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Data Base of Accident and Agricultural Statistics for Transportation Risk Assessment

Environmental Assessment and Information Sciences Division

by C.L. Saricks,* R.G. Williams, and M.R. Hopf

Environmental Assessment and Information Sciences Division,
Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439

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*Saricks is affiliated with Argonne's Energy Systems Division.

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NOMENCLATURE

The following is a list of the acronyms, initialisms, and abbreviations (including units of measure) used in this document.

ACRONYMS, INITIALISMS, AND ABBREVIATIONS

BMCS	Bureau of Motor Carrier Statistics
CVCF	commercial vessel casualty file
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EA	environmental assessment
FAI	Federal-Aid Interstate
FAI-R	FAI-Rural
FAI-U	FAI-Urban
FAP	Federal-Aid Primary
FARS	fatal accident reporting system
FAS	Federal-Aid Secondary
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration
HLW	high-level waste
HPMS	highway performance monitoring system
ICC	Interstate Commerce Commission
IPF	iterative proportional fitting
NWPA	Nuclear Waste Policy Act
OMC	Office of Motor Carriers
SNF	spent nuclear fuels
TWS	truck weight study
USDA	U.S. Department of Agriculture
VMT	vehicle-miles of travel

UNITS OF MEASURE

doz	dozen
kg	kilogram(s)
km	kilometer(s)
km ²	square kilometer(s)
lb	pound(s)
yr	year(s)

DATA BASE OF ACCIDENT AND AGRICULTURAL STATISTICS FOR TRANSPORTATION RISK ASSESSMENT

by

C.L. Saricks, R.G. Williams, and M.R. Hopf

ABSTRACT

A state-level data base of accident and agricultural statistics has been developed to support risk assessment for transportation of spent nuclear fuels and high-level radioactive wastes. This data base will enhance the modeling capabilities for more route-specific analyses of potential risks associated with transportation of these wastes to a disposal site. The data base and methodology used to develop state-specific accident and agricultural data bases are described, and summaries of accident and agricultural statistics are provided.

1 INTRODUCTION

The Nuclear Waste Policy Act (NWPA) of 1982 established a process for selecting a geologic repository site for the disposal of spent nuclear fuel (SNF) and high-level radioactive waste (HLW). Following the nomination of three potential geologic repository sites, the U.S. Department of Energy (DOE) published environmental assessments (EAs) for the sites in 1986 (DOE 1986a, 1986b, 1986c); these EAs included potential issues raised by public commenters (Appendix C of each EA). One issue of concern is the risk associated with transportation of SNF and HLW to the nominated sites -- in particular, the lack of route-specific risk analyses in the EAs and the generic nature of the RADTRAN III computer code used for the analyses (Madsen et al. 1986). In addition, it was determined that the agricultural inputs to the model were inadequate.

To address these public concerns, the DOE Office of Civilian Radioactive Waste Management has initiated work to enhance capabilities for more route-specific risk analyses. This work involves two major tasks: (1) enhancement of the data base and (2) enhancement of methodology. This report summarizes a data base of accident and agricultural statistics recently developed for the first task.

In the EAs, accident-related risks for the national transportation system were computed using a single set of accident rates for the entire country. To account for the differences in accident patterns across the country, state-specific accident data are developed in this report. Within each state, accident data are separated for different road types according to the Federal-Aid Administrative Classification System, i.e.,

federal-aid interstate (FAI), federal-aid primary (FAP), and federal-aid secondary (FAS). Transportation accident rates (probabilities per shipment-kilometer) are calculated on the basis of these disaggregated data.

One of the important radiation exposure pathways considered in the EAs was the ingestion of contaminated foodstuffs resulting from dispersion and subsequent uptake of radioactive materials following transportation accidents. In the EAs, ingestion doses were computed using a generic approach; agricultural productivity for different types of food and for different regions of the United States were not considered. To adequately represent agricultural production patterns for route-specific analyses and to better approximate potential doses from the ingestion pathway, state-level agricultural data are developed in this report. These data include dairy, meat, and crop production data as well as land area in production for each state.

2 ACCIDENT STATISTICS

A prevalent theme in the comments received on the EAs for the candidate geologic repository sites was that data from national sources or highly aggregated sources were used to develop risk parameters for the comparative analysis. In particular, a single national accident rate for shipments of nuclear materials, based on over 10 years of historical information about such shipments, was used to assess potential transportation risks for all projected SNF shipments through all host and transit states. Many commenters expressed dissatisfaction with this apparent simplification and requested that DOE use actual state-level data in future assessments.

This chapter describes the data base and methodology used to develop a state-specific accident data base for future transportation risk assessment. The purpose is to provide a data base that can be used by a risk computer code to differentiate risk according to the location of populations along shipping routes. The procedure that is being applied to the problem of developing state accident rates is described in Sections 2.1, 2.2, and 2.3. These rates have been developed to be appropriate to the conveyance medium that will be used to transport spent fuel casks, i.e., heavy combination trucks, railcars, and water vessels.

2.1 HIGHWAY TRANSPORT BY HEAVY COMBINATION TRUCKS

2.1.1 Accident Data

Past risk estimation procedures for shipments of nuclear materials have focused on data specific to accidents and incidents involving hazardous and nuclear materials. In the current effort, the recent accident record for the type of vehicle that will be involved in highway transport of spent fuel casks under the NWPA repository program -- i.e., heavy combination trucks -- was examined as an appropriate indicator of risk. Although it may be assumed that trucks carrying spent fuel will be subject to safety precautions greater than the average, the current analysis is conservative in that neither the type of cargo nor the lading status of the truck (i.e., loaded or empty) is a factor and additional safety precautions are disregarded. Risk of highway transportation is therefore defined as the number of accident involvements* of heavy combination trucks in year i per unit of travel by heavy combination trucks in year i (if travel units are reported or estimated in miles, they are converted to kilometers). The rate is therefore a fractional value. Moreover, both loaded and unloaded truck travel is included in the denominator. Further, it was determined that this unit should be disaggregated within state by road type according to the Federal-Aid Administrative Classification System (i.e., FAI, FAP, and FAS road types), which is the basis of the road maintenance and improvement funding formulas under the Federal-Aid Highway Act. Such disaggregation

*An accident involvement is a truck-unit multiplier; for example, the collision of two trucks in a single accident represents two accident involvements.

not only enhances estimation of within-state (between class) variance, to complement the depiction of between-state (nonstratified) variance, but also introduces into the data base a surrogate for objective risk itself (i.e., differences among the systems with respect to average roadway standards and permitted extremes in geometrics).

State-level data, which are readily available, were processed for the numerators of the risk rates (i.e., total counts of accident involvements by road type). The procedure for estimating the denominator was less straightforward but almost equally reliable, as described in Section 2.1.2.

The primary source of heavy combination truck accident data is the *50-T Master File of Accidents of Motor Carriers of Property*, compiled annually from carrier-submitted reports by the Office of Motor Carriers (OMC), formerly the Bureau of Motor Carrier Statistics (BMCS), of the U.S. Department of Transportation (DOT). The 50-T file is the only comprehensive central source of public-use, easily accessed data covering heavy combination truck accident involvements by year for all states. All but a few of the accidents recorded in this file each year involve some configuration (bobtail to "turnpike triple") of heavy combination truck. Reporting requirements in the past have stipulated that carriers must report any accident in which damage to property of \$2,000 or more occurred (reporting of less costly accidents was at the carriers' discretion). Subsequently, the reporting threshold was raised to \$4,200 in 1986, \$4,400 in 1987, and \$4,900 in 1988.

Another source of data covering what are generally the most severe accidents involving heavy trucks is the fatal accident reporting system (FARS), compiled by calendar year by DOT's National Highway Traffic Safety Administration. This file contains a record of every accident in which a fatality is reported. The principal source of these data is accident reports prepared by civil protection authorities. Because such reports generally provide accurate, detailed data for any accident in which a fatality has occurred, the FARS contains the most comprehensive, nationally available descriptions of accident involvements and consequences not subsequently investigated by the National Transportation Safety Board (whose reports are even more thorough and detailed). Each record contains information on vehicle deformation, fire occurrence, jackknife, and rollover situations not generally available in the OMC file; in addition, accident location information by road type is usually more precise. However, the subset of heavy truck accidents contained in the FARS file is not sufficiently unbiased to expand to, or even make reasonable inferences about, the full spectrum of truck accident involvements.

The OMC 50-T public-use file for 1986 was selected as the recommended source for the numerator of the accident unit-risk factor for over-the-road SNF shipments because of its exclusive focus on commercial truck traffic and its high degree of representation of accidents involving such traffic, and because the period covered was the most recent (i.e., representative) that was also complete at the time the task described herein was undertaken. The FARS file for 1985 was selected as the recommended source of the numerator for the nonradiological fatality unit-risk factor because it corresponds to the 1986 50-T record in both timeliness and completeness, but with respect to fatal accidents only. Processing of a single-year cross section as the initial data base for rate estimation accomplished two desired ends: (1) use of data only from a time period representative of post-recession, post-deregulation conditions (i.e., after

1980) in the road transport industry and of the essential completion of the interstate system, and (2) inclusion of the most recent available consistent set of data believed to be complete for the time period covered.

The method of Peterson and Southworth (1984) for estimating state-level truck flows (see Section 2.1.2) represents such a fundamental improvement of the estimation procedure for the state-level risk factor denominator that a commensurate improvement in quality assurance had to be applied to the numerator. Therefore, a state-by-state listing of the salient components of each of the 23,000 heavy truck accident involvement records in the 1986 OMC 50-T master file was generated through the Statistical Analysis System (SAS®) in order to manually assign the accident location provided on each record to the relevant administrative category (FAI-Urban, FAI-Rural, FAP, FAS, or none of the above). This in turn necessitated state-by-state transcription of the FAP system overlay from a national map of that system provided by the regional office of the Federal Highway Administration (FHWA). Although this method is rather cumbersome, it was determined to be at least 50% more accurate than the method used in a pilot study for this task, in which accident records were tabulated according to the road identifier preface of the coded location (assuming that the 50-T records are complete and authentic). Moreover, it enabled efficient "cleanup" of misassigned or miscoded records, which could not be accomplished under the pilot method. It is therefore planned to repeat this procedure during fiscal years 1989-1992 using annual OMC data for the period 1987-1990.

2.1.2 Flow Data

To construct a denominator for the estimate of road accident/fatality risk per shipment-kilometer, it was necessary to develop estimates of total kilometers (converted from miles) of heavy combination truck travel by state per unit time. The following factors must also be considered: (1) a proportion of truck travel is dead-head mileage in which no actual shipment is involved and (2) a truck's accident risk is largely independent of its cargo. Therefore, for both highway and rail activity, all relevant movements, loaded or empty, on the systems of interest are included in the denominator.

In its annual publication *Highway Statistics*, the FHWA (1987) reproduces a series of tables that present the results of data analyses performed using fuel sales data reported by states, vehicle counts by type at official 24-hour counting stations across the country, and data from studies such as the *Truck Inventory and Use Survey* (U.S. Bureau of the Census 1982) regarding vehicular usage patterns and fuel economy. These tables report the following categories:

- Category A -- Estimated vehicle-miles of travel (VMT) by vehicle type on urban and rural roadways,
- Category B -- VMT for all highway vehicles (combined) by state and road functional classification, and
- Category C -- VMT for highway vehicles by state and federal-aid classification.

In order to supply the denominator needed to compute each unit-risk factor for road accident involvements, the FHWA data are used to allocate the appropriate share of the "known" national total VMT by heavy combination trucks in Category A to each state.

Currently, no actual flow data (total truck movements $\times$ miles of road by road type) are available in either state- or national-level summaries -- except as estimated by the FHWA in modeling efforts (not yet certified). According to count station data, a high proportion of heavy combination truck flow (truck share of total miles not known) takes place on the interstate highway system, and this flow is generally higher than the national average in states with one or both of the following characteristics:

- Category 1 -- A large number of commercial and industrial origins and destinations, and/or
- Category 2 -- An interposed location with respect to the major national commodity flow vectors.

Systematic identification and appropriate weighting of these states have heretofore been achievable only through ad hoc methods with statistically weak justification. Recently, however, Peterson and Southworth (1984) have circumvented this problem in their development of a procedure (originally designed to project transportation fuel use) that generates improved estimates of travel miles by vehicle type at the state level.

This procedure begins with the FHWA summaries of the previous year's state-level VMT by functional classification (Category B) and national VMT by vehicle type (Category A). However, it also systematically takes into account information developed by FHWA's ongoing truck weight study (TWS) and highway performance monitoring system (HPMS) file of traffic counting data by type (19 total vehicle classes) and time period; these data are collected by individual states at count stations, several hundred of which are in operation.

The siting of these count stations on each of the eight functional classes of roadway is not random and may, in fact, introduce a bias in favor of relatively higher truck counts. However, the values for Category B (state functional-class VMT data) and Category A (vehicle-type VMT data) may be entered as control margins in an iterative proportional fitting (IPF) cell-filling algorithm using log-linear adjustment techniques (Willekens 1985). This ensures that no published VMT totals (by state or vehicle type) are violated and that each applicable road/vehicle type combination is assigned a nonzero value of VMT within a state (for example, no "rural interstate" road miles exist in Delaware, so no VMT would be assigned to that functional classification there). The resulting VMT matrix can then be used in a subsequent IPF routine for which the control margins are obtained from Category C (state federal-aid VMT) data.

Peterson and Southworth's method expands the three-dimensional matrix of VMT by state, functional class, and administrative class to four dimensions (vehicle information added) using vehicle type proportions from TWS/HPMS count station data. The latter matrix is then collapsed back to three dimensions, dropping Category B but forcing consistency with all totals in Category A and Category C (which has the desired

effect of systematically modifying heavy truck count shares within state and administrative class upward or downward so that they become actual VMT shares). As expected, this increases light and heavy truck shares in corridor states and less densely populated regions and reduces them in the most densely populated states (where truck trip lengths are lower on the average).

Analysis of the results of Peterson and Southworth (1984) yields approximate state-specific indexes for heavy combination truck VMT, as shown in Table 2.1. Although it is feasible to use these new multipliers in future year computations, it would be far more consistent to repeat Peterson and Southworth's procedure with the most recent year's data to determine whether or not state-level rates are stationary. Otherwise, an assumption that heavy truck activity is growing at a uniform national rate applicable within every state would be implicit; based on past data, such an assumption is not tenable.

TABLE 2.1 State-Specific Multiplier Indexes for Heavy Combination Truck VMT

State	Index ^a	State	Index ^a	State	Index ^a
Alabama	1.7	Maine	0.4	Ohio	1.5
Arizona	2.0	Maryland	0.5	Oklahoma	1.3
Arkansas	1.0	Massachusetts	0.4	Oregon	1.2
California	1.25	Michigan	0.5	Pennsylvania	1.1
Colorado	0.6	Minnesota	0.4	Rhode Island	0.3
Connecticut	0.7	Mississippi	0.8	South Carolina	1.0
Delaware	1.7	Missouri	0.9	South Dakota	1.0
Florida	0.7	Montana	2.5	Tennessee	1.0
Georgia	1.5	Nebraska	1.0	Texas	1.0
Idaho	0.75	Nevada	0.75	Utah	1.0
Illinois	1.0	New Hampshire	0.75	Vermont	0.3
Indiana	1.4	New Jersey	0.4	Virginia	1.25
Iowa	1.8	New Mexico	1.7	Washington	1.1
Kansas	0.9	New York	0.6	West Virginia	0.7
Kentucky	1.3	North Carolina	0.8	Wisconsin	0.5
Louisiana	1.25	North Dakota	0.7	Wyoming	2.0

^aMultiplier of the value for state share of combination truck VMT if taken as the computed value of the state's share of total VMT for 1986.

2.2 RAIL TRANSPORT BY FREIGHT TRAIN RAILCARS

2.2.1 Accident Data

As for highway transport, it was deemed appropriate for rail transport to examine the types of railroad shipments that will be involved in relocation of spent fuel. Spent fuel casks will move over railroad routes in sections of one, two, three, or more railcars, up to and including unit (dedicated) trains. Therefore, although the propulsion medium for rail shipments is the locomotive, the conveyance (haulage) medium is the railcar, which has no independent power source and may bear the consequences of forces originating from elsewhere in the train. The rail parallel to the numerator for the truck accident unit-risk factor is total reportable railcar accident involvements by state per unit time. In this case, distinctions may be drawn from available data about the type of track on which an accident occurred (main, yard, siding, or industrial); however, similar partitioning according to track speed class (an index of track physical condition) is very difficult because this parameter is incomplete in accident records and does not appear at all in flow data. Track class may not be a significant variable (Battelle Memorial Institute 1989).

For railroads, reliable sources of empirical information and inference exist for both accidents and fatalities (numerator) and railcar-kilometers (denominator). The source for the numerator is the annual *Accident/Incident Bulletin* compiled from carrier reports by DOT's Federal Railroad Administration (FRA) Office of Safety. This file (available on tape in a public-use version and supplemented by a published annual summary of statistics) contains comprehensive and internally consistent descriptors for each accident, including the state of occurrence. The file is checked by the FRA for duplicate entries (more than one railroad involved in an accident), which are eliminated. By definition, an accident is a collision, derailment, or other event involving the operation of railroad on-track equipment resulting in damages that exceed the reporting threshold (\$4,900 in 1985 and 1986). The 1985 and 1986 files are the most recent complete annual records available for this study, and they have therefore been used for a one-year (1986) and two-year (1985-1986) cross-sectional estimation of rates.

