Economic Impact of Deer Breeding Operations in Texas

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The deer breeding industry is a growing industry in the Texas economy, particularly the rural economy. Industry participants were surveyed to provide estimates of economic activity, which was then input into the IMPLAN model. The industry generates an estimated $652 million in economic activity, while supporting 7,335 jobs.

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Introduction

The deer breeding industry is a vital and growing industry in the Texas economy, particularly the rural economy. As traditional agricultural revenue sources decline in rural communities, their economies increasingly rely on new industries, such as this one. At the national level, the industry is governed by a myriad of state and federal laws, regulations, and jurisdictions. Since the overwhelming majority of industry regulation is left up to the states, a significant amount of variability in the regulations exists from state to state. This lack of consistency in laws and regulations is a factor affecting future industry growth. The rapid growth of the industry and an array of policy issues led the industry to request this study of the size and economic importance of the deer breeding industry. The primary objective of this study is to determine the economic impact of the Texas deer breeding industry. Secondary objectives include providing a current description of typical industry participants and cost estimates for the major categories of expenses on deer breeding operations.

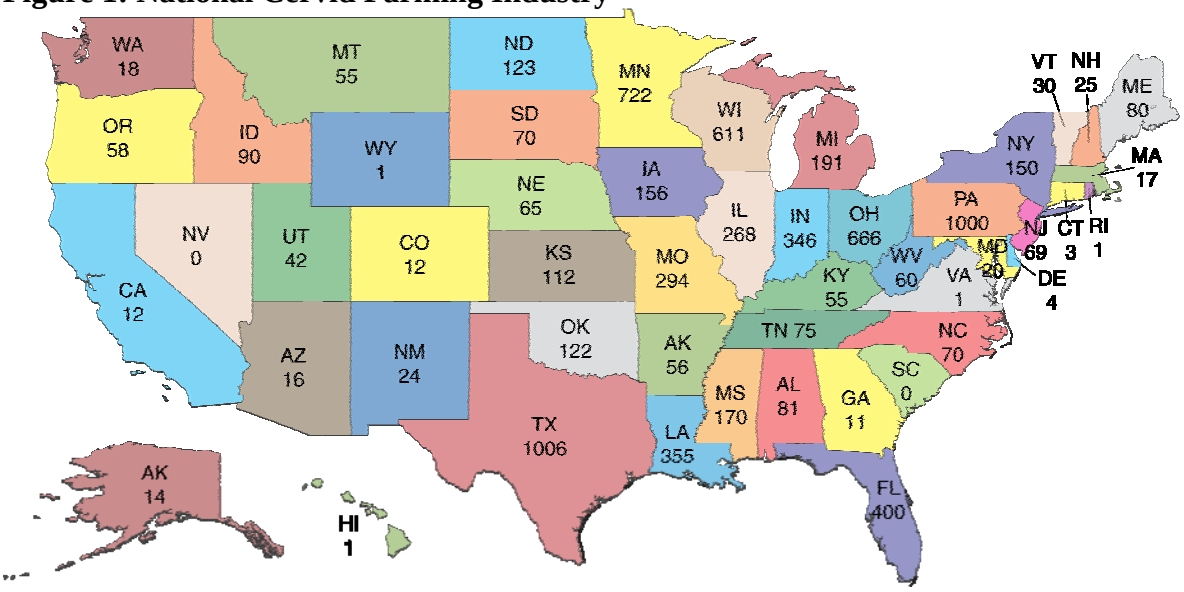
Industry Overview

Like any industry, the deer, or cervid, breeding industry involves the production and consumption of products. In Texas, the main product, or species, is the whitetail deer. The production side of the industry is comprised of deer breeding facilities whereas the consumption side is represented by other breeders, trophy hunting preserves, or game ranches, and ultimately, hunters. Producers market breeding stock to other breeders and stocker deer to game ranches. With hunting as the end market the industry serves, producers selectively breed deer in an

attempt to attain consistent genetics to produce trophy whitetail. The Texas deer breeding industry represents a portion of the national cervid farming industry.

