PRAIRIE VIEW A&M UNIVERSITY

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The Economic Impact of Prairie View A&M University on Waller County, the Houston-Baytown-Sugar Land Metropolitan Statistical Area, and the State of Texas

College of Business

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*This study was conducted at the request of Mary Lee Hodge, Vice President of Business Affairs at Prairie View A&M University. The team of authors, all faculty members in the College of Business, is pleased to present this study as a first effort in analyzing the various benefits the taxpayers and the community derive from supporting this historic institution. Rod Mireles, Comptroller, Anthony Adams, Interim Director for Institutional Research, and others on campus have been helpful in providing the necessary data. We take full responsibility for the results and the analysis presented herein. Please contact Dr. Munir Quddus if you have questions, or wish to point out an error or an omission.

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Executive Summary

This study presents estimates of the economic impact of Prairie View A&M University (PVAMU) on the local, regional, and state economies in 2006. Prairie View A&M University plays an important role in the social and economic life of the local economy. The University's considerable short-term and long-term contributions extend throughout the local (Waller County), regional (Houston-Baytown-Sugar Land Metropolitan Statistical Area), and State (Texas) economy. The variables used to measure short-term economic benefits include direct spending, total output, value-added output, labor income, and employment. To estimate the long-term benefits, the study presents estimates of the annual contributions PVAMU makes to the enhancement of the lifetime earnings potential for residents in Waller, the Greater Houston metropolitan area, and Texas. In addition to estimating the quantifiable economic impact of this historic institution of higher learning, this report captures some of the non-quantifiable impacts through a summary of the research and service contributions of the some of the centers on campus that serve the greater community. The research methodology includes using *IMPLAN software* and other standard techniques found in the literature on economic impact analysis. Financial and non-financial data used in the study are from the University Comptroller's Office, Office of Institutional Research, and the *Prairie View A&M University Fact Book*. Additional statistics were collected through surveys. The Key results are presented in the next section.

Key Findings

This study reports the extent to which Prairie View A&M University impacts the local, regional, and state economies with additional business activity, household income, employment, and lifelong earnings potential. In addition to the quantifiable economic impact, this report also presents a summary of various center activities through which the University serves the greater community.

1. Economic Impact of PVAMU on Waller County:

- The direct spending impact to the economy of Waller County is $155,799,683 annually.
    - The direct economic impact of PVAMU on Waller County is estimated at $155.80 million per year. This impact is associated with $61.01 million in faculty and staff wages and salaries, $64.64 million in other institutional spending (including construction), $20.78 million in spending by undergraduate students, $7.45 million in spending by graduate students, and $1.91 million in spending by visitors.
- The total output impact on Waller County is $192,964,613 annually.
    - The total economic impact of PVAMU on Waller County is estimated at $192.96 million annually, which includes $155.80 million in direct impact, which in turn generates an additional $37.16 million in secondary effects. This economic impact is associated with $77.0 million in wages and salaries for faculty and staff, $82.16 million in other institutional spending, $23.31 million in spending by undergraduate students, $8.35 million in spending by graduate students, and $2.15 million in spending by visitors to the University.
- The labor income impact on Waller County is $71,204,654 annually.
    - The labor income impact of PVAMU on Waller County is estimated at $71.20 million annually. Of this total, $63.16 million is generated by faculty and staff wages and salaries, $3.49 million by other institutional spending, $3.15 million by undergraduate student spending, $1.12 million by graduate student spending, and $0.29 million by visitor spending.
- The employment impact on Waller County is 1,497 full-time jobs.
    - PVAMU supports a total of 1,497 full-time jobs in Waller County. Of this total, 1,221 jobs are supported by faculty and staff wages and salaries, 92 jobs by other institutional spending, 127 jobs by undergraduate student spending, 45 jobs by graduate student spending, and 12 jobs by visitor spending. PVAMU is the largest employer in Waller County.
- The increase in lifelong earnings power of PVAMU alumni residing in Waller County, a measure of long-term impact, equals $107,518,114 annually.
    - Based on the gains in lifelong earning streams from a university degree, the University annually contributes $107.52 million to additional lifetime earnings of PVAMU alumni who reside in Waller County. Of this total, $61.93 million is contributed to alumni with bachelor's degrees, and $45.59 million is contributed to alumni with master's degrees.

2. Economic Impact of PVAMU on the Greater Houston Region (Houston-Baytown - Sugar Land Metropolitan Statistical Area):

- The direct spending impact on the greater Houston region is $214,923,712 annually.
    - The direct economic impact of PVAMU on the greater Houston region is estimated at $214.92 million per year. This impact is associated with $61.01 million in wages and salaries for faculty and staff, $64.64 million in other institutional spending, $51.45 million in spending by undergraduate students, $30.57 million in spending by graduate students, and $7.26 million in spending by visitors to the University.
- The total output impact on the greater Houston region is $369,120,176 annually.
    - The total economic impact of PVAMU to the greater Houston region is estimated at $369.12 million annually, which includes $214.92 million in direct impact, which in turn generates an additional $154.20 million in secondary effects. The total economic impact is associated with $112.14 million in wages and salaries for faculty and staff, $132.27 million in other institutional spending, $71.48 million in spending by undergraduate students, $42.48 million in spending by graduate students, and $10.75 million in spending by visitors to the University.
- The labor income impact on the greater Houston region is $118,384,379 annually.
    - The labor income impact of PVAMU to the greater Houston region is estimated at $118.38 million annually. Of this total, $72.60 million is generated by faculty and staff wages and salaries, $17.15 million by other institutional spending, $16.37 million by undergraduate student spending, $9.72 million by graduate student spending, and $2.54 million by visitor spending.
- The employment impact on the greater Houston region is 2,555 full-time jobs.
    - PVAMU supports a total of 2,555 full-time jobs in the greater Houston region. Of this total, 1,443 jobs are supported by faculty and staff wages and salaries, 354 jobs by other institutional spending, 431 jobs by undergraduate student spending, 256 jobs by graduate student spending, and 71 jobs by visitor spending.
- The increase in lifelong earnings power of PVAMU alumni residing in Greater Houston, a measure of long-term impact, equals $1,028,687,525 (roughly $1.03 billion) annually.
    - Based on the gains in lifelong earning streams from a university degree, the University annually contributes $1.03 billion to additional lifetime earnings of PVAMU alumni who reside in the greater Houston region. Of the total, $441.31 million is contributed to alumni with bachelor's degrees, and $587.37 million is contributed to alumni with master's degrees.

