FY 2020 Annual Report of Accomplishments and Results

Texas
Texas A&M AgriLife Extension
Texas A&M AgriLife Research
Texas A&M University

I. Report Overview

The NIFA reviewer will refer to the executive summary submitted in your FY 2020 Plan of Work located in the Institutional Profile. Use this space to provide updates if needed.

1. Executive Summary (Optional)

Texas is the second largest state in the nation with approximately 29 million citizens. The size and scope of Texas pose unique challenges with a wide range of diversity including both the agricultural and human sectors. The issues and needs of Texans vary by numerous factors and, in many cases, are complex. Texas is one of the most rural and most urban states in the nation with a majority of its citizens living in 20 of the 254 counties in the state.

AgriLife Extension and AgriLife Research

Texas A&M AgriLife Research (AgriLife Research) and the Texas A&M AgriLife Extension Service (AgriLife Extension) are the land-grant research and Extension components of the Texas A&M System and are headquartered in College Station, Texas. Since its beginning in 1876 as a land-grant institution, Texas A&M University has been a recognized leader in agriculture, food, and natural resources. Today, Texas A&M University, AgriLife Research, and AgriLife Extension continue this legacy through outstanding academic programs, important contributions to science through research and discovery, and life-long learning and youth development through Extension programs.

The work of both AgriLife Research and AgriLife Extension is guided by strategic plans. AgriLife Research developed a strategic plan to focus its resources on issues of highest importance as identified by agency scientists and other stakeholders. The major topical areas in the strategic plan are identified as priorities. These priorities are vital and equally important to ensuring a positive future for Texas and its citizens. The priorities are as follows:

1) Achieve resilience in food, fiber, and ecological systems through adaptive strategies.
2) Detect, monitor, and mitigate insect vector-borne diseases and invasive species.
3) Enhance agricultural information systems and expand their use through innovative applications.
4) Integrate basic and applied research at the nexus of food and health.

The Extension strategic plan is designed to enable the dissemination of research-based information to the citizens of Texas on issues of importance as identified through grassroots and other stakeholder input processes. This information is intended to allow the citizens of Texas to make sound decisions that will improve the overall quality of life for themselves and all Texans. The goals of the Extension strategic plan are:

1) Ensure a sustainable, profitable, and competitive food and fiber system in Texas.
2) Enhance natural resource conservation and management.
3) Build local capacity for economic development in Texas communities.
4) Improve the health, nutrition, safety, and economic security of Texas families.
5) Prepare Texas youth to be productive, positive, and equipped with life skills for the future.
6) Expand access to Extension education and knowledge resources.

Work on issues of importance in the state is a joint endeavor by both AgriLife Research and AgriLife Extension. Research-based information is translated to practical best management practices and disseminated via multiple channels including the network of agents in all 254 counties in the state.

Both AgriLife Research and AgriLife Extension conduct identification of issues and needs at multiple levels. Grassroots involvement by citizens, advisory groups, and commodity and industry groups are just a few of the ways this information is generated. Work with other states on areas of shared interest is also of high priority. This report addresses programs of primary importance in Texas. The programs selected also address federal initiatives for agriculture and natural resources, individuals and families, communities, and youth and adult leadership development.

Note: Numbers and results for 2020 were likely affected by the Covid-19 pandemic.

II. Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your 2020 Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Process	Updates ONLY
1. The Merit Review Process	No updates to previous submission.
2. The Scientific Peer Review Process	No updates to previous submission.

III. Stakeholder Input

The NIFA reviewer will refer to your 2020 Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Stakeholder Input Aspects	Updates ONLY
1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation	**AgriLife Extension and AgriLife Research** Both AgriLife Extension and AgriLife Research use multiple methods to reach stakeholder groups within the State of Texas. AgriLife Extension uses multiple sources of input from various stakeholders. These include local clientele, commodity/special interest groups, trend data monitored by specialists, various county committees, elected officials, and emerging issues. Teams of Extension and research faculty meet to analyze these issues, which lead to priority setting and development of programs to address the needs and issues raised by the various stakeholder groups and methods. Beginning in 2021, AgriLife Extension will employee a statewide electronic needs assessment and asset mapping process to gain community data from across the state. This process, called TexasSpeaks, will allow all Texans to provide input on their communities. Data will be used for decision making and program development. Local Leadership Advisory Boards (LABs) meet to validate issues raised in the local stakeholder input process in the non-forum years. Leadership Advisory Boards serve as a conduit to local citizens and their needs. These boards are comprised of community opinion leaders charged with providing long-term visioning and advocacy for the local Extension program. Approximately 2,500 individuals serve on Leadership Advisory Boards across the state. This process continues as the local process to raise and validate issues. Another 10,000 citizens serve on program area committees, task forces, coalitions, and youth boards. These volunteers represent specific areas of the local program and are involved in issues identification, program development and delivery, evaluation and interpretation of programs, and management of other volunteers. These volunteers represent all 254 counties in the state. AgriLife Research Administration, Department Heads, and Resident Directors regularly meet with the major agricultural industries and commodity groups in Texas. AgriLife Research has encouraged the public to participate in helping set priorities, assess current program and process effectiveness, and determine future directions. These processes were open, fair, and accessible to encourage individuals, groups, and organizations to have a voice, and treated all with dignity and respect. Stakeholders were initially identified by membership in listed organizations, though all events were public and were announced in the press and other written notice. Input from these events was captured by AgriLife Research participants, and in some cases, was published for further public use. Stakeholder input has always been critical to AgriLife Research processes and programs, and listed events and organizations continue as essential partners in setting the

	AgriLife Research agenda and recognizing and addressing emerging issues. A concentrated effort was done for small grains, corn, sorghum, and cotton resulting in a jointly developed strategic plan. AgriLife Research also met with leading animal health companies, large cow-calf operators, stockers, cattle feeders, and leaders in high-throughput sequencing to develop a research strategy to benefit the beef industry.
2. Methods to identify individuals and groups and brief explanation.	No updates to previous submission.
3. Methods for collecting stakeholder input and brief explanation.	Beginning in 2021, AgriLife Extension will employee a statewide electronic needs assessment and asset mapping process to gain community data from across the state. This process, called TexasSpeaks, will allow all Texans to provide input on their communities. Data will be used for decision making and program development.
4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.	Beginning in 2021, AgriLife Extension will employee a statewide electronic needs assessment and asset mapping process to gain community data from across the state. This process, called TexasSpeaks, will allow all Texans to provide input on their communities. Data will be used for decision making and program development.

IV. Critical Issues Table of Contents

No.	Critical Issues in order of appearance in Table V. Activities and Accomplishments
1.	Agriculture Production (1862)
2.	Natural Resources and the Environment (1862)
3.	Community and Economic Development (1862)
4.	Connecting Agriculture and Health (1862)
5.	Health and Wellness (1862)
6.	Youth Development and Leadership (1862)
7.	Adult and Community Leadership (1862)

V. Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). In your outcome or impact statement, please include the following elements (in any order): 1) the issue and its significance (e.g. who cares and why); 2) a brief description of key activities undertaken to achieve the goals and objectives; 3) changes in knowledge, behavior, or condition resulting from the project or program's activities; 4) who benefited and how. Please weave supporting data into the narrative.

No.	Project or Program Title	Outcome/Impact Statement	Critical Issue Name or No.
1.	**Supporting Livestock Production through Education**	Livestock producers are facing serious threats from pervasive and invasive vector-borne diseases. Concerns over variable prices, uncertain weather conditions, and increasing production expenses have spurred demand for sound management practices and decision making that is key to optimizing production efficiency and competitiveness. The Texas A&M AgriLife Extension Service delivers wide-ranging educational programs focused on research-based livestock production and management practices, evaluation of technologies, improved decision making, water-use efficiency, and job training. Programs for livestock operations focus on improved reproduction strategies, animal health, feeds and nutrition, forage production, breeding-stock replacement strategies, livestock marketing, and financial risk management. Through 10,900 educational events, planning meetings, and workshops in 2019, AgriLife Extension achieved more than 1.8 million educational and other contacts. AgriLife Extension often collaborates with industry groups and with other government entities to deliver educational programs.	Agriculture Production (1862)

		• Selected programs are highlighted below where impacts were measured by the increase in net returns associated with adoption of certain management practices taught in 2019. • The increase in net returns resulting from the adoption and implementation of selected beef cattle management practices taught at the Texas A&M Beef Cattle Short Course and Ranch Management University resulted in a total economic benefit of $5.9 million. • For dairy operations, the economic benefits resulting from the adoption of heat abatement and other management strategies was estimated at $12.7 million. • The net returns increase resulting from the implementation of selected beef cattle management practices taught at the Beef Quality Assurance trainings and Hemphill County Beef Conference resulted in economic benefits of $32.9 million. • Extension programs focusing on managing livestock and crop financial risk led to estimated gains of $31.4 million. • The economic benefits of the Beef Cattle Reproduction Management Schools were estimated at $7.3 million. • Job training and continuing education through Beef Quality Assurance trainings, Feedyard Camp, and the Feedyard Technician Program support 198 Texas jobs, with an annual wage base of $5.2 million. Since these impacts represent just a selection of livestock educational programs, the economic impacts are considered to be conservative as they do not reflect all livestock educational programs.	
2.	**Livestock & Plant Genetics**	Animal agriculture is dominant in Texas. It accounts for over two-thirds of gross farm-gate sales and contributes substantially to rural communities and the overall statewide economy. This is only possible as long as animal agriculture can deliver a safe and healthy consumable product to the global market through efficient and sustainable production methods. Texas farmers and ranchers plant nearly 8 million acres of small grains annually, which include wheat (>6 million acres), oats (>600 thousand acres), and barley, rye, and triticale. Whether protecting commodity crops or developing drought-resistant landscaping plants, AgriLife Research provides solutions for natural	Agriculture Production (1862)

