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## 2001 Kansas Oil & Gas Production and Value

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### Summary

During the last four years wellhead prices for oil and gas have fluctuated widely. The price of oil reached a low of \$8.10 per barrel in December 1998. A high of \$30.70 per barrel was recorded in November 2000. Gas prices spiked to \$8.06 per thousand cubic feet (mcf) in January of 2001. However, gas prices were below \$2.00 per mcf during much of 1999, recording a low of \$1.68 per mcf in March of 1999. Fluctuations in oil and gas prices have resulted in year-to-year changes of one billion dollars. These rapid changes in the value of oil and gas at the wellhead have a significant impact on the Kansas economy, tax revenues and employment.

Using average monthly wellhead prices for oil and gas in Kansas, the value of the oil and gas produced in the state in 2001 was approximately \$2.742 billion. Annual wellhead value in 2001 is up almost a billion dollars from 1998 and 1999, and is a slight increase of over \$70 million dollars from 2000 (2.5%). The increase in total annual wellhead value from 2000 to 2001 is a result of increased prices for natural gas offsetting the decrease in oil prices (Table 1). In 2001, the value of natural gas production (\$1.988 billion) is more than 2.5 times the value of oil production (\$0.742 billion). The significance of Kansas' oil and gas production relative to other parts of the Kansas economy is illustrated by a comparison to agriculture. Over the past 40 years, the value of Kansas oil and gas production is comparable to the value of total statewide crop production as measured by the cash receipts for all the crops produced in the state (Figure 1). In 2000, the wellhead value of Kansas oil and gas production exceeded the value of Kansas crop production. The 2001 Kansas cash receipts for all crops are currently not available, but is probably less than 2000, and less than the wellhead value of oil and gas production.

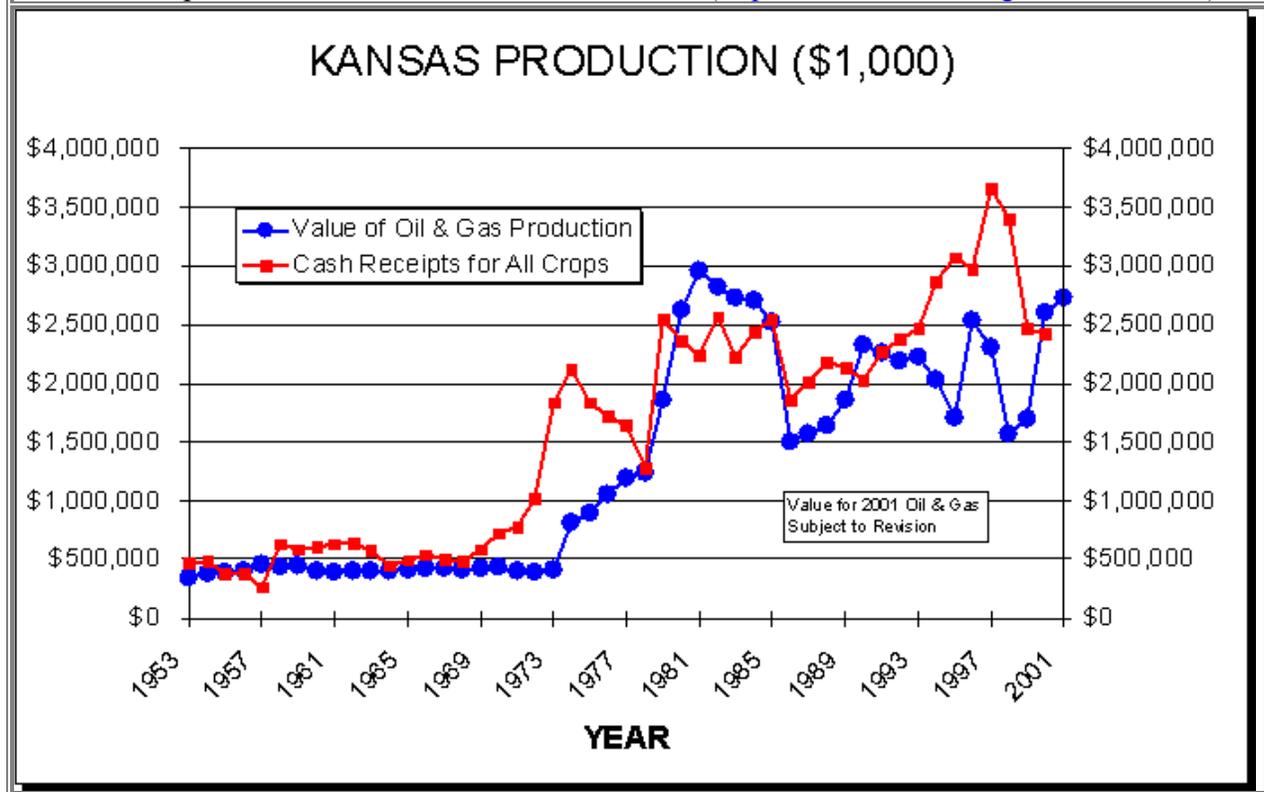
Oil and Gas production is a major component of Kansas tax revenues through severance, ad valorem and other taxes. During fiscal year 2001, severance taxes totaled over \$100 million. Severance tax revenues are estimated to have decreased in fiscal year 2002 to just over \$50 million. Statewide 2001 property taxes on oil and gas mineral leasehold totaled over \$115 million up from \$83 million during the previous year. It is expected that assessed value and tax revenues from mineral leasehold will be down in 2002.