3. Economic Impact of PVAMU on the State of Texas:

- The direct spending impact on the State of Texas is $228,109,408 annually.
    - The direct economic impact of PVAMU on the State of Texas is estimated at $228.11 million per year. This impact is associated with $61.01 million in wages and salaries for faculty and staff, $64.64 million in other institutional spending, $63.76 million in spending by undergraduate students, $31.45 million in spending by graduate students, and $7.26 million in spending by visitors to the University.
- The total output impact on the State of Texas is $450,039,272 annually.
    - The total economic impact of PVAMU on the State of Texas is estimated at $450.04 million annually, which includes $228.11 million in direct impact, which in turn generates an additional $221.93 million in secondary effects. The total economic impact is associated with $127.49 million in wages and salaries for faculty and staff, $170.01 million in other institutional spending, $94.94 million in spending by undergraduate students, $46.84 million in spending by graduate students, and $10.75 million in spending by visitors to the University.
- The labor income impact on the State of Texas is $139,787,143 annually.
    - The labor income impact of PVAMU on the State of Texas is estimated at $139.79 million annually. Of this total, $76.67 million is generated by faculty and staff wages and salaries, $26.70 million by other institutional spending, $22.68 million by undergraduate student spending, $11.20 million by graduate student spending, and $2.54 million by visitor spending.
- The employment impact on the State of Texas is 3,183 full-time jobs.
    - PVAMU supports a total of 3,183 full-time jobs in the state of Texas. Of the total, 1,576 jobs are supported by faculty and staff wages and salaries, 589 jobs by other institutional spending, 634 jobs by undergraduate student spending, 313 jobs by graduate student spending, and 71 jobs by visitor spending.
- The lifelong earnings power, a measure of long-term impact of PVAMU alumni who reside in Texas, is boosted by $1,386,850,067 (roughly $1.39 billion) annually.
    - Based on the gains in lifelong earning streams from a university degree, the University annually contributes $1.39 billion to additional lifetime earnings of PVAMU alumni who reside in Texas. Out of this total, $639.91 million is contributed to alumni with bachelor's degrees, and $746.94 million is contributed to alumni with master's degrees.

1. Introduction

This report presents estimates of economic benefits that Prairie View A&M University delivered to the local (Waller County), regional (Houston-Baytown-Sugar Land Metropolitan Statistical Area), and State (Texas) economy in fiscal year 2006. To capture some of the long-term benefits, this report presents estimates of the annual contributions PVAMU makes to the lifetime earnings potential for residents in Waller, Greater Houston, and Texas. In addition to estimating the quantifiable economic impact of PVAMU, this report presents a summary of various center (or service) activities through which the University serves the greater community. The literature recognizes that many beneficial contributions of an institution of higher learning cannot be quantified, but are significant for improving the quality of life in the neighboring communities.

The primary focus of this study is to estimate the short-term economic impact of PVAMU, which is defined as the change in overall economic activity that is associated with the spending related to the University. Economic impact is estimated for five categories of university-related expenditures: (1) University spending on wages and salaries of faculty and staff, (2) University spending on other budget categories (other than wages and salaries), (3) spending by undergraduate students, (4) spending by graduate students, and (5) spending by visitors to the University. The estimated results measure the extent to which the University creates additional economic activities, labor income, and employment.

This economic impact analysis, we believe, will help PVAMU document the scope and extent of the role the University plays in positively impacting the local community and the citizens of Texas.

2. Literature Review

Measuring the total economic impact of a university on a defined study area is a challenging task. There are several facets of this economic impact: short-term and long-term benefits; tangible and intangible benefits. The short-term, tangible economic benefits measure the changes in overall economic activities associated with expenditures related to universities. The long-term, intangible benefits capture the positive effects of universities on human capital, labor productivity, technology transfer, business assistance and recruitment, increased lifetime earnings of graduates, and many types of positive social externalities, which are often difficult to quantify. Most impact studies have generally focused on capturing the short-term, tangible benefits universities deliver to pre-defined study areas.

Among the early impact studies, Caffrey and Issacs (1971) made a seminal contribution to the impact study literature. Commissioned by the American Council of Education, this study estimated the short-term economic impacts of universities on their local economies. Using linear cash flow formulas and multipliers, their models estimated the economic benefits to three groups within the local economy -- local businesses, local government, and local individuals. The more recent impact studies have used more sophisticated input-output models, which are reviewed in Stokes and Coomes (1998). Among other significant impact studies, Elliot et al (1988) discuss

how the focus of impact studies can be expanded from measuring only the short-term spending impacts to include the long-term economic impact of universities on local development.

In a recent study of the impact of a public university on the economy of a community, Jafri et al (2004) provide a good summary of many short-term impact studies conducted by universities. For example, the University of Colorado and the University of Massachusetts conducted studies estimating the economic effects on the state level, while Southern Illinois University and the University of Waterloo studies had a more regional focus, and the Texas A&M University-Corpus Christi, Sam Houston State University, and Tarleton State University studies had a more local focus. Using the IMPLAN input-output models, these studies derived several measures of multipliers, which are summarized below:

Table 1: Summary of Multipliers from Several Impact Studies

	Total Output Multiplier	Employment Multiplier	Value Added Multiplier
University of Colorado (state level)	1.90	1.80	
University of Massachusetts (state level)	2.40	1.98	
Southern Illinois University (36 county region)	2.00		
SIU-Carbondale (19 county region)	1.78		
SIU-Edwardsville (14 county region)	1.75		
University of Waterloo (region only)			0.84
University of Waterloo (entire province)			1.46
University of Waterloo (region only)		1.34	
University of Waterloo (entire province)		1.65	
Texas A&M – Corpus Christi (local level)	2.75		
Sam Houston State University (local level)	1.70		
Tarleton State University (local level)	1.48		
Tarleton State University (state level)	1.70		

Source: Jafri et al (2004)

The Thurgood Marshall Scholarship Fund (TMSF) published a comprehensive overview of the economic impacts of 42 public HBCUs that are members of the fund (Thurgood Marshall Scholarship Fund, 2001). The TMSF study reported only the direct spending associated with the HBCUs; the multiplier effects of direct spending (the re-spending and induced effects) and the total economic impact of individual institutions on their host communities were not reported. Based on the estimated direct spending, the study concluded: “Through buying and spending together the students and the universities are a significant portion of the economic activity of the host communities. The impact is greatest felt in the more rural communities. However, the greatest spending is in the metropolitan communities.”

