Adjustments to Resource Depletion: The Case of American Agriculture -- Kansas 1874-1936

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THE CASE OF AMERICAN AGRICULTURE -- KANSAS, 1874-1936

(ICPSR 7594)

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STUDY DESCRIPTION

This study contains two data files on a selected set of agricultural variables for 105 Kansas counties over the period 1874-1936. The first file contains 44 variables, each of which is an exact representation of data found in various quarterly, annual and biennial reports of the Kansas State Board of Agriculture. Variables in the first file include information on acreage sown; number of bushels and value of different field crops harvested; and number and value of livestock. The second file consists of 45 variables, including manipulations of the series in the first file. For example, the second file contains variables on the value per bushel of various field crops, adjusted total cultivated acres, adjusted field crop income, and prices per animal.

The information in this dataset was initially prepared by Stephen J. DeCanio and Joseph Trojanowski, Yale University. Preparation of their data file was financed by the National Science Foundation (Grant #SOC 75-08056). At the request of the principal investigators, any publications drawing upon this file should acknowledge the preparers, DeCanio and Trojanowski, and note that the data were prepared as part of an NSF-funded research project.

DATA FORMAT

The data are organized in matrix form. Each of the rows of the matrix is a single logical record and consists of 63 observations (one per year) for one county for one variable. Within each matrix, the counties are in alphabetical order. Each variable is fourteen characters wide. Both data files contain some blanks.

PROCESSING INFORMATION

These data and documentation are distributed in the form received by the ICPSR from the principal investigator. The ICPSR can take no responsibility for the technical condition or for the accuracy of the codebook.

KANATICS - A <u>Ka</u>nsas <u>Ag</u>ricultural <u>T</u>ime Series/<u>C</u>ross <u>S</u>ection (Version 2)[*]

I. INTRODUCTION

This tape makes available two data files, both of which comprise obser-
vations on a selected set of agricultural variables for 105 Kansas counties
over the period 1874-1936. The first file contains 67 series, each of which
is an exact representation of data found in various Quarterly, Annual and Bi-
ennial <u>Reports</u> of the Kansas State Board of Agriculture. The second file con-
sists of 49 series including some manipulations and consolidations of the data
in the first file.

Version 2 of KANATICS extends and corrects the version documented in

Yale Department of Economics Working Paper #41 dated November 1977.

II. FORMAT, SOURCES, DEFINITIONS AND VERIFICATION

Characteristics of the Tape

The tape as it is available at Yale is a 9-track, labelled tape of 1600 bpi density, created on the IBM 370 of the Yale Computer Center. The first file, containing the exact representation of the data in the Kansas Reports, is named KANSAS.ORIG.SJDJMT. The second file, containing the consolidated and manipulated series, is named KANSAS.TRAN.SJDJMT. These two files are referred to hereafter simply as File 1 and File 2 when the context makes clear which file is being discussed.

Description of the Data

Tables 1 and 2 contain information on four aspects of the two files: first, a listing of the series in each file; second, the order in which these series appear; third, the time interval over which observations for each series are available; and fourth, the Fortran format in which each observation in each series has been placed. To facilitate the use of both files, a value of negative one (-1.00 in the correct format) was ordinarily specified whenever an observation in a series was either not collected or not recorded. The only exceptions to this rule occur in File 2. In that file, alternative methods were used to fill in certain gaps in the data. These instances are enumerated in Table 3 and will be described more fully below.

Organization of the Files

A file may be thought of as comprising a string of 105 x 63 matrices, each of which consists solely of observations on one variable for 105 counties for 63 years. Each of the rows of a matrix is a single logical record

and consists of 63 observations (one for each year in the 1874-1936 interval) for one county for one variable. Within each matrix the counties are arranged in alphabetical order (see Table 4). A column of any matrix consists of observations on one variable for all counties for one year. Although the number of places to the right of the decimal point varies by series, Tables 1 and 2 indicate that each observation is always contained in a fixed field of 14 characters. Thus, since each row of a matrix is a logical record the logical record length is 882 (14 x 63). The blocksize is fixed at 8820.

Data Sources

The sources used to construct the two data files described above were the following:

1874-1876: Third - Fifth Annual Report of the Kansas State Board of Agriculture (Topeka).

1877-1936: First - Thirtieth Biennial Report of the Kansas State Board of Agriculture, for all observations except the Value of Prairie Hay (series 19, file 1) for 1914, which due to a change in reporting practices was not included in any Biennial Report. These observations for 1914 were obtained from the Report of the Kansas State Board of Agriculture for the Quarter Ending December 1915 (Topeka).

In addition to information taken from these sources, livestock prices and weather data from various other sources were utilized to fill in the gaps occurring in the series noted in Table 3. The supplementary weather data do not, however, appear in either file. (See Section III below.)

The Annual and Biennial Reports of the Kansas State Board of Agri-

culture were organized in a manner such that most observations found in the first file were reported twice in each volume: first, in a section usually termed "County Tables," in which two or more tables and/or paragraphs were devoted exclusively to each county, and second, in a summary table which presented observations for one or two years on all counties for at least one series, and often up to six series per table. The summary tables formed the basic listing from which the data were keypunched. The instances in which "County Tables" were utilized as the data source because of the absence of summary tables are enumerated in Table 5.

Kansas State Board of Agriculture's Statistical Machinery

When the Kansas State Board of Agriculture was created in March of 1972 it was given no governmental authority. Its sole duty was to prepare an annual report which among other things was to include a general review of the conditions of the state's agricultural sector. The fact that the Kansas Legislature chose not to specify the nature of the annual agricultural review provided the Board with considerable discretionary power. From the beginning the State Board of Agriculture undertook to compile a highly accurate record of Kansas crop and livestock production. In the view of the Board there were three reasons for producing such a record: first, to provide the people of Kansas with reliable statistical information; second, to promote immigration to Kansas; and third, to provide an accurate historical record for future generations. In reference to the first and third goals, the Board of Agriculture stated in 1874 that:

> This system of taking the acreage for the current year is very important. From the acreage or data thus taken the statistician is enabled to correct from year to year, as the surveyor is enabled to make corrections from each principal meridian. It gives an initial or starting point which it is essential to establish, especially in the great Northwest, where progress in material development is so rapid. The decennial census establishes very uncertain data, or rather leads to unreliable results. The initial or correcting points are too far apart. All interim estimates must necessarily be the result of superficial investigation;

and too, in case of an extraordinary yield at a given decennial period, the productions of the country will be overstated. If crops are cut off by withering drouth, devastation of locusts, or other causes, as is sometimes the case, the productions will be underestimated. In either case another decennial period will have to elapse before the correction can be made, thus making in all, twenty years in which the bewildered statistician is groping in the labyrinth of uncertainties; and in the possible event of a partial failure of crops at one decennial period and the consequential stagnation of other industries, and an over production at the next, with its opposite results, the deception is still more disastrous. Annual corrections from absolute data, one year with another, will correct all this. [1]

As regards immigration, in 1872 the Board stated in its First Annual Report that: "During the past year there has been an increasing interest in and demand for information concerning agriculture, horticulture, stock growing, manufactures, etc., by those seeking houses and investments in the west. They want facts, not approximate statements."[2]

In its first year of operation the State Board of Agriculture did not receive an appropriation from the Legislature to organize its own machinery to gather agricultural statistics. As a result, it was forced to make use of a system for gathering agricultural statistics which was created in 1868 and amended in 1869. This law provided that:

> Each township trustee, as the township assessor of his township, at the time for taking lists of property for taxation in each year shall require each person in his township to make a statement specifying the number of acres he may have had in wheat, rye, barley, corn, buckwheat, oats, potatoes, sorghum, flax, hemp, cotton, castor beans and tobacco; also the quantity of wheat, flax, wool, hemp, cotton, tobacco, and grape wine by him produced in the preceeding year; also the number of mules, horses, cattle, sheep, and hogs over six months old. Such assessor shall make a return of such statement to the county clerk of his county at the time of returning the list of property for taxation. (emphasis added)[3]

The county clerks were required to furnish the assessors with the forms required for the collection of the above information. There was no central agency which distributed the forms and as a result it may have been the case that the forms varied by county as regards the reference point for the number of stock and endpoints defining "the preceeding year."[4] The county clerk was

directed to complete and forward to the Auditor of the State, within sixty days of the receipt of the assessors completed forms, a tabular statement of all the returns received. The Auditor was then to include in his report to the legislature all returns made to him. There was no penalty for noncompliance by county assessors or clerks.