The term "cervid" refers to any one of the various members of the cervidae family, including whitetail deer, elk, fallow, reindeer, axis, sika, and red deer among others (Heritage Dictionary, 2007). At the national level, the industry includes commercial venison producers, commercial urine collection operations, and antler and other products operations, in addition to breeding operations. Figure 1 displays the estimated number of cervid farms per state. This inventory was compiled by the administrative staff at the North American Deer Farmers Association (NADeFA®) through contact with the appropriate state agencies. Those states without an exact count provided their best estimate. Across the nation, the total number of cervid farms was 7,828, with Texas and Pennsylvania home to around 1,000 farms each. As an example of the growth the industry is experiencing, there were 946 permitted breeding facilities in Texas in late summer 2006. However, when the analysis took place early in the spring of 2007, there were 1,006 permitted facilities and as of December, there were 1,060 permitted facilities.

Figure 1: National Cervid Farming Industry



There are some discrepancies in the number of operations presented here versus the most recent census of agriculture. The last census of agriculture was in 2002. Since that time, regulations affecting the industry to combat chronic wasting disease have been enacted. That may have reduced the number of operations in a state like Colorado. The next census may provide updated information. The survey results presented in this research may be superior given that the operations inventory data comes from the industry working with the state agencies that, in some cases, are charged with licensing the operations.

In Texas, the majority of operations include both breeding and hunting. Hunting operations may be for private use only, corporate clientele, paying clients, or a combination of these. As the title implies, breeding operations raise and sell breeding stock to other industry breeders or the hunting industry. The trophy hunting segment only includes those operations that raise or purchase deer for release into a hunting operation, and represents the end market for the breeding stock industry. Trophy hunting, in this sense, involves hunting for trophy deer at high fenced game ranches. These are usually hunt packages over a 3-6 day period, where the hunter is provided lodging, meals, and a guided hunt for a set fee. In addition to this fee, a trophy fee may also apply, for bucks that surpass a pre-set score threshold. Deer are typically "scored" using the Boone and Crocket system, which is a standardized system that measures the antlers in inches. The higher the score, the larger the antlers, and the larger, more expensive the trophy. Hunter expenditures included in this study only include those hunters that are related to this industry. Hunters, in the context of this study, are only those that hunt at operations that either purchase or release deer from breeding operations into their hunting operations.

Methodology

In order to estimate the economic impact of the deer breeding industry, a survey instrument was developed to collect detailed operational information from industry participants. This information was then combined with the inventory of deer breeding operations to analyze the production side of the industry. In addition, an analysis was performed to determine the impact of hunters, but only the portion of hunters who are related to the deer breeding industry. These two components were then combined to perform the economic impact analysis of the deer breeding industry.

Data Collection

During the late summer and early fall of 2006, background information to develop the survey was gained through site visits to deer breeding facilities across the state. Interviews from these visits provided a base set of information that was then utilized to develop the survey instrument. The survey instrument was then reviewed by industry participants for accuracy and relevance, revised, and sent to over 1,300 members of the Texas Deer Association (TDA) over the fall of 2006 to early 2007. Overall, the survey achieved a response rate of 11 percent.

Sampling Procedure

In choosing the sample to survey, no prior statistics were available for comparison as this is the first study to generate descriptive statistics of the deer breeding industry. TDA members were selected to participate in this study because they represent a vast majority of the participants in the deer breeding industry. The TDA estimates that they represent approximately 85 percent of the operations in the Texas deer breeding industry. For an accurate sample of

operations involved in the deer breeding industry and in an attempt to prevent selection bias in the sample, the survey was limited to ranch or business members that are located in Texas, as TDA members come from many states. This sample is felt to be most representative of the target population, which includes breeding only, breeding and hunting, and hunting only operations.