In a more recent study, Humphreys (2006) estimated the short-term economic impacts of 101 Historically Black Colleges and Universities (HBCUs), including PVAMU, on their regional economies for the year 2001. The impact estimates are based on IMPLAN regional input-output models of each HBCU's regional economy and data collected from the Integrated Postsecondary

Education Data System (IPEDS) and Consumer Expenditure Survey. The study estimates four indicators of economic impact --total output, total value added, total labor income, and total employment. The key findings of this study are summarized below.

- The collective initial spending of all HBCUs in their host communities totaled nearly $6.6 billion in 2001.
- The combined total economic impact of all HBCUs was $10.2 billion (65 percent of this total is initial impact, while the remaining 35 percent is the multiplier effect).
- The collective labor income impact of all HBCUs was nearly $4 billion.
- The combined employment impact of all HBCUs was 180,142 jobs.

Humphreys (2006) reports the following short-term economic impacts of PVAMU on the greater Houston region (Houston-Baytown-Sugar Land Metropolitan Statistical Area) in the year 2001.

Table 2: Previous Estimates of Economic Impact of PVAMU on the Houston-Baytown-Sugar Land MSA (2001)

	Initial Spending (mil $)	Output Impact (mil $)	Value-added Impact (mil $)	Labor Income Impact (mil $)	Employment Impact
Wages and salaries	40.7	95.6	65.7	54.8	2,358
Other institutional spending	36.8	55.2	26.0	16.6	364
Undergraduate students	52.2	66.8	42.4	23.5	832
Grad/professional students	9.9	13.0	8.3	4.7	161
Total Impact	139.6	230.6	142.4	99.6	3,715

Source: Humphreys (2006)

This present study improves upon the Humphreys (2006) study in many important ways: first, it estimates the short-term economic impact of PVAMU on three levels - the local, regional, and state level; second, this study uses the most recent available statistics (FY 2006); third, it relies upon a more accurate local measure of student spending, compared to Humphrey's study which applies national average student spending estimates to Prairie View students; fourth, this study includes the impact of construction spending and visitor spending related to PVAMU, types of spending omitted in the Humphreys study; fifth, this study more accurately measures the consequences of staff and administrator spending than the Humphreys study, by segmenting staff and administrators into three income groups; and finally, in addition to short-term impacts, this study estimates the potential lifelong earnings gain of PVAMU graduates.

3. Estimated Results

The results presented in Tables 6, 7 and 8 below are calculated with multipliers developed by IMPLAN (Impact Analysis for Planning - Professional Version 2.0) modeling system and data gathered from the *PVAMU Fact Book*, Office of Institutional Research, and Comptroller's Office.

3.1 Initial Spending

The initial spending accruing to the local economy is the aggregation of all five types of spending: spending on wages and salaries, spending on other budget categories (including construction), spending by undergraduate students, spending by graduate students, and spending by visitors. In FY 2006, initial spending associated with PVAMU totaled $155.80 million in Waller County, $214.92 million in the greater Houston region, and $228.11 million in the State of Texas. Next, for each category of initial spending, four indicators of economic impact - total output, total value-added, labor income, and total employment - are calculated.

3.2 Total Output Impact

The total output impact was calculated for each category of initial spending using the multiplier effect, which captures the total economic repercussions of repeated rounds of spending and re-spending that take place throughout the region until the initial spending has completely leaked to other regions. The total output impact is the largest measure of economic impact, which estimates the value of production by all industries and households. In FY 2006, PVAMU's total output impact is estimated at $192.96 million in Waller County, $369.12 million in the greater Houston region, and $450.04 million in the State of Texas.

3.3 Total Value-Added Impact[1]

Total value-added impact avoids double-counting of intermediate goods (both produced in the region and purchased outside the region) by excluding expenditures related to foreign and domestic trade. This measure is approximately equal to the increase in the local economy's gross regional product caused by PVAMU spending, which provides a more accurate measure of the actual economic benefits accruing to local businesses and households. In FY 2006, PVAMU generated a total value-added impact of $80.38 million in Waller County, $165.64 million in the Greater Houston region, and $203.46 million in Texas.

3.4 Labor Income Impact

The labor income received by local residents includes all forms of employment income, such as wages, salaries, and proprietors' incomes. It does not include non-wage compensation (e.g., pensions or health insurance), transfer payments (e.g., welfare or Social Security benefits), or unearned income (e.g., dividends, interest, or rent). In FY 2006, PVAMU generated a total labor

[1] "Value-added (or gross regional product) consists of employee compensation, proprietor income, other property income, and indirect business taxes. Value-added is equivalent to gross output (sales or receipts and other operating income, commodity taxes, and inventory change) minus intermediate inputs (consumption of goods and services purchased from industries or imported). It is often referred to as the state- or regional-level counterpart of the nation's gross domestic product (GDP)." Humphreys, J., The Economic Impact of Nation's Historically Black Colleges and Universities, National Center for Education Statistics, NCES 2007-178, October 2006.

income impact of $71.20 million in Waller County, $118.38 million in the Greater Houston region, and $139.79 million in Texas.

3.5 Employment Impact

The economic impact of an institution on the local economy is probably most easily understood in terms of its effects on employment, which includes wage and salary employees and self-employed individuals. In FY 2006, PVAMU-related spending supported a total of 1,497 jobs in Waller County, 2,555 jobs in the greater Houston region, and 3,183 jobs in Texas.

4. Basic Statistics on University Spending

This section presents a few basic statistics on the University's revenue sources (FY 2006), expenditures (FY 2006) and graduation numbers in recent years (2000-2006).