The Board of Agriculture decided to utilize this system as a source of statistical material for its report for 1872, its first report. The Board requested that the Auditor of the State forward to it any information returned to his office by the county clerks. The response to this request provides some indication of the quality of the statistical material produced by this system. Tax lists were gathered beginning March 1, but by November 1872 only six of sixty-six counties had made any returns and most of those were imperfect. Subsequent to that date eight additional counties submitted reports. Commenting on this poor response the Board stated that: "This report is sent out to the world as the "Products of the State of Kansas for the year 1872," a most mischievous libel on the productive resources and energies of the state."[5] Because of this unsatisfactory response the Board apparently decided to delay the publication of its 1872 report until a more satisfactory set of statistics could be obtained. To that end the Board sent out a standardized set of forms to every county clerk in the state, with a request that they be filled from the assessors' returns. It characterized its efforts thus: "Blanks had been issued by the respective county clerks without concert of action, which resulted in a want of uniformity, which alone would have destroyed the value of the information sought to be obtained. On the part of the assessors there seemed, in a great majority of cases, a want of appreciation of the importance of the information sought. Some made no returns at all, others partial. After a great deal of work and voluminous correspondence, ...tables were compiled from the returns of thirty-six counties."[6]

The Board concluded from its experience that "first, the services of in-
telligent and reliable men, as a rule cannot be had without compensation; second,
township trustees are selected for the performance of other duties, very unlike
those required for gathering and arranging statistics. It has been proverbially
the case in Kansas that either through a want of appreciation of the value and
importance to the State of the information sought, refusal, neglect or incompet-
ency, the returns are of little value without bestowing on them about as much
labor, in correspondence and otherwise, as it would have taken to make complete
and accurate returns in the first instance."[7] To remedy the situation legisla-
tion was sought to organize a network of county statisticians to be "selected for
their peculiar fitness to perform the important duty assigned them [and] whose
tenure of office and compensation are wholly dependent upon faithfulness and
efficiency...."[8] The legislature objected to this proposal on the basis of cost
and it was amended so as to make the assessors the statisticians, a move which
in essence amounted to a retention of the basic data gathering mechanism out-
lined above. The system was modified, however. The range of statistics to be
gathered was broadened and assessors would be paid only if the county clerk cer-
tified that they complied with the provisions of the new law. The most important
aspect of the law, passed on March 6, 1873, was that it made the State Board of
Agriculture responsible for the provision of the required forms and for the pub-
lication of the information obtained. To cite the act: "It shall be the duty
of the State Board of Agriculture to publish, as a part of their annual trans-
actions, a detailed statement, by counties, of the various industries of the
State, and other statistics, which shall be collected from the return of the
county clerks, and from such other reliable sources as the said board may deem
best."[9]

Since the township assessors, by law, were to begin taking tax lists on
March 1, the passage of the new law six days after that date meant that the re-

quired forms had to be hurridly designed, printed and distributed if information was to be available for the 1873 report. In 1874 it was concluded that : "This celerity of action afforded no opportunity to consult with assessors and acquaint them with the work. The year 1873 was the first in which an attempt was made to collect anything like full statistics in this State. The result was, as might have been expected, incomplete returns."[10] The Report for the year 1873 contained figures collected in the spring of 1873 and detailed the acreage, amount and average yield per acre for 1872, except winter wheat for which the acreage then on the ground but sown in 1872 was taken. The average winter wheat yield was estimated from county reports and other reliable sources, and market prices of all crops were obtained from the averages paid by milling companies and other wholesale dealers.

Despite the great improvement in the statistical presentation the Board was still dissatisfied: "It was very soon ascertained that statistics relating to the previous year--one year old before being gathered, and from one and a half to two years before publication--were out of date and only valuable for reference and comparison."[11] To rectify this problem the Board directed assessors to gather the acreage currently sown to the various crops rather than the acreage sown in the previous year. The average yield was obtained through county correspondents and when practicable, from those running threshing machines. The value of the crops was obtained from milling companies, wholesale dealers and other reliable sources. The procedure for collecting up-to-date information was first used by the Board in the preparation of its 1874 Report. The switch over to the new system has left a gap in the historical record as information on the crops sown and harvested during the 1873 crop year was, to the best of our knowledge, never published. This is why the KANATICS data sets have as their starting point 1874 rather than 1872. The new system for gathering agricultural information was approved by the Legislature with the passage of a bill which amended the 1873 act

and directed that a census of agriculture be taken each year: "The assessors are hereby required respectively to cause all the inhabitants to be enumerated... and to collect all other statistical information within their respective townships relating to agriculture, horticulture, manufactures, etc., in the manner provided for in this act, and specified in the instructions which shall be given by the State Board of Agriculture, and to return [it] to the same State Board of Agriculture on or before the first day of September next ensuing."[12]

The agricultural statistics to be collected were as follows:

> ... name of person managing farm; size of farm; quantity of land under cultivation; quantity of land under fence; quantity of land not under fence; acreage of the principal crops; number of rods of the different kinds of fence, and the cost of each; value of the farm; value of farming implements; number of the different kinds of livestock; number and value of slaughtered animals. [13]

The information requested by the Board was to be gathered by the assessors by means of a personal visit to each dwelling house and each family in his township or city and direct questioning of some member of the family or some reliable agent of the family. All information was to be taken with reference to March 1.

In addition to township assessors, the State Board of Agriculture also employed the services of a network of correspondents who assisted in the provision of information required to prepare the monthly and quarterly reports it produced. When the frequency of the Board's primary report changed from annual to biennial in 1877, crop information on off-years became available in the Board's December Quarterly Reports. [14]

This system of reporting remained substantially unchanged until 1924 at which time the statistical work was considerably enlarged by means of a plan whereby the Kansas Board and the Division of Crop and Livestock Estimates of the United States Department of Agriculture began to cooperate in the gathering and analysis of statistical information. This program substituted federal for

state employees and resulted in the collection of information more detailed than was possible with the limited resources available to the Kansas Board.[15]

Reporting Years of Data Presented

It was the goal of the Kansas State Board of Agriculture to review a given crop year as soon after its conclusion as was practicable. The crop years for most of the agricultural products of primary concern to the Board ran from early spring to late summer or early fall. Winter wheat was the exception as it was sown in the fall and harvested before the other crops. As a result, the annual report reviewing a year in agriculture would contain the acreage sown in winter wheat during the previous fall and would appear late in the year, usually in December, approximately three months before the assessors were required to begin collecting statistics for the next report. Consequently, the year(s) mentioned in the titles of the various Reports indicate the year(s) whose crop information is included in those Reports.

Until the 1920's the Board was, because of budgetary considerations, forced to rely exclusively on the returns of the township assessors for information regarding the state's livestock industry, in particular the size of herds, the value of animals slaughtered or sold for slaughter, and the number of livestock deaths. As was noted above, all statistics were to be collected utilizing March 1 as a reference point. The reporting year for the three livestock series mentioned above was thus fixed as beginning on March 2 and ending March 1 of the following year. This fact, in conjunction with the Board's eagerness to present crop information as quickly after the harvest as possible, meant that each annual report contained the value of livestock slaughtered and the number of livestock deaths for the year ending March 1 of the year reviewed in the report. The herd sizes were as of March 1 of the year reviewed in the report.

The table headings utilized by the Board tended, for a great many years, to

obscure the timing of the livestock deaths and value of livestock slaughtered.
It was not until 1895 that the livestock deaths table indicated that the figures
contained therein were for the year ending March 1 of the report year. The table
containing the value of livestock slaughtered did not receive a heading indicat-
ing the endpoint of the reporting year until 1915.

The reporting year for livestock deaths remained unchanged throughout the
period covered by the KANATICS data sets. The herd sizes were also continuously
reported as of March 1. The reporting year for the value of livestock slaughter-
ed was changed in 1929 to correspond to the calendar year.[16] This revision was
made possible because of the availability of information on livestock marketing
collected on a monthly basis. It is probably the case that these marketing sur-
veys were made available by the United States Department of Agriculture which be-
gan to assist the Board in its collection of statistics in 1924.

File 1 mirrors the reports issued by the State Board of Agriculture; as
a result the number of livestock by type, the Value of Livestock Slaughtered,
and the number of livestock deaths are credited to the year in which their re-
porting years end. Thus, for example, the number of hog deaths in 1922 (which is
actually the number of deaths from March 2, 1921, to March 1, 1922) occupies the
same column in its data matrix as the number of bushels of winter wheat harvested
in 1922 does in its. In File 2 the Value of Livestock Slaughtered series is ad-
justed to correspond more closely to the calendar year in which the livestock
were slaughtered. (See series 25, File 2 below.)

Unorganized Counties and Boundary Changes

It was not until 1893 that the boundaries and number of Kansas countries
were finally stabilized. In 1874, not all counties were organized and data for
many was not available (see Table 4). As a result, construction of the data
files for the 1874-1892 period presented two problems: first, determining a

procedure to integrate newly organized counties into the data files, and second, deciding on how best to handle the frequent county boundary changes which accompanied the settlement of western Kansas.