		resources and water conservation, disease-free crops and plants and systems for crop production. Research Impacts • Amarillo researchers estimate that a Panhandle feedlot with a capacity over 32,000 head could save about $40,000 per year by adopting dust-abatement practices alone. • The Amarillo center has developed a scientific basis for cost-effective air quality emissions abatement for open-lot cattle feedlots and dairies in the Southern Great Plains of Texas and Kansas. • The Lubbock center conducted a multi-year study showing that fertilizing cotton with more than 100lbs of nitrogen per acre could negatively affect cotton quality. • San Angelo researchers are selecting goats that ovulate earlier in the spring to enhance the production of year-round goat meat and allow producers to benefit from the almost 20% higher prices in the low volume winter months. • The ruminant nutrition and health team focuses on improving feeding strategies through implementation of alternative feed technologies, forage and grain processing, and appropriate utilization of byproduct feeds. Genomic selection tools are being implemented to improve animal health, fertility and production. One example is the Stephenville Research Center scientists developed an in vitro embryo production and transfer system to improve summer fertility in commercial or dairy cows, this advance save the industry $40 million annually. • Another Department of Animal Science research program focusing on the biochemistry and nutrition of protein and amino acids in animals has demonstrated that the use of functional amino acids improves placental development and meat quality in pigs, that there is a lack of degradation of extracellular glutamate and citrulline by ruminal bacteria, and functional amino acids and dipeptides in beef improve human health. Other research has identified biomarkers and management strategies for pregnancy success in cattle which could result in predicting, identifying and preventing pregnancy loss in 20-30% of cattle. These approaches	

		could be worth $500 per head, or more than $1 billion for cattle producers and include biomarkers of pregnancy loss and paternal versus maternal contributions to pregnancy loss.	
3.	**Crop and Forage Production**	**Cotton** The selection of cotton varieties is one of the most important decisions cotton growers face each season. Unlike other management decisions which can be modified throughout the season according to current challenges and conditions, variety selection is a "one-time" decision that will impact the management of the field for the remainder of the season and has a major influence on cotton yield and fiber quality. Each year, cotton RACE (Replicated Agronomic Cotton Evaluation) trials are conducted across the diverse cotton productions regions of Texas to provide growers with the highest quality, unbiased information on the performance of currently available cotton varieties. These trials are conducted with the help of numerous county Extension agents and cooperating growers. The data from these trials is summarized and made available as soon as possible to growers through county extension programs, AgriLife websites, newsletters, and social media. In 2020, Texas cotton producers planted over 6.8 million acres of cotton. When top-performing cotton varieties are compared to field averages, the 2020 RACE trials demonstrated yield and lint value advantages of **128 to 193 lb per acre** and **$42 to $102 per acre**, respectively. Assuming the results of these trials influence variety selection decisions on 10% of the cotton acres in these regions, a statewide impact of over **$68.6 million** is estimated for 2020. Research at AgriLife's Drought tolerance Laboratory at the Corpus Christi Center study drought tolerance of cotton and sugarcane. One study found two cotton genotypes that showed high water use efficiency as a result of higher biomass partition into seed cotton. Two transgenic sugarcane varieties showed higher water use efficiency while maintaining biomass production. **Wheat** The winter wheat varieties included in the 2020 statewide pick's list showed an overall net grain yield increase of 5.2% relative to the set of varieties included in	Agriculture Production (1862)

		the evaluations. Relative to the overall average yield observed in 2020 (34 Bu/ac), this means the pick's lists varieties yield an additional 1.8 Bu/ac. A survey carried out by the NASS USDA showed that in 2020 these select varieties were planted in 21.1% of the harvested winter wheat acreage in Texas, and that a total of 2.1 million acres were harvested in 2020. Thus, the pick's list varieties were planted in approximately 443,000 acres. This generated a net increase in grain production of 783,400 Bu, which, at a winter wheat cash price of $5.17/Bu observed in Texas in November 2020, gives a net increase in revenue of **$4,050,182.** In 2020, there were 2.67 million wheat acres planted on the Texas High Plains for grain and forage production. Of the planted wheat acres, 1.29 million acres were harvested for grain production. Regional wheat variety trials demonstrated that improved variety selection can generate an additional 33 and 18 bushels/ac yield increase on irrigated and dryland acres, respectively. On average, improved variety selection had the potential to increase 2020 grain production on harvested wheat acres by 33 million bushels and gross receipts by $140 million. Our wheat silage (wheatlage) research demonstrated that wheat silage is an essential forage to meet the forage gap for dairies and beef cattle feedlots in the semi-arid Texas High Plains. As groundwater levels continue to decline and livestock numbers increase, summer silage (corn and forage sorghum) cannot be produced in sufficient quality to mee the annual silage demand. In 2020, our research demonstrated that wheat silage returned $88 more per acre than grain increasing the net return on regional wheat acres over $2 million dollars. Research also demonstrated that improved variety selection with TAM wheat could generate an additional $100/acre.	

Variety	Forage Yield* (tons/ac) DM Basis	Gross $/ac ($42/ton)	Grain Yield (bu/ac)	Gross $/ac ($4.50/bu)	Gross $ Diff.
TAM 114	5.9	$ 245.85	18.5	$ 83.25	$ 162.60
WB4792	5.7	$ 240.89	16.7	$ 75.15	$ 165.74
SY Monument	4.5	$ 190.17	20.1	$ 90.45	$ 99.72
AP EverRock	4.5	$ 190.16	28.2	$ 126.90	$ 63.26
TX14V70214	4.4	$ 186.19	24.4	$ 109.80	$ 76.39
TAM 113	4.3	$ 180.86	23.8	$ 107.10	$ 73.76
SY Grit	4.2	$ 176.63	25.3	$ 113.85	$ 62.78
TAM 205	3.6	$ 151.14	23.8	$ 107.10	$ 44.04
SY Wolverine	3.4	$ 140.87	22.0	$ 99.00	$ 41.87
Average	**4.5**	**$ 189.19**	**22.5**	**$ 101.40**	**$ 87.79**

*Forage yield at soft dough

*Grain yields taken from grain plots adjacent to forage plots

Corn:

Corn is produced on approximately 800,000 acres on the Texas High Plains' primarily as corn grain and silage for the livestock industries. To meet the crop water demand, irrigation is necessary to stabilize corn production. As a result, corn is the primary irrigated crop in the Texas High Plains utilizing 53% of irrigation resources. Declining well capacities have resulted in producers seeking agronomic practices to stabilize production with declining well capacities. Recent research evaluating planting alternative planting dates (Bell, Xue, Marek, and Heflin) demonstrated that shifting planting from traditional planting in April and May to a late planting in June. Under full irrigation, delaying the planting date resulted in a water savings of 2.5 acre-inches while increasing grain yields an average of 30 bushels across all hybrids and irrigation levels evaluated. Delaying planting may provide farmers a strategy to increase grain yields with limited irrigation capacities. Assuming planting dates are modified, and 2.5 acre-inches are saved on 10% of the corn acres, it is estimated that 5.4 billion gallons of water could be conserved. These findings could lead to reducing water withdrawals from the Ogallala Aquifer while maintaining sustainable irrigated crop production.

		Poor weed management negatively impacts corn yields resulting in wasted water resources as well as the need for multiple herbicide applications to control yield limiting weeds. Evaluation of the impact of weed pressure on corn yields in the Texas High Plains corn herbicide trials (Heflin and Bell) demonstrated that improvements in herbicide selection and application may save producers up to $20/ac in addition to the yield benefit. Consequently, it is estimated that improved herbicide selection on 10% of the corn acres may result in over $1.6 million dollars savings for regional farmers. Corn fertility research (Bell) evaluating preplant fertilizer and side-dress fertilizer placement. Results demonstrated that appropriate fertilizer applications increased corn yields by 84 bushels. It is estimated that improved herbicide selection on 10% of the corn acres may result in over $6.7 million increased revenue for regional farmers. High Plains' corn research demonstrated that improved agronomic management could regionally increase net returns by $8.9 million. **Grain Sorghum** Texas High Plains forage demands continue to increase as a result continued CAFO (concentrated animal feeding operations) expansion; specifically increasing dairy herds. In addition to beef cattle production, approximately 50% of Texas dairies are located on the High Plains resulting in a significant forage demand (https://amarillo.tamu.edu/files/2019/12/Impact-of-AgriBusiness.pdf). Forage sorghums provide a water efficient, drought tolerant alternative to corn silages. The Texas A&M AgriLife Research Forage Sorghum Silage trial at Bushland provides producers with an annual hybrid report in addition to research addressing silage management. Research demonstrated that utilization of improved forage sorghum hybrids improved production by 7.2 tons/acre compared to the trial acreage in a water stressed environment. At current silage prices of $40/acre, improved hybrid selection could increase revenue of $288/acre. If improved hybrids are adopted on 20,000 acres, selection could increase farmer profits by $5.8 million regionally. Forage sorghum silage research also demonstrated that timely sugarcane aphid management can preserve sorghum silage yield and nutritive value. Of significance, research demonstrated that silage quality does not further degrade in the silage pit, and timely sugarcane aphid control can increase yield by more than 10 tons/acre while preserving the forage nutritive value. Assuming implementation of recommended management guidelines on 20,000 acres at $40/ton, management could generate an additional	