Oil and gas remain an important mainstay of the Kansas economy and government revenue. It is probably not an overstatement that changes in oil and gas production volumes and value continue to have a significant impact on health of the Kansas economy.

**Table 1** - Summary of annual Kansas oil and gas production, and value at wellhead for calendar years 1998, 1999, 2000 and 2001<sup>1</sup>.

Year	Oil Production Barrels X 1,000	Average Price \$/bbl	Total Oil Value \$1,000,000	Gas Production mcf X 1,000	Average Price \$/mcf	Total Gas Value \$1,000,000	Total Oil & Gas Value \$1,000,000
1998	36,413	\$11.54	\$420	608,639	\$1.95	\$1,187	\$1,607
1999	33,993	\$16.10	\$547	567,245	\$2.07	\$1,177	\$1,724
2000	35,133	\$26.81	\$942	532,327	\$3.25	\$1,730	\$2,672
2001	34,104	\$22.11	\$754	480,944	\$4.13	\$1,988	\$2,742

**Figure 1** - Value over the past 50 years of Kansas' oil and gas production relative to the value of statewide crop production as measured by the cash receipts for all crops produced in the state. Value for crops 1953 – 2001 from Kansas Farm Facts (<http://www.nass.usda.gov/ks/ffsel.htm>).



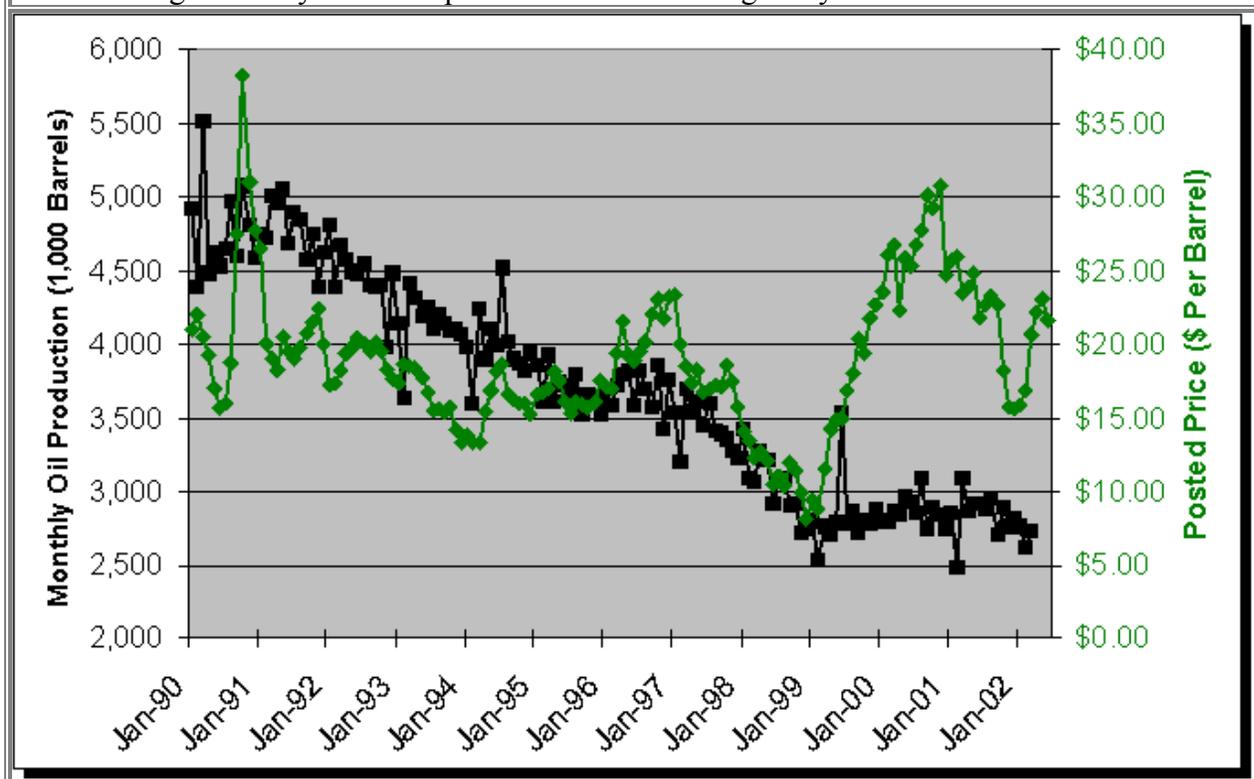
<sup>1</sup> Notes to Table: 1) Gas price is weighted monthly average of wellhead price per thousand cubic feet (mcf) from the Energy Information Agency ([http://www.eia.doe.gov/oil\\_gas/natural\\_gas/info\\_glance/prices.html](http://www.eia.doe.gov/oil_gas/natural_gas/info_glance/prices.html)). Oil price is the weighted monthly average purchase price per barrel (bbl) for the best quality merchantable crude oil purchased and delivered into authorized pipelines or facilities as reported by Koch Industries, Wichita (<http://www.kochoil.com/>). 2) Oil production in 2001 may be subject to minor upward revision.

## Oil Production

Oil production in Kansas is from online databases at the Kansas Geological Survey (<http://www.kgs.ukans.edu/PRS/petroDB.html>). The production data are sales volumes reported to the Kansas Department of Revenue. Monthly production from 1990 through 2001 shows the significant influence of wellhead price on oil production (Figure 2). The decrease in nominal prices from 1990 through 1999 is reflected by decreases in monthly production of more than 2,000,000 barrels per month. The increase in price from January 1999 until present appears to have arrested the production decline and resulted in small increases. Even the short duration decrease in price during late 2001 and early 2002 appears to have affected monthly production.

Kansas oil production is dominated by low volume economically marginal wells that are extremely sensitive to wellhead prices. Over 98% of the oil wells in Kansas average less than 15 BOPD, and approximately 36,885 wells (96% of the number of wells) producing 74.8% of the state's oil would be classified as stripper production<sup>2</sup>.