2.2.2 Flow Data

The unit-risk factor denominator based on flow data for rail shipments is total railcar-kilometers moved per unit time by state, yielding the desired ratio of accident involvements per shipment-kilometer. Because rail shipments move on dedicated, privately owned networks, they are much more closely monitored by the carriers themselves through the manifests or waybills required for each shipment. That is, the commodity, number of cars, and actual routing of the shipment are entered into a computer file along with other data. The Interstate Commerce Commission (ICC) requires that all railroads annually report on these shipments by submitting a representative, quality-checked sample of waybills (nominally 1%, but actually higher). The ICC then processes these records into both proprietary data (carriers, origin, and destination points identified) and public-use data (origin, interchange, and destination

states only identified). The public-use file for an average year contains well over 300,000 records; each record is drawn from a specific waybill and includes origin and destination regions, rail miles of the shipment, and (expanded) number of railcars loaded for that shipment.

Expansion factors are applied to obtain a reliable estimate of the total (loaded) shipments in a given year. In its annual handbook, *Railroad Facts*, the Association of American Railroads (1986, 1987) reports the proportion of railcar-miles in the preceding year that were actually involved in shipments; by converting the waybill sample's railcar-miles to railcar-kilometers and dividing by this proportion (usually 50 to 60%), total railcar-kilometers by origin and destination state are obtained.

Finally, these values (cars $\times$ kilometers) are assigned to the appropriate origin, destination, and intervening states. Shipments with origin and destination in the same state require only summation of the (factored) car-kilometers. For interstate shipments, a procedure developed for an earlier project on freight network flow forecasting was utilized. A fully coded version of the FRA national rail network is on file at Argonne National Laboratory; this code includes link-specific movement/impedance costs by commodity type. The impedances appropriate for a typical commodity shipment of high value (but not premium service) were applied to develop a set of most probable flow vectors for all interchanges among each of the 48 states (plus the District of Columbia). These vectors provide length information as well as actual fractions of each state-to-state vector on the rail network that are accounted for by the origination, intervening, and destination states. Thus, an algorithm already constructed to manipulate such vectors was used to allocate each cell total of the state-to-state origin/destination matrix for year 1985 car-kilometers across all appropriate states. This total was multiplied by the corresponding set of fractions and all state fractional allocations were summed into a car-kilometer total by state. This final set of 49 state totals became the denominators for the 1985 risk estimates.

Beginning with the 1986 waybill sample, the ICC no longer provides state origin and destination data in the public-use file but includes such information only at the more aggregated district level of the Bureau of Economic Analysis. This is apparently due to a confidentiality requirement on public-use data; with the recent increase in railroad mergers and consolidations, some states are effectively served by only one rail carrier, and state-level data therefore become carrier-specific data, which remain proprietary. In order to develop 1986 unit-risk denominators consistent with the 1985 assignment procedure, it was necessary to use a secondary source of waybill information, namely, *Railroad Traffic in the United States*, a compendium of statistics developed from the waybill sample and published annually by ALK Associates (1986, 1988). Schematics of interstate railcar movements presented in the compendium, in conjunction with car-movement data from the edition of *Railroad Facts* covering 1986, served as the basis for expanding the 1985 state-level railcar-kilometer totals to 1986 estimated values. Comparison of 1985 and 1986 flow graphs in these publications enabled a reasonable determination of which states had increased rail traffic, decreased traffic, and no net change; expansion factors were applied consistent with both these inferences and with the national control total presented in the 1986 compendium (ALK Associates 1988, p. 43).

2.3 WATER TRANSPORT ON INLAND WATERWAYS AND ALONG THE COASTS

2.3.1 Accident Data

In the context of freight transport by domestic waterways, state borders have no significance. That is, the characteristics of each waterway are independent of the lower political jurisdictions through which it passes because a single national entity, the U.S. Army Corps of Engineers (the Corps), is responsible for maintenance over the entire navigable length of the waterway. Therefore, an administrative decision was made to use each geographic waterway system, rather than each state, as the basis for estimating unit-risk factors for water transport. The Corps manages five such domestic (48-state) waterway systems and the coastwise routes (waterborne within a 32-km limit) of the Atlantic Ocean, Gulf of Mexico, Pacific Ocean, Mississippi River (including the Ohio, Tennessee, Missouri, and Arkansas navigable tributaries), and Great Lakes.

The source of data for barge and other (revenue) marine vessel accidents and damage on the domestic waterway system is the commercial vessel casualty file (CVCF) of the U.S. Coast Guard. Records are continuously compiled from reports of waterway situations in which:

1. Actual physical damage to property exceeds \$25,000,
2. Material damage affects the seaworthiness, maneuverability, or efficiency of a vessel,
3. A vessel is stranded or grounded (with or without damage),
4. Loss of life occurs, and/or
5. Injury occurs causing any person to remain incapacitated for more than 72 hours, except injury to harbor workers not resulting in death and not resulting from vessel casualty or vessel equipment casualty.

The records include vessel characteristics, event, cause, total vessels/crafts involved in the incident, fatalities/injuries, and monetary damage; specific vessel codes indicate whether the vessel was carrying hazardous cargo (U.S. Coast Guard 1984).

The 1985 CVCF was used in developing the numerators for waterborne unit-risk factors because, although the file records now extend well into 1988, the most recent waterway flow data available for use in development of the denominators date from 1985. All 1985 casualty records for the following vessel activities were included: break-in-bulk hauls, barge tows, bulk solid cargoes, oil tankers, container hauls, roll-on roll-off cargoes, unclassified freight hauls, combination (mixed) freight hauls, gas carriers, ore or bulk oil hauls, offshore transfers, bulk liquid chemical hauls, and other unclassified or unknown freight.

All casualties for each waterway were tabulated, and total fatalities and injuries were extracted from the output records. Also, the total vessel involvement in each

situation (often greater than the casualty count) was obtained from each record in order to estimate the likelihood of a craft's involvement in accident-related waterway delays, even if no reportable damage was sustained by that vessel.

2.3.2 Flow Data

Waterway movement statistics were obtained from the Corps' most recent annual report on domestic waterborne commerce, which covers calendar year 1985 (U.S. Army Corps of Engineers 1987). Movement statistics are reported in tons and ton-miles by waterway; in order to convert these values to units consistent with those used in the highway and rail transport analysis, ton-miles were first converted to ton-kilometers by multiplication, then divided by a barge shipment weight that would be representative of future spent fuel movements in large casks. Tobin, Meshkov, and Jones (1985) have estimated this value to be about 500 short tons. Thus, dividing each waterway's ton-kilometer total by 500 yields the shipment-kilometer denominator needed for computing the unit-risk factor.

2.4 SUMMARY OF TRANSPORTATION ACCIDENT DATA

Table 2.2 presents highway data extracted from the OMC 50-T file for 1986, the results of Peterson and Southworth's allocation method, and fatality information from the 1985 FARS file. The values in columns 2 through 6 and 7 through 11 were divided, respectively, by the values in columns 12 through 16 and a corresponding set of values that were normalized to the total 1985 national heavy combination truck VMT (except as noted) to yield quotients in units expressible in shipment-kilometers. Table 2.3 shows the resulting accident, fatality, and injury rates per kilometer according to the Federal-Aid Administrative Classification System; the magnitudes are 10^{-7} , 10^{-8} , and 10^{-7} , respectively (the injury rates were derived from injury counts in the OMC file).

Table 2.4 shows the corresponding data from the 1986 FRA *Accident/Incident Bulletin* (DOT 1986) and the 1985 ICC waybill sample public-use tape, expanded to 1986 as described above, and the resulting one- and two-year rates for railcar accidents by state. These rates are reported for total accidents (main plus siding plus yard) and mainline-only accidents involving railcars on carrier property. The great majority of railcar accidents in many states occur in railyards (therefore at low speeds) and, even when all accidents are counted, the rate for rail operations per unit shipping distance is consistently less than for truck operations. Moreover, fatalities due to railroad accidents are so low that a single value is applied for all operations.

Table 2.5 presents first-level estimates of vessel accident and casualty involvement counts and unit-risk factors by waterway. The sources of these estimates are the 1985 Coast Guard casualty file and the Corps data on waterborne commerce. As with rail, fatalities and injuries are relatively infrequent in domestic waterway movements, perhaps due to the low speed of the crafts involved. However, the probability of a vessel accident involvement is significantly higher than sustaining reportable damage or any other casualty, especially on the relatively congested Mississippi River and Gulf of Mexico waterway systems.

TABLE 2.2 Reportable Highway Combination Truck Accidents, Fatalities, and Estimated Flows by State and Road Type, 1986^a

State	Combination Truck Accidents					Truck Accident Fatalities					Estimated Heavy Truck Traffic (10 ⁶ km)				
	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS
Alabama	78	98	176	228	49	8	20	28	45	0	700.5	978.5	1679.0	1491.5	386.2
Arizona	39	142	181	49	10	4	49	53	23	7	295.3	1750.8	2006.1	680.4	109.5
Arkansas	57	108	165	195	34	4	18	22	79	6	135.7	381.6	517.3	619.2	70.0
California	223	170	393	307	16	76	52	128	218	40	1742.1	9810.2	11552.3	4572.1	772.4
Colorado	56	62	118	83	17	6	25	31	31	4	253.8	344.6	598.4	476.6	43.9
Connecticut	165	44	209	39	11	7	7	14	13	2	585.4	225.1	810.5	164.6	37.4
Delaware	21	-	21	37	4	2	-	2	10	0	151.1	0	151.1	261.8	55.0
Florida	118	102	220	301	43	9	31	40	124	25	896.6	1154.2	2050.8	1581.0	152.4
Georgia	192	184	376	273	44	14	27	41	114	19	1455.3	1941.6	3396.9	1362.0	385.9
Idaho	9	43	52	40	7	0	8	8	16	3	28.2	201.2	229.4	152.2	66.2
Illinois	472	186	658	317	13	12	34	46	79	7	1547.7	1403.6	2951.3	1301.1	129.9
Indiana	273	172	445	378	35	5	25	30	72	21	382.4	1485.3	1867.7	1319.5	419.8
Iowa	40	124	164	139	16	1	4	5	44	4	223.1	733.8	956.9	914.2	336.8
Kansas	57	63	120	177	1	2	7	2	56	4	131.6	396.3	527.9	569.5	80.5
Kentucky	37	110	197	107	55	8	27	35	52	20	329.9	1051.7	1381.6	564.8	464.2
Louisiana	75	78	153	146	30	3	16	19	60	28	402.9	1029.9	1432.8	629.6	258.1
Maine	14	22	36	32	4	0	1	1	7	4	12.7	116.1	128.8	103.5	29.5
Maryland	154	76	230	141	19	9	6	15	40	5	327.9	465.3	793.2	383.9	28.6
Massachusetts	53	53	106	43	23	6	0	6	16	2	486.2	222.6	708.8	315.3	45.7
Michigan	179	98	277	175	3	19	17	36	48	13	395.9	909.1	1305.0	645.7	195.4
Minnesota	45	54	99	130	17	1	7	8	50	3	96.8	194.5	291.3	473.0	64.2
Mississippi	33	55	88	187	11	3	25	28	61	18	71.9	369.7	441.6	385.7	49.3
Missouri	173	148	321	236	34	21	16	37	63	10	296.5	770.0	1066.5	1022.1	173.9
Montana	18	48	66	53	3	1	9	10	20	1	18.2	492.7	510.9	630.6	61.7
Nebraska	21	56	77	69	2	0	10	10	26	0	50.0	308.0	358.0	354.8	64.9
Nevada	19	42	61	24	5	0	12	12	5	1	53.7	237.0	290.7	98.9	29.1

TABLE 2.2 (Cont'd)

State	Combination Truck Accidents					Truck Accident Fatalities					Estimated Heavy Truck Traffic (10 ⁶ km)				
	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS
New Hampshire	0	6	6	26	7	1	0	1	9	0	38.9	177.2	216.1	149.0	31.0
New Jersey	140	149	289	214	29	18	3	21	38	11	735.8	134.3	870.1	419.3	96.3
New Mexico	24	97	121	57	7	4	23	27	37	6	111.2	746.4	857.6	378.5	75.3
New York	212	211	423	217	74	23	19	42	59	11	1593.4	812.1	2405.5	1152.8	36.0
North Carolina	111	133	244	287	97	10	18	28	87	52	178.7	726.2	904.9	1133.0	602.2
North Dakota	3	18	21	24	0	0	2	2	3	0	10.5	135.6	146.1	126.2	34.8
Ohio	199	397	596	368	101	23	33	56	86	22	2122.6	2576.2	4698.8	2176.3	873.3
Oklahoma	60	74	134	136	25	11	17	28	60	18	437.1	797.3	1234.4	1064.2	260.0
Oregon	36	128	164	130	9	2	7	9	47	8	222.9	700.5	923.4	531.0	91.2
Pennsylvania	151	565	716	496	53	25	69	94	86	4	624.3	2232.9	2857.2	2015.1	308.0
Rhode Island	13	5	18	5	2	3	0	3	0	0	58.8	24.3	83.1	29.4	4.1
South Carolina	22	108	130	177	19	10	12	22	59	13	99.1	787.9	887.0	672.7	136.0
South Dakota	0	32	32	41	1	1	4	5	8	0	6.7	187.0	193.7	126.7	20.8
Tennessee	154	185	339	199	8	17	40	57	55	13	260.6	1184.6	1445.2	662.9	217.7
Texas	291	272	563	461	54	68	60	128	237	72	2315.2	2473.5	4788.7	3901.8	843.9
Utah	23	79	102	45	4	8	7	15	18	3	212.5	313.8	526.3	216.7	70.2
Vermont	0	12	12	26	4	0	0	0	7	1	5.8	67.4	73.2	80.0	26.7
Virginia	75	224	299	230	30	10	16	26	61	13	748.6	672.5	1421.1	1583.1	945.1
Washington	38	106	144	80	11	5	3	8	48	4	464.1	741.6	1205.7	691.1	669.4
West Virginia	25	100	125	130	21	1	7	8	28	2	33.0	276.3	309.3	177.8	101.7
Wisconsin	50	111	161	192	12	4	10	14	58	5	92.7	165.8	258.5	835.7	69.1
Wyoming	14	145	159	41	5	0	8	8	8	2	20.1	376.3	396.4	178.1	25.9

^aAccidents = accident involvements of heavy combination trucks; fatalities = accident-related deaths occurring up to 30 days after date of accident; FAI-U = Federal-Aid Interstate highway system in urbanized areas; FAI-R = Federal-Aid Interstate highway system in rural areas; FAI = Federal-Aid Interstate highway system (urban and rural combined); FAP = Federal-Aid-Primary highway system; FAS = Federal-Aid Secondary (rural) highway system.