		$8 million for the regional economy. Improved hybrid selection and sugarcane aphid management could improve forage sorghum returns by $13.8 million. **Corn and Sorghum Variety Trials** Corn, grain sorghum, soybean, and corn/sorghum silage trials are conducted annually to provide producers with unbiased information on hybrid performance. Performance trials for corn and grain sorghum are conducted at dozens of locations across all major grain producing regions in Texas. Crops are grown according to practices common in each production region in cooperation with growers, county extension agents and regional research and education centers. Yield and agronomic characteristics are compared across hybrids at each location and across locations within production regions. Information developed by these trials is delivered at Extension producer training events, websites and other forms of media. Economic impact at each testing site is estimated by comparing gross grain value of top performing hybrids to trial averages. Total impact is derived from estimates of 10% of adoption of top performing hybrids on current year planted acres. Corn hybrid trials resulted in an average of $66/A. With 2.25 million planted corn acres in Texas during 2020, potential economic impact was estimated at $14.9 million. For sorghum hybrid trials, a statewide average difference of $108/A was observed. With 1.8 million planted sorghum acres, potential economic impact was estimated at $19.6 million during 2020 in Texas. **Crops and Vegetation Management** AgriLife's Natural Resources Institute completed a new map using satellite imagery collected throughout 2019 and brought them together in an animation to illustrate the phenological changes of vegetation across Texas. Showing the annual phenology or pattern of green-up and die-back of vegetation in Texas, the map includes the recurring life cycle stages of leafing, flowering and fruiting plants as well as the maturation of crops. From an agricultural standpoint, these data can be used to monitor the progression of crops throughout a growing season to detect plant stress or identify irrigation needs," he said. These data can be applied in a way to help land stewards determine what management practices may be needed – in the case of severe drought, for example, at larger scales. A regional assessment can be determined in vegetative response related to longer-term climate patterns.	

		Another effort is the Texas High Plains Plant Pathology Project, which is involved with the Great Plains Diagnostic Network (GPDN), a consortium of land grant institutions that provide services for plant disease diagnosis, plant identification, and insect/pest identification. GPDN uses a common software platform to process diagnostic requests and share information between diagnostic laboratories. GPDN is regional member of the larger National Plant Disease and Pest Diagnostic Network (NPDPDN). **Soils** Row Crops $2,272,400: Extension survey results when similarly applied to cotton ($2.6 b.), corn ($1.2 b.), sorghum ($490 m.), and wheat ($276 m.) producers show a 67% increase in knowledge of soil and fertilizer management (88% intention to adopt), 77% gain in cover crop knowledge (30% intention to adopt), and economic benefit of $8,740 per farm. 4 producer meetings with typical attendance of 65 indicate in a total statewide economic impact from education efforts of **$2,272,400.** Forages $1,490,220: Total cattle industry value in Texas is $12.3 billion. Most of these feed on forages (grazing pasture or cut hay). Based on a typical survey median of 181 head of cattle and 600 acres per producer knowledge of fertilizer nutrient management increased by 77.5% (N = 71). 88% of those surveyed reported an intention to adopt recommended practices for soil management. Mean economic impact for this program was $8,279 per participant. Through 6 forage focused programs and, and an average of 30 producers, the total statewide economic benefit is estimated **at $1,490,220.** **Soil, Water, and Forage Testing Laboratory** The Soil, Water and Forage Testing Laboratory analyzed 645 biosolid, 2693 water, 8937 research, 5463 plant/forage, 53 Profile N and 24240 client soil samples. Additionally, 673 TCEQ compliance samples were analyzed. Revenues to the laboratory in 2020 were $691,161.68. Direct outreach activities through CEAs included 28 hay shows (31 counties), 12 soil testing campaigns (45 counties) and 4 water testing campaigns (6 counties). The laboratory uses soil testing campaigns as a mechanism for determining both the current status of producer knowledge of soil fertility and the efficacy of our	

		outreach programming. Through the Soil, Water and Forage Testing Laboratory and County Extension Agents, we had 14 soil testing campaigns representing 31 counties. These campaigns yielded 1223 samples representing approx. 30,948 acres. The analyses of these samples identified 563,010 million pounds of nitrate-N with an estimated value of $365,950. This monetary impact was determined by accounting for residual nitrogen and acreage the sample represented. The monetary impact of the application of un-need phosphorus, was substantially lower than that of nitrogen. Twenty three percent of samples received indicated full crop sufficiency with regard to phosphorus availability. Forty-three percent of the clientele submitting these samples indicated the planned intention of applying phosphorus for the upcoming growing season. If these clientele follow soil test recommendations, and estimate reduction of 320,336 pounds of phosphorus, valued at $288,302 would be realized. A general trend of lower soil phosphorus has been observed in southern agriculture for the past 20 years. In these campaigns, Furthermore, 49.7% of producers indicated that were not planning on applying phosphorus, however soil testing identified these soils as moderately to highly deficient this nutrient. The economic gain from identifying loss revenue due to nutrient deficiencies were calculated, based on estimated of phosphorus sufficiency percentage for each crop, estimated crop availability and producer yield goals. This estimate suggests a potential increased revenue of 2.930 million dollars with the addition of an estimated $49998,056 of additional phosphorus fertilizer. The impact of low phosphorus on economic return in most forage and row crop settings is very significant for much of the state. Additionally, 61.9% of campaign participates had never soil tested or had not soil tested in the past 3 years, representing a significant change in best management practices. This percentage of non-recent or first time soil testing is significantly higher than in the past number of years, and upon review of the dataset, is believed to be caused by campaigns held in counties which have historically not been strong supporters of soil testing. Additionally, wet weather limited participation for some counties The two specific campaigns have had strong CEA support for more than 10 years. Three urban soil testing campaigns were held in during 2019 in Corpus Christi, and Austin, TX, Fayette, Colorado, Washington and Austin Counties. found that 53.1% of participates who had planned on applying spring (2018) nitrogen	

		fertilizer already had adequate nitrogen in the upper six inches to supply nitrogen for at least one traditional fertilization period. Additionally, 72.5% of these urban samples were high, very high or excessive in soil test phosphorus. A small subset of the urban campaign clientele were sent emails regarding their thoughts following soil testing, limited to clientele with high levels of nitrate-N and/or phosphorus. Of the respondents, 74% were surprised of their nitrate-N levels, when informed that following the winter months, the expected levels of nitrate-N should be close to zero. The majority (69%) of clientele (outside of the Austin campaign) used the local home center, garden center staff or radio/newspaper to recommend what fertilizer to buy or when to apply fertilizer. Approximately 17% contacted the laboratory (SWFTL) or their local County Extension office or/Master Gardener group regarding their recommendations and how to purchase the right fertilizer(s). Overall, 77% of the high P sample clientele, indicated they would had looked for zero phosphorus fertilizers and selection were either very limited or not available.	
4.	**New Crops**	Population growth has a direct impact on demand for for agricultural products and services. A large majority of the population now resides in urban communities rather than rural areas. This continued population growth places a demand on the agricultural industry to produce more food, thus increasing our focus on new crops to sustain the population growth and reduce stress on the current food supply. Research Impacts • Beaumont Center researchers developed Texas A&M AgriLife Research's first rice cultivars, which have a 5% yield advantage compared to currently grown varieties which will increase statewide production revenue by $1.22 million per year. • Corpus Christi center scientists and AgriLife Research peanut breeders have developed new peanut varieties that have a greater potential yield and make better use of irrigation water. • El Paso center researchers are developing bioenergy crops that can use marginal-quality water sources such as treated urban wastewater and gray water.	Agriculture Production (1862)

5.	**Economics and Management**	**Training Socially Disadvantaged Farmers** The Rio Grande Valley (RGV) is a predominately Hispanic region located in the southernmost part of Texas bordering Mexico and it comprises the counties of Hidalgo, Cameron, Starr and Willacy. The region leads the nation in terms of the percentage of population living in poverty and number of persons without educational degrees at all levels. Small-scale farmers and ranchers living in deprived communities are traditionally characterized by their limited resources and lack of technical skills. Hence, these small-scale producers have lower possibilities to succeed in a competitive market compared to their more knowledgeable and larger counterparts. In 2016, the RGV Small Acreage Program was created to empower underserved agricultural producers of the RGV. The main goal of the program is to increase the sustainability and retention of small-scale farming operations in the RGV by training underserved and underrepresented farmers and ranchers in sustainable and profitable production and marketing practices. To-date, 30 educational workshops and field days have been conducted and over 1,220 farmers and ranchers have attended the training sessions. Evaluation results indicate that there was a 75% increase in knowledge, 86% of participants plan to adopt what was learned, and 60% of respondents anticipate a positive economic benefit as a direct result of the training sessions. Each educational workshop is expected to generate an economic impact of $1,391 per participant, which could be equivalent to an overall impact of $1,522,812 if those expectations are achieved. Additionally, over 94% of participants are mostly or completely satisfied with the program. **Master Marketer** Agricultural producers continue to look for better ways to manage the many risks they face given the increasing volatility of input and output prices, tighter profit margins, and changes in farm program supports. The Extension Agricultural Economics Unit continues to provide in-depth risk management education through its Master Marketer program. While the extensive program provides over 64 hours of classroom training, it is important for extension educators to understand whether the program is providing the	

		desired educational benefit and is resulting in effective learning and adoption of risk management practices. A 2.5-year post evaluation of the Waco Master Marketer (January-February 2018) participants was conducted during the summer of 2020. Participants ranked the educational quality of the Master Marketer program a 6.7 on a 1 – 7 scale with 7 being excellent. Results from survey questions indicated: an increase in the use of a marketing plan from 22% pre-Master Marketer to 100% post-Master Marketer, an increase in determining production costs and incorporating those into the marketing plan from 44% pre-Master Marketer to 100% post-Master Marketer, and an increase in building profit and growth needs into price targets from 22% pre-Master Marketer to 89% post-Master Marketer. The evaluation also showed an increase in participants using market fundamentals in developing their personal market outlook from 75% pre-Master Marketer to 100% post-Master Marketer, an increase in their ability to manage price and production risk from a 2.1 pre-Master Marketer to a 5.9 (on a 7-point scale with 7 being excellent) post-Master Marketer and knowing when to use forward cash contracting from 50% pre-Master Marketer to 100% post-Master Marketer. The 2018 Master Marketer education had an average individual economic impact of a 4.6% and $39,745 increase in gross farm income for the Waco class. Due to meeting and travel restrictions in the midst of the coronavirus pandemic, the Master Marketer program originally scheduled for Weslaco, Texas in September, October, and November 2020 was held in a virtual format on Zoom. Originally a 64+ hour course, the converted Master Marketer Seminar Series was held as six 2-hour sessions on Thursday mornings September 29 – October 29, 2020. Registration for the online Master Marketer Seminar Series totaled 145 and overall, the participants rated the program a 4.38 on a 1 – 5 scale with 5 being excellent. Participants rated their knowledge level with an average of 2.45 before attending the program and 3.33 after attending the program (on a 5-point scale with 5 being high), for an increase in knowledge gained of 36%. **FARM Assistance** Agricultural producers continue to look for information/education to help better manage the many strategic planning and investment risks they face given the increasing volatility of input and output prices, tighter profit margins, and changes in farm program supports.	