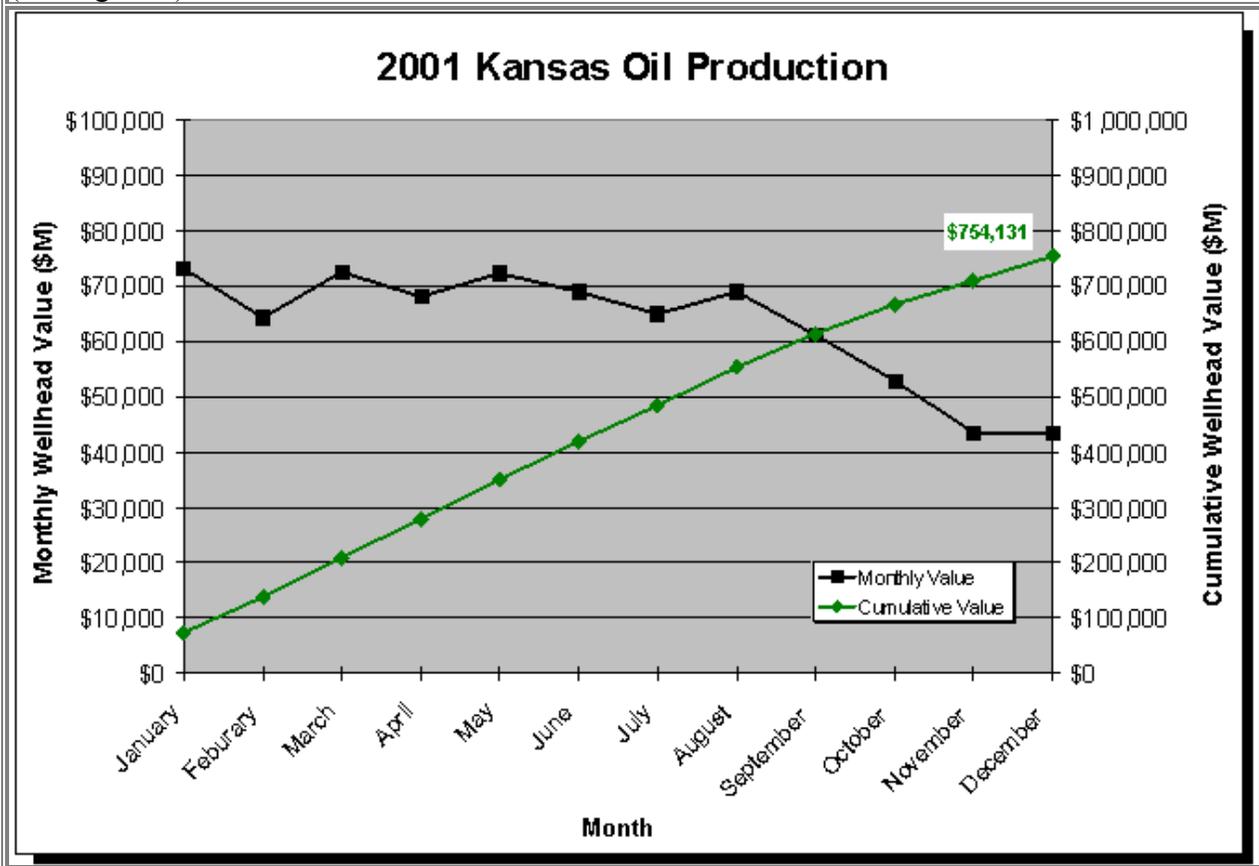
**Figure 2 -** Kansas monthly oil production, and average monthly wellhead price for 1990 through 2001. Average monthly wellhead prices are current through July 2002.



<sup>2</sup> Stripper wells are economically marginal oil and gas wells that produce at relatively low rates. The definition of stripper wells varies. For oil, stripper production is usually defined as less than some value of between 5 and 15 barrels of oil per day (BOPD). In Kansas 80% of the wells make less than 5 BOPD and 96% make less than 15 BOPD. Wells making less than 15 BOPD produce almost 75% of the oil. Data and analysis from Kansas Geological Survey Open-File Report 2000-16 (<http://www.kgs.ukans.edu/PRS/publication/2000/ofr2000-16/index.html>)

In 2001, the wellhead value of oil production was estimated at just over \$754 million (Figure 3). Monthly value decreased significantly in the last four months as oil prices decreased from \$23.00 per barrel to less than \$16.00 per barrel. The effect was to decrease wellhead value by approximately \$100 million. The rebound wellhead price in 2002 to above \$20 per barrel should result in an increase in monthly value to 60-70 million. If prices remain firm production volumes are expected to increase. The value for oil at the wellhead is a decrease of almost \$200 million from the 2000 wellhead value (Table 1).