TABLE 2.3 Highway Combination Truck Accident, Fatality, and Injury Rates Based on Reportable Accidents, 1986

State	Truck Accident Involvement Rates (10 ⁻⁷ accidents per shipment-kilometer)					Truck Accident Fatality Rates (10 ⁻⁸ fatalities per shipment-kilometer)					Truck Accident Injury Rates (10 ⁻⁸ injuries per shipment-kilometer)				
	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS
Alabama	1.11	1.00	1.05	1.53	1.27	1.19	2.13	1.74	3.14	0.62	1.07	1.04	1.05	1.68	1.42
Arizona	1.32	0.81	0.88	0.72	0.91	1.41	2.92	2.70	3.52	6.66	1.39	0.75	0.85	0.91	2.65
Arkansas	4.20	2.83	3.19	3.15	4.86	3.07	4.91	4.43	13.29	8.93	2.14	3.70	3.31	2.70	4.43
California	1.28	0.17	0.34	0.67	0.21	4.54	0.55	1.15	4.97	5.39	0.98	0.20	0.31	0.69	0.21
Colorado	2.21	1.80	1.97	1.74	3.87	2.46	7.56	5.40	6.78	9.49	1.54	2.06	1.84	1.95	2.96
Connecticut	2.82	1.95	2.58	2.37	2.94	1.25	3.24	1.80	8.22	5.57	1.38	3.73	2.04	2.00	3.74
Delaware	1.39	-	1.39	1.41	0.73	1.38	-	1.38	3.98	0.62	3.64	-	3.64	1.30	0.36
Florida	1.32	0.88	1.07	1.90	2.82	1.05	2.80	2.03	8.17	17.09	1.24	0.94	1.07	1.93	2.82
Georgia	1.32	0.95	1.11	2.00	1.14	1.00	1.45	1.26	8.72	5.13	1.05	1.27	1.17	2.14	1.01
Idaho	3.19	2.14	2.27	2.63	1.06	0.47	4.14	3.63	10.95	4.72	2.48	1.79	1.87	2.04	1.36
Illinois	3.05	1.33	2.23	2.44	1.00	0.81	2.52	1.62	6.32	5.61	2.60	0.95	1.81	2.37	0.85
Indiana	7.14	1.16	2.38	2.86	0.83	1.36	1.75	1.68	5.68	5.21	7.01	0.97	2.19	2.55	0.76
Iowa	1.79	1.69	1.71	1.52	0.48	0.47	0.57	0.54	5.01	1.24	1.70	1.25	1.36	1.15	0.33
Kansas	4.33	1.59	2.27	3.11	0.12	1.58	1.84	1.78	10.24	5.18	3.34	1.72	2.12	2.21	0.13
Kentucky	2.64	1.05	1.43	1.89	1.18	2.53	2.67	2.64	9.59	4.49	3.88	0.89	1.61	1.79	1.21
Louisiana	1.86	0.76	1.07	2.32	1.16	0.78	1.62	1.38	9.93	11.30	2.88	0.71	1.32	3.07	1.12
Maine	11.02	1.89	2.80	3.09	1.36	0.47	0.90	0.81	7.05	14.12	6.30	1.21	1.71	2.22	1.02
Maryland	4.70	1.63	2.90	3.67	6.04	2.86	1.34	1.97	10.85	18.21	5.54	1.42	3.14	4.09	5.59
Massachusetts	1.09	2.38	1.50	1.36	6.13	1.29	0.42	0.88	5.29	4.56	0.78	1.39	0.97	1.17	5.47
Michigan	4.52	1.08	2.12	2.71	0.15	5.00	1.95	2.87	7.74	6.93	4.07	0.75	1.75	2.60	0.15
Minnesota	4.65	2.78	3.40	2.75	2.65	1.08	3.75	2.86	11.01	4.87	3.51	1.49	2.16	2.07	1.71
Mississippi	4.59	1.49	1.99	4.85	2.23	4.35	7.04	6.60	16.47	38.03	3.89	1.51	1.90	5.42	1.62
Missouri	5.83	1.92	3.01	2.31	1.96	7.38	2.16	3.61	6.42	5.99	6.37	1.90	3.12	2.30	1.44
Montana	9.89	0.97	1.29	0.84	0.49	5.72	1.90	2.04	3.30	1.69	4.95	0.75	0.90	0.62	0.16
Nebraska	4.20	1.82	2.15	1.94	0.31	0.47	3.38	2.91	7.63	0.62	3.60	1.36	1.68	1.61	0.15
Nevada	3.54	1.77	2.10	2.43	1.72	0.47	5.27	4.30	5.27	3.58	2.05	1.60	1.69	1.72	2.41

TABLE 2.3 (Cont'd)

State	Truck Accident Involvement Rates (10^{-7} accidents per shipment-kilometer)					Truck Accident Fatality Rates (10^{-8} fatalities per shipment-kilometer)					Truck Accident Injury Rates (10^{-8} injuries per shipment-kilometer)				
	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS
New Hampshire	0.82	0.34	0.28	1.74	2.26	2.68	0.42	0.46	6.29	0.62	0.69	0.09	0.11	1.88	1.29
New Jersey	1.90	11.09	3.32	5.10	3.01	2.55	2.33	2.51	9.44	11.90	1.83	12.21	3.44	5.89	5.09
New Mexico	2.16	1.30	1.41	1.51	0.93	3.75	3.21	3.28	10.18	8.30	1.08	1.09	1.08	1.27	0.66
New York	1.23	2.60	1.76	1.88	20.56	1.50	2.44	1.82	5.33	31.83	1.05	2.17	1.42	1.48	18.61
North Carolina	6.21	1.83	2.70	2.53	1.61	5.83	2.58	3.22	7.99	8.99	6.55	1.57	2.55	2.86	1.63
North Dakota	2.86	1.33	1.44	1.90	6.12	0.47	1.54	1.43	2.48	0.62	2.86	0.74	0.89	1.51	0.13
Ohio	0.94	1.54	1.27	1.69	1.16	1.13	1.33	1.24	4.12	2.62	0.84	1.37	1.12	1.75	1.26
Oklahoma	1.37	0.93	1.09	1.28	0.96	2.62	2.22	2.36	5.87	7.21	1.35	0.90	1.06	1.08	0.81
Oregon	1.62	1.83	1.78	2.45	0.99	0.93	1.04	1.02	9.22	9.14	1.57	1.20	1.29	1.88	0.44
Pennsylvania	2.42	2.53	2.51	2.46	1.72	4.17	3.22	3.43	4.45	1.35	2.08	2.44	2.35	2.61	1.66
Rhode Island	2.21	2.06	2.17	1.70	4.88	5.31	0.42	3.76	2.48	0.62	2.72	1.65	2.41	0.34	0.13
South Carolina	2.22	1.37	1.47	2.63	1.40	10.51	1.59	2.58	9.14	9.96	2.32	1.37	1.48	2.79	1.32
South Dakota	0.82	1.71	1.65	3.24	0.46	15.55	2.23	2.69	6.57	0.62	0.67	0.70	0.69	2.60	0.13
Tennessee	5.91	1.56	2.35	3.00	0.37	6.30	3.52	4.11	8.64	6.22	5.72	1.45	2.21	3.03	0.32
Texas	1.26	1.10	1.18	1.18	0.64	3.06	2.53	2.78	6.32	8.89	1.12	0.90	1.00	1.09	0.51
Utah	1.08	2.52	1.94	2.08	0.57	3.92	2.32	2.97	8.65	4.45	0.94	2.36	1.79	1.85	0.28
Vermont	0.82	1.78	1.64	3.25	1.50	0.47	0.42	0.48	9.11	3.90	0.69	1.04	0.96	2.38	1.50
Virginia	1.00	3.33	2.10	1.45	0.32	1.39	2.48	1.91	4.02	1.43	0.96	3.05	1.94	1.56	0.33
Washington	0.82	1.43	1.19	1.16	0.16	1.12	0.42	0.69	7.23	0.62	0.69	1.12	0.95	0.78	0.13
West Virginia	7.58	3.62	4.04	7.31	2.06	3.16	2.64	2.69	16.40	2.05	7.58	3.22	3.69	7.71	1.47
Wisconsin	5.39	6.69	6.23	2.30	1.74	4.49	6.28	5.64	7.23	7.54	4.32	5.73	5.22	2.11	1.59
Wyoming	6.97	3.85	4.01	2.30	1.93	0.47	2.21	2.26	4.68	8.05	0.69	3.24	3.08	1.40	0.77

TABLE 2.4 Total and Mainline-Only Reportable Railroad Freight Car Accidents, Estimated Railcar-Kilometers for 1986, and Accident Rates for 1986 and 1985-1986 Combined^a

State	1986 Accidents Involving Railcars		1986 Estimated Railcar- Kilometers	Rail Freight Accident Rates			
	Total	Mainline Only		1986		1985-1986 Combined (10 ⁻⁸ accidents per railcar-kilometer)	
				Total	Mainline Only	Total	Mainline Only
Alabama	40	17	8.51 × 10 ⁸	4.70	2.00	6.08	2.54
Arizona	24	18	1.72 × 10 ⁹	1.40	1.05	2.27	1.52
Arkansas	39	21	7.33 × 10 ⁸	5.32	2.86	7.59	4.16
California	127	63	2.27 × 10 ⁹	5.59	2.77	6.94	2.99
Colorado	23	16	1.39 × 10 ⁹	1.66	1.15	2.06	1.21
Connecticut	5	3	1.13 × 10 ⁷	44.12	26.47	47.06	15.69
Delaware	3	1	1.09 × 10 ⁷	27.44	9.15	13.51	4.50
District of Columbia	0	0	6.00 × 10 ⁵	1.00	0.52	80.00	0.67
Florida	25	17	8.03 × 10 ⁸	3.11	2.12	4.50	2.28
Georgia	80	35	1.10 × 10 ⁹	7.26	3.17	7.22	3.02
Idaho	18	16	3.05 × 10 ⁸	5.90	5.25	6.23	4.43
Illinois	395	90	2.51 × 10 ⁹	15.71	3.58	15.38	3.37
Indiana	74	28	1.46 × 10 ⁹	5.07	1.92	6.75	2.51
Iowa	127	48	2.30 × 10 ⁸	20.17	7.62	19.71	7.89
Kansas	83	42	2.16 × 10 ⁹	3.85	1.95	4.38	1.91
Kentucky	61	30	1.05 × 10 ⁹	5.83	2.87	6.37	3.38
Louisiana	61	27	4.18 × 10 ⁸	14.58	6.45	17.90	5.93
Maine	11	7	3.54 × 10 ⁷	31.04	19.75	42.33	19.75
Maryland	30	14	3.95 × 10 ⁸	7.59	3.54	7.89	3.58
Massachusetts	21	10	1.70 × 10 ⁸	12.33	5.87	15.42	6.82
Michigan	86	35	4.04 × 10 ⁸	21.31	8.67	20.34	8.63

TABLE 2.4 (Cont'd)

State	1986 Accidents Involving Railcars			Rail Freight Accident Rates			
	Total	Mainline Only	1986 Estimated Railcar- Kilometers	1986		1985-1986 Combined (10^{-8} accidents per railcar-kilometer)	
				Total	Mainline Only	Total	Mainline Only
Minnesota	144	36	1.29×10^9	11.20	2.80	11.83	2.88
Mississippi	48	34	3.03×10^8	15.82	11.20	13.82	8.73
Missouri	122	51	2.03×10^9	6.02	2.52	7.61	2.75
Montana	32	23	2.08×10^9	1.54	1.11	2.05	1.34
Nebraska	82	37	1.61×10^9	5.10	2.30	5.74	2.99
Nevada	7	4	2.14×10^8	3.27	1.87	4.19	2.96
New Hampshire	1	1	1.52×10^7	6.60	6.60	22.26	19.79
New Jersey	24	4	1.51×10^8	15.84	2.64	16.88	4.57
New Mexico	21	11	2.10×10^9	1.00	0.52	1.11	0.67
New York	52	28	6.64×10^8	7.84	4.22	10.50	5.02
North Carolina	25	12	4.45×10^8	5.62	2.70	5.71	2.24
North Dakota	27	18	1.15×10^9	2.35	1.57	4.57	3.27
Ohio	149	60	2.08×10^9	7.18	2.89	7.28	2.69
Oklahoma	57	30	8.96×10^8	6.36	3.35	6.68	3.87
Oregon	51	20	3.83×10^8	13.30	5.22	13.14	5.55
Pennsylvania	95	57	1.69×10^9	5.63	3.97	5.53	3.46
Rhode Island	0	0	2.34×10^5	1.00	0.52	219.30	0.67
South Carolina	16	7	3.24×10^8	4.94	2.16	6.27	3.06
South Dakota	13	10	1.59×10^8	8.16	6.27	2.63	2.15
Tennessee	69	18	1.00×10^9	6.87	1.79	6.33	1.64
Texas	290	122	3.30×10^9	8.79	3.70	10.39	4.03
Utah	13	5	2.98×10^8	4.36	1.68	5.67	2.30

TABLE 2.4 (Cont'd)

State	1986 Accidents Involving Railcars			Rail Freight Accident Rates			
			1986 Estimated Railcar- Kilometers	1986		1985-1986 Combined (10^{-8} accidents per railcar-kilometer)	
	Total	Mainline Only		Total	Mainline Only	Total	Mainline Only
Vermont	3	1	3.35×10^7	8.96	2.99	19.42	13.45
Virginia	70	17	1.19×10^9	5.86	1.42	5.48	1.76
Washington	36	11	7.94×10^8	4.53	1.38	4.59	1.60
West Virginia	73	54	5.74×10^8	12.71	9.40	12.37	8.97
Wisconsin	95	35	4.52×10^8	21.00	7.74	20.22	7.77
Wyoming	33	17	1.10×10^9	3.01	1.55	4.01	2.91
Total U.S.	2990	1279	4.47×10^{10}	6.68	2.86	7.34	3.09

^aStates with no recorded accidents on any type of rail line were assigned the lowest observed state-level rate for that column. Thus, several states have identical (low) rates for a given category. The national average fatality rate for railcar accident involvements averaged over 1985 and 1986 data is 1.26×10^{-9} per railcar-kilometer. This value excludes fatalities due to railroad "incidents" (on-track events in which the railroad property damage does not exceed the reporting threshold) because comparable truck "incidents" are not included in the OMC 50-T file.

TABLE 2.5 Freight Vessel Accident and Casualty Involvement Rates on Domestic Waterways of the United States, Including Coastwise Shipping, 1985

Waterway System	Total Accident Count	Total Accident Involvements ^b (no. of vessels)	Total Vessel Casualty Count ^c	Accident and Casualty Rates ^a (10^{-6} involvements per shipment-kilometer)	
				Accident	Casualty
Atlantic Coast	229	379	349	4.75	4.37
Gulf Coast	215	556	475	4.73	4.04
Pacific Coast	68	115	2157	1.80	1.51
Mississippi River (including Ohio Tennessee and Missouri systems)	412	3509	97	4.85	2.98
Great Lakes	77	151	127	0.62	0.52
Average for inland waterways ^d	1001	4710	3205	3.83	2.79
Coastwise movements ^d	148	220	270	0.14	0.12

^aEstimated shipment weight for spent fuel cask on barge is 500 short tons (based on Tobin, Meshkov, and Jones 1985).

^bCount of vessels involved in accidents.

^cCount of vessels sustaining reportable damage, fatality, or injury.

^dComposite fatality rate for inland waterway movements is 2.32×10^{-8} per shipment-kilometer; fatality rate for all domestic water traffic (including coastwise) is 1.04×10^{-8} . Composite injury rate for inland waterway movements is 3.54×10^{-8} per shipment-kilometer; injury rate for all domestic water traffic (including coastwise) is 1.39×10^{-8} .

3 AGRICULTURAL STATISTICS

Food pathways were not considered in the transportation accident scenarios modeled in the EAs. The EA modeling used only a generic transfer factor for deriving the potential ingestion dose from an accident during the transport of SNF and HLW to any of the nominated geologic repository sites. No state-specific data were used to estimate the potential for food chain uptake. This approach ignored the variation in productive capability of states located in different areas of the country and thus ignored the potential for accident impacts (through the food chain) to be greater in some states than others.

In order to incorporate food chain uptakes into the transportation modeling, values for agricultural production for all states were calculated. Agricultural production was divided into three main food groups: crops, meat (including eggs), and dairy. These three groups were selected because they correspond to the food groups considered in past studies relating to the food chain by the U.S. Nuclear Regulatory Commission. However, the U.S. Department of Agriculture (USDA) defines four major food groups: fruits and vegetables, cereals and grains, dairy and dairy products, and meat and meat alternatives. The first two of these USDA categories were combined to form the "crop" category considered in this report. The latter two USDA categories correspond directly to the dairy and meat categories used here. Production of each of the three main food groups is discussed in detail in Section 3.1 and Appendix A. Per capita consumption of these food groups is discussed in Section 3.2.

The 1982 *Census of Agriculture* (U.S. Bureau of the Census [USBC] 1984) was used as the primary source for all agricultural statistics, unless otherwise noted. The USDA Statistical Reporting Service was the secondary source of data. Although later statistics are available in some areas, the 1982 data were used for consistency across categories. These data represent a summary of agricultural statistics suitable for national-level modeling. If more-site-specific models are used, it is recommended that county-level agricultural statistics be combined with geographic information showing the location of agricultural land in each county.

3.1 AGRICULTURAL PRODUCTION

Production data by state for the agricultural products included in the crop, meat, and dairy categories were obtained from the USBC (1984) and USDA (1985a, 1985b, and 1985c), and are listed in Appendix A. These data were input into a spreadsheet program for data manipulation, and the results are also listed in Appendix A. The formulas for manipulating the data are given in Appendix B, along with details (e.g., tables and page numbers) on the USBC and USDA data sources. Summary tables showing aggregate state production totals and production per unit area in the crop, meat, and dairy categories are presented and discussed in Sections 3.1.1-3.1.3.

3.1.1 Crops

Crops are defined as corn, wheat, soybeans, potatoes, honey, sorghum, barley, oats, rye, sunflowers, dry beans, dry peas, sweet potatoes, sugar beets, peanuts, apples, cherries, grapes, nectarines, peaches, pears, plums and prunes, and other fruits. Crops produced specifically for animal feed, such as corn for silage, are not included. Although the census data are primarily reported in bushels, the spreadsheet program converted these data to pounds based on the following conversion factors (lb/bu): corn, sorghum, and rye, 56; wheat and soybeans, 60; barley, 48; oats, 32; and sweet potatoes, 55. These conversion factors were obtained from Jahnke (1987). Some crop data, e.g., fruits and nuts, are available in pounds and did not require conversion. The total weight of all crops produced in each state is presented in Table 3.1.

For land area in farms, crop production in pounds per acre and kilograms per square kilometer is summarized in Table 3.2. This calculation was carried out by multiplying the percentage of land in farms (Table 3.1) by total land in the state (Table 3.1) and dividing production in each major category by the resulting "land in farms" number. These values represent the average weight of crops produced per unit area in a given state. The rationale for using land in farms is that average production per acre is a more accurate representation of production on a given acre of agricultural land. The data presented in Table 3.3 represent production calculated using the total land area in the state. This results in a lower production number per unit area. Use of the data in Table 3.2 (land in farms) will result in more conservative estimates in modeling because agricultural production per unit area will be higher.