		While the 2020 calendar year has been marked with unprecedented challenges, the FARM Assistance team continues to work individually with Texas farmers and ranchers. The team completed 51 analyses, helping producers analyze alternatives and develop successful strategic plans. Although nothing beats in-person discussion and relationship building, specialists and our clients alike have adjusted in stride to conducting interviews, data collection, validation, and results communication via email, phone, and Zoom. The FARM Assistance team continues a strong working relationship the USDA-FSA Loan program, providing required borrower training in production and financial management for Texas farmers/ranchers with FSA loans. The outcome of client participation is measured through participant evaluations. Client assessments (over the last 3 years) of the FARM Assistance program indicate a very positive impact on management ability. As a result of participating in the FARM Assistance program, 89% claim a better understanding of the financial aspects of their operation and 96% claim an improved ability to assess the financial risks and potential impacts of strategic decisions they make. One of the objectives of the program is to help managers become more comfortable with formal financial analysis, and 87% indicated that they would be more likely to use a formal financial analysis (like FARM Assistance) to help make decisions in the future. 98% of respondents indicated they would recommend FARM Assistance to another producer. Finally, in responding to anticipated economic value, respondents estimated an average $24,289 annual benefit to their operation as a result of their FARM Assistance participation. Additionally, data and specialists' experience with individuals across the state helps contribute to other extension programs, applied research output, and Extension publications. The FARM Assistance Focus Series publications (http://farmassistance.tamu.edu/publications/) include topics such as case studies of High Plains agriculture, the economic incentives for adopting specific livestock or crop management practices, and an analysis of the farm level implications of the COVID-19 impact on commodity markets.	

		Agriculture and Food Policy Center Policy (AFPC) Major Activity in Response to COVID-19 and Educational Training COVID-19 caused major disruptions for Agricultural producers, other businesses, and consumers throughout the economy resulting in the need for education. In April, AFPC Extension and Research faculty developed a report on the initial impacts of COVID-19 on Texas agriculture available at: https://www.afpc.tamu.edu/research/publications/files/698/RR-20-01.pdf. AFPC followed up that publication a week later by conducting a virtual Texas Ag Forum focusing on the impacts that the COVID-19 pandemic was having on Texas agriculture. Over 300 clientele attended the meeting live and an additional 115 viewed the Youtube video of the conference that is available here https://youtu.be/Gdkf59K5jFk. AFPC developed a paper on the CARES Act https://www.afpc.tamu.edu/research/publications/files/697/BP-20-03.pdf and a follow-up paper on the details of the CFAP program https://www.afpc.tamu.edu/research/publications/files/699/RR-20-02.pdf. AFPC faculty developed educational videos working in cooperation with AgriLife Communications. The Coronavirus Food Assistance Program (CFAP) 1.0 and 2.0 were packages of financial assistance provided by the administration through USDA. AFPC faculty and staff developed a tool to assist producers with signup as well as answered hundreds of individual calls from around the U.S. asking for assistance. CFAP 1.0 provided $10.5 billion with $649 million going to Texas producers and CFAP 2.0 provided $13.2 billion with $694 million going to Texas producers. AFPC faculty were also involved in the latest round of COVID stimulus in the FY21 omnibus appropriations bill (otherwise known as CFAP 3.0). **Cross-Border Threat Screening and Supply Chain Defense COIVD_19 Economics** Texas A&M's Department of Homeland Security, DHS, Center of Excellence Cross-Border Threat Screening and Supply Chain Defense, or CBTS, teamed up with Arizona State University's DHS Center of Excellence, the Center for Accelerating Operational Efficiency, and researchers at the Victoria University in Australia to examine the economic impacts of COVID-19 on U.S. agricultural sectors. In July 2020, the researchers completed their initial quarterly economic projections of the immediate impacts and recovery that may be experienced by the U.S.	

		economy and agricultural sectors between March 2020 and February 2022. Their findings estimate COVID-19 will reduce U.S. GDP over the next year by 11.9% or $2.5 trillion and reduce employment by 12.2% or the equivalent of 19 million full-time jobs. However, the report concluded that compared to most other sectors such as tourism, air transport, education, restaurants and lodging, the U.S. food and agricultural sectors will experience smaller economic impacts because they were not subject to shutdowns and reductions in aggregate consumer spending brought on by job losses. The researchers also found that the economic impacts of COVID-19 were not uniform across agriculture. The team estimated livestock operations would experience more negative effects, and, in fact, USDA's latest figures show that animal product receipts in 2020 are down just over 8.1%. However, for crops, cash receipts are expected to increase 6.9%. The research team is currently re-estimating the economic impacts of COVID-19 by updating the influence of policy actions. They are also working with the Food and Agricultural Policy Research Institute at the University of Missouri to examine the impacts the pandemic has had and is expected to have on major U.S. agricultural commodities and trade.	
6.	**Range Management**	Texas native rangeland continues to be the prevailing general category of land use in Texas, with 92.6 million acres being managed across the state. The 2017 USDA Census of Agriculture accounted for over 248,000 farming and ranching operations in the state. This number represents an 8.5 % increase since the 2002 census. Texas has gained about 1,300 new working farms and ranches *annually* over that past 15 years. The average size of operation declined by nearly 10 % over this same period to 511 acres. In 2017, smaller operations – those less than 50 acres in size – accounted for 44 % the state's total farming & ranching operations. These smaller operations have increased by nearly 50 % since 2002. Operations less than 179 acres now represent 71 % of all Texas farms and ranches. Many of these smaller operations are owned by novice landowners unfamiliar with proper range management and land stewardship practices.	Natural Resources and the Environment (1862)

		County Extension and non-Extension Educational Events During 2020, Covid-19 required a shift to virtual programming. About 96 percent of all events were delivered technology assisted. AgriLife Extension Range Specialists conducted 83 presentations at 80 county Extension educational events involving 3,256 participants and an additional 78 presentations at 67 non-Extension events with 7,410 participants. ***Texas A&M Beef Cattle Short Course Sessions*** Range Specialists conducted Range Management: Emerging Precision Management Tools and Brush Busters sessions with 109 and 229 participants, respectively. ***Advocating for Agriculture Symposium*** Conducted stateside with technology assistance to 214 participants in 76 counties representing 163,000 acres of rangeland. ***Texas Range Facebook Page*** 590 educational posts, 3,969 followers and 207,765 views. ***West Texas Rangelands Facebook Page*** 268 educational posts, 3,604 followers and 222,189 views. ***Online Courses*** Generation Next: Our Time to Ranch • In 2014, the Generation Next program was launched to address the growing need to provide an educational program aimed at first-time ranch landowners, and people inheriting agricultural businesses, enterprises that can be started on ranch land range from traditional cattle, sheep and goat operations, to the many forms of nature tourism. • In 2015, the program implemented an online format to make it accessible to more people across the state. The program consists of one session being taught each week for 12 weeks. • Topics during the first half of the course include starting an agricultural business, business taxes, understanding insurance needs, financial management, evaluating land resources, and setting goals for success with measurable objectives. During the second half of the course, participants learn about basic ranch laws, grazing	

		and wildlife management leases, land management strategies, conservation hot topics, alterative business enterprises, and creating a generational business transition plan. • A primary goal during the course is for participants to develop and complete a formal, written business plan for their business. To facilitate this, smaller weekly activities are used to build toward the completion of a final business plan. • In 2020, there were 69 participants who manage, or will soon be managing, a combined 43,000 acres of land. AgriLife Extension Prescribed Burn School • Developed to increase understanding of fire effects on rangeland plants. • Covers the liability and risks associated with prescribed burning. • In 2020, 29 participants completed the school and represented 472,100 acres of rangeland. Texas Grass Gathering (subsequently renamed Texas Plant Party) • Designed to supplement Bluestem Grasses in Texas field guide. 211 people attended the virtual event, with another 512 viewing it after the live program. ***Applied Research*** This is an important effort with 41 new projects established in 37 counties and 66 on-going projects evaluated in 46 counties. ***Generation Next: Our Time to Ranch Online Course*** The economic benefits of Generation Next were measured in terms of the potential increase in net income resulting from their participation in the program. • One-half of all participants completed their business plans by the end of the course and indicated that they would not have completed a business plan without this course. • Participants estimated an economic benefit of $10,400 per ranch ($4.13/acre), or $717,600 for all participants who completed the 2020 Generation Next program.	