Arrangement of the data files as a series of 105 x 63 matrices necessitated that each matrix position be filled. Therefore, for those years in which a county that appeared in a post-1892 enumeration was not yet organized, a zero (in the correct format) was placed in the appropriate location for each of that county's series. In effect, the county was treated as coming into existence (for purposes of the dataset) only when it was officially organized. (Prior to organization only fragmentary reports were filed with the State Board of Agriculture.) Use of this procedure was made feasible by the fact that once counties were organized their names were never subsequently assigned to other counties. That is, excluding slight boundary changes, once a section of the state was organized under a given county name that name always specified only one location.

An examination of state maps throughout the 1874-1893 period reveals that in western Kansas county boundary and name changes occurred frequently. Fortunately, most of this activity centered on unorganized areas. However, in several instances the boundaries of organized counties were changed in the process of creating new western counties. Table 6 presents a list of those counties as well as their areas throughout the 1874-1893 interval. Appendix 1 contains the details of these boundary changes.

During the 1874-1893 period Davis, Garfield, and Howard Counties appeared as organized counties in one or more Annual or Biennial Reports of the Kansas State Board of Agriculture but were excluded from the two data files. Davis was omitted from the list of Kansas counties because in 1888 its name was changed to Geary. It was decided to combine what would have been two incomplete matrix rows into one under the name of Geary County.

Garfield County was organized in 1887 and was annexed to Finney County in 1892. As a result of the small number of observations available for this county and its relatively small size (432 square miles) it was decided to omit it from the dataset entirely. During the 1887-1892 interval the observations on this county were not added to those of Finney County. Howard County was divided to form Chautauqua and Elk Counties in 1875 and ceased to exist as of that date. As a result, it was excluded from the dataset. Since information on the distribution of acreage and other quantities within Howard County for the year 1874 was not available, Chautauqua and Elk Counties were considered to be unorganized in that year.

Verification Procedures

Verification of the data was accomplished in several stages. First, the initial keypunched version of the entire first file was listed and then proofread by two-person teams, one reading from the original summary tables or handwritten tables derived from the county tables, the other comparing those figures against those keypunched. The corrections were themselves proofread, and the corrected data file was then subjected to a second verification procedure. The basis for this test was the assumption that while agricultural magnitudes would be subject to moderate year-to-year fluctuations, excessive variation was likely to be the result of keypunching, transcription, or typographical errors. The test consisted of computing the ratio of successive observations in a given series for each county and then determining whether or not the value thus obtained fell within the range of .20 to 5.00. In mathematical terms, if

$$.20 < X_t/X_{t+1} < 5.00; \quad t = 1 \text{ to } 62 \tag{1}$$

then both X_t and X_{t+1} were assumed to be correct. The variables thus tested were acres (sown and harvested), prices and yields (these computed

as the appropriate ratios of value per unit of output and output per acre
from the basic series), population, total cultivated acres, total crop in-
come, value of animals slaughtered, herd size, value of the herd, and livestock
deaths. For alfalfa and the sorghums, only the File 2 series were tested. The
test was carried out only when X_t and X_{t+1} were both greater than zero. The
.20 to 5.00 range was selected on the basis of its ability to detect order-of-
magnitude errors (i.e., an incorrect placement of the decimal point) as well as
many errors which occurred in the keypunching of the leftmost digit in any number.
(These are, of course, the most serious types of errors in data of this type.)
If the quotient of X_t and X_{t+1} was outside the specified range, the observa-
tions were checked in two ways. First, they were verified against the
values appearing in the original tables. If no keypunching error was in
evidence, the county tables were consulted. In cases in which discrepan-
cies between the two sources arose, whenever the values given in the
county tables produced test ratio values falling within the prescribed
bounds the county tables were assumed to contain the correct information.
If the county tables and summary table agreed, the observation was assumed
to be correct.

In the case of the Total Value of Field Crops and Total Cultivated
Acreage series,[17] data for the 1874-1907 period were available only in
county tables. As a result a different verification procedure was employed
for these two series when no obvious keypunching error was found. The
first step was to check for errors in transcription from the county tables
to the tables prepared for keypunching. If no transcription errors were
found, the addition of values presented in the county tables to compute
Total Value of Field Crops and Total Cultivated Acreage was checked. The
instances of discrepancies between summary and county tables and of addi-
tion errors in county tables are enumerated in Table 7.

Series Definition Changes

In three instances the Kansas State Board of Agriculture changed the definition of a series while continuing to utilize the same series name. From 1874 to 1914 Total Cultivated Acres included fenced prairie for meadow and pasture, but from 1915 onward only that fenced prairie from which hay was mown was included in the total. This definitional change resulted in a 14 million acre decline in Total Cultivated Acres between 1914 and 1915. In 1917 the category of Milk Cows was changed so as to include only cows kept solely for milk production. The returns of preceding years also included many cows kept for raising beef animals. This classification change resulted in a decline of a half million animals between 1916 and 1917. Finally, the Tons and Value of Tame Hay and Grasses included alfalfa through 1913. The value of alfalfa is not available for 1914 or earlier, and beginning in 1915 alfalfa acres, tons, and value were reported separately from the figures for tame hays and grasses.

No Reports and Incomplete Returns

On a few occasions in the 1874-1936 period counties failed to file returns with the Kansas State Board of Agriculture or filed only incomplete returns. The Board dealt with this situation in three different ways: it either entered a zero for that county's observation in each summary table for the year in question, utilized the county's reported values for the previous year, or used the two procedures in some combination. In the case of incomplete returns the Board reported the data made available to it. Table 8 contains a listing of the counties and years in which there were no reports or only incomplete reports, along with the procedure employed by the Board to supply the missing information in each case.

III. CONSTRUCTION OF TRANSFORMED DATA FILE (FILE 2)

It is the purpose of this section to detail the procedures by which (a) the gaps enumerated in Table 3 were filled and (b) the series appearing solely in File 2 were created.

Series 7 and 17 (Acres of Spring Wheat and Oats Harvested)

In 1935 and 1936 there were no acres harvested figures available for spring wheat and oats on a county-by-county basis. In order that yields for these years be comparable to yields in previous years (see discussion below), an acres harvested figure was calculated by multiplying each county's acres sown by the state acres harvested/acres sown ratio. The figures used and their sources are as follows:

	Spring Wheat (000 acres)				Oats (000 acres)		
	Sown	Harvested	Ratio		Sown	Harvested	Ratio
1935	18	12	.67		1,694	1,540	.91
1936	10	6	.60		2,016	1,679	.83

[Source: USDA Agricultural Marketing Service, Statistical Bulletin No. 158, Wheat: Acreage, Yield, Production By States 1866-1943 (Washington: 1955), p. 11.]

[Source: Kansas State Board of Agriculture, 1960/61 Biennial Report (Topeka), p. 520.]

Series 4, 6, 9, 11, 14, 16, 19, 21 (Yields and Prices of Winter Wheat, Spring Wheat, Corn and Oats, respectively)

Yields were obtained by dividing bushels harvested by acres harvested. Prices were computed by dividing the total value of the harvested crop by the bushels harvested. If a county did not plant any acreage to a given crop or experienced a complete crop failure (so that no bushels were harvested), a

zero was initially inserted as the value of the yield or price in that year. However, while the yield of the crop was in fact zero in these instances, its price was not. As a result, it was decided that when a sufficient number of price observations were available for a county and crop, the missing prices should be estimated as fitted values in a regression explaining the price in "normal" years. Equations of the following form were estimated.

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + U, \tag{2}$$

where

Y = County Price

X_1 = Constant Term

X_2 = Time Trend

X_3 = State Price Per Unit of Crop [Source: Kansas State Board of Agriculture, 1960-61 Biennial Report, pp. 516-520.]

U = Disturbance term.

This equation was estimated for each county which had a zero price inserted for winter wheat, corn or oats. Fitted spring wheat prices could not be obtained because the number of observations was insufficient to estimate the equation with confidence. The high frequency of zero observations was the result of the limited acreage of that crop which was planted. The interval of estimation in general extended from the first observation after the county's organization through 1936, excluding the year(s) in which the price could not be calculated directly. The coefficients thus obtained were utilized to compute the missing prices.

Series 22 (Price Per Ton of Prairie Hay)

This series was obtained by first combining series 18 and 21 (Tons of Prairie Hay and Tons of Prairie Meadow, respectively) of File 1 to yield a Tons of Prairie Hay series for the 1874-1936 period and series 19 and 22

(Value of Prairie Hay and Value of Prairie Meadow, respectively) of File 1 to yield a Value of Prairie Hay for the 1874-1936 interval. Having completed that step the value series was divided by the tons series, thereby yielding a price. In instances of crop failure or no harvest for other reasons, a fitted value of the price was inserted instead of zero. The regression procedure utilized was identical to that described above in (2), the only difference being the use of a state tame hay price as one of the independent variables (no state prairie hay price was available).