3.1.2 Meat and Eggs

Meat production includes cattle, calves, hogs, pigs, broilers, chickens, turkeys, and eggs. Data from the 1982 Census of Agriculture (U.S. Bureau of the Census 1984) were used for red meat, and data from the USDA (1985c) Statistical Bulletin 725 were used for poultry. These data represent the actual number of animals sold (with the exception of poultry). In the case of cattle/calves, only 55.13% of the animals sold were slaughtered, thus making their way into the food chain. This value was used to convert sales to slaughter for cattle/calves (ratio of animals sold to animals slaughtered in 1982 as reported in *Meatfacts* (American Meat Institute 1986). The average weight of cattle/calves was obtained either from *Meatfacts* or by the following calculation:

$$\text{weighted average} = \frac{(\text{cattle} \times \text{lb}) + (\text{calves} \times \text{lb})}{\text{cattle} + \text{calves}}$$

The total pounds produced in the state was calculated by:

$$\text{total pounds} = \text{state sales} \times \% \text{ slaughtered} \times \text{weighted average}$$

TABLE 3.1 Summary of Total State Agricultural Production, 1982^a

State	Land in State ^a (acres)	Land in Farms ^a (%)	Total Production (lb)		
			Crops	Meat	Dairy
Alabama	3.25×10^7	31.4	5.11×10^9	2.08×10^9	5.80×10^8
Alaska	3.65×10^8	0.4	2.03×10^7	2.85×10^6	1.38×10^7
Arizona	7.26×10^7	52.0	2.69×10^9	4.12×10^8	1.20×10^9
Arkansas	3.33×10^7	44.1	1.06×10^{10}	2.91×10^9	8.28×10^8
California	1.00×10^8	32.1	3.83×10^{10}	3.04×10^9	1.45×10^{10}
Colorado	6.63×10^7	50.6	1.49×10^{10}	1.32×10^9	9.72×10^8
Connecticut	3.12×10^6	14.2	1.21×10^8	1.66×10^8	6.44×10^8
Delaware	1.24×10^6	53.0	1.60×10^9	5.49×10^8	1.37×10^8
Florida	3.47×10^7	37.0	1.84×10^{10}	1.07×10^9	2.11×10^9
Georgia	3.72×10^7	33.1	1.05×10^{10}	2.93×10^9	1.41×10^9
Hawaii	4.11×10^6	47.6	1.24×10^8	7.89×10^7	1.44×10^8
Idaho	5.27×10^7	26.4	2.53×10^{10}	5.72×10^8	2.25×10^9
Illinois	3.56×10^7	80.7	1.05×10^{11}	2.13×10^9	2.66×10^9
Indiana	2.30×10^7	70.9	5.22×10^{10}	2.06×10^9	2.33×10^9
Iowa	3.58×10^7	91.0	1.01×10^{11}	5.57×10^9	4.00×10^9
Kansas	5.23×10^7	89.9	4.39×10^{10}	2.81×10^9	1.36×10^9
Kentucky	2.54×10^7	55.8	1.14×10^{10}	7.11×10^8	2.36×10^9
Louisiana	2.85×10^7	31.3	5.51×10^9	5.03×10^8	9.75×10^8
Maine	1.98×10^7	7.4	2.67×10^9	2.86×10^8	7.27×10^8
Maryland	6.30×10^6	40.6	4.93×10^9	8.96×10^8	1.58×10^9
Massachusetts	5.01×10^6	12.2	2.03×10^8	7.01×10^7	6.02×10^8
Michigan	3.65×10^7	30.0	2.55×10^{10}	7.29×10^8	5.25×10^9
Minnesota	5.09×10^7	54.4	6.62×10^{10}	2.65×10^9	1.03×10^{10}
Mississippi	3.02×10^7	41.1	7.28×10^9	1.25×10^9	9.00×10^8
Missouri	4.41×10^7	66.3	2.66×10^{10}	2.19×10^9	2.91×10^9
Montana	9.30×10^7	65.1	1.52×10^{10}	6.97×10^8	3.41×10^8
Nebraska	4.91×10^7	91.7	5.71×10^{10}	3.29×10^9	1.34×10^9
Nevada	7.03×10^7	14.2	6.48×10^8	9.92×10^7	2.25×10^8

TABLE 3.1 (Cont'd)

State	Land in State ^a (acres)	Land in Farms ^a (%)	Total Production (lb)		
			Crops	Meat	Dairy
New Hampshire	5.76×10^6	8.2	5.34×10^7	3.41×10^7	3.65×10^8
New Jersey	4.78×10^6	19.2	1.38×10^9	6.77×10^7	4.92×10^8
New Mexico	7.77×10^7	60.6	1.80×10^9	4.58×10^8	8.12×10^8
New York	3.03×10^7	30.3	7.36×10^9	5.59×10^8	1.11×10^{10}
North Carolina	3.13×10^7	33.0	1.30×10^{10}	2.65×10^9	1.69×10^9
North Dakota	4.44×10^7	90.7	3.65×10^{10}	4.52×10^8	1.02×10^9
Ohio	2.62×10^7	58.7	3.48×10^{10}	1.30×10^9	4.55×10^9
Oklahoma	4.39×10^7	73.7	1.22×10^{10}	1.52×10^9	1.17×10^9
Oregon	6.16×10^7	28.8	8.05×10^9	5.04×10^8	1.30×10^9
Pennsylvania	2.87×10^7	28.9	9.27×10^9	1.57×10^9	9.26×10^9
Rhode Island	6.75×10^5	9.3	7.72×10^7	1.24×10^7	4.60×10^7
South Carolina	1.93×10^7	28.9	4.79×10^9	5.55×10^8	5.67×10^8
South Dakota	4.86×10^7	90.1	2.18×10^{10}	1.39×10^9	1.76×10^9
Tennessee	2.63×10^7	47.4	7.86×10^9	8.75×10^8	2.33×10^9
Texas	1.68×10^8	78.3	3.27×10^{10}	4.88×10^9	3.78×10^9
Utah	5.25×10^7	18.6	1.24×10^9	2.68×10^8	1.16×10^9
Vermont	5.93×10^6	26.5	1.32×10^8	6.71×10^7	2.39×10^9
Virginia	2.54×10^7	37.1	6.23×10^9	1.05×10^9	2.06×10^9
Washington	4.26×10^7	38.7	1.95×10^{10}	6.50×10^8	3.22×10^9
West Virginia	1.54×10^7	23.1	7.45×10^8	2.23×10^8	3.49×10^8
Wisconsin	3.48×10^7	49.5	2.34×10^{10}	1.31×10^9	2.32×10^{10}
Wyoming	6.21×10^7	54.0	3.20×10^9	3.54×10^8	1.37×10^8
U.S. Total	2.27×10^9	43.6	1.13×10^{12}	6.20×10^{10}	1.36×10^{11}

^aSources given in Appendix B; crops, meat, and dairy defined in Section 3.1.

TABLE 3.2 Summary of State Agricultural Production for Land in Farms, 1982^a

State	Crops		Meat		Dairy	
	lb/acre	kg/km ²	lb/acre	kg/km ²	lb/acre	kg/km ²
Alabama	5.00×10^2	1.76×10^4	2.04×10^2	7.19×10^3	5.69×10^1	2.00×10^3
Alaska	1.39×10^1	6.22×10^0	1.95×10^0	8.73×10^{-1}	9.44×10^0	4.23×10^0
Arizona	7.13×10^1	4.15×10^3	1.09×10^1	6.36×10^2	3.18×10^1	1.85×10^3
Arkansas	7.24×10^2	3.58×10^4	1.98×10^2	9.77×10^3	5.63×10^1	2.78×10^3
California	1.19×10^3	4.29×10^4	9.46×10^1	3.41×10^3	4.52×10^2	1.63×10^4
Colorado	4.44×10^2	2.52×10^4	3.94×10^1	2.24×10^3	2.90×10^1	1.64×10^3
Connecticut	2.74×10^2	4.36×10^3	3.75×10^2	5.97×10^3	1.45×10^3	2.32×10^4
Delaware	2.45×10^3	1.45×10^5	8.38×10^2	4.98×10^4	2.09×10^2	1.24×10^4
Florida	1.43×10^3	5.94×10^4	8.37×10^1	3.47×10^3	1.64×10^2	6.82×10^3
Georgia	8.50×10^2	3.15×10^4	2.38×10^2	8.84×10^3	1.15×10^2	4.26×10^3
Hawaii	6.33×10^1	3.38×10^3	4.03×10^1	2.15×10^3	7.36×10^1	3.93×10^3
Idaho	1.81×10^3	5.37×10^4	4.11×10^1	1.22×10^3	1.62×10^2	4.79×10^3
Illinois	3.64×10^3	3.29×10^5	7.41×10^1	6.70×10^3	9.25×10^1	8.36×10^3
Indiana	3.20×10^3	2.54×10^5	1.26×10^2	1.00×10^4	1.43×10^2	1.14×10^4
Iowa	3.11×10^3	3.17×10^5	1.71×10^2	1.74×10^4	1.23×10^2	1.25×10^4
Kansas	9.32×10^2	9.40×10^4	5.96×10^1	6.01×10^3	2.88×10^1	2.90×10^3
Kentucky	8.07×10^2	5.05×10^4	5.02×10^1	3.14×10^3	1.67×10^2	1.04×10^4
Louisiana	6.18×10^2	2.17×10^4	5.64×10^1	1.98×10^3	1.09×10^2	3.84×10^3
Maine	1.82×10^3	1.51×10^4	1.95×10^2	1.62×10^3	4.95×10^2	4.11×10^3
Maryland	1.93×10^3	8.79×10^4	3.50×10^2	1.59×10^4	6.19×10^2	2.81×10^4
Massachusetts	3.32×10^2	4.55×10^3	1.15×10^2	1.57×10^3	9.85×10^2	1.35×10^4
Michigan	2.33×10^3	7.84×10^4	6.66×10^1	2.24×10^3	4.80×10^2	1.62×10^4
Minnesota	2.39×10^3	1.46×10^5	9.56×10^1	5.83×10^3	3.73×10^2	2.28×10^4
Mississippi	5.86×10^2	2.70×10^4	1.01×10^2	4.65×10^3	7.24×10^1	3.34×10^3
Missouri	9.09×10^2	6.76×10^4	7.48×10^1	5.56×10^3	9.93×10^1	7.38×10^3
Montana	2.52×10^2	1.84×10^4	1.15×10^1	8.39×10^2	5.63×10^0	4.11×10^2
Nebraska	1.27×10^3	1.31×10^5	7.31×10^1	7.51×10^3	2.98×10^1	3.06×10^3
Nevada	6.49×10^1	1.03×10^3	9.93×10^0	1.58×10^2	2.25×10^1	3.59×10^2

TABLE 3.2 (Cont'd)

State	Crops		Meat		Dairy	
	lb/acre	kg/km ²	lb/acre	kg/km ²	lb/acre	kg/km ²
New Hampshire	1.13×10^2	1.04×10^3	7.22×10^1	6.63×10^2	7.73×10^2	7.11×10^3
New Jersey	1.50×10^3	3.23×10^4	7.38×10^1	1.59×10^3	5.36×10^2	1.15×10^4
New Mexico	3.83×10^1	2.60×10^3	9.72×10^0	6.61×10^2	1.73×10^1	1.17×10^3
New York	8.01×10^2	2.72×10^4	6.08×10^1	2.07×10^3	1.21×10^3	4.10×10^4
North Carolina	1.26×10^3	4.65×10^4	2.57×10^2	9.51×10^3	1.63×10^2	6.05×10^3
North Dakota	9.08×10^2	9.23×10^4	1.12×10^1	1.14×10^3	2.54×10^1	2.58×10^3
Ohio	2.26×10^3	1.49×10^5	8.44×10^1	5.55×10^3	2.95×10^2	1.94×10^4
Oklahoma	3.76×10^2	3.10×10^4	4.69×10^1	3.87×10^3	3.60×10^1	2.97×10^3
Oregon	4.54×10^2	1.47×10^4	2.84×10^1	9.18×10^1	7.34×10^1	2.37×10^3
Pennsylvania	1.12×10^3	3.62×10^4	1.89×10^2	6.13×10^3	1.12×10^3	3.61×10^4
Rhode Island	1.23×10^3	1.28×10^4	1.98×10^2	2.06×10^3	7.33×10^2	7.64×10^3
South Carolina	8.57×10^2	2.78×10^4	9.94×10^1	3.22×10^3	1.01×10^2	3.29×10^3
South Dakota	4.99×10^2	5.04×10^4	3.17×10^1	3.20×10^3	4.02×10^1	4.06×10^3
Tennessee	6.30×10^2	3.34×10^4	7.01×10^1	3.72×10^3	1.86×10^2	9.90×10^3
Texas	2.49×10^2	2.19×10^4	3.71×10^1	3.26×10^3	2.88×10^1	2.53×10^3
Utah	1.27×10^2	2.66×10^3	2.75×10^1	5.72×10^2	1.19×10^2	2.48×10^3
Vermont	8.36×10^1	2.48×10^3	4.27×10^1	1.27×10^3	1.52×10^3	4.50×10^4
Virginia	6.61×10^2	2.75×10^4	1.11×10^2	4.61×10^3	2.18×10^2	9.08×10^3
Washington	1.18×10^3	5.13×10^4	3.94×10^1	1.71×10^3	1.96×10^2	8.48×10^3
West Virginia	2.09×10^2	5.41×10^3	6.26×10^1	1.62×10^3	9.79×10^1	2.53×10^3
Wisconsin	1.36×10^3	7.53×10^4	7.57×10^1	4.20×10^3	1.35×10^3	7.47×10^4
Wyoming	9.54×10^1	5.77×10^3	1.06×10^1	6.39×10^2	4.09×10^0	2.47×10^2
U.S. Total	1.14×10^3	5.58×10^4	6.28×10^1	3.07×10^3	1.37×10^2	6.71×10^3

^aSources given in Appendix B; crops, meat, and dairy defined in Sec. 3.1.

TABLE 3.3 Summary of State Agricultural Production for Total Land in State, 1982^a

State	Crops		Meat		Dairy	
	lb/acre	kg/km ²	lb/acre	kg/km ²	lb/acre	kg/km ²
Alabama	1.57×10^2	5.53×10^3	6.41×10^1	2.26×10^3	1.79×10^1	6.28×10^2
Alaska	5.55×10^{-2}	2.49×10^{-2}	7.79×10^{-3}	3.49×10^{-3}	3.78×10^{-2}	1.69×10^{-2}
Arizona	3.71×10^1	2.16×10^3	5.68×10^0	3.31×10^2	1.65×10^1	9.64×10^2
Arkansas	3.19×10^2	1.58×10^4	8.72×10^1	4.31×10^3	2.48×10^1	1.23×10^3
California	3.83×10^2	1.38×10^4	3.04×10^1	1.09×10^3	1.45×10^2	5.23×10^3
Colorado	2.25×10^2	1.27×10^4	2.00×10^1	1.13×10^3	1.47×10^1	8.31×10^2
Connecticut	3.89×10^1	6.19×10^2	5.33×10^1	8.48×10^2	2.07×10^2	3.29×10^3
Delaware	1.30×10^3	7.70×10^4	4.44×10^2	2.64×10^4	1.11×10^2	6.58×10^3
Florida	5.30×10^2	2.20×10^4	3.10×10^1	1.28×10^3	6.09×10^1	2.52×10^3
Georgia	2.81×10^2	1.04×10^4	7.88×10^1	2.93×10^3	3.80×10^1	1.41×10^3
Hawaii	3.01×10^1	1.61×10^3	1.92×10^1	1.02×10^3	3.50×10^1	1.87×10^3
Idaho	4.79×10^2	1.42×10^4	1.08×10^1	3.21×10^2	4.27×10^1	1.26×10^3
Illinois	2.94×10^3	2.66×10^5	5.98×10^1	5.41×10^3	7.46×10^1	6.75×10^3
Indiana	2.27×10^3	1.80×10^5	8.96×10^1	7.12×10^3	1.01×10^2	8.07×10^3
Iowa	2.83×10^3	2.89×10^5	1.56×10^2	1.59×10^4	1.12×10^2	1.14×10^4
Kansas	8.38×10^2	8.45×10^4	5.36×10^1	5.40×10^3	2.59×10^1	2.61×10^3
Kentucky	4.50×10^2	2.82×10^4	2.80×10^1	1.75×10^3	9.31×10^1	5.82×10^3
Louisiana	1.93×10^2	6.79×10^3	1.77×10^1	6.19×10^2	3.42×10^1	1.20×10^3
Maine	1.35×10^2	1.12×10^3	1.44×10^1	1.20×10^2	3.66×10^1	3.04×10^2
Maryland	7.84×10^2	3.57×10^4	1.42×10^2	6.48×10^3	2.51×10^2	1.14×10^4
Massachusetts	4.06×10^1	5.55×10^2	1.40×10^1	1.91×10^2	1.20×10^2	1.64×10^3
Michigan	6.99×10^2	2.35×10^4	2.00×10^1	6.72×10^2	1.44×10^2	4.85×10^3
Minnesota	1.30×10^3	7.93×10^4	5.20×10^1	3.17×10^3	2.03×10^2	1.24×10^4
Mississippi	2.41×10^2	1.11×10^4	4.15×10^1	1.91×10^3	2.98×10^1	1.37×10^3
Missouri	6.03×10^2	4.48×10^4	4.96×10^1	3.68×10^3	6.58×10^1	4.89×10^3
Montana	1.64×10^2	1.20×10^4	7.49×10^0	5.46×10^2	3.66×10^0	2.67×10^2
Nebraska	1.16×10^3	1.20×10^5	6.70×10^1	6.89×10^3	2.73×10^1	2.81×10^3
Nevada	9.22×10^0	1.47×10^2	1.41×10^0	2.25×10^1	3.20×10^0	5.09×10^1