		County Educational Event Economic Benefit During 2020, economic benefit estimates were available for educational events at which Range Specialist made presentations. Participants reported managing 914,000 acres and an estimated economic benefit of $14.4 million.	
7.	**Sustainability**	As our population grows, increased demand is placed on our land, food supply, and already decreasing water supply. That is why Texas A&M AgriLife emphasizes sustainability in our efforts and developing new sustainable processes. We believe sustainability is a simple fact of good stewardship of resources. To develop a sustainable system, it must increase output to optimize the utilization of resources. Research Impacts • Stephenville center researchers developed strategies to increase waste management efficiency by 45% through on-dairy phosphorus recycling, which saves dairy producers $900 in a land purchase or lease costs. • Scientists discovered that conservation practices in streams of the Upper Mississippi River reduce sediment loads by 31%. • Efforts are underway at the Uvalde center to launch a statewide initiative on reusing gray water for irrigating urban areas with the goal of generation water saving of at least 8%. • A Department of Entomology Integrative research program addresses fundamental questions in biology that have direct relevance to developing responsive agriculture, such as the origin and maintenance of biodiversity and how organisms respond to environmental changes, using the insect order Orthoptera (grasshoppers, locusts, crickets, katydids) as a model system. Research on swarming locusts, the ancient enemies of agriculture, affecting the livelihood of one in ten people on Earth and threatening global food security, focuses on integrating cutting-edge genomic technologies with field- and lab-based experiments that will ultimately lead to sustainable management practices, which will have tangible impacts to the stakeholders around the world affected by these pests. A recently funded multi-institution NSF Behavioral Plasticity Research Institute (BPRI) will further this effort by research to understand mechanisms behind locust swarms and migration;	Natural Resources and the Environment (1862)

		and then use this knowledge to develop effective methods to limit the destruction the swarms cause.	
8.	**Water**	**Texas Well Owners Network** **Private Water Well Concerns** More than a million private water wells in Texas provide water to 2.3 million people in rural areas and to those living on small acreages at the growing rural-urban interface. Private water wells have a greater risk of exposure to compromised water quality than do public supply water wells, which are monitored according to the Safe Drinking Water Act. Nitrates and *E. coli* bacteria are the most common contaminants of private water wells. The Texas Well Owner Network (TWON) was created by the Texas A&M AgriLife Extension Service in cooperation with the Texas State Soil and Water Conservation Board (TSSWCB) and other collaborating agencies and organizations. The program is designed to deliver science-based, community-responsive education curricula focused on protecting groundwater quality and aquifer integrity. It complements the successful Texas Watershed Stewards Program, which also emphasizes best management practices. TWON offers two programs: "Well Educated," a half-day educational curriculum, and "Well Informed," a one-hour curriculum. TWON teaches Texans about water quality and best management practices for protecting their wells and surface waters, with the goal of averting off-site contaminants away from surface waters, preventing contamination of underlying aquifers, and safeguarding the health of landowners and their families. Since TWON began screening well water in 2011, private water well screenings and wellhead protection trainings have been conducted for 10,129 private water well managers through 81 "Well Educated" and 110 "Well Informed" events. Overall, for Well Informed programs, primary (potential health risk) or secondary water quality standards were exceeded in 58% of 6,182 private water well samples tested by TWON since 2011. *E. coli* was detected in 5% of screened samples. Although the benefits of improved water quality to public health and the environment are clear, estimating the economic value of clean water to communities served by a local aquifer can be a challenge.	Natural Resources and the Environment (1862)

		Participants of TWON programs in 2020 were asked to self-assess the value of the program. The average response from 111 participants was $366, or a total of $40,700. ***Healthy Lawns and Healthy Waters*** (HLHW, hlhw.tamu.edu). HLHW aims to improve and protect surface water quality by enhancing awareness and knowledge of lawn management best management practices. Attendees learn about the design and installation of residential rainwater harvesting systems and appropriate turf and landscape species based on local conditions, efficient irrigation and appropriate fertilization. In 2020, 387 people participated and 742 have participated in a HLHW program to date. Free soil tests are available to HLHW attendees and for 2020, about 27% of participants submitted soil samples through the program compared to about 32% over the total program. Because of the pandemic, we have shifted to delivering the educational component of HLHW online. Outcomes to date for this program are: Six-month follow-up results o Homeowners reported an average 42% reduction in total fertilizer product applied. o To date, fertilizer applications have been reduced by about 74,466 pounds of N and 24,822 pounds of P, also saving homeowners around $51,063. o Rain tanks installed as a result of the program will capture about 7.3 million gallons of rain in 2020 reducing *E. coli* loading to surface waters by about 8.7E+12 colony forming units	

		Participant intentions to adopt behavior change recorded immediately after attending the program o 97% will fertilize based on recommendations from soil testing, o 94% will install some type of rainwater harvesting system, o 96% will improve management of their home irrigation system, and o 98% will select plants/grass based on water conservation. Post-training evaluation o The value of participating in the program as estimated by attendees was an average of $376 or about $137,316 for all 2020 participants. o 95% of participants were satisfied with the HLHW training. **Water Quality Protection and Restoration** Faculty are engaged in additional watershed protection projects with $7 million + >500 CEUs derived from the Texas Watershed Stewards program. (Sum of value of land and ecosystem services improved through adoption of recommended practices). Through educational programs to raise awareness of water quality issues and to increase voluntary action towards the protection and restoration of water resources. Through 50 Texas Watershed Stewards workshops, 87% reported satisfaction with the educational delivery, 83% of >2,000 participants have adopted best management practices to help protect their watershed (six-month post program evaluations). **Water Management** The Amarillo Water Management Team was recently honored with the Texas Water Development Board's Water Conservation Advisory Council's Blue Legacy Award for their innovative work in developing a center pivot automation and control system. The team developed innovative hardware, software and logic technologies combined in a novel, next-generation, center-pivot automation and control system, or CPACS. CPACS Center pivot Control System guides the center pivot speed and location controls, while the software analyzes weather, crop and soil moisture data to prescribe the right amount of water at the correct time. Crop models with crop type and growth stage also help the system know how much water the plants need at different times during the growing season. Last,	

		the soil moisture sensor placement was optimized on a location-specific basis; this methodology recommends sensor placement based on local soil conditions, crop root zone depth, as well as sensor and communications reliability. This assists in balancing data reliability and cost- effectiveness. **The Ogallala Water Coordinated Agriculture Project (OWCAP)** is a USDA-NIFA funded (2016-2021), multidisciplinary research and outreach project focused on helping to address issues related to groundwater declines (quantity & quality) and long-term agricultural sustainability in the High Plains region. The team of ~70 university researchers, Extension specialists, students and post-docs is based at 9 institutions and 6 hub agricultural experiment stations in 6 Ogallala states. AgriLife Research recently hosted the Ogallala Aquifer Summit as a conclusion of the multi-state project spanning most of the Ogallala aquifer region. OWCAP achieved the aim to encourage greater visibility and adoption of practical, best management approaches that can help extend the productive life of the Ogallala aquifer. Some accomplishments include: • An Ogallala region producer survey, the first of its kind in the region since 1984, gathered producers' perspectives on the value of groundwater and water conservation, with participation of more than 1,100 producers from Colorado, Kansas, Nebraska, New Mexico, Oklahoma, and Texas, with data featured in peer-reviewed publications and a project resource guide. • The team published 26 peer-reviewed journal articles during 2019 and 70 total during the six year project. • Technological innovation, financial and economic conditions, infrastructure changes, social values – are all factors which drive change. • Consensus of the Summits' participants included that the Ogallala Aquifer's future requires not just adapting to declining water levels, but the involvement of a wide range of participants comfortable with innovation who will help manage the situation and drive future changes. • The project leveraged more than $6 million in additional resources over 6 years.	

		• The final report is still in process, including suggested next steps as a result of the project. **Urban Water Management** Rapid land development without sufficient planning puts the city at risk for floods, damage to fish habitats, and less drought resilience. The Hydrologic Modeling Team at the Blackland Research and Extension Center is working with Austin, Texas to improve water management in the city. The team has updated and expanded the Soil and Water Assessment Tool (SWAT) model to simulate the hydrology of urban watersheds in Austin, TX. As a part of this project, the team is developing tools for rainfall-runoff modeling at sub-hourly time steps, stormwater best management practices, and green infrastructures to improve downstream water quantity and quality.	
9.	**Using Research and Education to Reduce Wildlife Damage**	Texas is a diverse mix of urban, suburban, agricultural, forest, and desert environments and it is home to more than 28 million people and a wide range of wildlife species. Wildlife is important to the aesthetics and health of the state's environment and economy. But wild animals and birds also cause millions of dollars in damage to Texas agriculture, natural resources, property, and their activities can pose a threat to public health and safety. Texas Wildlife Services (WS) is a cooperative program between the USDA Animal and Plant Health Inspection Service, the Texas A&M AgriLife Extension Service, and private and public partners. Its mission is to use research-based methods and education to protect Texas agriculture and other industries, natural resources, property, and public health and safety from damage caused by wildlife. WS is the largest wildlife damage management program in the United States, providing its services on 4,700 properties, covering 17.5 million acres. In addition to technical and direct assistance, WS educates property owners and residents about wildlife damage management in both rural and urban areas. WS works with Texas livestock industries to help protect beef cows, calves, sheep, and goats from predation losses to coyotes, bobcats, feral hogs, and other predators. WS responds to emerging issues, such as rabies threats which affect human health-including canine and bat vectored rabies. WS dropped oral rabies baits along the international border to prevent the reemergence of canine and gray fox rabies as well as initiated a public outreach campaign to alert livestock owners and	Natural Resources and the Environment (1862)