Table 3: Sources of Revenue FY 2006

State Appropriations	62,479,169.17
Tuition and Fees	29,064,045.84
Contracts and Grants	37,394,522.61
Gifts	4,691,444.10
Other income	5,528,586.71
AUF	12,143,000.00
Auxiliary Operations	10,318,097.52
Total	$161,618,865.95

Source: PVAMU Comptroller's office

Table 4: Sources of Expenditures FY 2006

Wages, Salaries & Benefits	75,962,584.84
Operating Expenses and Equipment	46,990,036.80
Net Student Aid	11,233,406.82
Capital Outlay - Non-construction	2,767,011.91
Other Expenditures	3,642,939.11
Debt Service	12,343,615.42
Total	$152,939,594.90

Source: PVAMU Comptroller's office

Table 5: Degrees Awarded by Level

	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06
Undergraduate	720	746	738	721	795	889
Graduate	397	417	474	685	678	697
Total	1,117	1,163	1,212	1,406	1,473	1,586

Source: PVAMU Institutional Research Office

5. Short-Term Economic Impact Estimates

The tables below present estimates of the present study of the various economic impacts on the Waller, greater Houston, and Texas economy from the University' direct and related spending.

Table 6: Economic Impact of PVAMU on Waller County (FY 2006)

	Initial Spending ($)	Output Impact ($)	Value-added Impact ($)	Labor Income Impact ($)	Employment Impact
Wages and Salaries	61,008,219	76,995,040	65,886,528	63,159,647	1,221
Other Institutional Spending*	64,640,079	82,163,636	4,834,860	3,485,498	92
Undergraduate Students	20,784,834	23,310,070	6,649,719	3,153,174	127
Graduate Students	7,453,353	8,348,002	2,352,760	1,116,482	45
Visitors	1,913,197	2,147,865	651,289	289,853	12
TOTAL	**155,799,683**	**192,964,613**	**80,375,156**	**71,204,654**	**1,497**

Table 7: Economic Impact of PVAMU on Houston-Baytown-Sugar Land MSA (FY 2006)

	Initial Spending ($)	Output Impact ($)	Value-added Impact ($)	Labor Income Impact ($)	Employment Impact
Wages and Salaries	61,008,219	112,136,641	83,432,131	72,604,989	1,443
Other Institutional Spending*	64,640,079	132,268,508	28,642,719	17,154,106	354
Undergraduate Students	51,452,028	71,482,741	30,534,689	16,366,268	431
Graduate Students	30,568,183	42,480,522	18,196,093	9,721,412	256
Visitors	7,255,202	10,751,764	4,833,674	2,537,604	71
TOTAL	**214,923,712**	**369,120,176**	**165,639,306**	**118,384,379**	**2,555**

Table 8: Economic Impact of PVAMU on the State of Texas (FY 2006)

	Initial Spending ($)	Output Impact ($)	Value-added Impact ($)	Labor Income Impact ($)	Employment Impact
Wages and Salaries	61,008,219	127,494,923	90,957,464	76,673,505	1,576
Other Institutional Spending*	64,640,079	170,014,297	44,858,651	26,697,040	589
Undergrad. Students	63,757,160	94,942,289	42,064,710	22,683,009	634
Graduate Students	31,448,748	46,835,999	20,746,858	11,195,985	313
Visitors	7,255,202	10,751,764	4,833,674	2,537,604	71
TOTAL	**228,109,408**	**450,039,272**	**203,461,357**	**139,787,143**	**3,183**

Notes: *Other institutional spending includes construction spending (4 year annual average).
Source: Calculations based on data provided by the University, authors' assumptions (following other studies), and the IMPLAN multipliers

6. Summary of Short-Term Impacts

This section presents estimates of the following short-term economic impact of PVAMU in FY 2006:

- Waller County
  - Direct spending impact is $155.80 million.
  - Total output impact is $192.96 million.
  - Labor income impact is $71.20 million.
  - Employment impact is 1,497 jobs.

- Greater Houston Region
  - Direct spending impact is $214.92 million.
  - Total output impact is $369.12 million.
  - Labor income impact is $118.38 million.
  - Employment impact is 2,555 jobs.

- State of Texas
  - Direct spending impact is $228.11 million.
  - Total output impact is $450.04 million.
  - Labor income impact is $139.79 million.
  - Employment impact is 3,183 jobs.

7. Long-Term Benefits

a. Effects on Lifelong Earnings Potential

It is generally accepted that a college education significantly enhances human capital of graduates, which in turn helps them achieve significant boosts in their lifetime earnings potential. The U.S. Census Bureau (2002) reports the following average "synthetic work-life earnings" according to education level:

- High school graduate: $1,037,759
- Some college education: $1,267,803 (a premium of $230,044 compared to a high school graduate)
- Bachelor's degree: $1,838,432 (a premium of $800,673 compared to a high school graduate)
- Master's degree: $2,127,947 (a premium of $1,090,188 compared to a high school graduate)

In 2005-06, PVAMU awarded 889 bachelor's degrees and 697 master's degrees. It is estimated from university data that among the PVAMU alumni with bachelor's degrees, 8.7% ultimately reside in Waller County, while 62% reside in the Houston-Baytown-Sugar Land (H-B-SL) MSA, and 89.9% reside in Texas. For alumni with a master's degree, the corresponding figures are 6% in Waller County, 77.3% in the H-B-SL MSA, and 98.3% in Texas. Given this residency breakdown and the average lifelong earnings potential for university graduates (reported by the Census Bureau), we estimate that PVAMU contributes total benefits of $107.52 million annually in the enhancement of lifetime earning power potential for residents in the Waller County; $1.03 billion in the H-B-SL MSA; and $1.39 billion for the citizens of Texas. The breakdown of the increase in the life-long earnings potential for alumni with bachelor's degree vis-à-vis master's degree in the three geographic areas is given in Table 9.