TABLE 3.3 (Cont'd)

State	Crops		Meat		Dairy	
	lb/acre	kg/km ²	lb/acre	kg/km ²	lb/acre	kg/km ²
New Hampshire	9.29×10^0	8.53×10^1	5.92×10^0	5.44×10^1	6.34×10^1	5.83×10^2
New Jersey	2.88×10^2	6.21×10^3	1.42×10^1	3.05×10^2	1.03×10^2	2.22×10^3
New Mexico	2.32×10^1	1.58×10^3	5.89×10^0	4.00×10^2	1.05×10^1	7.10×10^2
New York	2.43×10^2	8.24×10^3	1.84×10^1	6.26×10^2	3.66×10^2	1.24×10^4
North Carolina	4.14×10^2	1.53×10^4	8.48×10^1	3.14×10^3	5.39×10^1	1.99×10^3
North Dakota	8.23×10^2	8.37×10^4	1.02×10^1	1.04×10^3	2.30×10^1	2.34×10^3
Ohio	1.33×10^3	8.72×10^4	4.95×10^1	3.26×10^3	1.73×10^2	1.14×10^4
Oklahoma	2.77×10^2	2.29×10^4	3.45×10^1	2.85×10^3	2.65×10^1	2.19×10^3
Oregon	1.31×10^2	4.22×10^3	8.19×10^0	2.64×10^2	2.11×10^1	6.82×10^2
Pennsylvania	3.23×10^2	1.04×10^4	5.47×10^1	1.77×10^3	3.22×10^2	1.04×10^4
Rhode Island	1.14×10^2	1.19×10^3	1.84×10^1	1.92×10^2	6.81×10^1	7.10×10^2
South Carolina	2.48×10^2	8.03×10^3	2.87×10^1	9.30×10^2	2.93×10^1	9.50×10^2
South Dakota	4.49×10^2	4.54×10^4	2.86×10^1	2.89×10^3	3.62×10^1	3.66×10^3
Tennessee	2.98×10^2	1.59×10^4	3.32×10^1	1.76×10^3	8.83×10^1	4.69×10^3
Texas	1.95×10^2	1.71×10^4	2.91×10^1	2.55×10^3	2.25×10^1	1.98×10^3
Utah	2.37×10^1	4.94×10^2	5.11×10^0	1.06×10^2	2.21×10^1	4.61×10^2
Vermont	2.22×10^1	6.58×10^2	1.13×10^1	3.36×10^2	4.02×10^2	1.19×10^4
Virginia	2.45×10^2	1.02×10^4	4.11×10^1	1.71×10^3	8.10×10^1	3.37×10^3
Washington	4.58×10^2	1.99×10^4	1.53×10^1	6.62×10^2	7.57×10^1	3.28×10^3
West Virginia	4.83×10^1	1.25×10^3	1.44×10^1	3.74×10^2	2.26×10^1	5.85×10^2
Wisconsin	6.72×10^2	3.73×10^4	3.75×10^1	2.08×10^3	6.67×10^2	3.70×10^4
Wyoming	5.15×10^1	3.12×10^3	5.70×10^0	3.45×10^2	2.21×10^0	1.34×10^2
U.S. Total	4.97×10^2	2.43×10^4	2.74×10^1	1.34×10^3	5.98×10^1	2.92×10^3

^aSources given in Appendix B; crops, meat, and dairy defined in Sec. 3.1.

Hogs/pigs data were calculated similarly, but using 87.4% of sales as slaughtered and without taking the weighted mean.

Chicken data, reported in thousands of pounds, were directly input from Statistical Bulletin 725 (USDA 1985c). The pounds sold was added to on-farm consumption to obtain total production. These data were multiplied by a conversion factor of 61.77% to offset those chickens that are sold but not used for human consumption (percent consumed calculated from USDA [1983]). Broiler production and turkey production were entered directly from the 1982 *Census of Agriculture* in numbers of head sold; these data were then converted by the percent consumed -- 73.15% and 79.70%, respectively -- and by a conversion factor based on average weights of 4.03 lb and 19.19 lb, respectively (conversion provided by Sitzman [1987]).

Egg production was calculated by taking total production from Statistical Bulletin 721 (USDA 1985a), dividing total production by 12 to produce dozens, and multiplying by a conversion factor of 1.57 lb/doz (the conversion factor provided by the USDA National Agricultural Statistical Service).

For each state, meat production per acre was calculated by summing cattle/calves, hogs/pigs, broilers, chickens, and turkeys and dividing by the total land in farms (acres) in that state. The resulting data (Table 3.2) represent average meat production per unit area of farmland in a given state (lb/acre or kg/km²). Total production divided by the total area in the state is presented in Table 3.3. Meat production does not include fish.

3.1.3 Dairy

Dairy production was calculated using milk production for 1982 (in millions of pounds) as reported in Statistical Bulletin 722 (USDA 1985b). These data are presented in Table 3.1. Dairy production data for land in farms and land in state are presented in Tables 3.2 and 3.3, respectively. These data were calculated in the same manner as described in Section 3.1.2 for meat.

3.2 PER CAPITA CONSUMPTION

Estimated per capita food consumption data were obtained from the USDA (1986). These data were aggregated into the three major food groups (crops, meat, dairy) and are presented in Table 3.4. Slight differences exist in the definitions of crops, meat, and dairy used in Table 3.4 compared with the definitions used in Tables 3.1-3.3. In addition, the definitions of agricultural production are not directly comparable. In Table 3.4, agricultural production is defined as imports and beginning-of-year inventories minus exports, military use, year-end inventories, and nonfood use; in Tables 3.1-3.3, agricultural production represents production in the United States for the year 1982. Also, Table 3.4 is consumption-based, whereas Tables 3.1-3.3 are production-based.

It is recommended that the most recent consumption estimates be used for modeling purposes, although there are some deviations from year to year and some

TABLE 3.4 Annual Per Capita Consumption of Major Food Groups

Year	Crops ^a		Meat ^b		Dairy ^c	
	lb/yr	kg/yr	lb/yr	kg/yr	lb/yr	kg/yr
1947-1949	902.2	409.23	234.8	106.50	482.6	218.90
1957-1959	807.1	366.09	245.9	111.54	470.1	213.23
1967-1969	776.0	351.99	266.5	120.88	439.6	199.40
1970	779.0	353.35	273.6	124.10	432.3	196.09
1971	779.3	353.49	278.8	126.46	434.0	196.86
1972	779.2	353.44	276.5	125.42	435.7	197.63
1973	788.1	357.48	260.5	118.16	437.6	198.49
1974	772.5	350.40	270.0	122.47	421.9	191.37
1975	795.2	360.70	260.0	117.93	424.0	192.32
1976	809.2	367.05	272.4	123.56	437.6	198.49
1977	806.5	365.82	271.8	123.29	432.6	196.22
1978	802.8	364.14	269.9	122.43	431.9	195.91
1979	820.2	372.04	273.0	123.83	431.4	195.68
1980	824.3	373.90	275.8	125.10	425.4	192.96
1981	818.1	371.08	274.0	124.28	419.7	190.37
1982	830.1	376.53	268.4	121.74	428.1	194.18
1983	843.1	382.42	275.3	124.87	438.2	198.76
1984	841.1	381.52	277.3	125.78	447.5	202.98

^aCrops include vegetables; dried beans, peas, nuts, and soya products; flour and cereal products; sugar and other sweeteners (includes refined sugar, corn sweeteners, molasses, honey, maple, and other syrups); coffee, tea, and cocoa (including regular and instant coffee on a roasted basis, tea, spices, and chocolate liquor equivalent of cocoa and chocolate products); spices and herbs; butter/margarine; shortening; edible oils; and fruits. Crops are on a product-weight basis except for concentrated juices, which are on a single-strength equivalent basis. Also includes home garden produce of fruits, vegetables, potatoes, dried beans, and dried peas.

^bMeat includes meat counted on a fresh-retail-cut equivalent basis (including fat cuts of pork, game, and edible offal); poultry (excluding game birds) counted on a ready-to-cook basis; fish (including game fish) counted on; eggs counted on a shell-egg basis; and lard and beef tallow.

^cDairy includes fluid milk (based on calcium equivalent of whole milk and creams); canned, evaporated, and dry milk; whey; ice cream and other frozen desserts; and yogurt.

Source: USDA (1986).

apparent trends in consumption. It is also recommended that any modeling dependent on food chain uptake rely on these numbers in estimating the uptake by individuals and populations. For 1984, per capita consumption was crops, 841.1 lb; meat, 277.3 lb; and dairy, 447.5 lb. These numbers are inherently conservative, however, because they are based on production divided by population, not by actual consumption.

Because actual consumption numbers are unavailable, a technique for deriving more-accurate consumption data from the data in Table 3.4 has been suggested by Hanson (1989). He recommends using the ratio of calories produced to calories consumed as a basis for moving from production to consumption. He estimates 3,600 calories per person per day are produced, with 2,000 calories per person per day actually consumed. Thus, to use this approach, any number in Table 3.4 should be multiplied by 0.56; the resulting consumption data for 1984 are crops, 471.01 lb; meat, 155.29 lb; and dairy, 250.6 lb. (Alcohol consumption is not believed to be accurately reported, so the caloric ratios estimated by Hanson may be understating "ingestion.") The recommended multiplier constitutes only a basis for determining consumption for all agricultural commodities. The actual multiplier within one of these commodities may be different than the multiplier for another commodity; thus, the multiplier used in this model represents a summary measure of actual consumption.

3.3 USE OF THE AGRICULTURAL DATA IN TRANSPORTATION ACCIDENT MODELING

A number of potential problems may arise when the summary statistics presented in Tables 3.2 and 3.3 are used in route-specific analyses of the risks associated with SNF and HLW transport. The first is that agricultural production is not often evenly distributed across a given state. Thus, using average statistics per area either overestimates or underestimates the production in any one location. In addition, the agricultural export economy means that production is not necessarily consumed in-state. One should be careful in making any assumptions that would have local residents consuming all state-produced agricultural products. However, the problem remains for modelers regarding how to distribute the impacts to the food chain over the population. This problem is complicated by the fact that agricultural products grown in one state may be processed in another state and then distributed regionally, nationally, or internationally. The originating state may receive only a small portion of the final product. The exception to this is on-farm consumption. The more site-specific the modeling, the more detailed the agricultural statistics must be. The data presented here are suitable for use at the national level. It is suggested that county-level agricultural production be calculated using the approach presented here for modeling at the regional or state level. In addition, digitized maps indicating agricultural production areas should be considered along with growing-season information in order to more accurately identify agricultural production along transportation routes. Data are currently available at the county level. New data were collected in 1987 but were not published at the time this report was written. The data in Tables 3.2 and 3.3 should be recalculated based on 1987 data, when available.

The USDA estimates of per capita consumption of crops, meat, and dairy products (Table 3.4) can be used as one means to calculate impacts on an individual or a population from food chain uptake. In situations where the amount of contaminated farm land is known or projected, per capita consumption can be used as a way of determining the minimum number of people likely to be affected by the contaminated food. The minimum number of people affected (assuming that they received their total food input from the contaminated area) can be calculated by:

$$\text{number of people affected} = \frac{\text{number of acres affected} \times \text{production/acre}}{\text{per capita consumption/year}}$$

This approach would be independent of state population.

Given these recommendations, it is anticipated the agricultural statistics data presented in this report can have wide applicability in models dealing with production, movement/transportation, and disposal of a variety of hazardous substances at the national level.

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APPENDIX A:
STATE AGRICULTURAL PRODUCTION STATISTICS, 1982

TABLE A.1 State Agricultural Production, 1982: Crops (spreadsheet columns are given for ease of reference to Appendix B)

State (Col. A)	Corn		Wheat		Soybeans	
	bu ^a (Col. Q)	lb (Col. R)	bu (Col. S)	lb (Col. T)	bu (Col. U)	lb (Col. V)
Alabama	2.01×10^7	1.13×10^9	1.41×10^7	8.44×10^8	3.64×10^7	2.18×10^9
Alaska	- ^b	-	2.80×10^3	1.68×10^5	-	-
Arizona	1.50×10^6	8.39×10^7	1.19×10^7	7.13×10^8	-	-
Arkansas	2.39×10^6	1.34×10^8	6.13×10^7	3.68×10^9	9.86×10^7	5.92×10^9
California	3.77×10^7	2.11×10^9	6.31×10^7	3.79×10^9	1.71×10^4	1.02×10^6
Colorado	9.49×10^7	5.31×10^9	7.83×10^7	4.70×10^9	2.88×10^4	1.73×10^6
Connecticut	6.28×10^5	3.52×10^7	8.14×10^3	4.88×10^5	1.28×10^3	7.69×10^3
Delaware	1.49×10^7	8.33×10^8	2.23×10^6	1.34×10^8	6.37×10^6	3.82×10^8
Florida	1.26×10^7	7.03×10^8	2.77×10^6	1.66×10^8	8.53×10^6	5.12×10^8
Georgia	6.00×10^7	3.36×10^9	3.19×10^7	1.91×10^9	5.20×10^7	3.12×10^9
Hawaii	-	-	-	-	-	-
Idaho	8.08×10^6	4.53×10^8	8.80×10^7	5.28×10^9	-	-
Illinois	1.43×10^9	7.98×10^{10}	6.20×10^7	3.72×10^9	3.36×10^8	2.02×10^{10}
Indiana	7.12×10^8	3.99×10^{10}	3.70×10^7	2.22×10^9	1.61×10^8	9.69×10^9
Iowa	4.67×10^8	8.21×10^{10}	2.85×10^6	1.71×10^8	2.91×10^8	1.75×10^{10}
Kansas	1.31×10^8	7.32×10^9	3.73×10^8	2.24×10^{10}	4.30×10^7	2.58×10^9
Kentucky	1.32×10^8	7.37×10^9	1.97×10^7	1.18×10^9	4.43×10^7	2.66×10^9
Louisiana	2.77×10^6	1.55×10^8	1.35×10^7	8.11×10^8	6.77×10^7	4.06×10^9
Maine	6.48×10^5	3.63×10^7	3.54×10^4	2.12×10^6	2.99×10^3	1.79×10^5
Maryland	6.28×10^7	3.52×10^9	5.66×10^6	3.38×10^8	1.13×10^7	6.77×10^8
Massachusetts	5.92×10^5	3.31×10^7	1.28×10^3	7.66×10^4	-	-
Michigan	2.56×10^8	1.44×10^{10}	2.08×10^7	1.25×10^9	3.43×10^7	2.06×10^9
Minnesota	6.10×10^8	3.42×10^{10}	1.12×10^8	6.69×10^9	1.51×10^8	9.07×10^9
Mississippi	4.76×10^6	2.66×10^8	2.92×10^7	1.75×10^9	8.19×10^7	4.92×10^9
Missouri	1.79×10^8	1.00×10^{10}	6.83×10^7	4.10×10^9	1.54×10^8	9.22×10^9
Montana	1.93×10^6	1.08×10^8	1.59×10^8	9.55×10^9	1.49×10^4	8.95×10^5

TABLE A.1 (Cont'd)

State (Col. A)	Corn		Wheat		Soybeans	
	bu (Col. Q)	lb (Col. R)	bu (Col. S)	lb (Col. T)	bu (Col. U)	lb (Col. V)
Nebraska	6.76×10^8	3.79×10^{10}	8.80×10^7	5.28×10^9	7.02×10^7	4.21×10^9
Nevada	-	-	1.39×10^6	8.32×10^7	-	-
New Hampshire	1.46×10^5	8.16×10^6	-	-	-	-
New Jersey	1.02×10^7	5.70×10^8	1.46×10^6	8.77×10^7	4.11×10^6	2.47×10^8
New Mexico	6.90×10^6	3.86×10^8	1.00×10^7	6.02×10^8	4.28×10^4	2.57×10^6
New York	7.03×10^7	3.94×10^9	4.95×10^6	2.97×10^8	5.84×10^5	3.50×10^7
North Carolina	1.34×10^8	7.48×10^9	2.07×10^7	1.24×10^9	4.23×10^7	2.54×10^9
North Dakota	3.41×10^7	1.91×10^9	2.96×10^8	1.78×10^{10}	8.80×10^6	5.28×10^8
Ohio	4.18×10^8	2.34×10^{10}	4.74×10^7	2.85×10^9	1.24×10^8	7.46×10^9
Oklahoma	3.65×10^6	2.05×10^8	1.72×10^8	1.03×10^{10}	4.63×10^6	2.78×10^8
Oregon	7.19×10^6	4.03×10^8	5.89×10^7	3.54×10^9	-	-
Pennsylvania	1.20×10^8	6.71×10^9	7.79×10^6	4.67×10^8	3.83×10^6	2.30×10^8
Rhode Island	1.09×10^4	6.11×10^5	-	-	-	-
South Carolina	3.11×10^7	1.74×10^9	1.48×10^7	8.89×10^8	2.90×10^7	1.74×10^9
South Dakota	1.74×10^8	9.75×10^9	8.59×10^7	5.15×10^9	2.23×10^7	1.34×10^9
Tennessee	4.85×10^7	2.72×10^9	2.50×10^7	1.50×10^9	5.54×10^7	3.32×10^9
Texas	1.10×10^8	6.17×10^9	1.23×10^8	7.38×10^9	1.78×10^7	1.07×10^9
Utah	1.62×10^6	9.06×10^7	6.66×10^6	4.00×10^8	-	-
Vermont	1.17×10^6	6.57×10^7	1.04×10^4	6.22×10^5	-	-
Virginia	5.83×10^7	3.26×10^9	1.09×10^7	6.52×10^8	1.77×10^7	1.06×10^9
Washington	2.08×10^7	1.17×10^9	1.28×10^8	7.68×10^9	-	-
West Virginia	7.42×10^6	4.15×10^8	2.44×10^5	1.46×10^7	1.63×10^5	9.76×10^6
Wisconsin	3.32×10^8	1.86×10^{10}	5.51×10^6	3.30×10^8	1.06×10^7	6.37×10^8
Wyoming	4.68×10^6	2.62×10^8	9.17×10^6	5.50×10^8	-	-
U.S. Total	7.51×10^9	4.20×10^{11}	2.37×10^9	1.42×10^{11}	1.99×10^9	1.19×10^{11}