Series 23 (Adjusted Cultivated Acres)

This series was constructed for two reasons. First, given the change in the definition of Total Cultivated Acres which occurred in 1915 (see above), failure to adjust the series would have meant retention of a series that was constructed in an inconsistent manner. Second and more importantly, since prairie hay, meadow and pasture were not actually sown and cultivated by farmers, their inclusion in a Total Cultivated Acreage series was deemed to be inappropriate. As a result, it was decided to simply subtract all acres in prairie hay, meadow, and pasture from the Total Cultivated Acreage Series, thus yielding an Adjusted Cultivated Acres series. The actual procedure employed was as follows:

$$ACA = TCA - APH - APM - APP \tag{3}$$

where ACA = Adjusted Cultivated Acres; TCA = Total Cultivated Acres (Series 26); APH = Acres Prairie Hay (Series 17); APM = Acres Prairie Meadow (Series 20); and APP = Acres Prairie Pasture (Series 23). (The series numbers refer to File 1.)

Series 24 (Adjusted Field Crop Income)

During the 1887-1923 interval the Total Field Crop Income figures presented in the Biennial Reports of the Kansas State Board of Agriculture

contained a few inconsistencies in the reporting of the value of the various types of hay grown in the state. Specifically, over the 1887-1914 period the value of prairie hay included in a given year's Total Field Crop Income figure was that of the previous year. This was also the case with tame hay for the 1887-1923 period. The proper method of adjusting the income figures to make all components contemporaneous was simply to subtract the value of the prairie and tame hays produced in year t-1 from the Total Income figure in year t and then to add the hay values for year t. The only difficulty with this procedure arose when the State Board of Agriculture made the hay components contemporaneous. In the case of tame hay, the Biennial Report for 1922-1923 contained the value of tame hay for the years 1921 and 1922; however, in its 1924-1925 Biennial Report the State Board of Agriculture made all income components contemporaneous and chose not to publish the value of tame hay for 1923. Thus, while one could subtract the value of tame hay in 1922 from the 1923 total income figure, there was no 1923 tame hay value figure to add to the 1923 total income figure. A similar problem arose in 1914, a year for which the value of alfalfa was not reported. (The value of alfalfa appeared as a separate crop starting in 1915 and was contemporaneous with the major income components). The value of tame hay in 1913 included alfalfa as one of its components (it was this value of tame hay which was used by the Board of Agriculture to compute the 1914 Total Value of Field Crops). However, the 1914 value of tame hay did not include the value of alfalfa. As a result the adjustment procedure described above would understate 1914 income by the value of alfalfa. By utilizing the Quarterly Report of the Kansas State Board of Agriculture listed earlier, the value of prairie hay in 1914 was obtained, allowing the income adjustment with respect to that crop to be completed without any difficulty.

Since certain tame hay and alfalfa values were missing, it was necessary to estimate them. To obtain the value of alfalfa in 1914 it was

assumed that the ratio of (Value of Tame Hay/Acres of Tame Hay Cut) to

(Value of Alfalfa/Acres of Alfalfa) in each county in 1914 was the same as

that value in 1914 for the state as a whole. Thus the value of alfalfa in

1914 could be obtained by solving one equation in one unknown (all other

values were available in the 1913/14-1915/16 Reports). After computing the

value of alfalfa for the state as a whole, each of the counties was appor-

tioned a share of that total on the basis of its share of total alfalfa

acreage in 1914. Algebraically,

$$(\text{VTH}/\text{ATH})_{1914} \ / \ (\text{VA}/\text{AA})_{1914} \ = \ (\text{VTH}/\text{ATH})_{1915} \ / \ (\text{VA}/\text{AA})_{1915} \qquad (4)$$

where

		1914	1915
VTH =	Value of Tame Hay	3,585,330	3,699,566
ATH =	Acres of Tame Hay Cut	337,846	326,178
VA =	Value of Alfalfa	to be solved for	28,433,930
AA =	Acres of Alfalfa Cut	1,193,641	1,359,498

Solution of (4) yields the value of alfalfa in 1914 for state as whole as

$23 million to two significant digits.

The value of tame hay in 1923 was obtained by fitting an equation

estimated over the years in which Value of Tame Hay was available. The

Value of Tame Hay was assumed to be a function of precipitation and tem-

perature during both the planting and growing seasons, as well as a time

trend, a constant term, a dummy variable which was set equal to one if

alfalfa was included in the total value of tame hay and zero otherwise,

and the product of the dummy variable and the time trend. Monthly weather observations [Source: USDA Statistical Bulletin No. 101, Fluctuations in Crops and Weather, 1866-1948 (Washington: 1951)] were aggregated into a Spring planting season composed of March, April, and May, and a Summer growing season encompassing June, July and August.

In order to avoid the possibility of obtaining negative fitted values of tame hay in 1923, a log-log specification was employed. Since several variables contained occasional zero values, the following adjustments were made prior to taking logarithms: (a) one was added to the Value of Tame Hay series and the series which was defined as the product of the time trend and dummy variable; (b) the dummy variable was converted from a one-zero type to a ten-one type; (c) the constant term was multiplied by ten. The interval of estimation was from 1887 (or the first year for which data were available for the county, in the cases of those counties not yet organized in 1887) to 1922. The starting date was determined by the availability of state weather data in most instances, while the concluding date was dictated by the discontinuance of the Value of Tame Hay series (the components of the series were disaggregated starting in 1924).

The equation which was estimated for each county was (all variables in logs):

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_8 X_8 + U, \tag{5}$$

where

Y = Value of Tame Hay

X_1 = Constant Term

X_2 = Dummy Variable for inclusion of alfalfa

X_3 = Time Trend (1887 = 0)

X_4 = Spring Temperature

X_5 = Spring Precipitation

X_6 = Summer Temperature

X_7 = Summer Precipitation

X_8 = Product of X_2 and X_3

U = Disturbance term.

The coefficients obtained from the above regressions were then used to obtain the Value of Tame Hay in 1923 for each county. The translation of the resultant fitted values into natural units was accomplished by the following transformation:

$$\text{Value in Natural Units} = \exp[\text{Fitted Value} + (\text{SSE})^2/2] - 1 \qquad (6)$$

The $(\text{SSE})^2/2$ correction factor (SSE = standard error of estimate) is required to compensate for bias due to lognormality of the disturbance in the equation expressed in natural units. In those cases in which the value in natural units was negative a zero value was substituted as the fitted Value of Tame Hay.

Series 25 (Value of Animals Slaughtered or Sold for Slaughter.)

During the 1879-1928 period the State Board of Agriculture presented the value of animals slaughtered or sold for slaughter (this series name is shortened to Value of Animals Slaughtered here and in Tables 1 and 2) on the basis of a March 2 to March 1 reporting year and considered this to represent the Value of Animals Slaughtered for the year in which the reporting year ended. Since what is desired is to obtain a livestock income figure which corresponds to the same period as that covered by the crop income series, it is necessary to adjust the data presented in File 1. Failure to do this would result in a series in which the Value of Animals Slaughtered for year t would consist

primarily of the income derived from this source in the previous calendar year.

It was decided to credit the Value of Animals Slaughtered in the year ending March 1 to the previous calendar year. This was accomplished by replacing column t in the matrix containing series 25 with column t+1 (t = 5 to 54, yielding values for calendar years 1878 to 1927, inclusive). Columns 56 to 63 did not have to be adjusted as they represented the Value of Animals Slaughtered for the entire calendar year indicated. The use of this procedure left column 55 temporarily empty because in 1929, when the State Board of Agriculture adopted the calendar year as its reporting year for this series, it did not publish the Value of Animals Slaughtered for the year ending March 1, 1929. As a result, the value of that series for the year ending March 1, 1929, to be subsequently used as the Value of Animals Slaughtered during the calendar year 1928, was estimated by means of multiple regression analysis. An equation was estimated over the years in which values of the series were available and the resulting coefficients were used to fit the desired value of the series. The Value of Animals Slaughtered for the year ending March 1 consisted of the slaughters of other cattle, sheep and hogs in that reporting year.[19] The independent variables in each regression therefore were the values of other cattle, sheep, and hog herds as of the start of the reporting year, plus a constant term.

In order to avoid the possibility of obtaining negative fitted values of series 25, a log-log specification was employed. Since on occasion a county may have had none of one or more of the above mentioned types of livestock, one was added to the value of each of the series prior to taking logarithms. The constant term was multiplied by ten before logarithms were taken. The starting date of each country's regression was 1879 for those counties organized before 1878 and the year after organization for those counties organized in 1879 or later. The concluding date was the year ending March 1, 1928. The equation which was estimated for each county was (all variables in logs):

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U \qquad (7)$$

Y = Value of Animals Slaughtered

X_1 = Constant Term

X_2 = Value of Other Cattle

X_3 = Value of Sheep

X_4 = Value of Hogs

The coefficients obtained from these regressions were then used to compute the Value of Animals Slaughtered for the year ending March 1, 1929, for each county. The translation of the resultant fitted values into natural units was accomplished by the transformation given in equation (6). In those cases in which the fitted value in natural units was negative a zero value was substituted as the fitted Value of Animals Slaughtered. The results were inserted as column 55 in the matrix containing the values of series 25.