Survey Development

For the purpose of the survey, the deer breeding industry was segmented into three operational structures: breeding only, breeding and hunting, and hunting only operations. Breeding only operations were defined as those that only involve the scientific breeding and rearing of deer. Hunting only operations relate to only those hunting operations that purchase deer from breeding operations as stockers or as breeding stock for release into the hunting ranch. Operations that manage their deer populations by selective harvest and nutritional supplements, rather than supplementing the natural genetics with deer released from breeding operations, are not included in this study. Breeding and hunting operations represent those that engage in breeding activities while also utilizing their own breeding stock, or purchased breeding stock, to supplement the genetics and/or populate their hunting operation. For breeding operations, the survey included questions regarding the operation in general, herd inventory, purchases, sales, capital expenditures, veterinary expenditures, labor, feeding rates and expenditures, utilities, and other miscellaneous expenses. For hunting operations, the base operational questions remained the same, however, hunting related questions were included as well, such as the number of hunters, harvest rate, percentage of herd from breeding operations, hunt revenues, processing, and taxidermy.

Survey Results

General Operations

Of the 143 respondents, 50 percent were breeding and hunting operations, 36 percent were breeding operations, with the remainder being hunting only operations. On average, survey respondents have been in business since 2000.

Table 1 contains a summary of the average annual operational costs of survey respondents. As expected, differences due to the operational structure are reflected in the survey responses. Breeding and hunting operations were the largest, covering approximately 2,000 acres, with 20 acres dedicated to their breeding pens. Eighty–one percent of breeding only operations reported purchasing land, averaging 272 acres, with only 22 of these acres in pens. On average, these operations contained 9 pens on 16 acres. Breeders will typically group deer together by age and gender and place them into separate pens, such as a pen for yearling does or four year old bucks. Pens, in this sense, can be described as a high-fenced paddock. For those pens holding bucks, a protective screening is often placed on the fence to keep an antler from accidentally hooking in the fence in addition to the minimal shade it provides the deer. Screening can also be found on perimeter fencing as a visual barrier, particularly if the operation is near a road, to shield the deer from view from passers by.

Overall, breeding and hunting operations had more area devoted to breeding pens, more pens, and more deer (Table 2) than breeding only operations. This was expected as the breeding and hunting operations tend to supply their hunting operation from their breeding operation, and are not necessarily relying on sales or transfers to move deer off the operation. Lodge, fencing, and improvements were the top three expenditures, in terms of the capital cost, for both breeding and hunting and hunting only operations, while breeding operations spent the most on buildings,