		veterinarians about the risks of vampire bat rabies due to the imminent range expansion of this species into Texas Mitigating wildlife attractants at and around airports is necessary to protect the flying public and military aircraft. Through cooperative agreements, WS has full-time wildlife biologists at six Department of Defense airfields and three commercial airports. WS also provides wildlife training to personnel at commercial airports across the state to help cities comply with Federal Aviation Administration. Economic impacts are measured by the reduction in property damage caused by feral hogs and other wildlife, the value of livestock and wildlife saved from predation, and property protected from beaver damage. WS directly assisted landowners in removing over 29,155 feral hogs from more than 4.5 million acres, saving landowners an estimated $8.7 million in avoided crop and property losses. Predation management efforts saved an estimated $71.4 million in livestock and wildlife losses. Beaver damage management protected flood-control structures, roads, bridges, timber, crops, and pastures valued at $9.7 million. Texas Wildlife Services programs provide broad benefits for the public, including conserving natural resources, protecting human health and safety, and reducing economic losses.	
10.	**Community and Economic Development**	**CDC Farm-to-School** Schools provide an avenue to combat chronic disease by instilling healthy eating habits in youth while supporting local farmers and economies. AgriLife CRED faculty are working with Roma ISD through a CDC Farm-to-School supplemental grant to improve school-based nutrition and agricultural activity in schools. In 2019-2020, R.T. Barrera staff worked with AgriLife Extension specialists to secure CDC Farm-to-School funding and orchestrate the planting of a .34 acre Fruit Orchard to initiate local production of fresh fruits that will be included in students' lunches. Students and volunteers began planting the orchard in late February 2020. In summer 2020, USDA-Natural Resource Conservation Service awarded R.T. Barrera a G.R.E.E.N. grant for $9,500 to add a pollinator garden and hoop house to the students' farm. This will expand the growing season and the variety of fruits and vegetables available to students and their families.	Community and Economic Development (1862)

		Market Matchmaking for Specialty Crop Producers in Texas Texas specialty crop producers struggle to understand and implement opportunities in wholesale markets, especially in current times under COVID-19. However, they understand that the market channel disruptions may offer opportunities for niche producers AgriLife Extension is working with the Sustainable Food Center, National center for Appropriate Technology, and Foodshed Investors to help farmers determine the feasibility of expanding into wholesale markets. Extension faculty evaluated the first of a series of virtual workshops replacing an in-person two-day workshop cancelled due to COVID-19. Participants were interested in vegetable distribution across multiple wholesale channels. Producers were not consistent in views of business planning, although all aspects within the Access to Market aspect of planning registered some discomfort for participants. **Economic Impact Analysis to Support Local Government and Business** **Brazos County Expo, FY2010** Local governments face pressure for accountability and financial analysis. AgriLife CRED faculty completed the FY 2019 annual study of Expo economic impacts. Spending by visitors at Expo events a record $22.3 million and 225 jobs to the county. **Cogdell Memorial Hospital Economic Impacts** Public entities face a need for accountability and financial analysis in making economic development decisions. AgriLife CRED faculty updated an economic impact study to report the Cogdell Memorial's economic contribution to the Scurry County Economy. With tax-based funding of $7.1 million, each local tax dollar invested in Cogdell Memorial directly provides $8.70 in health services to the local community. With $62.1 million revenue, the hospital contributed $74.1 million in output and 401 jobs to the Scurry County economy in 2019.	

		Permian Basin Oil and Gas Contribution The decline in oil drilling and extraction in 2020 combined with decreased state revenues in the wake of COVID-19 increased pressure to divert transportation funds approved for the Permian Basin to other parts of the state. AgriLife CRED faculty, in collaboration with the Texas A&M Transportation Instituted completed a study of Permian Basin traffic and economic activity. On average between 2015 and 2019, oil and gas activity in a 25-county region of the Permian Basin contributed $62.7 billion in GDP annually and 203,000 to the Texas economy. Conservative annual estimates of median contributions from oil and gas within the next three to five years include $99.6 billion in GDP and 322,500 jobs. **Small Business Support During COVID-19** **Small Business Resilience** COVID-19 stay-at-home measures have reduced or eliminated sales at many small businesses, especially those deemed non-essential. AgriLife CRED faculty and students drafted two publications to help small business (1) adopt online sales options and (2) plan to weather probably recession. **Cyber Security for Small Businesses** COVID-19 has increased the need for small businesses to provide online sales and service, but many lack a strong web presence. AgriLife CRED faculty and students released a three-paper series to help small business owners improve their web presence and online security, including Simple Steps for Small Business Cybersecurity, released by the AgriLife Bookstore in August 2020. **Mapping Economic Opportunity in Rural America: Mining Big Data for Decision Making in Business Development** Communities, local governments, and businesses are looking for information that con enhance and inform their decision process regarding factors important to the survival and growth of businesses.	

		Research and Extension faculty cooperated on a multi-state USDA-NIFA grant (funded 2017-2022). The project uses confidential data from restricted-access government databases to create algorithms that help researchers and practitioners more accurately estimate rural business establishments, employment, and payroll using publicly available data, which is often complicated by disclosure issues in rural communities. Thus far, the project has engaged clientele, such as economic development corporations, rural Main Street workers, and small business owners, with numerous focus groups, presenting information and research on factors important to the survival and growth of businesses. The interactive and engaging online mapping and data tool is available at https://communities.tamu.edu/economic-opportunity-maps/. **Economics of Transportation for the Rural Elderly** The elderly face transportation constraints made worse by diseconomies of scale in rural areas, but economists have paid little attention to this field, despite aging rural communities and a large number of Baby Boomers entering this demographic. Texas A&M AgriLife Extension faculty and Texas A&M AgriLife Research faculty have cooperated on research project as a result of 2016 USDA-NIFA funding that considers ways to improve the viability of rural transit systems and increase transit access for older rural populations. Two publications were released through the AgriLife Bookstore in September detailing Rural Transit Needs for Older Adults and offering research-based innovative solutions for Improving Rural Transit. Rural transit districts, local communities, and local leaders and entrepreneurs can design and implement innovations in technology, service, and institution to improve transit access and system sustainability. Individual communities must leverage unique assets to build innovative solutions. Many communities offer examples, which were discussed in several publications. Older adults (generally age 65+) benefit from increased social interaction and mobility. Transit districts benefit from a framework for innovative thinking about sustainability. Communities benefit as older people remain engaged in the local community and economy.	

11.	**Disaster Assessment and Recovery (DAR)**	AgriLife Extension teams help communities prepare long-term plans for land use, natural resources, and mitigation to reduce the impacts of disasters. Assisting individuals, families, businesses, and agricultural producers in disaster response and recovery enhances a rural community's return to a healthy state and makes Texas' food supply more secure. Extension agents maintain daily contact with local school, municipal, and county officials to help convey information to and from state and federal agencies. DAR serves as a "surge force" of personnel that can deploy into the disaster theater and, among other tasks, help establish Federal Emergency Management Agency (FEMA) disaster recovery centers and USDA Disaster Supplemental Nutrition Assistance Program distribution locations, support debris removal and inspect temporary housing locations, liaise between locations, and incident command posts, support preliminary damage assessments, assist with TDEM hazard mitigation grant applications, and assist with FEMA reimbursement filings. AgriLife Extension is uniquely positioned to provide this assistance due to its statewide network of educators, volunteers, and offices serving all 254 Texas counties. The agency can rapidly deploy specialized professionals to the disaster impact zone and, as a member of the Texas Emergency Management Council, continue its support of lead state agencies during such operations. • Full time representative at State Operations Center • 19 Extension Agents – Disaster Assessment and Recovery • 226 Specialist Network • 250 County Coordinators (Liaisons to County Courts, Cities and Schools) • 12 Strike Teams • 40 Central Leadership Team members (12 locations) <u>Focus Areas</u> Mental Health First Aid (MHFA) • Agents across the state continue to reach community members through partnerships with local behavioral health alliances, local mental health authorities, and school districts.	Community and Economic Development (1862)

		• AgriLife Extension currently has 65 certified instructors in Youth or Adult MHFA. • Agency has formalized partnerships with two local mental health authorities in the state to teach MHFA classes. Flood and Storm Water Mitigation GIFT – Green Infrastructure for Texas • The TCWP GIFT Team met major milestones in a multi-year project with the new Houston Botanic Garden. Earth work to create a 5-acre stormwater wetland was completed, and installation of 25,000 wetland plants began by Extension staff and volunteers. This wetland will collect water from the parking areas and other hard surfaces at the garden, holding the water to reduce downstream flooding. This system is designed to use plants and other wetland components to clean the water while in the wetland. • GIFT Program Volunteers are essential to the success of our on the ground projects. Fifty-nine volunteer workdays were held, engaging a core of Texas Master Naturalist volunteers as well as scouts, school classes, corporate groups, and community members. These volunteers assist Extension staff in propagating and planting native wetland vegetation as well as maintaining the nursery ponds. In addition, the GIFT Team supported these groups by hosting field trips, lectures, and trainings. Digital EDEN https://texashelp.tamu.edu/ **Texas** Extension Disaster Education Network (**EDEN**) is a collaborative educational network dedicated to educating citizens about disaster mitigation, preparedness, response and recovery. **Texas EDEN** is a part of the **Texas** A&M AgriLife Extension Service and is affiliated with National Extension Disaster Education Network. Resilient Texas https://agrilife.org/resilienttexas/ In collaboration with Texas A&M AgriLife Extension Service, Resilient Texas addresses the needs of Texan communities. **Funding opportunities, events, training,** and **other resources** are organized by nine categories:	

		1. ***Community & Culture*** – community and civic engagement, funding for religious and nonprofit organizations, fine arts, community planning, historic and cultural preservation 2. ***Disability Services*** – organizations, programs and services for individuals with disabilities 3. ***Economic Development*** – small business, job training, and brown fields 4. ***Health & Education*** – universities, research, primary education, healthcare agencies 5. ***Housing*** – affordable housing, homelessness, rebuilding and repair 6. ***Infrastructure*** – wells, wastewater, storm water management, drainage, roads, mitigation activities, broadband, or other municipally owned activities 7. ***Natural Resources*** – parks, green spaces, surface water, fisheries, and trails 8. ***Recognized Tribes*** – healthcare, housing, education initiatives, economic development 9. ***Rural Communities*** – healthcare, housing, utilities, infrastructure, education initiatives, economic development **COVID 19 Response** AgriLife Extension DAR agents and AgriLife Extension faculty and staff continue to provide support statewide with COVID-19 response. • Supported the testing of 1,333,636 individuals at 1,194 testing sites in 231 Texas counties by mobile testing teams. • Supported the testing of 115,760 high risk individuals (nursing homes, food processing plant workers, etc.) at 817 locations in 185 Texas counties by the Quick Reaction Testing Force. • Worked with Texas Division of Emergency Management, Texas A&M Engineering Extension Service and the Texas Military Department to deploy a team with 100 doses each of Modena vaccine to vaccinate rural Texans in the following Texas counties: Marion, Sherman, Dewitt, Starr, Real, Motley, Terrel, Kenedy, McMullen, and Glasscock. To view a video	

of the vaccination day in Motley County, please click on the following link: https://www.youtube.com/watch?v=tacGzj4kJsM.