Series 26 (Population)

The population figures for each county in 1877 and 1879 were obtained by assuming a uniform rate of growth or decline from year t-1 to year t+1. As a result, the population in year t was simply the average of the t-1 and t+1 populations. The population is as of March 1 for all years.

Series 27 (Total Farm Income)

This series is the sum of Adjusted Field Crop Income and the adjusted value of Animals Slaughtered. Since it was not possible to determine from the

Kansas Reports whether the Adjusted Field Crop Income Series included or excluded the value of crops fed to livestock it is uncertain whether series 26 represents the upper or lower bound on Total Farm Income.

Series 28 (Total Farm Income per Capita)

This series is the quotient of Total Farm Income in year t and Population as of March 1 of year t.

Series 29 (Adjusted Field Crop Income per Adjusted Acre)

This series is the quotient of Adjusted Field Crop Income and Adjusted Total Cultivated Acres.

Series 30, 34, 38 and 42 (Livestock Deaths)

Series 42 for the period 1916-1936 was obtained by summing the number of hog deaths by cholera (File 1 series 43) and the number of hog deaths by other causes (File 1 series 44). Regression analysis was employed to obtain estimates of the deaths in the years 1893 and 1894 of the four livestock types included in the dataset. Livestock deaths during a given reporting year were assumed to be a function of that year's precipitation and temperature and other variables, including the size of the herd at the start of the reporting year and a time trend to account for the general advance in veterinary medicine during the 1874-1936 period.

A. Weather Variables.

Three factors influenced the aggregation of monthly weather data into seasonal variables used to estimate the deaths of milch cows, other cattle, sheep, and hogs. The reporting year for the deaths of these animals extended from March 2, year $t-1$, to March 1, year t. Second, it was hypothesized that only those months in which extremes of temperature and precipitation

occurred would exert any influence on the health of the animals. Third, in an effort to reduce the number of variables in each regression, seasonal variables were constructed by averaging the values of adjacent monthly observations which were most similar. On the basis of these three guidelines, two three-month seasons were defined for both precipitation and temperature: Winter, which was an average of the observations for December, year t-1 and January and February, year t, and Summer, which consisted of an average of the observations for June, July and August, year t-1.

B. Other Variables.

The equation for the deaths of each of the four types of livestock included as independent variables the herd (or flock) at the start of the reporting year, a time trend (1887=1), and a constant term. The milch cow deaths regressions contained in addition a dummy variable to indicate the change in the definition of milch cows which occurred as of 1918, and a variable which was the product of the herd in the previous year and the dummy variable.

D. Estimation

A log-log specification was employed in the estimation of the deaths of each of the four types of livestock. As in the case of the Value of Tame Hay, this specification was employed in order to minimize the number of instances in which the fitted values of livestock deaths were negative. The problem of zero values in several series was resolved by adding one to the herd (flock) size, the number of deaths and the dummy variable utilized in milch cow deaths regressions before taking logs. The constant term was multiplied by ten before logs were taken. With the exception of those counties organized after 1887 the interval of estimation for milch cows, other cattle, and sheep was 1888-1936; for hogs the interval was 1888-1936 (in both cases excluding the missing years 1893-94). The starting point of the estimation interval was dictated by the availability of the weather data.

The coefficients obtained from the above regressions were utilized to obtain fitted values of livestock deaths in 1893 and 1894 for each county. The translation of the resultant fitted values into natural units was accomplished by the transformation given in equation (6). In those cases in which the value in natural units was negative a zero value was substituted as the estimated number of deaths.

Series 31, 35 (Number of Milch Cows and Other Cattle)

In 1874, only the sum of milch cows and other cattle was reported. It was assumed that in each county the ratio of milch cows to the sum of milch cows and other cattle in 1874 was identical to that ratio in 1875, and similarly with other cattle. Thus, the Number of Milch Cows in 1874 was obtained by multiplying the Number of All Cattle in 1874 by the fraction of the sum of milch cows and other cattle represented by milch cows. Algebraically,

$$MC_{1874} = [MC_{1875} / (MC_{1875} + OC_{1875})] \cdot AC_{1874} \qquad (8)$$

where MC = Number of Milch Cows; OC = Number of Other Cattle; and AC = Number of All Cattle. The same method was used to compute the Number of Other Cattle in 1874.

Series 32, 36, 40 and 44 (Total Value of Livestock)

For many of the years of the sample period, the total value of each animal type published by the State Board of Agriculture was simply the product of the herd (or flock) size and a single state average price. Animal prices differing from county to county were found only in 1897 (except hogs), 1899, 1900 (other cattle only), and all years after and including 1924. Thus in most years the total value of each animal type's herd was obtained by multiplying the herd or flock size by the state average price of the animal type.

Series 33, 37, 41 and 45 (Price per Animal)

In 1874 and 1877 for milch cows and other cattle and in 1877 for sheep and hogs, neither county nor statewide prices existed. Since the prices reported by the Kansas State Board of Agriculture were highly correlated with those reported by the United States Department of Agriculture, the missing statewide prices were estimated by regression. The estimated equation was:

$$Y = \beta_1 X_1 + \beta_2 X_2 + U, \tag{9}$$

where

Y = Statewide price reported by Kansas Board of Agriculture

X_1 = Constant Term

X_2 = Statewide USDA Price [Source: USDA, Bureau of Agricultural Economics, Livestock on Farms, January 1, 1867-1935, by States and Divisions (Washington: 1938), pp. 82-83.]

U = Disturbance term.

The interval of estimation consisted of only those years in which the Kansas State Board of Agriculture applied a statewide price to obtain the total value of each county's herd.

In years in which only a statewide price was available, that price was entered in each county's livestock price series, whether the county was organized or not. In the years in which livestock prices varied between counties, the price of each type of animal was obtained by dividing the total value of the particular animal by the herd (or flock) size of that animal. In those instances in which there was no herd, a zero price was entered.

Series 46 and 47 (Acres and Value of Alfalfa)

In the Reports of the Kansas State Board of Agriculture, the acreage of alfalfa is first separately enumerated in 1891. Beginning with 1915 the value of the crop and the "product" (in tons) are also given. The presentation of the series is changed again in 1921 when a distinction is drawn between alfalfa grown for seed and for hay. The acreage and value of the crop is separately listed for the two, with the "product" or quantity measured in bushels where alfalfa is grown for seed and in tons where it is grown for hay. However, the acreage cut for seed is stated to be included also in the acreage cut for hay, so that unduplicated total alfalfa acreage is obtained by reference to the alfalfa hay acreage alone.

It seems likely that the total value (though not the acreage) of the alfalfa crop is understated between 1915 and 1920 by the value of alfalfa seed harvested. The extent of this possible understatement cannot accurately be assessed. Between 1921 and 1936, however, the value of alfalfa seed as a percentage of the value of alfalfa hay ranged from 0.74 to 8.59, with an unweighted mean over the 16 years of 3.64 per cent. Series 46, Acres of Alfalfa, was formed by summing the non-minus one portions of File 1, series 45 and 46; series 47 Value of Alfalfa, was formed by summing the non-minus one portions of File 1, series 47, 48 and 49.

Series 48 and 49 (Acres and Value of Sorghum)

Several varieties of sorghum[20] were grown in Kansas between 1874 and 1936, but in the Reports of the State Board of Agriculture these were at first aggregated into composite series. Beginning in the 1890's a large number of varieties, and the purposes for which they were grown, were distinguished,

but at the end of the period some of these were again reaggregated. Therefore the construction of continuous and consistent series relating to even the broader types of sorghum (for example grain or saccharine sorghum) has not been possible.

Broom corn was separately listed in the agricultural statistics over the full 63-year period and required no adjustment.

Of the several varieties of grain sorghum grown in Kansas, figures were collected and published for rice corn for the period 1880 to 1884, Jerusalem corn 1893 to 1924, milo maize 1893 to 1934, kaffir corn 1893 to 1934, and feterita 1914 to 1932. In 1933 a series described as "other grain sorghums" appeared in place of the discontinued feterita series, with virtually no change occurring in the acreage between the two years, suggesting that little of significance was included in the "other grain sorghums" in addition to feterita. In 1934, although milo, kaffir and "other grain sorghums" are all distinguished, an aggregate "grain sorghums" series appears, which is the sum of these three categories. In 1935 and 1936 the component figures are not separately published.

Between 1874 and 1882 a series described simply as "sorghum" was published, giving acres, gallons and values. Clearly, saccharine sorghum was being grown for syrup. It is unclear, however, whether only saccharine sorghum is included in the acreage series, and whether the value of forage is included along with that of the syrup produced. From 1883, separate acreage and value figures are presented for the sorghum grown for syrup and for forage, seed, grain or hay, the exact description varying over time. In File 1, only the total acreage and value of sorghum are given, 1874-94 and 1915-36. From 1895 to 1914 the aggregate values and acreages were not published, and for these years File 1 contains the two component series—sorghum grown for syrup or sugar and sorghum grown for forage and seed (or grain). From 1915 the series

are explicitly described as relating to saccharine sorghum, and the aggregate values and acreages were again published.