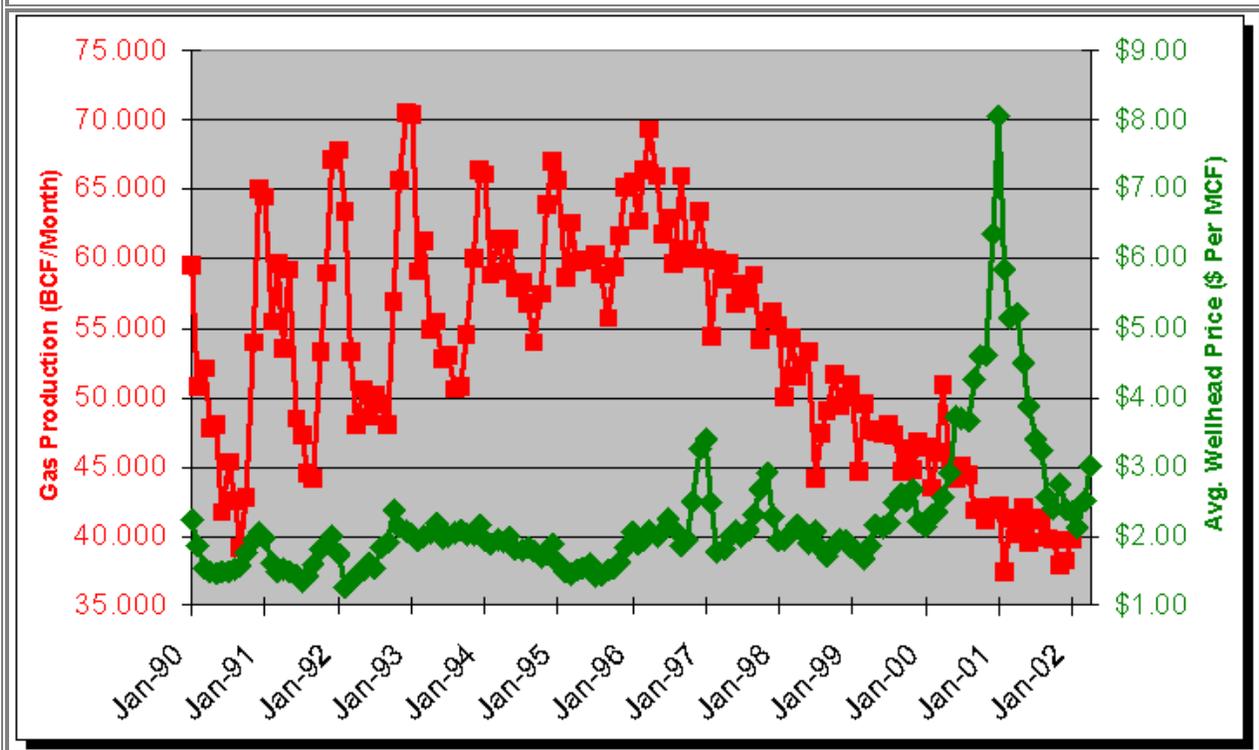
**Figure 3 - Kansas monthly and cumulative value of oil production for 2001.** The estimated wellhead value of oil production is \$754 million. The decrease in monthly value in the last four months is a result of a significant decrease in posted price per barrel of oil of more than \$5.00 (see Figure 2).