Table 9: Annual Potential Earning Power Gains

Area	Alumni with Bachelor's Degrees	Alumni with Master's Degrees	Total Lifelong Earnings Gains
Waller County	$61,926,452	$45,591,662	$107,518,114
H-B-SL MSA	$441,314,944	$587,372,581	$1,028,687,525
State of Texas	$639,906,669	$746,943,398	$1,386,850,067

Source: Authors' calculations based on data provided by the PVAMU Alumni and Placement offices, and assumptions used by authors in the impact study literature

Summary of Long-Term Impact (Annual)

- Lifelong earnings power of Waller residents is boosted by $107.52 million.
- Lifelong earnings power of Greater Houston residents is boosted by $1.03 billion.
- Lifelong earnings power of Texas residents is boosted by $1.39 billion.

b. The Higher Education Gap in Texas and the Houston Metropolitan Area

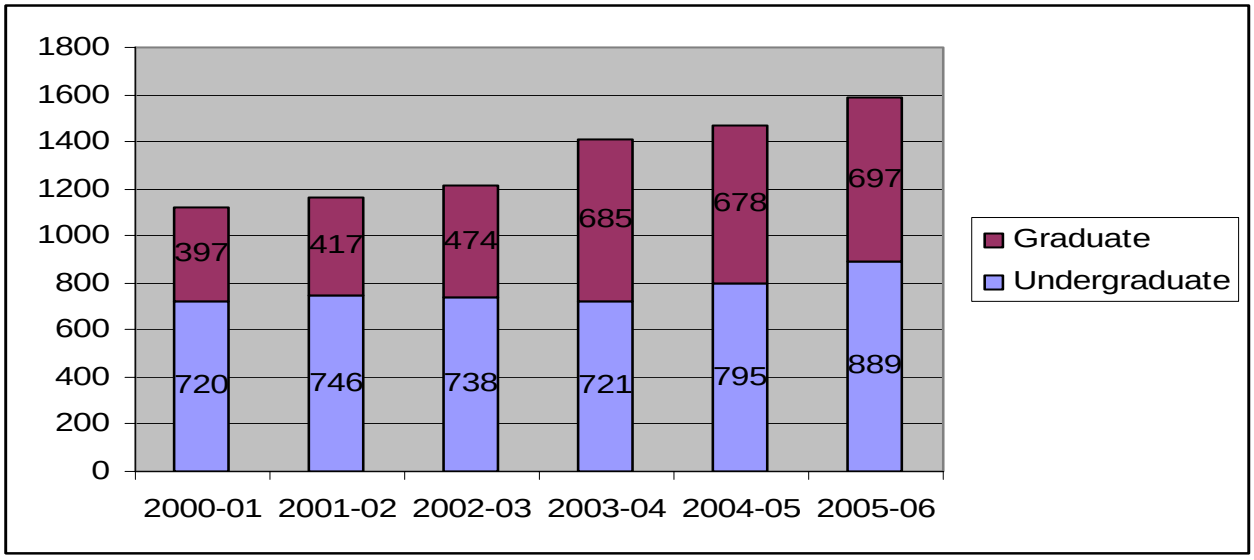
Prairie View A&M's most important long-term contribution to Texas is college-educated citizens. A college degree benefits not only the recipient, but also the state in many ways. College graduates attract more high value businesses to the state; they pay more state and local taxes; they are less likely to be unemployed; and they are less likely to need government benefits. Yet for decades, Texas colleges and universities have produced fewer college graduates than have been required by Texas employers, and as a result Texas has been a net importer of college graduates from other states. This reliance upon importing skilled workers has hindered economic development in the state.

Recent demographic trends will put further pressure on colleges and universities in Texas. The average education level of immigrants to Texas has fallen in the 1990s and 2000s relative to the education levels of immigrants in the 1970s and 1980s. An increasing portion of Texas families have members that have not attended college; hence the proportion of Texans who are underserved by the higher education system continues to grow. This trend places even more importance on universities such as Prairie View A&M University whose primary mission is to educate those who have traditionally shunned college.

The higher education gap in Texas is mirrored in the Houston metropolitan area. Research by economist Barton Smith (2006) indicates that the Houston area ranks second to last among the 60 largest metropolitan areas in the percentage of its residents enrolled in college. Smith predicts a shortage of more than 50,000 college graduates in the Houston metropolitan area over the next five years, and the surge in lower-skilled immigrants into the Houston area portends a reduction in the education level of the average Houston-area worker. Prairie View A&M University, its expertise honed over its 130-year history, has demonstrated success in educating the underserved, with graduation rates exceeding its peer institutions who educate similarly underserved students. Prairie View A&M can be a leader in enhancing the economic future of Houston and of Texas by helping to close the higher education gap and to lift opportunities for the educationally underserved.

Prairie View A&M University is one of the largest producers of minority professionals in business, engineering, nursing, education, architecture, and juvenile justice in Texas and perhaps in the nation. With four doctoral programs, it is well on its way in impacting the production of minority doctorates in engineering, juvenile justice, psychology and education leadership. The chart below presents the graduation data for the University in the last six years.

Chart 1: Prairie View A&M University Graduation Statistics (2000-2006)



Source: University Institutional Research

Table 10: Graduation Rages: Impact on the Workforce

Institution	Graduation Rate (6-year)
Prairie View A&M University	38%
University of Houston – Downtown	17.6%
Texas Southern University	17.1%

Source: THECB Higher Education Accountability System, which uses certified data, reports these statistics for the Fall 1998 cohort (6-yr graduation rate):
http://www.txhighereddata.org/Interactive/Accountability/UHRI_Success.cfm

Non-Quantifiable Impacts

Through a variety activities (teaching, research, and service) conducted by departments and special centers, Prairie View A&M University serves the greater community. This section describes the scope and activities of some of these Centers.

Center for Applied Radiation Research, http://carr.pvamu.edu/

The Center for Applied Radiation Research (CARR), founded in 1995, focuses on research in space radiation dosimetry, instrumentation, shielding and radiation effects on materials and electronic devices. The center performs ground-based and flight experiments to explore space radiation effects on crew, spacecraft materials and electronic devices to determine how these effects can be mitigated. These experiments are performed at various radiation facilities around the country. CARR also has experience in the weapons and nuclear reactor radiation environments.

CARR research uses a unique suite of instruments called proportional counters that measure the radiation dose to small volumes of tissue, silicon and other materials in various radiation environments. These instruments make measurements relevant to both human crew and electronic devices. The tissue equivalent proportional counter (TEPC) is functionally identical to instruments used on board the space shuttle and International Space Station (ISS).

CARR is truly an interdisciplinary center with faculty investigators and research staff with expertise in radiation physics, electrical engineering, mechanical engineering, physics, nuclear engineering and material science. This allows CARR to research complicated questions related to radiation effects on materials and devices, model the radiation environment, and devise mitigation strategies. CARR also investigates new methods of radiation detection that may benefit the space program and have homeland defense applications.

CARR research emphasizes participation of undergraduate and graduate students in all projects. Student researchers do experimental work in the CARR labs and radiation facilities all over the world. This hands-on experience prepares them for future careers in academia, government and industry. CARR faculty and students also participate in outreach projects that enhance K-12 students' interest in science, technology, engineering and math and the space program.