The principal uncertainty regarding the coverage of these figures is whether they include any of the grain sorghums that were first published (as noted above) in 1893. Inspection of the acreage figures for 1892 and 1893 show little change in the area planted to "sorghum" (169,105 and 172,893 acres), but a relatively large acreage in 1893 in milo, kaffir and Jerusalem corn combined (77,942 acres). The implication is that these latter crops were not previously included in the sorghum series, but there is no obvious means by which earlier years' acreage and production of these three crops can accurately be estimated for each county. A discontinuity thus persists in the grain sorghums at this time.

One additional complication is that in both 1934 and 1936 the "seed" data in both the saccharine sorghum series are omitted, the stated explanation being that "very little grain [was] produced...on account of extreme dry weather," and estimates of the value of the crops are based on syrup and forage only.

Series 48, Acres of Sorghum, was formed by summing the non-minus one segment of File 1, series 50 through 59 inclusive; series 49, Value of Sorghum, was formed by summing the non-minus one segments of File 1, series 60 through 67 inclusive. The observations for the years 1934 and 1936, series 48 and 49, were formed as the sum of the observations found in File 1, series 52 and 53, and 61 and 62 respectively.

Table 1 – Variables in File 1: KANSAS.ORIG.SJDJMT

Series	Position in File	Years Available	Format
Acres of Winter Wheat Sown	1	1885–88, 1890, 1911–13, 1915–18, 1920–36	F14.2
Acres of Winter Wheat Harvested	2	1874–1936	F14.2
Bushels of Winter Wheat	3	1874–1936	F14.2
Value of Winter Wheat	4	1874–1936	F14.2
Acres of Spring Wheat Sown	5	1935–36	F14.2
Acres of Spring Wheat Harvested	6	1874–1934	F14.2
Bushels of Spring Wheat	7	1874–1936	F14.2
Value of Spring Wheat	8	1874–1936	F14.2
Acres of Corn Sown	9	1887–88, 1890	F14.2
Acres of Corn Harvested	10	1874–1936	F14.2
Bushels of Corn	11	1874–1936	F14.2
Value of Corn	12	1874–1936	F14.2
Acres of Oats Sown	13	1889, 1935–36	F14.2
Acres of Oats Harvested	14	1874–1934	F14.2
Bushels of Oats	15	1874–1936	F14.2
Value of Oats	16	1874–1936	F14.2
Acres of Prairie Hay	17	1883–1936	F14.2
Tons of Prairie Hay	18	1875–1936	F14.2
Value of Prairie Hay	19	1875–1936	F14.2
Acres of Prairie Meadow	20	1874–82	F14.2
Tons of Prairie Meadow	21	1874	F14.2
Value of Prairie Meadow	22	1874	F14.2
Acres of Prairie Pasture	23	1874–82	F14.2
Tons of Tame Hay	24	1886–88, 1890–91	F14.2
Value of Tame Hay	25	1886–1922	F14.2
Total Acres Cultivated	26	1874–1936	F14.2
Total Value of Field Crops	27	1874–1936	F14.2
Value of Animals Fattened and Slaughtered	28	1878–1936	F14.2
Population	29	1874–76, 1878, 1880–1936	F14.2
Number of All Cattle	30	1874	F14.2
Number of Milch Cows	31	1875–1936	F14.2
Total Value of Milch Cows	32	1889–92, 1897, 1899, 1924–36	F14.2
Number of Milch Cow Deaths	33	1879–92, 1895–1936	F14.2
Number of Other Cattle	34	1875–1936	F14.2
Total Value of Other Cattle	35	1889–92, 1897, 1899–1900, 1924–36	F14.2
Number of Other Cattle Deaths	36	1899–92, 1895–1936	F14.2
Number of Sheep	37	1874–1936	F14.2
Total Value of Sheep	38	1889–92, 1897, 1899, 1924–36	F14.2
Number of Sheep Deaths	39	1879–92, 1895–1936	F14.2
Number of Hogs	40	1874–1936	F14.2
Total Value of Hogs	41	1889–92, 1899, 1924–36	F14.2
Number of Hog Deaths	42	1879–92, 1895–1915	F14.2
Number of Hog Deaths by Cholera	43	1916–36	F14.2
Number of Hog Deaths by Other Causes	44	1916–36	F14.2

Table 1 - Variables in File 1: KANSAS.ORIG.SJDJMT (cont'd.)

Series	Position in File	Years Available	Format
Acres of Alfalfa	45	1891-1920	F14.2
Acres of Alfalfa for Hay	46	1921-1936	F14.2
Value of Alfalfa	47	1915-1920	F14.2
Value of Alfalfa Hay	48	1921-1936	F14.2
Value of Alfalfa Seed	49	1921-1936	F14.2
Acres of Broom Corn	50	1874-1936	F14.2
Acres of Saccharine Sorghum	51	1874-94, 1915-36	F14.2
Acres of Sorghum (Syrup or Sugar)	52	1895-1914, 1934, 1936	F14.2
Acres of Sorghum (Forage or Grain)	53	1895-1914, 1934, 1936	F14.2
Acres of Feterita	54	1914-1932	F14.2
Acres of Rice Corn/Jerusalem Corn	55	1880-84, 1893-1924	F14.2
Acres of Kaffir Corn	56	1893-1933	F14.2
Acres of Milo Maize	57	1893-1933	F14.2
Acres of Grain Sorghums	58	1933-1936	F14.2
Value of Broom Corn	59	1874-1936	F14.2
Value of Saccharine Sorghum	60	1874-94, 1915-1936	F14.2
Value of Sorghum (Syrup or Sugar)	61	1895-1914, 1934, 1936	F14.2
Value of Sorghum (Forage or Grain)	62	1895-1914, 1934, 1936	F14.2
Value of Feterita	63	1914-1932	F14.2
Value of Rice Corn/Jerusalem Corn	64	1880-1884, 1893-1924	F14.2
Value of Kaffir Corn	65	1893-1933	F14.2
Value of Milo Maize	66	1893-1933	F14.2
Value of Grain Sorghums	67	1933-1936	F14.2

Table 2 - Variables in File 2: KANSAS.TRAN.SJDJMT

Series	Position in File	Years Available	Format
Acres of Winter Wheat Sown	1	1885-88, 1890, 1911-13, 1915-18, 1920-36	F14.2
Acres of Winter Wheat Harvested	2	1874-1936	F14.2
Bushels of Winter Wheat	3	1874-1936	F14.2
Yield (Bushels per Acre) of Winter Wheat	4	1874-1936	F14.10
Total Value of Winter Wheat	5	1874-1936	F14.2
Price per Bushel of Winter Wheat (in $)	6	1874-1936	F14.10
Acres of Spring Wheat Harvested	7	1874-1936	F14.2
Bushels of Spring Wheat	8	1874-1936	F14.2
Yield (Bushels per Acre) of Spring Wheat	9	1874-1936	F14.10
Total Value of Spring Wheat	10	1874-1936	F14.2
Price per Bushel of Spring Wheat (in $)	11	1874-1936	F14.10
Acres of Corn Harvested	12	1874-1936	F14.2
Bushels of Corn	13	1874-1936	F14.2
Yield (Bushels per Acre) of Corn	14	1874-1936	F14.10
Total Value of Corn	15	1874-1936	F14.2
Price per Bushel of Corn (in $)	16	1874-1936	F14.10
Acres of Oats Harvested	17	1874-1936	F14.2
Bushels of Oats	18	1874-1936	F14.2
Yield (Bushels per Acre) of Oats	19	1874-1936	F14.10
Total Value of Oats	20	1874-1936	F14.2
Price per Bushel of Oats (in $)	21	1874-1936	F14.10
Price per Ton of Prairie Hay (in $)	22	1874-1936	F14.10
Adjusted Total Cultivated Acres	23	1874-1936	F14.2
Adjusted Field Crop Income	24	1874-1936	F14.2
Adjusted Value of Animals Slaughtered	25	1877-1936	F14.2
Population	26	1874-1936	F14.2
Total Farm Income	27	1874-1936	F14.2
Total Farm Income per Capita	28	1874-1936	F14.2
Adjusted Field Crop Income per Acre	29	1874-1936	F14.10
Number of Milch Cow Deaths	30	1879-1936	F14.2
Number of Milch Cows	31	1874-1936	F14.2
Total Value of Milch Cows	32	1874-1936	F14.2
Price per Milch Cow	33	1874-1936	F14.10
Number of Other Cattle Deaths	34	1879-1936	F14.2
Number of Other Cattle	35	1874-1936	F14.2
Total Value of Other Cattle	36	1874-1936	F14.2
Price per Animal of Other Cattle	37	1874-1936	F14.10
Number of Sheep Deaths	38	1879-1936	F14.2
Number of Sheep	39	1874-1936	F14.2
Total Value of Sheep	40	1874-1936	F14.2
Price per Sheep	41	1874-1936	F14.10
Number of Hog Deaths	42	1879-1936	F14.2
Number of Hogs	43	1874-1936	F14.2
Total Value of Hogs	44	1874-1936	F14.2
Price per Hog	45	1874-1936	F14.10
Acres of Alfalfa	46	1891-1936	F14.2
Value of Alfalfa	47	1915-1936	F14.2
Acres of Sorghum	48	1874-1936	F14.2
Value of Sorghum	49	1874-1936	F14.2