Table 1: Average Annual Operational Costs of Deer Industry Survey Respondents

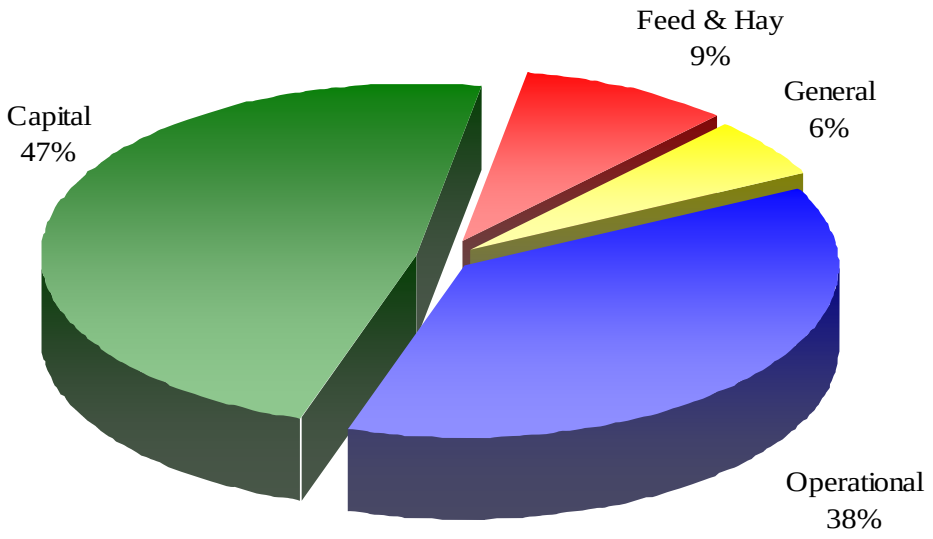
	(in dollars, except where noted)		
	Breeding	**Breeding & Hunting**	**Hunting**
Operation			
Year started (year)	2002	1998	1997
Area of breeding (acres)	22	93	NA
Area of hunting (acres)	NA	2,086	1,429
Land purchased (acres)	272	2,081	1,253
Purchase value ($/ac)	2,506	1,546	1,433
Facilities			
Capital cost of lodge(s)	NA	192,039	174,226
Number of pens	9	13	NA
Area of pens (acres)	16	20	NA
Fencing	33,318	157,088	109,537
Shelters	11,496	15,735	NA
Improvements	29,169	98,009	79,032
Buildings	33,371	94,214	63,517
Working pens	22,231	20,008	NA
Percent with Handling Facility	37%	43%	NA
Cost of Handling Facility	32,795	30,577	NA
Maintenance and Repair	4,556	22,706	15,377
Equipment			
Large equipment	50,645	102,769	65,856
ATV(s)	10,876	21,088	14,111
Ranch vehicles	31,240	60,775	39,407
Implements	10,906	28,369	21,374
Trailers/crates	7,855	15,917	9,763
Bulk feed bins	6,848	15,581	8,783
Feeding equipment	6,391	18,869	10,515
Watering equipment	2,851	11,239	10,229
Video equipment	2,126	3,766	2,096
Rental equipment	1,526	5,211	3,855
Sedation equipment	1,349	1,838	NA
Veterinary & Supplies			
Operating supplies	4,029	4,345	NA
Medical supplies	2,676	2,768	NA
Veterinary expense	2,711	3,995	NA
Lodge supplies	NA	5,318	5,135
Lodge food and beverages	NA	5,522	5,215
Labor			
Employees paid salary (number)	2	2	2
Employees paid hourly (number)	3	3	2
Total salary wages paid	45,667	64,382	36,957
Annual salary per employee	27,344	28,403	20,230
Total hourly wage paid	11,003	25,923	13,363
Annual hourly expense per employee	6,500	9,349	10,415
Outsourced services	4,881	17,356	11,858
Utilities			
Utilities	2,380	8,844	4,946
Fuel	3,340	11,517	5,686
Miscellaneous Expenses			
Insurance	2,637	6,189	3,632
Advertising/marketing	2,862	8,776	6,046
Travel	2,520	6,500	4,490
Property tax	2,646	7,305	4,443

fencing, and improvements. The category of improvements includes expenditures on land clearing, roads, tanks/ponds, and forage development among others. Large equipment, ranch vehicles, and implements were reported as the highest equipment expenditures across all three types of operations. Of all the respondents, 68 percent reported hiring labor, while 52 percent reported outsourcing labor and/or consulting needs. Breeding and hunting operations reported using approximately 3.5 times the amount of outsourced services than breeding only operations, or $17,356 versus $4,881. Examples of outsourced services include those of operational management and or nutritional consulting, bottle feeding services for newborns, annual herd maintenance/vaccination services, and accounting services.

Figure 2 illustrates the annual expenses for a typical breeding operation. Survey categories, such as those shown in Table 1, were combined into four primary expense categories: capital, operational, feed, and general. Across the state, breeding operations spend an average of $306,000 per year, with capital expenditures consuming the largest amount at 47 percent. These expenses refer to annualized capital costs for items such as land, improvements, fencing, buildings, breeding stock, feeding equipment, ATV's, and implements. Items that are generally not financed comprise the operational costs, such as supplies, labor, utilities, insurance, advertising, and travel. Feed refers to the annual feed costs, including supplemental feed, hay, and bottle feeding supplies. Lastly, general costs cover the remainder, such as food plots, artificial insemination, veterinary, and disease monitoring.