TABLE A.1 (Cont'd)

State (Col. A)	Potatoes		Honey	Sorghum	
	cwt ^c (Col. W)	lb (Col. X)	lb (Col. Y)	bu (Col. Z)	lb (Col. AA)
Alabama	2.03×10^6	2.03×10^8	1.35×10^6	2.12×10^6	1.19×10^8
Alaska	8.23×10^4	8.23×10^6	3.15×10^3	-	-
Arizona	1.21×10^6	1.21×10^8	3.18×10^6	8.33×10^5	4.67×10^7
Arkansas	1.97×10^4	1.97×10^6	1.55×10^6	1.39×10^7	7.77×10^8
California	1.79×10^7	1.79×10^9	2.51×10^7	3.97×10^6	2.22×10^8
Colorado	1.48×10^7	1.49×10^9	2.02×10^6	9.82×10^6	5.50×10^8
Connecticut	3.67×10^5	3.67×10^7	6.60×10^4	-	-
Delaware	1.33×10^6	1.33×10^8	1.33×10^4	4.41×10^3	2.47×10^5
Florida	6.53×10^6	6.53×10^8	1.16×10^7	7.69×10^5	4.31×10^7
Georgia	1.00×10^5	1.00×10^6	3.54×10^6	3.98×10^6	2.23×10^8
Hawaii	1.44×10^3	1.44×10^5	7.77×10^5	-	-
Idaho	8.95×10^7	8.95×10^9	3.87×10^6	-	-
Illinois	5.80×10^5	5.80×10^7	6.37×10^5	8.25×10^6	4.62×10^8
Indiana	9.08×10^5	9.08×10^7	3.01×10^5	3.43×10^5	1.92×10^7
Iowa	2.88×10^5	2.88×10^7	2.73×10^6	7.53×10^5	4.22×10^7
Kansas	1.45×10^5	1.45×10^7	1.13×10^6	1.92×10^8	1.08×10^{10}
Kentucky	3.48×10^5	3.48×10^7	1.20×10^5	2.03×10^6	1.13×10^8
Louisiana	5.35×10^4	5.35×10^6	2.34×10^6	6.23×10^6	3.49×10^8
Maine	2.46×10^7	2.46×10^9	3.23×10^5	-	-
Maryland	3.96×10^5	3.96×10^7	9.08×10^4	7.48×10^4	4.19×10^6
Massachusetts	7.33×10^5	7.33×10^7	1.23×10^5	-	-
Michigan	1.24×10^7	1.24×10^9	4.38×10^6	4.88×10^4	2.73×10^6
Minnesota	1.41×10^7	1.41×10^9	1.08×10^7	9.86×10^4	5.52×10^6
Mississippi	3.46×10^4	3.46×10^6	1.66×10^6	4.82×10^6	2.70×10^8
Missouri	2.70×10^5	2.70×10^7	9.62×10^5	5.49×10^7	3.07×10^9
Montana	1.89×10^6	1.89×10^8	1.01×10^7	-	-
Nebraska	2.01×10^6	2.01×10^8	5.43×10^6	1.17×10^8	6.55×10^9

TABLE A.1 (Cont'd)

State (Col. A)	Potatoes		Honey	Sorghum	
	cwt ^b (Col. W)	lb (Col. X)	lb (Col. Y)	bu (Col. Z)	lb (Col. AA)
Nevada	4.61×10^6	4.61×10^8	1.11×10^5	-	-
New Hampshire	4.29×10^4	4.29×10^6	3.09×10^4	-	-
New Jersey	2.07×10^6	2.07×10^8	2.43×10^5	6.94×10^4	3.89×10^6
New Mexico	6.26×10^5	6.26×10^7	7.55×10^5	9.65×10^6	5.40×10^8
New York	1.03×10^7	1.03×10^9	2.68×10^6	6.10×10^3	3.42×10^5
North Carolina	2.33×10^6	2.33×10^8	4.62×10^5	1.99×10^6	1.11×10^8
North Dakota	1.71×10^7	1.71×10^9	1.36×10^7	4.92×10^4	2.75×10^6
Ohio	2.33×10^6	2.33×10^8	1.29×10^6	1.42×10^5	7.94×10^6
Oklahoma	2.38×10^5	2.38×10^7	2.92×10^5	1.87×10^7	1.05×10^9
Oregon	2.04×10^7	2.04×10^9	1.12×10^6	-	-
Pennsylvania	4.43×10^6	4.43×10^8	1.33×10^6	1.76×10^5	9.87×10^6
Rhode Island	7.03×10^5	7.03×10^7	1.87×10^3	-	-
South Carolina	3.14×10^4	3.14×10^6	8.85×10^4	7.79×10^5	4.36×10^7
South Dakota	1.32×10^6	1.32×10^8	1.52×10^7	1.13×10^7	6.31×10^8
Tennessee	2.72×10^5	2.72×10^7	4.28×10^5	4.23×10^6	2.37×10^8
Texas	2.89×10^6	2.89×10^8	8.44×10^6	2.56×10^8	1.43×10^{10}
Utah	1.41×10^6	1.41×10^8	1.32×10^6	6.10×10^4	3.42×10^6
Vermont	7.60×10^4	7.60×10^6	3.31×10^5	-	-
Virginia	2.32×10^6	2.32×10^8	1.22×10^6	4.38×10^5	2.45×10^7
Washington	4.61×10^7	4.61×10^9	2.23×10^6	-	-
West Virginia	1.38×10^5	1.38×10^7	2.45×10^5	2.18×10^3	1.22×10^5
Wisconsin	2.11×10^7	2.11×10^9	3.79×10^6	1.11×10^4	6.22×10^5
Wyoming	1.13×10^6	1.13×10^8	2.24×10^6	-	-
U.S. Total	3.35×10^8	3.35×10^{10}	1.52×10^8	7.26×10^8	4.07×10^{10}

TABLE A.1 (Cont'd)

State (Col. A)	Barley		Oats		Rye	
	bu (Col. AB)	lb (Col. AC)	bu (Col. AD)	lb (Col. AE)	bu (Col. AF)	lb (Col. AG)
Alabama	4.51×10^4	2.17×10^6	1.69×10^6	5.39×10^7	1.25×10^5	7.02×10^6
Alaska	2.28×10^5	1.09×10^7	2.96×10^4	9.46×10^5	-	-
Arizona	3.33×10^6	1.60×10^8	4.92×10^5	1.58×10^7	-	-
Arkansas	2.42×10^4	1.16×10^6	2.36×10^6	7.51×10^7	2.88×10^4	1.61×10^6
California	3.20×10^7	1.54×10^9	3.32×10^6	1.06×10^8	2.68×10^4	1.50×10^6
Colorado	1.39×10^7	6.68×10^8	1.85×10^6	5.92×10^7	1.98×10^4	1.11×10^6
Connecticut	-	-	1.53×10^4	4.90×10^5	2.15×10^4	1.21×10^6
Delaware	1.91×10^6	9.18×10^7	6.70×10^4	2.15×10^6	3.63×10^4	2.03×10^6
Florida	-	-	1.60×10^6	5.11×10^7	1.17×10^5	6.54×10^6
Georgia	8.83×10^5	4.24×10^7	4.00×10^6	1.28×10^8	5.79×10^5	3.24×10^7
Hawaii	-	-	-	-	-	-
Idaho	7.32×10^7	3.51×10^9	2.79×10^6	8.94×10^7	2.20×10^3	1.23×10^5
Illinois	1.73×10^5	8.31×10^6	1.03×10^7	3.29×10^8	1.28×10^5	7.19×10^6
Indiana	1.64×10^5	7.86×10^6	5.87×10^6	1.88×10^8	8.15×10^4	4.56×10^6
Iowa	1.62×10^5	7.77×10^6	4.58×10^7	1.46×10^9	5.81×10^4	3.25×10^6
Kansas	1.49×10^6	7.15×10^7	7.80×10^6	2.50×10^8	6.08×10^4	3.41×10^6
Kentucky	1.16×10^6	5.57×10^7	2.27×10^5	7.28×10^6	1.15×10^4	6.42×10^5
Louisiana	-	-	1.03×10^6	3.28×10^7	3.74×10^3	2.09×10^5
Maine	3.58×10^4	1.72×10^6	2.51×10^6	8.05×10^7	2.49×10^4	1.40×10^6
Maryland	4.25×10^6	2.04×10^8	8.73×10^5	2.79×10^7	9.48×10^4	5.31×10^6
Massachusetts	1.62×10^3	7.76×10^4	-	-	2.31×10^4	1.29×10^6
Michigan	2.07×10^6	9.95×10^7	2.48×10^7	7.93×10^8	3.92×10^5	2.19×10^7
Minnesota	4.67×10^7	2.24×10^9	7.87×10^7	2.52×10^9	2.35×10^6	1.32×10^8
Mississippi	5.96×10^3	2.86×10^5	6.13×10^5	1.96×10^7	4.62×10^3	2.59×10^5
Missouri	2.79×10^5	1.34×10^7	2.84×10^6	9.09×10^7	1.35×10^4	7.55×10^5
Montana	7.21×10^7	3.46×10^9	8.07×10^6	2.58×10^8	1.58×10^5	8.83×10^6
Nebraska	8.98×10^5	4.31×10^7	2.22×10^7	7.09×10^8	7.43×10^5	4.16×10^7

TABLE A.1 (Cont'd)

State (Col. A)	Barley		Oats		Rye	
	bu (Col. AB)	lb (Col. AC)	bu (Col. AD)	lb (Col. AE)	bu (Col. AF)	lb (Col. AG)
Nevada	2.08×10^6	9.98×10^7	1.29×10^5	4.14×10^6	-	-
New Hampshire	-	-	7.61×10^3	2.44×10^5	-	-
New Jersey	8.52×10^5	4.09×10^7	3.25×10^5	1.04×10^7	1.01×10^5	5.65×10^6
New Mexico	1.91×10^6	9.19×10^7	2.60×10^5	8.33×10^6	3.24×10^3	1.81×10^5
New York	1.13×10^6	5.41×10^7	1.62×10^7	5.17×10^8	1.71×10^5	9.59×10^6
North Carolina	3.20×10^6	1.54×10^8	3.05×10^6	9.76×10^7	2.87×10^5	1.61×10^7
North Dakota	9.19×10^7	4.41×10^9	4.77×10^7	1.52×10^9	2.05×10^6	1.15×10^8
Ohio	2.64×10^5	1.27×10^7	2.06×10^7	6.58×10^8	9.05×10^4	5.07×10^6
Oklahoma	4.05×10^5	1.94×10^7	3.11×10^6	9.96×10^7	2.44×10^5	1.37×10^7
Oregon	1.43×10^7	6.87×10^8	5.27×10^6	1.69×10^8	7.83×10^4	4.39×10^6
Pennsylvania	2.99×10^6	1.43×10^8	1.81×10^7	5.79×10^8	3.28×10^5	1.84×10^7
Rhode Island	-	-	-	-	7.82×10^3	4.38×10^5
South Carolina	1.00×10^6	4.82×10^7	2.15×10^6	6.88×10^7	2.50×10^5	1.40×10^7
South Dakota	2.07×10^7	9.95×10^8	9.78×10^7	3.13×10^9	3.66×10^6	2.05×10^8
Tennessee	3.98×10^5	1.91×10^7	3.06×10^5	9.80×10^6	7.70×10^3	4.31×10^5
Texas	8.44×10^5	4.05×10^7	9.04×10^6	2.89×10^8	6.22×10^4	3.49×10^6
Utah	1.09×10^7	5.26×10^8	7.84×10^5	2.51×10^7	-	-
Vermont	6.60×10^4	3.17×10^6	7.06×10^4	2.26×10^6	1.58×10^3	8.88×10^4
Virginia	4.98×10^6	2.39×10^8	5.47×10^5	1.75×10^7	1.21×10^5	6.76×10^6
Washington	4.30×10^7	2.11×10^9	1.79×10^6	5.72×10^7	8.40×10^3	4.71×10^5
West Virginia	1.30×10^5	6.26×10^6	3.84×10^5	1.23×10^7	9.59×10^3	5.37×10^5
Wisconsin	2.45×10^6	1.18×10^8	4.64×10^7	1.49×10^9	2.26×10^5	1.27×10^7
Wyoming	8.79×10^6	4.22×10^8	2.27×10^6	7.32×10^7	6.33×10^3	3.54×10^5
U.S. Total	4.68×10^8	2.25×10^{10}	5.06×10^8	1.62×10^{10}	1.28×10^7	7.18×10^8

TABLE A.1 (Cont'd)

State (Col. A)	Sunflowers	Dry Beans		Dry Peas	Sweet Potatoes	
	lb (Col. AH)	cwt ^b (Col. AI)	lb (Col. AJ)	lb (Col. AK)	bu (Col. AL)	lb (Col. AM)
Alabama	-	-	-	1.94×10^4	8.55×10^5	4.70×10^7
Alaska	-	-	-	-	-	-
Arizona	-	2.30×10^4	2.30×10^6	-	-	-
Arkansas	2.60×10^5	-	-	8.11×10^4	7.07×10^4	3.89×10^6
California	1.33×10^7	2.22×10^6	2.22×10^8	1.46×10^7	2.00×10^6	1.10×10^8
Colorado	2.39×10^7	2.05×10^6	2.05×10^8	1.49×10^6	-	-
Connecticut	-	-	-	-	-	-
Delaware	-	1.90×10^3	1.90×10^5	-	1.46×10^3	8.06×10^4
Florida	2.66×10^6	-	-	3.79×10^5	2.82×10^5	1.55×10^7
Georgia	2.34×10^6	-	-	1.52×10^5	8.35×10^5	4.59×10^7
Hawaii	-	-	-	-	2.88×10^4	1.58×10^6
Idaho	3.77×10^5	3.13×10^6	3.13×10^8	1.89×10^8	-	-
Illinois	2.02×10^6	9.25×10^4	9.25×10^6	-	1.09×10^3	6.01×10^4
Indiana	2.25×10^6	3.94×10^4	3.94×10^6	-	-	-
Iowa	6.42×10^5	6.91×10^4	6.91×10^6	-	1.98×10^3	1.09×10^5
Kansas	4.85×10^7	2.62×10^5	2.62×10^7	-	1.84×10^4	1.01×10^6
Kentucky	-	-	-	-	4.15×10^4	2.28×10^6
Louisiana	-	-	-	-	1.54×10^6	8.49×10^7
Maine	-	-	-	9.28×10^5	-	-
Maryland	7.72×10^4	2.47×10^4	2.47×10^6	-	3.28×10^5	1.80×10^7
Massachusetts	-	-	-	-	-	-
Michigan	6.10×10^6	7.16×10^6	7.16×10^8	-	-	-
Minnesota	5.17×10^8	9.46×10^5	9.46×10^7	1.72×10^6	-	-
Mississippi	-	-	-	-	6.68×10^5	3.67×10^7
Missouri	2.40×10^6	-	-	-	1.68×10^4	9.24×10^5
Montana	9.78×10^6	1.12×10^5	1.12×10^7	1.27×10^6	-	-
Nebraska	7.36×10^6	3.28×10^6	3.28×10^8	-	-	-

TABLE A.1 (Cont'd)

