as much as 20 cents per cow per day in feed costs. This product has already provided ethanol producers with an opportunity for additional income by replacing soybean meal and other protein supplements with distillers dried grain in cattle diets.

Studies on extruding sheets of starch/synthetic polyester blend has shown that blends of up to 60 percent starch can be extruded with a thickness as low as 0.3 mm. Research into the technology for making highly refined cellulose from agricultural byproducts also offers potential as a value-added process.

New alfalfa varieties for use in the containment or removal of environmental contaminants will improve nutrient cycling and protect water quality. The creation of mowing tolerant alfalfa will allow the introduction of alfalfa into parklands and golf course fairways to increase the nutrient fertility of these grassland areas without having to apply inorganic fertilizer.

Experiment Station Projects: MIN-16-047, MIN-12-092, MIN-13-028

<http://www3.extension.umn.edu/mnimpacts>

#### 6. Funding: Hatch and State

7. Scope of Impact: (1) State Specific