Table 2 provides a summary of production data across all survey respondents. Breeding only operations averaged 77 deer on their 16 acres of pens. Respondents reported an average 5 breeder bucks, 20 stocker bucks, 30 does, and 33 fawns. Feed represents approximately 9 percent of total annual expenditures for breeding operations. Much care is directed towards

Figure 2: Annual Breeding Operation Expenditures for Texas Deer Breeding Operations, 2006



proper nutrition, as this is an essential component to bringing out the true genetic potential while also maintaining the physical health, development, and overall well being of the deer. Forty-four percent of breeding only operations indicated bottle feeding their fawns, while only 25 percent of breeding and hunting operations did.

On average, adult whitetail males were fed close to 4 pounds of supplemental feed per day, while does consumed slightly over 3 pounds. Respondents indicated paying around $300 per ton for both supplemental feed and hay. Hay costs were extremely high during the study period due to severe drought conditions across the Southern Plains. In addition to purchased feed, 69 percent of all respondents reported planting food plots on their operations. These plots were typically planted in some type of supplemental forage, such as corn, soybeans, clover, oats, or different pea varieties, and ranged from half an acre to 500 acres in size.

Survey results indicated that 66 percent of all breeding operation respondents had some type of breeding stock purchase. This would include purchases of breeder bucks, stocker bucks, bred

Table 2: Average Production Data of Deer Industry Survey Respondents

	Breeding	Breeding & Hunting	Hunting
Herd Inventory (Final 2005)			
Total deer	77	141	NA
Breeder bucks	5	10	NA
Stocker bucks	20	42	NA
Does	30	54	NA
Fawns, 2005	33	52	NA
Fawning rate, 2005 (fawns per doe)	1.32	1.24	NA
Fawning rate, 2006 (fawns per doe)	1.48	1.29	NA
Mortality rate (percent)	5%	6%	NA
Feeding			
Fawns			
Percent bottle feeding	44%	25%	NA
Percent of fawns bottle fed	71%	42%	NA
Average bottle feeding days until weaning	96	89	NA
After weaning			
Daily protein feed rate (lbs)	1.9	1.7	NA
Daily hay feed rate (lbs)	0.7	0.8	NA
Does			
Daily protein feed rate (lbs)	3.1	3.1	NA
Daily hay feed rate (lbs)	1.2	1.4	NA
Bucks			
Daily protein feed rate (lbs)	3.5	3.9	NA
Daily hay feed rate (lbs)	1.3	1.5	NA
Area of food plots (acres)	25	98	71
Seed	1,636	3,292	2,138.47
Fertilizer	2,518	3,921	2,732.54
Protein feed price (per ton)	320	290	282
Hay price (per ton)	313	299	NA
Hunting			
Annual number of hunters	NA	27	26
Total annual harvest	NA	48	43
Total number of deer in area	NA	237	216
Percentage of herd from breeding	NA	42%	43%
Stocker buck release	NA	18	17
Does released	NA	11	11
Stocker bucks purchased for release	NA	12	10
Stocker buck expense	NA	44,683	38,339
Does purchased for release	NA	13	8
Doe expense	NA	19,625	12,938
Annual management harvest	NA	14	13
Receipts per management buck	NA	2,207	2,207
Annual trophy harvest	NA	10	9
Receipts per trophy buck	NA	6,439	6,372
Processing cost	NA	110	113
Percent for taxidermy	NA	63%	66%
Taxidermy cost	NA	491	485

does, open does, buck fawns, doe fawns, or semen straws. Some reported purchases of deer, while others reported purchasing only semen straws. For the 38 percent reporting the purchase of breeder bucks and the 35 percent reporting the purchase of bred does, an average of $65,000 was spent. In addition, 23 percent of breeders spent an average of $51,000 for semen straws, with most straw prices ranging from $1,000 to $3,500.