State (Col. A)	Sunflowers	Dry Beans		Dry Peas	Sweet Potatoes	
	lb (Col. AH)	cwt ^b (Col. AI)	lb (Col. AJ)	lb (Col. AK)	bu (Col. AL)	lb (Col. AM)
Nevada	-	-	-	-	-	-
New Hampshire	-	1.70×10^1	1.70×10^3	-	-	-
New Jersey	-	3.78×10^2	3.78×10^4	-	5.20×10^5	2.86×10^7
New Mexico	3.39×10^6	2.78×10^5	2.78×10^7	-	6.24×10^4	3.43×10^6
New York	3.45×10^6	6.84×10^5	6.84×10^7	-	-	-
North Carolina	3.30×10^6	-	-	-	1.03×10^7	5.66×10^8
North Dakota	3.25×10^9	2.46×10^6	2.46×10^8	5.20×10^6	-	-
Ohio	4.18×10^6	1.65×10^4	1.65×10^6	-	-	-
Oklahoma	-	-	-	1.14×10^5	6.80×10^3	3.74×10^5
Oregon	-	9.66×10^4	9.66×10^6	2.73×10^7	-	-
Pennsylvania	2.81×10^5	1.29×10^4	1.29×10^6	-	3.99×10^3	2.20×10^5
Rhode Island	-	-	-	-	-	-
South Carolina	1.36×10^6	-	-	-	1.01×10^6	5.53×10^7
South Dakota	4.72×10^8	1.49×10^5	1.49×10^7	-	-	-
Tennessee	5.59×10^4	-	-	-	2.36×10^5	1.30×10^7
Texas	1.37×10^8	1.55×10^4	1.55×10^6	1.38×10^6	9.40×10^5	5.17×10^7
Utah	1.76×10^6	4.80×10^4	4.80×10^6	-	-	-
Vermont	-	-	-	-	-	-
Virginia	7.86×10^5	-	-	-	6.73×10^5	3.70×10^7
Washington	9.82×10^6	7.59×10^5	7.59×10^7	2.38×10^8	-	-
West Virginia	-	-	-	-	3.42×10^2	1.88×10^4
Wisconsin	7.24×10^6	1.01×10^5	1.01×10^7	-	-	-
Wyoming	5.41×10^5	6.19×10^5	6.19×10^7	-	-	-
U.S. Total	4.53×10^9	2.47×10^7	2.47×10^9	4.82×10^8	2.04×10^7	1.12×10^9

TABLE A.1 (Cont'd)

State (Col. A)	Sugar Beets		Peanuts	Apples	Cherries	Grapes
	tons (Col. AN)	lb (Col. AO)	lb (Col. AP)	lb (Col. AQ)	lb (Col. AR)	lb (Col. AS)
Alabama	-	-	4.88×10^8	3.79×10^6	2.58×10^2	4.31×10^5
Alaska	-	-	-	-	-	-
Arizona	2.35×10^5	4.69×10^8	1.32×10^6	4.70×10^6	3.56×10^3	2.69×10^7
Arkansas	-	-	7.73×10^6	6.51×10^6	8.45×10^2	1.49×10^7
California	4.27×10^6	8.55×10^9	-	3.73×10^8	2.66×10^7	9.99×10^9
Colorado	9.15×10^5	1.83×10^9	-	4.65×10^7	8.38×10^5	7.41×10^4
Connecticut	-	-	-	4.20×10^7	3.09×10^3	9.40×10^4
Delaware	-	-	-	2.20×10^7	-	1.32×10^5
Florida	-	-	1.38×10^8	4.37×10^4	-	1.36×10^6
Georgia	-	-	1.38×10^9	1.28×10^7	3.26×10^2	3.52×10^6
Hawaii	-	-	-	-	-	-
Idaho	3.18×10^6	6.36×10^9	-	8.90×10^7	3.40×10^6	6.82×10^5
Illinois	-	-	-	7.31×10^7	1.25×10^5	3.98×10^5
Indiana	-	-	-	6.49×10^7	1.71×10^4	1.38×10^6
Iowa	-	-	-	1.32×10^7	2.00×10^4	1.02×10^4
Kansas	2.11×10^5	4.21×10^8	-	8.47×10^6	1.09×10^4	1.79×10^4
Kentucky	-	-	-	1.02×10^7	1.07×10^3	7.97×10^4
Louisiana	-	-	2.49×10^6	4.24×10^3	-	7.12×10^4
Maine	-	-	-	9.03×10^7	1.66×10^3	5.72×10^3
Maryland	-	-	-	7.92×10^7	2.87×10^5	7.21×10^5
Massachusetts	-	-	-	9.20×10^7	2.22×10^3	1.73×10^5
Michigan	1.81×10^6	3.62×10^9	-	9.16×10^8	2.31×10^8	9.49×10^7
Minnesota	4.67×10^6	9.33×10^9	-	1.98×10^7	-	2.92×10^4
Mississippi	-	-	8.52×10^6	1.18×10^5	-	4.02×10^5
Missouri	-	-	4.62×10^5	4.62×10^7	-	6.74×10^6
Montana	8.13×10^5	1.63×10^9	-	6.69×10^5	6.77×10^6	2.22×10^5

TABLE A.1 (Cont'd)

State (Col. A)	Sugar Beets		Peanuts	Apples	Cherries	Grapes
	tons (Col. AN)	lb (Col. AO)	lb (Col. AP)	lb (Col. AQ)	lb (Col. AR)	lb (Col. AS)
Nebraska	9.30×10^5	1.86×10^9	-	2.03×10^6	-	4.85×10^3
Nevada	-	-	-	2.37×10^4	-	-
New Hampshire	-	-	-	4.02×10^7	5.73×10^2	1.90×10^5
New Jersey	-	-	-	9.85×10^7	-	1.07×10^6
New Mexico	1.18×10^4	2.36×10^7	1.90×10^7	1.24×10^7	1.29×10^5	5.06×10^5
New York	-	-	-	1.01×10^9	2.68×10^7	3.11×10^8
North Carolina	-	-	4.00×10^8	1.07×10^8	7.84×10^2	6.28×10^6
North Dakota	2.53×10^6	5.06×10^9	-	7.39×10^4	5.5×10^1	-
Ohio	-	-	-	1.32×10^8	9.56×10^5	1.51×10^7
Oklahoma	-	-	1.59×10^8	6.27×10^6	-	6.26×10^3
Oregon	2.64×10^5	5.28×10^8	-	1.59×10^8	8.02×10^7	8.42×10^6
Pennsylvania	-	-	-	4.88×10^8	7.31×10^6	9.30×10^7
Rhode Island	-	-	-	5.45×10^6	-	-
South Carolina	-	-	2.72×10^7	6.56×10^6	5.00×10^0	4.48×10^6
South Dakota	-	-	-	5.37×10^4	1.80×10^1	-
Tennessee	-	-	2.24×10^6	6.73×10^6	5.99×10^4	6.06×10^5
Texas	4.86×10^5	9.72×10^8	3.24×10^8	4.45×10^5	-	8.32×10^5
Utah	-	-	-	3.15×10^7	1.38×10^7	5.45×10^5
Vermont	-	-	-	5.17×10^7	2.62×10^3	5.70×10^2
Virginia	-	-	2.87×10^8	3.81×10^8	3.28×10^4	1.72×10^6
Washington	-	-	-	2.66×10^9	9.72×10^7	2.76×10^8
West Virginia	-	-	-	2.53×10^8	9.10×10^4	1.13×10^5
Wisconsin	-	-	-	6.73×10^7	9.40×10^6	1.69×10^5
Wyoming	8.56×10^5	1.71×10^9	-	3.22×10^3	-	-
U.S. Total	2.11×10^7	4.24×10^{10}	3.25×10^9	7.54×10^9	5.06×10^8	1.09×10^{10}

TABLE A.1 (Cont'd)

	Nectarines	Peaches	Pears	Plums and Prunes	Other Fruits ^d
State (Col. A)	lb (Col. AT)	lb (Col. AU)	lb (Col. AV)	lb (Col. AW)	lb (Col. AX)
Alabama	2.66×10^4	1.78×10^7	5.94×10^4	1.91×10^5	5.96×10^6
Alaska	-	-	-	-	0.00×10^0
Arizona	-	2.92×10^6	3.18×10^4	3.57×10^6	1.04×10^9
Arkansas	1.88×10^4	1.66×10^7	2.82×10^4	7.82×10^3	8.16×10^5
California	3.15×10^8	1.30×10^9	5.99×10^8	9.21×10^8	6.29×10^9
Colorado	6.00×10^4	1.12×10^7	4.94×10^6	7.08×10^5	3.87×10^5
Connecticut	-	2.43×10^6	2.50×10^6	5.93×10^4	0.00×10^0
Delaware	-	1.99×10^6	-	-	0.00×10^0
Florida	-	5.34×10^6	6.11×10^4	2.27×10^3	1.61×10^{10}
Georgia	-	1.06×10^8	1.61×10^5	2.37×10^5	6.69×10^7
Hawaii	-	-	-	-	1.21×10^8
Idaho	2.65×10^5	4.94×10^6	1.96×10^6	9.54×10^6	2.15×10^5
Illinois	-	1.37×10^4	1.79×10^5	9.01×10^4	0.00×10^0
Indiana	-	2.22×10^4	2.18×10^5	7.19×10^4	8.50×10^3
Iowa	-	-	1.11×10^4	7.32×10^3	3.27×10^2
Kansas	-	4.82×10^4	4.93×10^3	4.20×10^3	1.96×10^5
Kentucky	-	1.94×10^4	1.79×10^3	6.08×10^2	0.00×10^0
Louisiana	-	3.82×10^6	8.02×10^3	8.00×10^3	3.59×10^6
Maine	-	-	6.79×10^4	5.12×10^3	0.00×10^0
Maryland	6.08×10^4	1.69×10^7	4.39×10^5	1.79×10^5	2.86×10^3
Massachusetts	-	1.44×10^6	1.44×10^6	3.19×10^4	0.00×10^0
Michigan	1.58×10^5	4.52×10^7	1.55×10^7	1.63×10^7	5.30×10^5
Minnesota	-	-	2.12×10^3	7.95×10^3	9.00×10^2
Mississippi	-	2.37×10^6	8.52×10^4	2.44×10^3	1.81×10^6
Missouri	-	4.68×10^6	-	3.37×10^3	2.84×10^5
Montana	-	-	8.81×10^3	5.92×10^3	1.10×10^3

TABLE A.1 (Cont'd)

	<u>Nectarines</u>	<u>Peaches</u>	<u>Pears</u>	<u>Plums and Prunes</u>	<u>Other Fruits^d</u>
State (Col. A)	lb (Col. AT)	lb (Col. AU)	lb (Col. AV)	lb (Col. AW)	lb (Col. AX)
Nebraska	-	-	-	-	0.00×10^0
Nevada	-	-	-	-	1.69×10^4
New Hampshire	-	1.52×10^5	1.85×10^5	-	0.00×10^0
New Jersey	4.91×10^4	7.69×10^7	2.74×10^5	1.24×10^5	3.40×10^2
New Mexico	-	4.32×10^5	1.59×10^5	2.25×10^4	1.73×10^7
New York	1.07×10^5	1.45×10^7	3.12×10^7	3.94×10^6	1.47×10^5
North Carolina	-	1.64×10^6	9.90×10^3	1.15×10^3	2.00×10^5
North Dakota	-	-	-	8.94×10^2	0.00×10^0
Ohio	2.69×10^4	7.15×10^5	1.20×10^6	6.28×10^5	8.47×10^3
Oklahoma	6.29×10^4	4.74×10^6	6.17×10^3	5.16×10^3	4.08×10^6
Oregon	1.52×10^5	9.32×10^6	3.27×10^8	2.43×10^7	3.89×10^7
Pennsylvania	2.27×10^6	6.01×10^7	1.03×10^7	1.38×10^6	8.83×10^4
Rhode Island	-	3.18×10^5	2.76×10^4	-	0.00×10^0
South Carolina	-	1.44×10^8	2.09×10^4	-	1.04×10^6
South Dakota	-	-	-	-	0.00×10^0
Tennessee	-	1.54×10^6	1.11×10^5	7.89×10^3	7.34×10^3
Texas	7.33×10^4	9.55×10^6	6.28×10^5	1.01×10^5	1.66×10^9
Utah	-	2.60×10^6	2.22×10^6	6.04×10^4	2.57×10^5
Vermont	-	-	4.28×10^4	2.08×10^3	0.00×10^0
Virginia	2.63×10^5	2.62×10^7	1.87×10^5	1.78×10^5	1.34×10^4
Washington	5.76×10^6	2.66×10^7	4.34×10^8	2.37×10^7	6.57×10^6
West Virginia	-	1.92×10^7	2.12×10^5	-	2.58×10^3
Wisconsin	-	-	1.15×10^5	5.20×10^4	1.40×10^2
Wyoming	-	-	-	-	0.00×10^0
U.S. Total	3.26×10^8	1.95×10^9	1.44×10^9	1.01×10^9	2.53×10^{11}

TABLE A.1 (Cont'd)

^aBushels.

^bA hyphen indicates that the data were unpublished by the U.S. Bureau of the Census for reasons of confidentiality. In such cases, total production was very low.

^cCwt = 100-lb units.

^dIncludes apricots, avocados, bananas, coffee, dates, figs, guavas, kiwifruit, mangoes, olives, papayas, passion fruit, persimmons, pomegranates, grapefruit, kumquats, lemons, limes, oranges, tangelos, tangerines, almonds, filberts, hazelnuts, macadamia nuts, pecans, pistachios, walnuts, as well as other fruits and nuts not specifically named.

Source: Listed in Table B.1 by spreadsheet column.

TABLE A.2 State Agricultural Production, 1982: Meat and Eggs (spreadsheet columns are provided for ease of reference to Appendix B)

State (Col. A)	Cattle/Calves		Hogs/Pigs		Broilers	
	No. Sold (Col. E)	lb Slaughtered (Col. F)	No. Sold (Col. G)	lb Slaughtered (Col. H)	No. Sold (Col. I)	lb Consumed (Col. J)
Alabama	8.22×10^5	2.88×10^8	7.86×10^5	1.18×10^8	4.27×10^8	1.26×10^9
Alaska	1.64×10^3	5.75×10^5	6.24×10^3	9.37×10^5	4.61×10^3	1.36×10^4
Arizona	1.02×10^6	3.57×10^8	2.61×10^5	3.92×10^7	0.00×10^0	0.00×10^0
Arkansas	8.22×10^5	2.88×10^8	8.27×10^5	1.24×10^8	5.69×10^8	1.68×10^9
California	3.34×10^6	1.17×10^9	2.82×10^5	4.23×10^7	1.24×10^8	3.65×10^8
Colorado	3.27×10^6	1.15×10^9	6.06×10^5	9.09×10^7	2.26×10^4	6.66×10^4
Connecticut	4.75×10^4	1.66×10^7	9.20×10^3	1.38×10^6	5.40×10^5	1.59×10^6
Delaware	2.62×10^4	9.19×10^6	1.02×10^5	1.53×10^7	1.70×10^8	5.02×10^8
Florida	1.11×10^6	3.88×10^8	3.28×10^5	4.93×10^7	7.65×10^7	2.25×10^8
Georgia	7.30×10^5	2.56×10^8	2.12×10^6	3.18×10^8	5.22×10^8	1.54×10^9
Hawaii	9.17×10^4	3.21×10^7	6.69×10^4	1.00×10^7	3.17×10^6	9.36×10^6
Idaho	1.49×10^6	5.22×10^8	1.14×10^5	1.72×10^7	1.46×10^4	4.31×10^4
Illinois	1.53×10^6	5.37×10^8	9.53×10^6	1.43×10^9	1.38×10^5	4.08×10^5
Indiana	8.90×10^5	3.12×10^8	7.28×10^6	1.09×10^9	1.26×10^7	3.71×10^7
Iowa	4.60×10^6	1.61×10^9	2.38×10^7	3.57×10^9	4.29×10^5	1.27×10^6
Kansas	6.52×10^6	2.28×10^9	3.04×10^6	4.56×10^8	9.45×10^4	2.79×10^5
Kentucky	1.22×10^6	4.28×10^8	1.39×10^6	2.09×10^8	2.41×10^6	7.11×10^6
Louisiana	4.35×10^5	1.52×10^8	7.13×10^4	1.07×10^7	9.19×10^7	2.71×10^8
Maine	5.24×10^4	1.84×10^7	1.21×10^4	1.81×10^6	2.01×10^7	5.91×10^7
Maryland	1.65×10^5	5.78×10^7	3.35×10^5	5.03×10^7	2.35×10^8	6.93×10^8
Massachusetts	4.70×10^4	1.65×10^7	4.44×10^4	6.66×10^6	1.63×10^5	4.80×10^5
Michigan	6.42×10^5	2.25×10^8	1.73×10^6	2.60×10^8	6.01×10^5	1.77×10^6
Minnesota	1.76×10^6	6.17×10^8	8.01×10^6	1.20×10^9	2.26×10^7	6.65×10^7
Mississippi	7.05×10^5	2.47×10^8	3.57×10^5	5.36×10^7	2.47×10^8	7.29×10^8
Missouri	2.50×10^6	8.75×10^8	5.89×10^6	8.85×10^8	2.15×10^7	6.33×10^7
Montana	1.78×10^6	6.23×10^8	3.12×10^5	4.68×10^7	1.84×10^4	5.44×10^4

TABLE A.2 (Cont'd)