Table 3 – Gaps in File 1 Series

Series Name	Position on File 2	Years
Acres of Spring Wheat Harvested	7	1935-36
Acres of Oats Harvested	12	1935-36
Population	26	1877, 1879
Number of Milch Cow Deaths	30	1893-94
Number of Milch Cows	31	1874
Total Value of Milch Cows	32	1874-88, 1893-96, 1898, 1900-23
Number of Other Cattle Deaths	34	1893-94
Number of Other Cattle	35	1874
Total Value of Other Cattle	36	1874-88, 1893-96, 1898, 1901-23
Number of Sheep Deaths	38	1893-94
Total Value of Sheep	40	1874-88, 1893-96, 1898, 1901-23
Number of Hog Deaths	42	1893-94
Total Value of Hogs	44	1874-88, 1893-98, 1900-23

Table 4 – Counties of Kansas

County	Number	Date Organized	Date of First Report
Allen	1	1855	1874
Anderson	2	1855	1874
Atchison	3	1855	1874
Barber	4	1873	1875
Barton	5	1872	1874
Bourbon	6	1855	1874
Brown	7	1855	1874
Butler	8	1855	1874
Chase	9	1859	1874
Chautauqua	10	1875	1875
Cherokee	11	1866	1874
Cheyenne	12	1886	1886
Clark	13	1885	1886
Clay	14	1866	1874
Cloud	15	1866	1874
Coffey	16	1859	1874
Commanche	17	1885	1886
Cowley	18	1870	1874
Crawford	19	1867	1874
Decater	20	1880	1880
Dickinson	21	1857	1874
Doniphan	22	1855	1874
Douglas	23	1855	1874
Edwards	24	1874	1875
Elk	25	1875	1875
Ellis	26	1867	1874
Ellsworth	27	1867	1874
Finney	28	1884	1885
Ford	29	1873	1874
Franklin	30	1857	1874
Geary	31	1855	1874
Gove	32	1886	1886
Graham	33	1880	1881
Grant	34	1888	1888
Gray	35	1887	1887
Greeley	36	1888	1888
Greenwood	37	1862	1874
Hamilton	38	1886	1886
Harper	39	1873	1879
Harvey	40	1872	1874
Haskell	41	1887	1888
Hodgeman	42	1879	1880
Jackson	43	1857	1874
Jefferson	44	1855	1874
Jewell	45	1870	1874
Johnson	46	1855	1874
Kearny	47	1888	1889
Kingman	48	1873	1879
Kiowa	49	1886	1886
Labette	50	1867	1874
Lane	51	1886	1886
Leavenworth	52	1855	1874

Table 4 (cont'd.)

County	Number	Date Organized	Date of First Report
Lincoln	53	1870	1874
Linn	54	1855	1874
Logan	55	1888	1887
Lyon	56	1858	1874
Marion	57	1865	1874
Marshall	58	1855	1874
McPherson	59	1870	1874
Meade	60	1885	1886
Miami	61	1855	1874
Mitchell	62	1870	1874
Montgomery	63	1869	1874
Morris	64	1858	1874
Morton	65	1886	1888
Nemaha	66	1855	1874
Neosho	67	1864	1874
Ness	68	1880	1881
Norton	69	1872	1874
Osage	70	1859	1874
Osborne	71	1871	1874
Ottawa	72	1866	1874
Pawnee	73	1872	1874
Phillips	74	1872	1874
Pottawatomie	75	1856	1874
Pratt	76	1879	1879
Rawlins	77	1881	1882
Reno	78	1872	1874
Republic	79	1868	1874
Rice	80	1871	1874
Riley	81	1855	1874
Rooks	82	1872	1874
Rush	83	1874	1875
Russell	84	1872	1875
Saline	85	1859	1874
Scott	86	1886	1887
Sedgwick	87	1870	1874
Seward	88	1886	1888
Shawnee	89	1855	1874
Sheridan	90	1880	1881
Sherman	91	1886	1886
Smith	92	1872	1874
Stafford	93	1879	1880
Stanton	94	1887	1888
Stevens	95	1886	1888
Sumner	96	1871	1874
Thomas	97	1885	1886
Trego	98	1879	1880
Wabaunsee	99	1859	1874
Wallace	100	1888	1888
Washington	101	1860	1874
Wichita	102	1886	1888
Wilson	103	1865	1874
Woodson	104	1855	1874
Wyandotte	105	1859	1874

Table 5 - Years for Which Source of Series was County Tables

Series	Years
Total Cultivated Acres	1877, 1879-1907, 1909
Total Value of Field Crops	1874-1907, 1909
Livestock Disease Deaths	1878, 1881, 1882

Table 6 - Areas in Square Miles of Certain Counties

Counties	1874	1882	1884	1886	1888	1890	1892	1894	1900
Edwards	972	972	972	612[1]	612	612	612	612	612
Finney	----	----	2,880	2,808[2]	864[3]	864	864	1,296[4]	1,296
Ford	1,080	1,080	3,024[5]	1,440[6]	1,080[7]	1,080	1,080	1,080	1,080
Hamilton	----	----	2,364	2,364	972[8]	972	972	972	972
Hodgeman	----	864	1,152[9]	1,152	864[10]	864	864	864	864

1. As of March 1886.

2. As of 1885.

3. As of 1887.

4. As of 1893.

5. As of 1883.

6. As of 1885.

7. As of 1887.

8. As of 1887.

9. As of 1883.

10. As of 1887.

Table 7a – Summary Table – County Table Discrepancies

Series	County	Year	Summary Table Observation	County Table Observation
Value of Winter Wheat	Crawford (#19)	1876	35,252.25	224,252.25
Acres of Corn	Linn (#54)	1875	6,791.00	65,791.00
Acres of Corn	Trego (#98)	1881	0,406	7,406
Acres of Corn	Wabaunsee (#99)	1881	41,851	40,851
Acres of Corn	Washington (#101)	1881	93,782	91,782
Acres of Corn	Wilson (#103)	1881	60,287	62,287
Acres of Corn	Woodson (#104)	1881	33,847	30,847
Acres of Corn	Wyandotte (#105)	1881	1,101	13,101
Bushels of Oats	Lincoln (#53)	1892	718,008.00	218,008.00
Value of Oats	Elk (#25)	1894	18,128.08	48,128.08
Acres of Prairie Hay	Finney (#28)	1909	336,032.00	236,032.00
Number of Other Cattle	Leavenworth (#52)	1912	71,117.00	7,117.00
Population	Johnson (#46)	1893	11,961	15,130

Table 7b – Addition Errors in County Tables

Series	County	Year	As Appears in Table	Correct Value
Total Value of Field Crops	Linn (#54)	1890	39,373.70	936,373.20

Table 8 - No Reports and Incomplete Returns

County	Year	Report Status	Values Entered
Russell	1874	No Report	Zeroes
Rooks	1875	No Report	Zeroes
Ford	1880	No Report	1879
Finney	1886	No Report	1885[1]
Riley	1886	No Report	1885[2]
Finney	1887	No Report	Zeroes
Hamilton	1887	No Report	Zeroes
Seward	1887	No Report	Zeroes
Montgomery	1890	Incomplete Returns	As Collected
Norton	1890	Incomplete Returns - Oats	As Collected
Riley	1890	Incomplete Returns	As Collected
Wyandote	1902	No 1902 Acreages or Livestock Reported	1901

1. The values entered in File 1 for this county in 1886 are a mixture of 1885 figures and observations from unknown sources. Value of Winter Wheat, Bushels and Value of Spring Wheat, Bushels and Value of Oats, and Total Value of Field Crops were obtained by the Kansas State Board of Agriculture in an unspecified manner; the values of all other series are 1885 figures.

2. The values entered in File 1 for this county in 1886 are a mixture of 1885 figures and observations from unknown sources. Bushels and Value of Winter Wheat, Value of Spring Wheat, Bushels and Value of Corn, and Bushels and Value of Oats were obtained by the Kansas State Board of Agriculture in an unspecified manner; the values of all other series are 1885 figures.

Appendix 1 - County Boundary Changes

Edwards County was organized in 1874 with an area of 972 square miles. In March 1886 the State Legislature detached the southern two tiers of townships from this county to form part of Kiowa County. This action by the legislature reduced the area of Edwards County to 612 square miles.