Hunting Operations

As Table 1 indicates, operations with hunting reported other expenses in addition to those of breeding operations. Seventy-nine percent of all respondents of operations that reported to be involved in hunting had a lodge on the premises for their clients. In addition to the cost of the lodge, these operations also accrued expenses in maintaining and supplying the lodge for their clients. Labor costs were reported to be higher than those of breeding operations due to an overall larger operation as well as seasonal hunting guides. Food plots in the hunting areas tended to be larger, along with more feeders, waterers, and fencing, all contributed to the higher reported expenses. Although the majority of hunting operations accepted paying clients and corporate clients, 17 percent reported their hunting operation as personal use only.

Hunting only operations reported an annual average of 26 clients, harvesting 43 deer per year. As with the herd inventory, individual harvests and total harvest may not add up because the annual doe harvest is not shown and reporting differences existed between survey respondents. Harvesting a management buck cost an average of $2,207, while a trophy buck would cost the client an average of $6,372. For both management buck and trophy buck hunts, fees typically begin at a set level for a base threshold or score and increase as the score of the harvested deer surpasses that threshold. The buck's score is measured in inches, symbolizing the

size of the deer's antlers. As the score increases, so does the cost. With hunting being the end market, the primary goal of breeding operations is to develop quality genetics in their deer herd that will consistently produce high scoring bucks.

Economic Impact

IMPLAN® (Impact Analysis for Planning), an input/output model, was used to estimate the economic impact of the deer breeding industry on the Texas economy. Originally developed by the USDA Forest Service, the IMPLAN model is now managed and maintained by the Minnesota IMPLAN Group (MIG). The model is arguably the most used and cited model for performing economic impact analyses in the United States.

According to the MIG, the IMPLAN model is driven by purchases of final goods and services in a certain region, such as a state, a group of states, or the entire nation. These purchases represent the dollar value of the increase in finished goods and services demanded, and create an impact that ripples throughout the economy. Industries both produce goods and services for final use and purchase goods and services from other industries. These other producers and industries buy goods and services as well, which the MIG designates as indirect purchases. In addition, each step along the cycle pays wages and salaries to employees, who, in turn, make additional expenditures into the economy of the region (Lindall and Olson, 2007).

In determining the overall economic impact of an industry, the IMPLAN model uses a set of multipliers, separated by sector, to estimate the direct, indirect, and induced effects (induced being effects of household spending) of the economic cycle. Over 500 sector codes are included in the IMPLAN model, where each code represents a unique industrial sector representing a specific product or category of products. The multipliers that are derived for each sector

quantify the ripple effects of a dollar change in final demand, thus resulting in an estimation of the economic impact (Lindall and Olson, 2007).

Deer Breeding Industry

In determining the economic impact of the deer breeding industry, the categories of the survey were prepared for input into the IMPLAN model. This was accomplished by extrapolating the survey results against the inventory of operations to arrive at total industry expenditures for each category. These totals represent the value of final goods and services demanded by the industry, and were the baseline inputs for the IMPLAN model. Categories from the extrapolated survey results, such as supplemental feed or fencing, are then assigned a sector code according to the underlying industry category. Table 3 provides an example of category inputs and their multipliers from IMPLAN, with each category belonging to a different sector. Differences between the multipliers for each category demonstrate how dollars move throughout different industries. For instance, a $1 million change in final demand for supplemental feed will generate a total of $1.77 million in total industry output, $1.06 million in value added, and will support 18.23 jobs. In this example, total industry output would include the output generated by the supplemental feed industry and those industries that supply it. Value added from this industry includes employee compensation, proprietary income, other proprietor income, and indirect business taxes that are generated (Lindall and Olson, 2007). The employment multiplier represents the number of jobs that are supported per million dollar increase in final demand.