## 2001 Gas Production

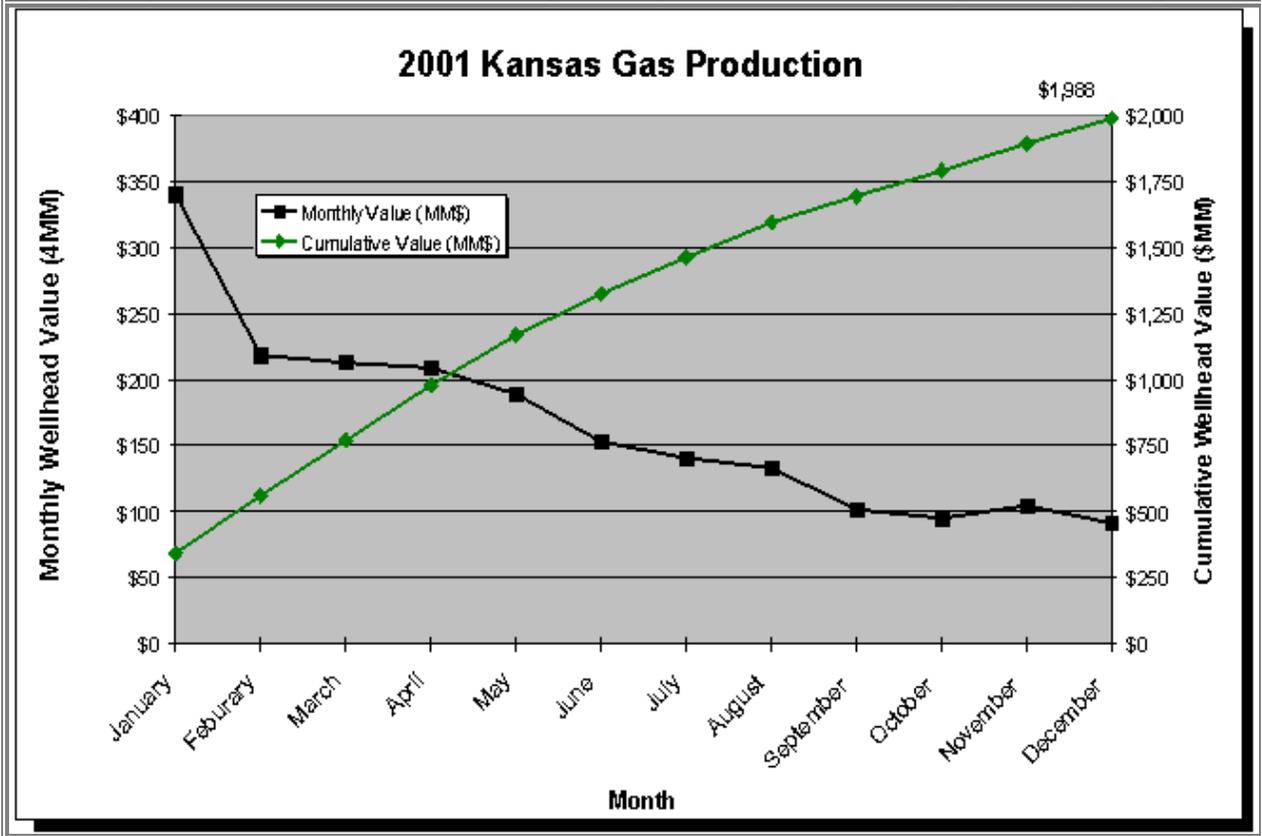
Gas production in Kansas is from online databases at the Kansas Geological Survey (<http://www.kgs.ukans.edu/PRS/petroDB.html>). The production data are sales volumes reported to the Kansas Department of Revenue. Monthly production displayed a seasonal fluctuations through the first five years of the nineties (Figure 4). As gas became subject to commodities markets and gas storage became available, seasonal fluctuations were dampened. Gas production volumes continued to rise until 1996. After 1996 there has been a steadily decline in gas production. Production decline appears to have slowed in 2001. Four gas areas, especially the Permian age Hugoton and Panoma, comprise the majority of Kansas gas production (78% of the gas in Kansas - see <http://www.kgs.ukans.edu/PRS/Info/topTen.html>). During the late 1980's the Hugoton was the target of infill drilling and both the fields were placed on compression (i.e., vacuum) during the early 1990's. The result was to increase and accelerate production from the Hugoton and Panoma fields. In the late 1990's, the new developments were complete, and the production from the fields began to decline. The unprecedented spike in prices during the winter of 2001-2002 resulted in new gas exploration and development throughout Kansas (e.g., coal bed methane in eastern Kansas, redevelopment in Greenwood Gas Area of Morton County).