Center for Materials, Micro-design and Micro-fabrication, http://www.pvamu.edu

The Center for Materials, Micro-design and Micro-fabrication was founded in 1993. The purpose of the Center is to provide a milieu in which researchers in the areas of materials, VLSI design and fabrication can collaborate to provide novel solutions to problems in the semiconductor industry. Resources of the Center are used by researchers to solve related problems in the areas of materials, micro-design and fabrication.

The strength of the Center is in the area of design and fabrication of integrated circuits. The Center also has the resources to conduct testing and characterization of materials.

In 1995, the Center provided the initial stimulus and resources for the formation of the NASA Center for Applied Radiation.

Center of Excellence for Communication Systems Technology Research (CECSTR), http://www.pvamu.edu/cecstr

Founded in 2001, The Center of Excellence for Communication Systems Technology Research (CECSTR)'s mission is to establish a comprehensive research program with the capabilities of understanding selected aspects of communication systems, DSP Solutions, Image Processing, Mixed Signal Systems and High-speed (Broadband) Communication Systems by way of algorithm developments, modeling, simulation, analysis, design, testing and performance evaluation. The Center seeks to answer relevant questions concerning various strategic enterprises and explores the means to use acquired knowledge to benefit society and increase the economic competitiveness of the State of Texas and the nation.

Research Expertise: Wavelets and Wavelet Transform Research; Design of Enterprise Security Network Management System for Intrusion Detection and Prevention; Signal, Image and Data Processing; Remote Sensing; Dynamic Spectrum Management for Broadband Communication Systems; Interoperability and Reliability Studies and Testing of Broadband Communication Systems; Algorithm Development of Real-Time Solutions Using DSPs; Control System Studies; Performance Evaluations; Modeling and Simulation; Design and Analysis of Systems; Sensors; Homeland Security; Biometrics; Space and Terrestrial Communications: Ultra-wideband Wireless Network; Mixed Signal Systems Design and Testing; Development of Vibration Detection and Mitigation Systems for Aeroelastic Systems; Wavelet-Based Algorithm Development for Signal Detection and Estimation of Miniaturized Satellite Threat Reporting Systems; Development of Wavelet-Based Noise Reduction/Removal, Compression, Restoration and Segmentation Systems.

CECSTR researchers have published over 200 articles. The Center has completed and developed resources to recruit and train students, developed new courses that will increase researcher and student knowledge base in DSP Solutions, Analog Mixed Signals and Broadband Communications. CECSTR has successfully contributed to novel solutions in selected aspects of communication systems research. CECSTR has awarded over 100 scholarships and assistantships to qualified students and the Center has performed outstanding projects for our sponsors (http://www.pvamu.edu/cecstr.) Over 30 graduate students have been supported by CECSTR research projects including several projects completed for our sponsors. Additionally, several peer-reviewed papers were published (see http://www.pvamu.edu/cecstr/projects). CECSTR has now positioned itself to serve as a national resource in communication systems technology research and education. The Center's facilities include State-of-the-art Research Laboratories such as DSP Solutions Research Lab, Mixed-Signal Systems Research Lab, Broadband (High-Speed) Research Lab, and Communication Systems Research Lab; Unix and Windows Servers; LABVIEW, OPNET, COMSOL FEMLAB MULTIPHYSICS facility, Cadence and MATLAB Simulation Facilities, Broadband (High-speed) Network Elements and Multi-service Traffic Generators; TI DSP Emulation and Simulation Boards; VLCT; Mixed Signal Evaluation Boards, etc.

Cooperative Agricultural Research Center, http://www.carc.pvamu.edu
College of Agriculture and Human Sciences

Prairie View A&M University is a land-grant institution dedicated to excellence in teaching, research and extension/service. Through the Cooperative Agricultural Research Center new knowledge is generated that is improving the economic viability and sustainability of agricultural producers throughout the state. Research being conducted in renewable energy, obesity and health has significant potential for impacting the economy. The Cooperative Extension Program with programs in 27 counties across the state conducts programs in the following areas: agricultural sustainability, 4-H and youth development, nutrition and health, family financial management, community economic development and others as identify by local needs.

The Cooperative Agricultural Research Center (CARC) is the organizational unit within the College of Agriculture and Human Sciences at Prairie View A&M University, originally established as an agricultural experimental substation in 1947, with assigned administrative and managerial responsibility research in the food and agricultural sciences. The Center serves to coordinate research activities in four major areas: Animal Systems, Food Systems, Plant and Environmental Systems and Socioeconomic and Family Systems.

One of the strengths of the Cooperative Agricultural Research Center is its commitment to animal systems research to increase animal production efficiency. The International Goat Research Center, which is a Center within the overall structure of the Agricultural Research Center, was established in 1983 to focus attention on goat research.

The Research Laboratories are equipped with state-of-the-art equipment, such as Electron microscopes, mass spectrometers, gas chromatographs, etc.

Future Aerospace, Science and Technology (FAST) Center

The Future Aerospace Science and Technology (FAST) Center was established with funds from the Air Force Office of Scientific Research (AFOSR). The three thrust areas of the Center are Research, Education and Technology Transfer. The purpose and objectives of the Center are: (1) to develop state-of-the-art research infrastructure and conduct research leading to new lightweight structural materials with improved tailored properties for aerospace, defense and other applications; (2)to use facilities at the Center to train undergraduate and graduate students on materials research and processing technology and prepare them to assume leadership roles in industry and research institutions; and (3) to foster close research/subcontract relations with aerospace, material processing, oil/gas companies and private/government research labs to advance the processing technology of polymeric composites and nanocomposites

The Center serves as a resource center for aerospace and other industries in the processing, characterization and testing of composites.

The Center has a strong research track record with past research funding from AFOSR, Raytheon, Wyle Labs and NASA. The current research funding is from NASA and AFRL. Capabilities of the Center include processing and fabrication of polymer matrix composites

(PMC) and nanocomposites using hand lay-up, vacuum bag molding, autoclave processing, compression molding, RTM and VARTM and development of lower cost methods for processing composites. The Center develops methods to improve shell life of prepregs and is engaged in the development of field repair techniques for composites.