State (Col. A)	Cattle/Calves		Hogs/Pigs		Broilers	
	No. Sold (Col. E)	lb Slaughtered (Col. F)	No. Sold (Col. G)	lb Slaughtered (Col. H)	No. Sold (Col. I)	lb Consumed (Col. J)
Nebraska	6.01×10^6	2.11×10^9	7.06×10^6	1.06×10^9	1.04×10^5	3.07×10^5
Nevada	2.75×10^5	9.65×10^7	1.60×10^4	2.41×10^6	5.49×10^2	1.62×10^3
New Hampshire	2.94×10^4	1.03×10^7	9.40×10^3	1.41×10^6	2.91×10^5	8.58×10^5
New Jersey	4.80×10^4	1.68×10^7	7.42×10^4	1.11×10^7	2.05×10^5	6.04×10^5
New Mexico	1.15×10^6	4.03×10^8	8.50×10^4	1.28×10^7	2.48×10^3	7.32×10^3
New York	7.47×10^5	2.62×10^8	1.83×10^5	2.75×10^7	3.81×10^5	1.12×10^6
North Carolina	3.79×10^5	1.33×10^8	3.91×10^6	5.87×10^8	3.48×10^8	1.03×10^9
North Dakota	1.02×10^6	3.57×10^8	4.48×10^5	6.72×10^7	3.54×10^4	1.04×10^5
Ohio	8.73×10^5	3.06×10^8	3.57×10^6	5.37×10^8	1.16×10^7	3.43×10^7
Oklahoma	3.37×10^6	1.18×10^9	3.56×10^5	5.34×10^7	4.94×10^7	1.46×10^8
Oregon	9.55×10^5	3.35×10^8	1.72×10^5	2.59×10^7	1.44×10^7	4.25×10^7
Pennsylvania	8.85×10^5	3.10×10^8	1.67×10^6	2.51×10^8	1.04×10^8	3.06×10^8
Rhode Island	3.54×10^3	1.24×10^6	3.27×10^3	4.91×10^5	0.00×10^0	0.00×10^0
South Carolina	2.14×10^5	7.49×10^7	6.47×10^5	9.71×10^7	4.16×10^7	1.23×10^8
South Dakota	2.42×10^6	8.48×10^8	3.07×10^6	4.60×10^8	2.00×10^5	5.90×10^5
Tennessee	1.04×10^6	3.66×10^8	1.51×10^6	2.27×10^8	5.39×10^7	1.59×10^8
Texas	1.06×10^7	3.71×10^9	9.25×10^5	1.39×10^8	1.76×10^8	5.20×10^8
Utah	4.58×10^5	1.61×10^8	5.04×10^4	7.56×10^6	4.36×10^3	1.28×10^4
Vermont	1.57×10^5	5.50×10^7	7.01×10^3	1.05×10^6	0.00×10^0	0.00×10^0
Virginia	8.14×10^5	2.85×10^8	8.05×10^5	1.21×10^8	1.20×10^8	3.54×10^8
Washington	1.13×10^6	3.95×10^8	1.17×10^5	1.76×10^7	1.69×10^7	4.98×10^7
West Virginia	2.38×10^5	8.34×10^7	5.80×10^4	8.70×10^6	2.30×10^7	6.78×10^7
Wisconsin	1.81×10^6	6.33×10^8	2.66×10^6	3.99×10^8	8.80×10^6	2.60×10^7
Wyoming	9.81×10^5	3.44×10^8	5.77×10^4	8.66×10^6	2.14×10^3	6.29×10^3
U.S. Total	7.12×10^7	2.50×10^{10}	9.48×10^7	1.42×10^{10}	3.52×10^9	1.04×10^{10}

TABLE A.2 (Cont'd)

State (Col. A)	Chickens		Turkeys		Eggs	
	1000 lb Sold (Col. K)	1b Consumed (Col. L)	No. Sold (Col. M)	1b Consumed (Col. N)	Millions (Col. O)	1b (Col. P)
Alabama	6.98×10^4	4.31×10^7	0.00×10^0	0.00×10^0	2.88×10^3	3.77×10^8
Alaska	2.71×10^2	1.67×10^5	1.65×10^2	2.52×10^3	8.80×10^0	1.15×10^6
Arizona	9.53×10^2	5.89×10^5	8.91×10^3	1.36×10^5	1.14×10^2	1.49×10^7
Arkansas	1.22×10^5	7.53×10^7	1.36×10^7	2.08×10^8	4.06×10^3	5.32×10^8
California	8.92×10^4	5.51×10^7	2.11×10^7	3.22×10^8	8.29×10^3	1.08×10^9
Colorado	5.69×10^3	3.51×10^6	0.00×10^0	0.00×10^0	6.27×10^2	8.20×10^7
Connecticut	1.32×10^4	8.18×10^6	0.00×10^0	0.00×10^0	1.06×10^3	1.38×10^8
Delaware	7.31×10^3	4.52×10^6	0.00×10^0	0.00×10^0	1.37×10^2	1.79×10^7
Florida	3.71×10^4	2.29×10^7	7.37×10^2	1.13×10^4	2.96×10^3	3.88×10^8
Georgia	1.15×10^5	7.13×10^7	2.99×10^6	4.58×10^7	5.36×10^3	7.01×10^8
Hawaii	1.50×10^3	9.24×10^5	0.00×10^0	0.00×10^0	2.02×10^2	2.65×10^7
Idaho	2.47×10^3	1.53×10^6	0.00×10^0	0.00×10^0	2.38×10^2	3.11×10^7
Illinois	1.39×10^4	8.60×10^6	0.00×10^0	0.00×10^0	1.16×10^3	1.52×10^8
Indiana	5.57×10^4	3.44×10^7	0.00×10^0	0.00×10^0	4.46×10^3	5.84×10^8
Iowa	2.79×10^4	1.72×10^7	7.22×10^6	1.10×10^8	1.98×10^3	2.60×10^8
Kansas	7.36×10^3	4.55×10^6	0.00×10^0	0.00×10^0	4.62×10^2	6.04×10^7
Kentucky	6.55×10^3	4.05×10^6	4.12×10^3	6.31×10^4	4.84×10^2	6.33×10^7
Louisiana	1.51×10^4	9.31×10^6	2.24×10^2	3.43×10^3	4.57×10^2	5.98×10^7
Maine	3.25×10^4	2.01×10^7	0.00×10^0	0.00×10^0	1.43×10^3	1.87×10^8
Maryland	1.36×10^4	8.40×10^6	0.00×10^0	0.00×10^0	6.58×10^2	8.61×10^7
Massachusetts	4.89×10^3	3.02×10^6	1.54×10^5	2.35×10^6	3.14×10^2	4.11×10^7
Michigan	2.05×10^4	1.26×10^7	1.85×10^6	2.83×10^7	1.53×10^3	2.00×10^8
Minnesota	3.69×10^4	2.28×10^7	2.75×10^7	4.20×10^8	2.43×10^3	3.18×10^8
Mississippi	3.99×10^4	2.46×10^7	1.37×10^2	2.10×10^3	1.52×10^3	1.99×10^8
Missouri	3.71×10^4	2.29×10^7	9.87×10^6	1.51×10^8	1.46×10^3	1.90×10^8
Montana	3.44×10^3	2.12×10^6	1.01×10^4	1.54×10^5	1.88×10^2	2.46×10^7
Nebraska	6.08×10^3	3.76×10^6	7.29×10^5	1.12×10^7	8.09×10^2	1.06×10^8

TABLE A.2 (Cont'd)

State (Col. A)	Chickens		Turkeys		Eggs	
	1000 lb Sold (Col. K)	lb Consumed (Col. L)	No. Sold (Col. M)	lb Consumed (Col. N)	Millions (Col. O)	lb (Col. P)
Nevada	3.20×10^1	1.98×10^4	0.00×10^0	0.00×10^0	1.80×10^0	2.36×10^5
New Hampshire	2.74×10^3	1.69×10^6	3.61×10^4	5.52×10^5	1.47×10^2	1.92×10^7
New Jersey	4.86×10^3	3.00×10^6	0.00×10^0	0.00×10^0	2.76×10^2	3.61×10^7
New Mexico	3.93×10^3	2.43×10^6	0.00×10^0	0.00×10^0	3.02×10^2	3.95×10^7
New York	3.29×10^4	2.03×10^7	3.10×10^5	4.74×10^6	1.86×10^3	2.43×10^8
North Carolina	6.60×10^4	4.08×10^7	2.96×10^7	4.53×10^8	3.15×10^3	4.12×10^8
North Dakota	2.69×10^3	1.66×10^6	8.27×10^5	1.27×10^7	1.02×10^2	1.33×10^7
Ohio	4.50×10^4	2.78×10^7	2.31×10^6	3.53×10^7	2.76×10^3	3.60×10^8
Oklahoma	7.55×10^3	4.67×10^6	1.60×10^6	2.44×10^7	8.18×10^2	1.07×10^8
Oregon	7.03×10^3	4.34×10^6	1.01×10^6	1.54×10^7	6.20×10^2	8.11×10^7
Pennsylvania	9.04×10^4	5.58×10^7	5.46×10^6	8.34×10^7	4.32×10^3	5.66×10^8
Rhode Island	1.60×10^3	9.89×10^5	0.00×10^0	0.00×10^0	7.40×10^1	9.68×10^6
South Carolina	2.41×10^4	1.49×10^7	1.90×10^6	2.90×10^7	1.66×10^3	2.17×10^8
South Dakota	5.08×10^3	3.14×10^6	1.41×10^6	2.16×10^7	4.28×10^2	5.60×10^7
Tennessee	1.20×10^4	7.44×10^6	2.87×10^3	4.39×10^4	8.84×10^2	1.16×10^8
Texas	4.53×10^4	2.80×10^7	4.40×10^6	6.73×10^7	3.11×10^3	4.07×10^8
Utah	3.67×10^3	2.27×10^6	2.64×10^6	4.03×10^7	4.39×10^2	5.74×10^7
Vermont	1.19×10^3	7.33×10^5	0.00×10^0	0.00×10^0	7.90×10^1	1.03×10^7
Virginia	1.87×10^4	1.16×10^7	9.91×10^6	1.52×10^8	9.29×10^2	1.22×10^8
Washington	2.03×10^4	1.26×10^7	0.00×10^0	0.00×10^0	1.33×10^3	1.75×10^8
West Virginia	4.12×10^3	2.55×10^6	2.76×10^6	4.22×10^7	1.41×10^2	1.84×10^7
Wisconsin	1.35×10^4	8.32×10^6	7.19×10^6	1.10×10^8	9.91×10^2	1.30×10^8
Wyoming	1.66×10^2	1.03×10^5	6.50×10^2	9.94×10^3	8.20×10^0	1.07×10^6
U.S. Total	1.20×10^6	7.41×10^8	1.68×10^8	2.56×10^9	6.97×10^4	9.12×10^9

Source: Listed in Table B.1 by spreadsheet column.

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APPENDIX B:
AGRICULTURAL PRODUCTION
STATISTICS DOCUMENTATION

APPENDIX B:

**AGRICULTURAL PRODUCTION
STATISTICS DOCUMENTATION**

Tables B.1-B.3 identify the sources and/or derivation formulas for the data entered into each column of the agricultural statistics spreadsheets. Actual data values are given in Appendix A.

TABLE B.1 Documentation for Basic Agricultural Production Statistics^a

Column	Description	Data Source ^b or Formula
A	State names	
B	Land in state (acres)	Census Table 1, pp. 134-140
C	Percent land in farms	Census Table 1, pp. 134-140
D	Dairy	SRS Statistical Bulletin 722, p. 22
E	Cattle/calves (no. sold)	Census Table 11, pp. 218-224
F	Cattle/calves (lb slaughtered)	Col. E $\times$ 55.13290366% $\times$ 635.66 lb
G	Hogs/pigs (no. sold)	Census Table 12, pp. 232-238
H	Hogs/pigs (lb slaughtered)	Col. G $\times$ 171.76 lb $\times$ 87.4029372%
I	Broilers (no. sold)	Census Table 14, pp. 243-249
J	Broilers (lb consumed)	Col. I $\times$ 4.03 lb $\times$ 73.1565%
K	Chickens (1000 lb sold)	SRS Statistical Bulletin 725, p. 14
L	Chickens (lb consumed)	Col. K $\times$ 1000 $\times$ 61.7731747%
M	Turkeys (no. sold)	Census Table 14, pp. 243-249
N	Turkeys (lb consumed)	Col. M $\times$ 19.19 lb $\times$ 79.701%
O	Eggs (millions)	SRS Statistical Bulletin 721, p. 17
P	Eggs (lb)	Col. O $\times$ 1,000,000 $\times$ 1.57 lb/12 (dozen)
Q	Corn (bu)	Census Table 15, pp. 250-262
R	Corn (lb)	Col. Q $\times$ 56 lb/bu
S	Wheat (bu)	Census Table 15, pp. 250-262
T	Wheat (lb)	Col. S $\times$ 60 lb/bu
U	Soybeans (bu)	Census Table 15, pp. 250-262
V	Soybeans (lb)	Col. U $\times$ 60 lb/bu
W	Potatoes (cwt)	Census Table 15, pp. 250-262
X	Potatoes (lb)	Col. W $\times$ 100
Y	Honey (lb)	Census Table 20, p. 298
Z	Sorghum (bu)	Census Table 24, pp. 311-312
AA	Sorghum (lb)	Col. Z $\times$ 56 lb/bu
AB	Barley (bu)	Census Table 24, pp. 312-313
AC	Barley (lb)	Col. AB $\times$ 48 lb/bu
AD	Oats (bu)	Census Table 24, pp. 312-315
AE	Oats (lb)	Col. AD $\times$ 32 lb/bu

TABLE B.1 (Cont'd)

Column	Description	Data Source ^b or Formula
AF	Rye (bu)	Census Table 24, p. 316
AG	Rye (lb)	Col. AF $\times$ 56 lb/bu
AH	Sunflowers (lb)	Census Table 24, p. 317
AI	Dry beans (cwt)	Census Table 25, p. 319
AJ	Dry beans (lb)	Col. AI $\times$ 100
AK	Dry peas (lb)	Census Table 25, p. 319
AL	Sweet potatoes (bu)	Census Table 25, p. 321
AM	Sweet potatoes (lb)	Col. AL $\times$ 55 lb/bu
AN	Sugar beets (tons)	Census Table 25, p. 321
AO	Sugar beets (lb)	Col. AN $\times$ 2000
AP	Peanuts (lb)	Census Table 25, p. 322
AQ	Apples (lb)	Census Table 28, p. 359
AR	Cherries (lb)	Census Table 28, p. 360
AS	Grapes (lb)	Census Table 28, pp. 361-362
AT	Nectarines (lb)	Census Table 28, p. 362
AU	Peaches (lb)	Census Table 28, p. 363
AV	Pears (lb)	Census Table 28, p. 364
AW	Plums and prunes (lb)	Census Table 28, p. 365
AX	Other fruits (lb)	Census Table 28, pp. 359-369
AY	State names	
AZ	Total crops (lb)	Cols. R + T + V + X + Y + A + AC + AE + AG + AH + AJ + AK + AM + AO + AP + AQ + AR + AS + AT + AU + AV + AW + AX
BA	Total meat (lb)	Cols. F + H + J + L + N + P
BB	Total dairy (lb)	Col. D $\times$ 10 ⁶

^aBasic agricultural production statistics are presented in Tables 3.1, A.1, and A.2 of this report.

^bThe census tables cited are all from the *1982 Census of Agriculture, Vol. 1, Geographic Series, Part 51, United States Summary and State Data*, U.S. Bureau of the Census, AC82-A-51 (Oct. 1984). The three statistical bulletins cited were all published by the USDA Statistical Reporting Service (SRS), Crop Rotating Board. The three cited are (1) Bulletin 722: *Milk Final Estimates 1979-82* (Feb. 1985), (2) Bulletin 721: *Chicken and Eggs, Final Estimates for 1980-83* (Jan. 1985), and (3) Bulletin 725: *Poultry Production, Disposition and Income Final Estimates for 1980-83* (April 1985).

TABLE B.2 Documentation for Agricultural Production for Land in Farms^a

Column	Description	Formula
BC	State names	
BD	Crops (lb/acre)	Col. AZ/[Col. B × (Col. C/100)]
BE	Meat (lb/acre)	Col. BA/[Col. B × (Col. C/100)]
BF	Dairy (lb/acre)	Col. BB/[Col. B × (Col. C/100)]
BG	State names	
BH	Crops (kg/km ²)	(Col. AZ × 0.45359237 kg/lb)/[Col. B × (Col. C/100) × 0.0040468564 km ² /acre]
BI	Meat (kg/km ²)	(Col. BA × 0.45359237 kg/lb)/[Col. B × (Col. C/100) × 0.0040468564 km ² /acre]
BJ	Dairy (kg/km ²)	(Col. BB × 0.45359237 kg/lb)/[Col. B × (Col. C/100) × 0.0040468564 km ² /acre]

^aAgricultural production statistics for land in farms are presented in Table 3.2 of this report.

TABLE B.3 Documentation for Agricultural Production for Total Land in State^a

Column	Description	Formula for Data Entered
BK	State names	
BL	Crops (lb/acre)	Col. AZ/Col. B
BM	Meat (lb/acre)	Col. BA/Col. B
BN	Dairy (lb/acre)	Col. BB/Col. B
BO	State names	
BP	Crops (kg/km ²)	(Col. AZ × 0.45359237 kg/lb)/ (Col. B × 0.0040468564 km ² /acre)
BQ	Meat (kg/km ²)	(Col. BA × 0.45359237 kg/lb)/ (Col. B × 0.0040468564 km ² /acre)
BR	Dairy (kg/km ²)	(Col. BB × 0.45359237 kg/lb)/ (Col. B × 0.0040468564 km ² /acre)

^aAgricultural production statistics for land in farms are presented in Table 3.3 of this report.