**Figure 4 -** Kansas monthly gas production, and average monthly wellhead price for 1990 through 2001.



In 2001, the wellhead value of oil production was estimated at just over \$1,988 million (Figure 5). Monthly value decreased steadily as average wellhead gas price declined from the peak in January. In January monthly wellhead value was almost \$350 million in the last four months of the year monthly wellhead value averaged \$100 million. In 2001 the value for gas at the wellhead is increased more than \$250 million from the 2000 wellhead value (Table 1).

**Figure 5 - Kansas monthly and cumulative value of gas production for 2001.** The estimated wellhead value of gas production is \$1,988 million. The decrease in monthly value in the last during the year is a result of a decrease in price of gas of more than \$5.00 per mcf (see Figure 4).



## **Estimated Economic Impact--Oil and Gas Production**

The US Department of Commerce's Bureau of Economic Analysis (BEA) prepares regional input-output multipliers that estimate the total economic impact of the addition or removal of industries or projects to a given region. This study continues on an approach used in Kansas Geological Survey Open-File Report 98-56 ([http://www.kgs.ukans.edu/PRS/publication/OFR98\\_56/index.html](http://www.kgs.ukans.edu/PRS/publication/OFR98_56/index.html)), and uses these multipliers to investigate the economic impact of the estimated 1998 to 2001 increase in oil and gas production on Kansas. These estimates are extrapolated to evaluate the economic impact of the change in value of oil and gas production to both the overall economy and the oil and gas industry specifically.

The BEA multipliers account for the interdependence of economic activity throughout a given region, where a region comprises one or more counties. Multipliers are provided for output, earnings and employment, considering final demand and direct effect. These multipliers, plus assumptions of projects or programs introduced into a region, can be used to calculate variables such as the increase in the output value. Multipliers are also instrumental in calculating earnings income such as wages, salaries or proprietor's income less any contributions to private pension funds, and employment levels.

Final demand multipliers for Kansas used in this report are reported in "Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II): US Department of Commerce's Bureau of Economic Analysis, 1992", and the " The Economic Impact of Stripper Wells in the United States: Interstate Oil and Gas Compact Commission, 1998".

The increase in revenue from 1998 to 2001 for oil production in Kansas is estimated at \$334 million (Tables 1 and 2a). Using final demand multipliers, the increased output to the Kansas economy is estimated at \$500 million with estimated increased earnings of \$64.3 million (Table 2a). Statewide increased employment is estimated at 4,742 (Table 2a). The positive impact would appear to offset the decrease in employment reported for the 1997-1998 period (Kansas Geological Survey Open-File Report 98-56). Direct effect multipliers can be used to estimate the impact of increased in revenue from oil production on the Kansas oil and gas industry (Table 2b). The industry is estimated to have had an increase of \$33 million in earnings and a potential increase of 3,041 employees. Again this offset the decreases experienced in the 1997-1998 period.

**Table 2a** - Estimated economic effects of oil prices and estimated decreased oil production on the Kansas economy.

<b>Change in Value at Wellhead (Million\$)</b>	<b>Final Demand Multiplier Output</b>	<b>Final Demand Multiplier Earnings</b>	<b>Final Demand Multiplier Employment</b>	<b>Change in Output (Million\$)</b>	<b>Change in Earnings (Million\$)</b>	<b>Change in Employment</b>
\$334	1.4982	0.1925	14.2	\$500	\$64.3	4,742

**Figure 2b** - Estimated economic effects of oil prices and estimated decreased oil production on the Kansas oil and gas industry.