- Continued support by AgriLife Extension agents from Washington and other surrounding District 9 and 11 counties to assist at the Washington County vaccination Sub-Hub where 11,609 individuals were vaccinated using a drive-through style operation.
- Continued work with Texas A&M Engineering Extension Service and Texas Military Department to support testing operations at the Texas State Capitol for state employees, congressional offices and staff, and the general public seeking access to the capitol during the legislative session.

Activity	May – Dec. 31, 2020 Totals
PPE Deliveries	**6,658**
New Test Kits and Collected Specimens	**3,675**
Long-Term Care/Nursing Home/Medical Office Deliveries of PPE and Test Kits	**8,339**
Retrieving Specimen Coolers	**2,351**
Bundles or Pallets of PPE, Cleaning Supplies, Sanitizer	**26,363**
Binax tests delivered to School Districts, Nursing Homes and City/County Govt., Chambers of Commerce & TAMU Colleges	**854,719 tests** **438 School Districts** **84 Nursing Homes** **48 Govt. Entities** **6 Chambers of Commerce** **3 TAMU System Colleges**
Binax Trainings Conducted	**44**
Therapeutic Drugs Delivered to Medical Facilities	**60 Doses** **2 Medical Facilities**

12.	**Path to the Plate**	When consumers are making connections between agriculture and health, there is concern about where information is obtained. Many turn to the easiest and quickest source of information, the internet. There is an abundant supply of information on the internet that is correct and useful to the consumer. The problem that many run into, is the amount of information being shown to them. Consumers have to sift through thousands of search results to find the information they seek and they trust. For this reason, digital misinformation has become so pervasive that the World Economic Forum has listed it as one of the main threats to human society. Texas A&M AgriLife Extension has developed a response to the questions consumers are asking titled Path to the Plate. Path to the Plate is a comprehensive, educational approach to providing relevant, current, and factual information to consumers. Our goal is to educate consumers so they can make informed decisions when it comes to agriculture and their health. Path to the Plate is an unbiased examination of agriculture, the food we eat, and the connection to our health. The program is designed to deliver correct, research-based information via a variety of methods. The overarching goal of the Path to the Plate program is for all Texans to make informed decisions based on truthful and accurate information. More specific objectives of the program include: • To work with organizations, agencies, communities and individuals to provide Texans with a wealth of information and perspectives so they may make better informed decisions about the food they eat. • To present the important role of agriculture in our daily lives – from production to harvest to how it arrives at your table. • To deliver correct, research-based information in order to educate the consumer in regard to agriculture and health.	Connecting Agriculture and Health (1862)

		Path to the Plate is a new effort. Limited evaluation and impact data is available at this time. We expect to provide this information as the program grows and matures.	
13.	**Chronic Disease and Wellness**	**Chronic Disease and Wellness – Type 2 Diabetes** An estimated 2.33 million Texans have type 2 diabetes (11.2%)[1]. Among them, an estimated 621,000 are undiagnosed, which may increase their health risk. Diabetes education programs can help these individuals understand how to manage their disease through healthy eating patterns, being physically active, and following proper self-care management. Clients who participate in an evidence or research-based diabetes education program have shown to delay and prevent further complications associated with type 2 diabetes. AgriLife Extension offers multiple type 2 diabetes self-management programs to Texans, including *Do Well, Be Well with* Diabetes (a five-class series covering basic nutrition and self-care management topics), and ¡*Sí, Yo Puedo Controlar Mí Diabetes!* and *Wisdom, Power, Control* (culturally relevant programs targeting traditionally underserved minority populations). The programs help people with prediabetes, type 2 diabetes, or caregivers learn the skills needed to manage the disease successfully. In 2020, 73 Texans participated in AgriLife Extension diabetes self-management programs. Programs were delivered using distance technology during the COVID-19 pandemic. An evaluation study, with 69 participants who completed the *Do Well Be Well* program, showed statistically significant increases 4 out of 7 behaviors specifically in their behaviors related to dietary (p value = .000 *{eating five or more servings of fruits and vegetables and spacing your carbohydrates evenly through the day}* and physical activity as well as self-care (p-value = .000 for behaviors). Moreover, participants reported statistically significant increases in 6 out of 7 self-confidence levels related to management of both dietary and self-care practices (p-value = .000 {confidence in *eating every 4 to 5 hours every day, choosing appropriate foods to eat when you are hungry, being physically active 15 to 30 minutes, 4 to 5 times a week, do something to prevent your blood glucose from dropping when you exercise, what to do when your blood glucose goes*	Health & Wellness (1862)

		higher or lower than should be, and control your diabetes so that it does not interfere with the things you want to do}). Economic impact based on 20 eligible participants estimated health cost savings is equivalent to $1.8 million. Note: Participation numbers likely reflect Covid-19 situation. ***Food Safety*** Each year the Centers for Disease Control and Prevention (CDC) estimate that 1 in 6 Americans (48 million) will become sick from a foodborne illness. Foodborne disease is a costly problem, and more than half of all foodborne illnesses are attributed to improper handling of food prepared away from home. Because almost half of our food dollars is spent on food prepared outside the home, food safety is a top concern among consumers. Therefore, food safety education is a critical prevention component for reducing the risk for foodborne diseases. AgriLife Extension implemented two programs that are designed for food service employees, the food handler's program and the certified food manager program. The food handler's program was offered in 75 counties across the state in 2020. This 2-hour program is targeted towards front-line food service workers and focuses on reducing cross contamination and time/temperature abuse as well as personal hygiene. At the county level, the food handler's program is offered in both English and Spanish. In addition, the food handler's program is available on-line (http://foodsafety.tamu.edu/courses/food-handlers-course/) and is available in English and Spanish. The certified food manager program is offered in a classroom format with hands-on activities that reinforce important concepts such as personal hygiene, handwashing, time/temperature control, food preparation and storage, and pest control. This program prepares individuals to take a national certified food manager exam (offered by the National Restaurant Association and/or Prometric). Passing a national CFM exam is required to receive the CFM credential. Food Handler: In 2020, 6,431 individuals completed the food handler's program either in a classroom format or via on-line. Program evaluations from those completing the program face-to-face demonstrated a statistically significant	

		increase in food safety knowledge (average score was 73 pre vs. 86 post). We also noted a significant change in knowledge among those participants who completed the course via online (average score pre was 82 vs. post average of 91). Certified Food Manager: In 2020, 343 individuals across the state completed the certified food manager certification exam. Subject material was delivered by trained Extension Agents using lecture, group discussion, and interactive, hands-on activities. **Global Food Security, Hunger, and Nutrition Education** In Texas, nearly 14% of households live at or below the federal poverty level. More than 3.7 million Texans receive SNAP benefits, and 4.3 million experience food insecurity. Limited-resource individuals are less likely to consume diets that meet current guidelines and suffer from diet-related chronic diseases compared to those with moderate or higher incomes. The burden of chronic disease is great from both a financial and societal perspective. The Better Living for Texans (BLT) program provided nutrition education to individuals and families who are receiving or who are eligible for benefits from the Supplemental Nutrition Assistance Program (SNAP). Programs focused on increasing vegetable and fruit intake, increasing physical activity, increasing home gardening skills to improve access to fresh produce, food safety, and food resource management. During the 2020 program year, BLT educators located across the state reached more than 121,613 individual adults and youth through direct and indirect educational outreach. The total number of individuals who graduated from a program series was 15,753; an additional 102,023 individuals participated in single education events, both in-person and virtually. Program impacts include: • Adult and youth participants completing nutrition series, 68 percent reported on pre- and post-surveys eating fruit more times during the day and 64 percent ate vegetables more times during the day; 58 percent filled half or more of their lunch and dinner plates with fruits and	

		vegetables; 84 percent washed fruits and vegetables before eating and preparing them; and 68% planned meals in advance. • Adult participants completing the *Get the Facts* series, 59 percent reported on pre and post-surveys using the Nutrition Facts labels to but food products. • Adults completing *Growing and Nourishing Healthy Communities Gardening Course,* 86 percent reported making fruits and vegetables available in the home. • Adult participants completing a program series with an emphasis on physical activity reported on pre and post-surveys, 50 percent of adults increased the number of days of the week they were physically active 30 minutes or longer; 56 percent of youth increased the number of days of the week they were physically active 60 minutes or longer. • BLT educators partnered with 1,019 agencies, schools, and sites throughout the state to deliver BLT programs in-person, virtually, or online. Due to COVID-19, programming was interrupted, thus a significant decrease in the number of educational contacts and partnering sites, however, the BLT State Office and county-based BLT social media presences expanded. Unique postings/engagements are as follows: Facebook, 26,875; Twitter, 19,583; Instagram, 1,276; and a podcast launched mid-summer via Spotify, 64. Additional BLT direct and indirect educational programs were delivered through various social media platforms (Facebook, Zoom, Microsoft Teams, Google classrooms, YouTube).	
14.	**Food & Nutrition**	We are keenly aware that hunger, specifically lack of nutrition, is one of the most important global issues of our time. We believe that we can help alleviate human suffering associated with hunger and poverty through agricultural science, and in a way that builds a better world for future generations. Research Impacts • New peanut varieties and better use of herbicides have produced an increased yield of almost 50% per acre, as compared to 20 years ago, and the added gain can be $100-150 per acre.	Health & Wellness (1862)