Finney County was organized in 1884 with an area of 2,880 square miles. In 1885 its area was reduced to 2,808 square miles as 72 square miles (two townships) were ceded to Meade County. In 1887 by an act of the State Legislature the following changes in its area were made:

to Garfield County 216 square miles (six townships)

to Grant County 288 square miles (eight townships)

to Gray County 432 square miles (twelve townships)

to Haskell County 576 wquare miles (sixteen townships)

to Kearny County 432 square miles (twelve townships)

leaving it with an area of 864 square miles. In 1893 Garfield County was annexed to Finney County thereby increasing its area to 1,296 square miles.

Ford County was organized in 1873 with an area of 1,080 square miles. The legislature of 1883 added Clark County (which was unorganized) and portions of Meade and Gray Counties (which were also unorganized) to Ford County thereby increasing its area to 3,024 square miles. In 1885 the following area changes were made:

to Clark County 975 square miles

to Meade County 609 square miles

thus leaving Ford County with an area of 1,440 square miles. In 1887, 360 square miles of Ford County were taken by the legislature for the formation of Gray County, leaving the area of Ford County at 1,080 square miles.

Hamilton County was organized in 1886 with an area of 2,364 square miles. However, by an 1887 Act of the Legislature the following changes in its area were made:

to Grant County 288 square miles

to Kearny County 432 square miles

to Stanton County 672 square miles

thus reducing its area to 972 square miles.

Hodgeman County was organized in 1879 with a territory of 864 square miles. In 1883 the State Legislature added six townships of Lane and Gray Counties (both unorganized) to the western end of Hodgeman County, thereby increasing its area to 1,152 square miles. In 1887, eight townships on the western end of the county were detached:

to Garfield County 216 square miles

to Gray County 72 square miles

leaving it with an area of 864 square miles.

Appendix 2 - Population Figures

Year	County	Year Used
1874	Barber	1873
	Barton	1873
	Commanche	Estimate - Unorganized
	Harper	Estimate - Unorganized
	Harvey	1873
	Kingman	Estimate - Unorganized
	Lyon	1873
	Ness	Estimated - Unorganized
	Ottawa	1873
	Pratt	Estimate - Unorganized
	Russell	1873
	Saline	1873
	Shawnee	1873
	Wallace	1873
1875	Rooks	1874
1876	Anderson	1875
	Atchison	1875
	Bourbon	1875
	Ellsworth	1875
	Jefferson	1875
	Labette	1874
	Lyon	1875
	Miami	1875
	Riley	1875
	Rooks	1875
	Sumner	1875
1883	Lyon	Estimate
	Riley	Estimate
1886	Atchison	1885
	Riley	1885
1887	Atchison	1885
	Barber	1886
	Finney	Estimate
	Hamilton	1886
	Morton	1886 - at Organization Date
	Steward	1886
	Stevens	1886
	Wichita	1886 - at Organization Date
1888	Grant	Estimate
	Kearny	1887 - Unorganized
	Stevens	Estimate

Appendix 2 (cont'd.)

Year	County	Year Used
1893	Atchison	1892
1894	Atchison	1892
1900	Atchison	1899
1901	Atchison	1899
1902	Atchison	1899
	Wyandote	1901
1906	Atchison	1905
	Morton	1905
1907	Atchison	1905
1909	Atchison	1908
	Franklin	1910
	Lyon	1908
	Morton	1910
1910	Atchison	1908
	Lyon	1908
1911	Atchison	1910 – U.S. Census
1912	Atchison	1910 – U.S. Census
	Bourbon	1911
1913	Atchison	1910 – U.S. Census
1914	Atchison	1910 – U.S. Census
	Morton	1913
	Shawnee	1913

Appendix 3 - Miscellaneous Data Notes

Printing Errors

The Total Value of Field Crops was not given for the years 1875-1877
in the sources we used. The figures for 1875 and 1876 were therefore obtain-
ed by addition of the data presented in county tables. The 1877-1878 Biennial
Report contained the Total Value of Field Crops for 1878 and the increase or
decrease that amount represented over 1877. The 1877 figure was obtained by
means of appropriate addition or subtraction. In the process of performing
the addition required to obtain the 1875 and 1876 figures, two errors were
detected in the Annual Report for 1875. First, the value of winter wheat list-
ed in the table for Linn County was $666,222.00 However, by multiplying the
quantity and price listed in the same table, a figure of $266,222.00, which
agreed with that presented in the summary table, was obtained. This second
figure was utilized in the computation of the Total Value of Field Crops.
Second, the acres, bushels and value of corn presented in Osborne County's
county table were found to be those of Osage County, i.e. the corn statistics
for Osage County appeared in two county tables. The process of determining
to which county the figures applied involved checking the summary table and
the 1874 and 1876 Reports. It appeared that the figures presented in the
summary table were correct and these were utilized in the computation of the
Total Value of the Field Crops in Osborne County in 1875.

Legislature's Handling of Unorganized Counties

Pratt County: Prior to its organization in 1879 Pratt County
was attached to Reno County for judicial and statistical purposes. This
action by the State Legislature had the following consequences: Pratt County
was treated as a township of Reno County and as a result data for Pratt County

are no longer included in Reno County's figures starting in 1879, the year of Pratt County's organization. As a result, one may observe an otherwise unexplained decline in the data for Reno County.

Gove County: The treatment of Gove County in the Third-Fifth Biennial Reports of the Kansas State Board of Agriculture (1881-1886) was similar to that given Pratt County (see above). Gove County was attached to Trego County before becoming organized. A few differences emerge between the two cases, however. Gove County, although not organized until 1886, has its own county table in 1882 and also appears in the summary tables for crops in that year. Its livestock and population were, however, included in the totals of Trego County. In the years prior to 1881 and in the 1883-1885 period the treatment of Gove County is less clear. The only fact which can be deduced is that the population of Gove County was included in the Trego County totals. This situation is analogous to the case of Pratt and Reno Counties discussed above.

FOOTNOTES

1. Kansas State Board of Agriculture, _Third Annual Report to the Legislature of Kansas for the Year 1874_, Topeka, Kansas, State Printing Works, George W. Mark, Public Printer, 1874, p. 89.

2. _Transactions of the Kansas State Board of Agriculture with an Abstract of Proceedings of County Agricultural Societies 1872 and Report of the State Horticulture Society_, Topeka, Kansas, S.S. Prouty, Public Printer, Printed at the Commonwealth State Printing House, 1873, p. 14.

3. State of Kansas, _The General Laws, Passed at the Ninth, Tenth and Eleventh Sessions of the Legislature held at the State Capital in the Years 1869, 1870, and 1871,_ Reprint, Topeka, Kansas, State Printing Works, George W. Martin, Public Printer, 1874, pp. 49-50.

4. _Ibid._

5. _Transactions of the Kansas State Board of Agriculture_, p. 14.

6. _Ibid._, p. 15.

7. _Report of the State Board of Agriculture to the Legislature of Kansas for the Year 1873_, Topeka, Kansas, State Printing Works, George W. Martin, Public Printer, 1874, pp. 63-64.

8. _Ibid._

9. Irwin Taylor, _General Statutues of Kansas of 1889, Being a Compilation of all the Laws of a General Nature, Including the Session Laws of 1889 Based Upon the General Statutes of 1868 and Dassler's Compiled Laws of 1885 Thoroughly Annotated to and Including Kansas Reports to Volume Forty, Volume 1_, Topeka, Kansas, George W. Crane and Co., Law Book Publishers, 1889, pp. 579-582.

10. _Third Annual Report_, p. 91.

11. _Ibid._, p. 89.

12. Irwin Taylor, _op. cit._, pp. 195-198.

13. _Ibid._

14. Kansas State Board of Agriculture, _First Biennial Report 1877-78_, Topeka, Kansas, 1879, p. 7.

15. Kansas State Board of Agriculture, _Twenty-Fifth Biennial Report_, _1925-26_, Topeka, Kansas, 1927, p. 241.

16. Kansas State Board of Agriculture, _Twenty-Seventh Biennial Report_, _1929-30_, Topeka, Kansas, 1931, p. 285.

17. Here and throughout, when a series is referred to by name it will be capitalized.

18. Sum of timothy, clover, sweet clover, and other tame grasses.

19. Kansas State Board of Agriculture, _Twenty-Seventh Biennial Report_, _1929-30_, Topeka, Kansas, 1931, p. 648-649.

20. Sorghums here are taken to mean any member of the family of _sorghum vulgare_. From a variety of reference books, discussions on sorghums in the Kansas State Board of Agriculture _Reports_, and a conversation with Dr. Washko of the Department of Agronomy, University of Connecticut at Storrs, it was established that of the crops separately listed in the _Reports_, the following were varieties of sorghums: Jerusalem (or rice) corn, milo (or milo maize), feterita, kaffir (or kaffir corn), and broom corn.