<b>Direct Effect Multiplier Earnings</b>	<b>Direct Effect Multiplier Employment</b>	<b>Change in Earnings (Million \$)</b>	<b>Change in Employment</b>
0.0984	9.1014	\$32.87	3,040

The increase of value of gas production of more than \$800 million would have had a significant impact on the Kansas economy (Tables 1 and 3a). Using final demand multipliers, the increased output to the Kansas economy is estimated at \$1,200 million with estimated increased earnings of \$154 million (Table 3a). Statewide increased employment is estimated at 11,374 (Table 3a). Direct effect multipliers can be used to estimate the impact of increase in revenue from 1998 gas production on the Kansas oil and gas industry (Table 3b). The industry is estimated to have had an increase of \$79 million in earnings and a potential increase of 7,292 employees. These are estimates that are subject to debate and flaws in analysis, but it appears that the industry has recovered from the long-term depression that reached a maximum in 1998. An industry that employs more than 7,000 Kansas citizens and contributes more than \$2.5 billion to the economy is on the rebound. However, continued prosperity is dependent on energy prices.

**Table 3a** - Estimated economic effects of oil prices and estimated decreased gas production on the Kansas economy.

<b>Change in Value at Wellhead (Million\$)</b>	<b>Final Demand Multiplier Output</b>	<b>Final Demand Multiplier Earnings</b>	<b>Final Demand Multiplier Employment</b>	<b>Change in Output (Million\$)</b>	<b>Change in Earnings (Million\$)</b>	<b>Change in Employment</b>
801	1.4982	0.1925	14.2	\$1,200	\$154	11,374

**Figure 3b** - Estimated economic effects of gas prices and estimated decreased gas production on the Kansas oil and gas industry.

<b>Direct Effect Multiplier Earnings</b>	<b>Direct Effect Multiplier Employment</b>	<b>Change in Earnings (Million \$)</b>	<b>Change in Employment</b>
0.0984	9.1014	\$78.82	7,292

## Impact on Tax Revenue

Oil and gas production comprises a very significant part of state and local tax revenues. It is difficult to estimate tax revenue from personnel and corporate income taxes, sales tax on equipment and materials, property taxes on pipelines and other equipment, and income taxes and royalty income. Based on wellhead value, royalty income can be estimated to be more than \$300 million. It is possible to provide figures on mineral severance tax and mineral leasehold property tax revenues (Table 4 and Figure 6. In calendar 2001, these two documented components provided over \$200 million to state and local tax revenues. Again this grossly understates the contribution to Kansas government revenues. However, it is evident that state and local tax revenues on oil and gas operations can fluctuate by more than 30% on an annual basis. Based on comparison of severance tax revenue from fiscal years 2001 and 2002, it is estimated that while historical healthy tax revenues from oil and gas operations have decreased significantly (Figure 6).

**Table 4** – Assessed value of mineral leasehold and ad valorem tax revenues from Kansas Department of Revenue, Division of Property Valuation (<http://www.ksrevenue.org/pvd/pvdcountystateinfo.html>). Severance tax revenue from Kansas Department of Administration, Division of Accounts and Reports restated in calendar years (<http://da.state.ks.us/ar/finrept/mfp.htm>).

Year	Severance Tax \$Thousand	Mineral Leasehold Assessed Value (at 25-30%) \$Thousand	Mineral Leasehold Property Tax \$Thousand	Annual Change in Tax Revenues Property & Severance
1998	\$51,686	\$1,454,822	\$103,552	
1999	\$43,985	\$986,269	\$76,320	-22.5%
2000	\$70,433	\$936,816	\$83,015	+27.5%
2001	\$90,377	\$1,361,579	\$115,393	+34.1%

**Figure 6 - Cumulative severance tax revenue for fiscal years FY2001 and FY2002.** Severance tax revenue for FY2002 is available through April. Estimated total revenue for FY2002 is \$52.5 million. The year-to-year decrease in revenue of approximately \$50 million is a result of decrease from the abnormal spike in gas prices during the winter of 2000-2001 (See Figure 4).