The Center developed an optimum cure cycle and process for field repair of composites leading to a 20 % increase in shear strength over current methods. The Center has worked to develop a technique for out-of-autoclave processing with improved composite properties. It developed test methods for screening candidate cryogenic tank materials and test methods for ascertaining the strength of composite patched parts. It has experimentally developed a substantial database for fatigue, hydrothermal, thermal oxidative stability, and blistering properties of BMI composites. Additionally, the Center provided financial assistance and research experience to over 50 undergraduate minority engineering students. Seven graduate students have obtained M.S. degrees in engineering through thesis research done at the Center and several other graduate students have used the facilities at the Center for their thesis research.

Texas Gulf Coast Environmental Data (TEXGED) Center, http://texged.ips4.pvamu.edu

Prairie View A&M University's Texas Gulf Coast Environmental Data Center (TEXGED), initially funded by the National Aeronautics and Space Administration (NASA), founded in 1995, is an academic Center for Knowledge and Technology of Remote Sensing. This Center is the result of a partnership and collaboration with NASA, Prairie View A&M University and TRW Space & Technology. TEXGED is a Center for collecting data from space, through NASA, using Hyper Spectral Imaging Systems such as AVIRIS or other NASA sensors such as AVHRR and Hyperion. The Center has established a database spectral library of agricultural crops that can be used for best management of agricultural crops. The Center also provides researchers and decision makers with information they need in planning and assessing the environmental problems facing the southern region along the Gulf Coast of Mexico and the United States of America. TEXGED provides services to local and state agencies including environmental data analyses.

The TEXGED Center supported several undergraduate, graduate students and post-doctoral research associates in gaining education, research and working experience in the scientific areas of remote sensing, computational technology, Geographic Information System (GIS) and field nature work. The Center is proud to report that one of the undergraduate students supported by TEXGED has graduated and received a Ph.D. in physics and is a tenure-track faculty member in the Physics Department at Prairie View A&M University. The Center has collaborated with other universities in the U.S. and the international community. The Center is known in scientific communities for its accomplishments in ecology, environmental issues and remote sensing. The director of the Center has been invited to present lectures at UNESCO, IGARS and the Ecological Society of America and INTECOL. The TEXGED Center also participated with the United Nations Millennium Ecosystem Assessment (http://www.millenniumassessment.org).

As the result of the funding of the TEXGED Center by NASA and other funding agencies, the Center has published several papers in scientific journals related to remote sensing and measuring water stress in crops and bioremediation technology (over 15 papers). The Center

conducted several workshops related to remote sensing applications for students and faculties at Prairie View A&M University and neighboring high schools. It developed a spectral library of field crops to detect crops from remote sensing images and has collaborated with the Protected Areas Center at Ain Shams University in Cairo, Egypt to develop Graduate Curricula in Environmental Management and Ecological Studies (funded by Fulbright, State Department). The TEXGED Center developed a computer model to study the ecology and population dynamics of crayfish in the River Nile in Egypt. The director of TEXGED Center has published a book "Soil Zoology for Sustainable Development in The 21st Century.

The TEXGED Center has published 15 scientific journal publications in peer-reviewed journals and peer-reviewed conferences.

Texas Juvenile Crime Prevention Center, http://www.pvamu.edu/pages 307.asp
College of Juvenile Justice and Psychology

The research agenda of the Texas JCPC is expansive and encompasses projects that deal with the mentally disabled youth to the dangers of being young in a western society, to the understanding of ethnic problems, to treatment offender problems during the 2004-2005 year, a total of 58 publications were reported from the faculty and staff, while over 20 projects are on-going.

The Texas JCPC has a powerful team of faculty and research scientists who possess the skills to handle projects of varying magnitudes. Faculty members are highly experienced in collaborative work and highly respected in their fields.

The ARO/ARL Center for Battlefield Communications (CebCom) Research and Development, http://cebcom.pvamu.edu

The ARO/ARL Center for Battlefield Communications (CebCom) Research and Development was founded in 2003. This center addresses state-of-the-art research, creates innovative educational programs and supports technology transfers using commercially viable results to assist the Army Research Laboratory to develop the next generation Future Combat System.

The scope of the Center is to develop enabling technologies for the Digital Battlefield Communications for the next generation based on bandwidth and power efficient ad hoc wireless networking. The Center's objective is to develop a novel battlefield communications network architecture that supports multi-service applications (voice, data and video) based on IP transport and support autonomous management of each application with minimal overhead for architecture efficiency.

The Center specializes in the following research areas: Network Architecture Design; Multi-Service Application Quality of Service (QoS); Security Management; Transmit Power Efficiency and Control; Embedded Systems Design; and Modeling and Analysis and Network Management.

The faculty in the Center has a combined experience of over 75 years of research experience in industry and academia and has excellent records of technology transfers and patents to their

credit. They have executed large projects and produced commercially viable results. The combined technical experience spans all of the IT and telecommunications areas.

The Solar Observatory, http://www.old.pvamu.edu/cps/

With support from NASA/Marshall Space Flight Center, the dome of the Prairie View Solar Observatory, located on the southeast corner of the campus, was constructed in 1998 and saw "first light" of the sun in December of that year. A partial routine observation program began in late April 1999 and continues up to five days per week, weather permitting. This observatory, founded by Dr. Tian-Sen Huang and his colleagues, is the first ground-based solar research facility in the State of Texas, which filled the long-standing gap between two well-developed scientific areas—space science and astronomy—in the State.

The Prairie View Solar Observatory is involved in the Max Millennium Project for Flare Research, the international program that will provide both ground and space data coordinated with the HESSI mission. Observations made at the PVSO will complete the database of ground flare observations to support the HESSI project. Another subject of research is the study of the sudden disappearances of solar prominences/filaments. Such study will give a new insight into the conditions and causes that produce the destabilization of prominences, important information that will bring us closer to the prediction of these phenomena. The PVSO will also focus on the classification of sudden disappearances (dynamic and thermal) and on their correlation with the coronal mass ejections. Other research interests include the long-term evolution of active regions and clustering of solar activity in activity complexes or active longitudes.

One research interest is the study of solar flares. As part of the observational program, large active regions with a complex magnetic structure that have a high flaring probability are selected as targets and followed with a high resolution 35 cm vacuum telescope. Interest is focused mainly on the pre-flare stage and the energy build-up processes. One aspect considered is the morphology of the H-alpha observed structures in pre-flare conditions. Another interest is to search for chromospheric or photospheric structures as precursors of solar flares. These structures, which in fact outline the magnetic field configuration, are easier to monitor, leading to a more effective prediction of solar flares. An important aspect covered in the analysis is the role and evolution of active region filaments before and during solar flares.