		• New peach and nectarine lines developed by AgriLife researchers advance commercial harvest by 2-3 weeks and potentially add 10% in production capacity. This could have a potential value of up to $50 million in the U.S. • The AgriLife Research wheat-breeding team has been recognized for developing wheat varieties, which are estimated to add more than $200 million annually to the US economy. • New rice cultivars, if adopted at 15% rate over the next five years, the 5% yield advantage will increase statewide rice production revenue by $1.22 million per year.	
15.	**Health and Safety**	Texans spend approximately $239 billion annually on health care, or about $8,000 per capita. More than **75% of health care costs are due to chronic conditions.** Higher diabetes incidence rates and increased costs are expected in the future due to the growing population of Hispanics/Latinos, who are at greater risk for the disease. Obesity prevalence among adults in Texas has risen sharply, from 12% in 1990 to **34% in 2018**. The Texas A&M AgriLife Extension Service delivers various educational programs focusing on health, wellness, and disease prevention for adults and youth, including diabetes education, nutrition and exercise, food safety, child safety seat education and early cancer detection. The economic impact of eight AgriLife Extension health and wellness programs was measured in terms of lifetime health care cost savings, avoidance of lost wages, and nutrition-related food cost savings. These programs delivered **22,600 educational events** in 2019, resulting in more than 2.2 million adult educational and other contacts, with economic benefits estimated at **$79.8 million**. • **Texas 4-H Youth Development Program** reached **23,212 youth** participants through health and safety education programs. Another **89,658 youth** participated in nutrition and physical activity education programs. • **Nutrition and food resource management programs** reached more than **12,400 participants**, with economic benefits estimated at **$5.4 million.**	Health & Wellness (1862)

		• **Physical activity** programs attracted **12,527 participants**, with lifetime economic benefits estimated at **$48 million**. • **Child safety seat programs** save lives. The economic benefit of the proper use of child safety seats for the **2,077 participants** is estimated at **$3.1 million**. • The **Healthy Texas** program engaged more than **38,000 adults** and youths in healthy lifestyle education programs, with lifetime economic benefits estimated at **$15.1 million**. AgriLife Extension and the Texas A&M Health Science Center are working to reduce the highest-impact diseases and their consequences throughout a 27-county region in South Texas. The goal is to focus on prevention by engaging families and communities, promoting healthy behaviors, encouraging preventive care and improving disease outcomes. **COVID_19 Research** Researchers at the Texas A&M College of Veterinary Medicine & Biomedical Science (CVM) have been leading a surveillance project sampling dogs and cats that live in homes with confirmed human COVID-19 cases in Brazos County and surrounding areas to learn more about animal exposure and transmission pathways, with the ultimate goal of protecting human and animal health. The United Kingdom variant, B.1.17, of SARS-CoV-2, the virus that causes COVID-19, has been detected for the first time in a dog and a cat from the same household in Brazos County. In over 25% of homes with infected humans, pet dogs or cats had confirmed SARS-CoV-2 infections, including one cat where virus was successfully isolated for the first time from a companion animal. Ongoing, the Texas A&M COVID-19 and Pets study is a CDC funded collaboration among Texas A&M University; the CVM; AgriLife's College of Agriculture and Life Sciences; the School of Public Health; the Brazos County Health Department; the Texas Department of State Health Services; the Texas Animal Health Commission; the CDC; the Wisconsin Veterinary Diagnostic Laboratory; and the U.S. Department of Agriculture National Veterinary Services Laboratory. The study's goals are to learn more about transmission of SARS-CoV-2 between people and animals, the potential impact of the virus on animal health and whether animals may be a reservoir for the virus, i.e. maintaining it in communities.	

		Vector-borne disease To control mosquito populations and prevent them from transmitting diseases such as malaria, many researchers are pursuing strategies in mosquito genetic engineering. A new Texas A&M AgriLife Research project aims to elucidate one possible way to be able to do risk assessment and field testing to program a transgene to remove itself and not persist in the environment. The project is testing and fine-tuning the self-deleting gene technology - enabling temporary "test runs" of proposed genetic changes in mosquitoes, after which the changes remove themselves from the mosquitoes' genetic code. The project's first results, describing three ways for an introduced genetic change to remove itself after a designated period of time, were published on December 2020 in Philosophical Transactions of the Royal Society B, titled "Making gene drive biodegradable." The team modeled how the genes would spread among mosquitoes based on generation times and parameters of an average mosquito's life. Of the three methods, the team has chosen one to pursue further. Texas A&M AgriLife Research entomologists saw an increase in kissing bugs collected in multiple regions of the state this year. The insects carry a parasite that can cause potentially fatal Chagas disease in humans and animals. For example, by July 2020 AgriLife researchers collected over 300 adult kissing bug specimens in a location where only six were collected in 2019. AgriLife entomologists across the state continue to search for factors leading to above-average number of kissing bug encounters. Educational material for the public was developed. The Uvalde Research and Extension Center aims to identify strategic research priorities in the conservation and management of native, exotic and invasive wildlife populations at the livestock interface. An improved understanding of wildlife epidemiology will allow for the identification of intervention strategies which will in turn benefit wildlife health, agricultural productivity, biodiversity and human health. Vector-borne diseases account for a substantial portion of human, livestock and wildlife morbidity and mortality in the United States and around the world. The Center's wildlife disease ecology research with captive wildlife is an integral step to engaging a systems level approach at understanding and preventing the spread of vector-borne disease to protect human, wildlife and livestock health. In just two years, the Wildlife Disease Ecology Lab has developed	

		a nationally recognized white-tailed deer research program and is currently researching innovative intervention strategies to protect humans, wildlife and livestock from ticks and tick-borne diseases.	
16.	**Life Skills for Youth**	*Head; Heart; Hands; Health…for my club, my community, my country, and my world.* All 4-H members pledge to live a life to better their world. Through life skill development members have opportunity to learn specific project/technical skills as well as responsibility, organization, communication, respect, teamwork, leadership, and civic engagement along with many other skills. All 4-H programs target life skill development. Strategies include 4-H club work, project work, county, district, and state events, regional programs, summer camp and leadership development programs. Impacted greatly by the COVID-19 health pandemic, Texas 4-H programming had to shift focus from face-to-face gatherings and events to a virtual and at-a-distance learning program. However, as the program made the shift, specialists and agents were creative in the various program methods and while virtual programming became the 2020 normal, Texas was the only southern region state to host an in-person summer camping experience as campers followed all governmental and CDC guidelines for staying healthy. The Texas 4-H Youth Development Program includes over 55,000 youth members and 9,014 screened adult volunteers. Texas boasts 1,941 chartered units. Because of the health pandemic and the restrictions placed on the program, virtual learning became a norm for 4-H members. The following results are a snapshot of specific state and county programming where data were gathered from participants. Space STEM Camp originated at the county level but quickly went international with the four lessons that were presented over a four-week time frame. The camp was made available to anyone who could connect electronically. Registrations included families and youth from all 50 states and 37 countries – 14,318 families registered; 29,119 youth registered along with an additional 200 school classes. Participants indicated an increase in their knowledge of the scientific process of creating a hypothesis, testing the hypothesis, and reporting	

		the gathered data – 43% reported knowledge increased a lot, 39% reported knowledge increased some. Leadership can be learned and with practice gets better. Texas 4-H Council plans, coordinates, and facilitates Junior Leader Retreat (JLR) for younger 4-H members. They reported that through the experience they learned to adjust and adapt based on audience needs and that being flexible and making adjustments quickly is sometimes needed. As a leader, you cannot control how others act but you can control how you respond. As a youth development program, it is important Texas 4-H create a sense of belonging for members. Of the participants at JLR, 82% responded they made new friends during the weekend camp and 86% indicated they would invite their friends to participate next year. Texas 4-H is able to create a space of belonging for all youth whether it is face-to-face or virtual. Members participated in club meetings, contests, trainings and camps for educational and social purposes. STEM camp surveys indicated that 64% of the participants were not 4-H members but were benefitting from 4-H programming.	
17.	**Volunteer Management**	Volunteers provide Extension with an opportunity to expand all levels of educational delivery reaching more people in Texas, help ensure our programs are relevant by providing input and feedback and assist in interpreting the outcomes of Extension work to stakeholders. Extension in Texas has a comprehensive volunteer management effort impacting all levels and program areas within the agency. Volunteers serve in many different capacities through our named Master Volunteer Programs: Master Gardener, Master Naturalist, and Master Wellness, as well as through committees, task forces, and coalitions at the county, district, and state levels. In 2020, 86,367 volunteers provided 5,056,200 hours of service. This provided an impact of $137,528,644 in support to Texans.	

OPTIONAL **Youth Development Expenditures (dollars)**	
State and/or Institution:	FY 2020 Expenditures ($)

1862 Smith-Lever	
1890 Extension	