Table 3: Deer Industry Multipliers

	Output	Value Added	Employment
Supplemental Feed	1.77	1.06	18.23
Food plots	1.95	1.12	40.54
Veterinary	1.75	0.85	21.92
Utilities	1.59	1.00	4.51
Insurance	1.62	1.14	13.60
Maintenance and repair	1.89	1.01	17.58
Handling facility	1.87	1.07	18.91
Fencing	1.91	1.05	18.11
Large equipment	1.62	0.57	7.57
ATV's	1.80	1.11	15.90

Hunter Expenditures

An additional component in determining the economic impact of the industry is to evaluate and include the role of hunter expenditures in the consumption of industry products. Not all hunting is related to deer breeding, but some is, therefore it is important to estimate only that hunting relating directly to deer farming. In other words, the hunting product of deer breeding is a small part of all deer hunting in Texas. Yet the hunting component or economic activity associated with deer breeding is an important part of the economic activity generated by the deer breeding industry. While overall hunter numbers in the state are down, the demand for trophy hunting appears to be increasing. Dollars spent on hunting, assorted gear, and travel, continue to grow. Time is increasingly the limiting factor for many industry participants, as they have the money to participate, but not the time to invest in traditional hunting. The growth of this segment of the industry is expected to continue, therefore, it is important to include this aspect of the industry in this study.

In order to determine this impact, the number of hunters per operation was taken from the survey, extrapolated against all hunting operations, and combined with a report that outlines

hunting expenditures on a per hunter basis. This report, entitled "The 2001 Economic Benefits of Hunting, Fishing, and Wildlife Watching in Texas", was based on the 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation survey conducted by the U.S. Fish and Wildlife Service and the U.S. Census Bureau (Southwick, 2003). These retail expenditures were then combined with other hunt related expenditures (trophy fees, venison processing fees, taxidermy fees, etc.) and assigned sector codes for the IMPLAN model. When totaled, close to 2 percent of the report's estimated 860,000 deer hunters are attributed to the deer breeding industry. However, this small percentage of hunters account for over 8 percent of the report's estimated $900 million in retail, travel, and hunt related expenditures.

Results

Table 4 provides a summary of the economic impact of the Texas deer breeding industry. Deer breeding operations generate an estimated $318.4 million in direct economic impacts on the Texas economy. This value represents the estimated increase in final demand of all goods and services consumed by the industry. These industries include feed suppliers, farm and ranch supply stores, veterinary services, medical and sedation product suppliers, construction, utilities, advertising, insurance, and numerous others. As these direct expenditures are multiplied throughout the economy, the deer breeding industry generates an estimated $523 million of economic activity. This value represents the total industry output generated by the Texas deer breeding industry and those input industries. In addition, deer breeding operations contribute over $177 million of value added in the form of employee compensation, proprietary income, other proprietor income, and indirect business taxes. Hunters supply an additional $73 million in direct economic impacts. This number represents annual retail (clothing, guns, hotels, food, fuel,

etc.) and hunt related (venison processing, taxidermy services, etc.) expenditures of hunters that consume the products of this industry. When combined, deer breeding industry generates $652 million of economic activity for the Texas economy. In addition, the industry provides the economic activity that supports 7,335 jobs in the economy, most of which are located in rural areas of the state. If this industry were to disappear, these jobs would have to find support from some other sector of the economy.

Table 4: Economic Impact of the Texas Deer Breeding Industry

	Direct	Output	Value Added	Employment
All Operations	318,450,195	523,161,605	177,394,148	5,942
Hunters	73,194,309	129,328,387	30,325,353	1,393
Total	**391,644,504**	**652,489,992**	**207,719,501**	**7,335**

Conclusion

With over 1,000 operations, the deer breeding industry has an established presence across the state, with the majority of operations located in rural areas. In addition, while traditional forms overwhelmingly dominate the hunting industry, the small niche of hunters this market serves continues to increase. This increase in demand is fueling the growth in the breeding industry. Over $391 million in direct expenditures are poured into the state economy each year by the deer breeders and sportsmen of this industry. In turn, this generates $652 million of economic activity while supporting 7,335 jobs. All told, these results highlight the fact that the deer breeding industry continues to be an important and vital contributor to the rural economies of Texas.

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