Thermal Science Research Center (TSRC)

The mission of the TSRC is to conduct both basic and applied research, development and design in the broad engineering area of Thermal Science. This includes emphasis in: (1) mutual verification, (2) advancements in product, component or process development, (3) co relational development, and (4) data reduction. The Institute for High Heat Flux Removal in the TSRC is developing a new facility to investigate mechanism and quantitative factors controlling high heat flux removal in fusion reactor components. Aspects of the results will be applicable also to electronic component cooling and other high heat flux applications including long-range air transport and advanced materials processing. Current research includes areas such as conjugate heat transfer and nucleate boiling, sub-cooled flow boiling, local heat transfer and flow in fusion

high heat component development which involves collaborating with researchers from the United States, the European Community, Japan, Canada and the former Soviet Union.

The TSRC was developed to enhance Prairie View A&M University and to fulfill the University's charter as being a University of the "First Class" in academics, research, training and service endeavors. As a result, the TSRC has consistently had technical articles published in refereed high-impact journals. In addition, technical presentations have been given at local, national and international conferences, symposiums and workshops. Being the first research center established in the College of Engineering, the TSRC has been a model for other centers and programs which are evolving and are being conceptualized.

Community Urban Rural Enhancement Service (CURES) Center, College of Architecture

Through collaboration, the Community Urban Rural Enhancement Service Center works with public and private entities to bring workable solutions to challenging community problems. By engaging students through the *Community Urban Rural Enhancement Service Learning STUDIO*, the CURES Center brings unprecedented focus and coordination of national, state and local resources to underserved areas and populations. The CURES Center seeks to establish joint ventures and special projects to foster community improvement. It is the mission of the CURES Center to be an agent for positive enhancement in communities. CURES and its community partners pursue sustainable solutions for problems identified by the communities through a democratic process within the context of comprehensive community planning and the building environment.

Texas Institute for the Preservation of History and Culture, College of Architecture

The Texas Institute for the Preservation of History and Culture (TIPHC) serves as a conduit for the preservation of history in developing strategies to document such history. TIPHC cooperates with heritage organizations throughout the nation, the region and the state, along with all those who are interested in African-American history and culture. TIPHC is dedicated to fostering a sense of belonging by provoking reflection and dialogue on what culture diversity and multi-centralism means. Public exhibitions and publications will provide unique opportunities for students, families, the academic community and the general public to view and participate in a wide variety of activities; to serve a broad cross section of the public to deepen appreciation for the arts and humanities and to inspire understanding of people and history.

TIPHC also strives to encourage and coordinate the collection and preservation of a wide variety of material, to promote historical research and investigation, to develop educational programs along with outreach and training activities, to develop and display exhibits and to provide automated systems for data retrieval. The goals of TIPHC are in accordance with the statewide plan for preservation set forth by the Texas Historical Commission.

PVAMU Athletics Department

The PVAMU Athletics Department has partnered with community organizations at various intervals throughout the year. Through these partnerships, the Department aims to promote the University and its athletic programs. The Athletic Department also conducts various community promotions in an effort to increase attendance and community involvement at athletic events.

Corporate sponsors and alumni contributed approximately $315,000 to the Athletic Department over the 2005-2006 academic year.

Over 150,000 individuals attend PVAMU athletic events throughout the course of the year. Some events are located in Houston and Dallas. For home athletic events, visiting teams for 18 sports require overnight travel.

Center for International Business Education, College of Business

The Center for International Business Education was established in spring 2005 with a grant from the Business and International Education (BIE) Program of the U.S. Department of Education. The Center is the College's first significant step towards advancing international business education and strengthening the University's community outreach in international business. The overarching goal of the Center is to work with local agencies (such as the City of Waller Economic Development Corporation, Grimes County Chamber of Commerce, Port of Houston Authority, etc.) to assist the College in training its graduates as active participants in the global economy of the 21st century, where expertise in the functional areas of business must be matched with proper understanding of the global economic system. Among the Center's many activities, two significant activities are highlighted below:

The Center sponsors a study abroad program at the Universidad de las Américas-Puebla (UDLA), which is among the most prestigious universities in Mexico. The study abroad program provides PVAMU students with an experiential learning opportunity that enriches their knowledge base, language and critical thinking skills in international business. To date, seven undergraduate business students have attended the program. The Center also sponsors a summer field trip program to Puebla to allow PVAMU students, faculty members and business leaders to visit academic institutions and business industries in Mexico.

The Center organizes outreach workshops and seminars throughout the year for the local business community and high school educators. These workshops/seminars typically feature a series of lectures on global business topics, with a primary focus on U.S.-Mexico business opportunities. The speakers include PVAMU faculty members and guests from the U.S. Department of Commerce, the local business community and other universities. The Center also publishes an electronic quarterly newsletter, *Prairie View International Business Digest*, featuring information about international business prospects and opportunities.

Prairie View A&M University Small Business Development Center, College of Business

The Prairie View A&M University Small Business Development Center (SBDC) has served more than 90 clients, 96 companies and given out information to more than 145 individuals since opening its doors on October 1, 2004.

During its first year, from October 1, 2004 to September 30, 2005, the Center hosted 33 workshops with more 283 in attendance. During the second year, eight conferences were hosted with 114 in attendance. While the number of seminars declined, the number of hours spent counseling clients and the number of investments in the community increased. In its first year, the SBDC recorded $2,179,000 in loans or personal investments with the addition of retention of at least 45 jobs. By November 30, 2006 another $3,572,688.51 was added to the economy, with an additional 145 jobs added or retained.

In 2006, a second county was added to the Center's area of operations. The two counties (Waller and Grimes) have a combined population of more than 59,000 people and cover more than 1,300 square miles. The Center interacts with the community, and Center staff serves on several Chambers of Commerce boards and work on several infrastructure committees. The Center's staff has obtained certificates in SBIR/STTR Small Business Administration service areas as well as Lean Manufacturing certification and T-Counseling certification. The Center works with a number of banks and lenders and is working with private investors. Clients range from restaurants to convenience stores to organic farms and manufacturing plants (including buildings, concrete transportation and bio-diesel).

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