Appendix K. Changes in the Economics of Alfalfa Farming with Deregulation of Glyphosate-Tolerant Alfalfa

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Changes in the Economics of Alfalfa Farming with Deregulation of Glyphosate-Tolerant Alfalfa

Executive Summary

This report analyses the potential impact on the economics of alfalfa farming due to the introduction of glyphosate-tolerant (GT) alfalfa into the market. It does so by reviewing the existing literature on alfalfa costs and returns, as well as on the potential impacts of GT alfalfa adoption. Based on this literature, scenarios of returns with GT alfalfa are constructed and described, where possible. Additional considerations are made regarding the potential long-term economic consequences of increased glyphosate resistance of weeds.

The report finds that alfalfa forage farmers aiming at maximizing returns during the time horizon of an alfalfa life stand would likely benefit financially from the adoption of GT alfalfa due to potential improvements in forage quality with reduced herbicide costs. The impact of GT alfalfa adoption for seed production is not as clear, given its dependence on conditions established by breeder company – producer contracts.

The increased returns expected for GT alfalfa farming in the short run might or might not persist in the long run, depending on market considerations (including technological fees), limitations to crop rotation imposed by the adoption of GT alfalfa, and cost impacts of any possible increased weed resistance over time.

A final analysis ranking counties based on the likely benefits of GT alfalfa adoption is presented at the end of this report and should be interpreted within the limited scope of this report.

1.0 Introduction

1.1 Objective, Scope, and Organization of Report

This report analyses the potential impact on the economics of alfalfa farming of the introduction of GT alfalfa into the market. By "economics of alfalfa" farming we refer to the costs of production and yields and their implications for farm income. Our analysis is restricted to looking at individual farms: we do not aggregate farmers to draw inferences on supply. This analysis – as well as demand considerations – is left for the remaining socioeconomic Technical Reports. In particular, the Technical Report *Economic and Social Impacts on Conventional and Organic Farmers of Deregulation of Glyphosate-Tolerant Alfalfa* (appendix S) will also include the impacts on farmers of conventional alfalfa.

Below we explain the methodology – assumptions, scenarios and limitations – upon which this analysis is based. Section 2 focuses on the production of alfalfa hay and section 3 on the production of alfalfa seeds. In both of these sections, we assume no glyphosate resistance in weeds. This assumption is relaxed in section 4 where we consider the impacts of increased glyphosate resistance of weeds on both hay and seed production, as well as on crops with which alfalfa is rotated on the farm.

1.2 Methodology

Alfalfa farming for forage and for seed are analyzed separately, the former in section 2, the latter in section 3. These are the two main – and quite distinct – cropping systems for alfalfa.

In section 2, we start with a brief description of alfalfa farming for forage, its cost factors and its value for the farmer. We then review the existing cost studies of alfalfa farming and identify the main factors affecting economic returns for alfalfa farmers. We then review the literature on the possible differences between conventional alfalfa farming and GT alfalfa farming, regarding those cost and return factors. The same methodology is adopted in section 3 regarding alfalfa farming for seed.

In section 2 we go a step further and build scenarios for GT alfalfa costs using some of the cost studies identified for conventional alfalfa. As alfalfa farming conditions vary considerably throughout the United States, these scenarios assume all conditions of the base conventional cost studies remain the same, except a few major changes previously identified as likely to occur in GT farming. The results are offered as an illustration of potential differences in costs and returns for the farmer under specific situations. We did not build similar scenarios in section 3. To do so would require investigation in greater depths into breeder company and seed grower agreements.

Sections 2 and 3 look at economic impacts to farmers when they plan with the time horizon of the life of an alfalfa stand, and assume no weed resistance occurs within this time horizon. Section 4 raises a few considerations regarding economic impacts beyond this time horizon and regarding weed resistance to glyphosate and its potential growth on alfalfa farms, whether in

alfalfa fields or in crops rotated with alfalfa. These considerations are based on the existing literature and on the analyses done in sections 2 and 3.

In appendix K-3 of this technical report, we present county level analysis identifying those counties that would most likely benefit from GT alfalfa deregulation, based solely on the short-term cost-return considerations made in section 2, and not incorporating considerations that will be dealt with in later Technical Reports (e.g. demand considerations, beyond the scope of the present report). It transposes, to the extent possible, the analysis done in this report to the county level.

1.2.1 Assumptions

Cause-effect relationships assumed in our analysis of the potential socioeconomic impacts of GT alfalfa on alfalfa farming stem from two potential sources of physical impacts. The first is the availability of a new variety of alfalfa with its own traits and implications for costs and farm income. Figure K-1 below illustrates the impact of the availability of this new variety, showing also potential implications for scale economies.

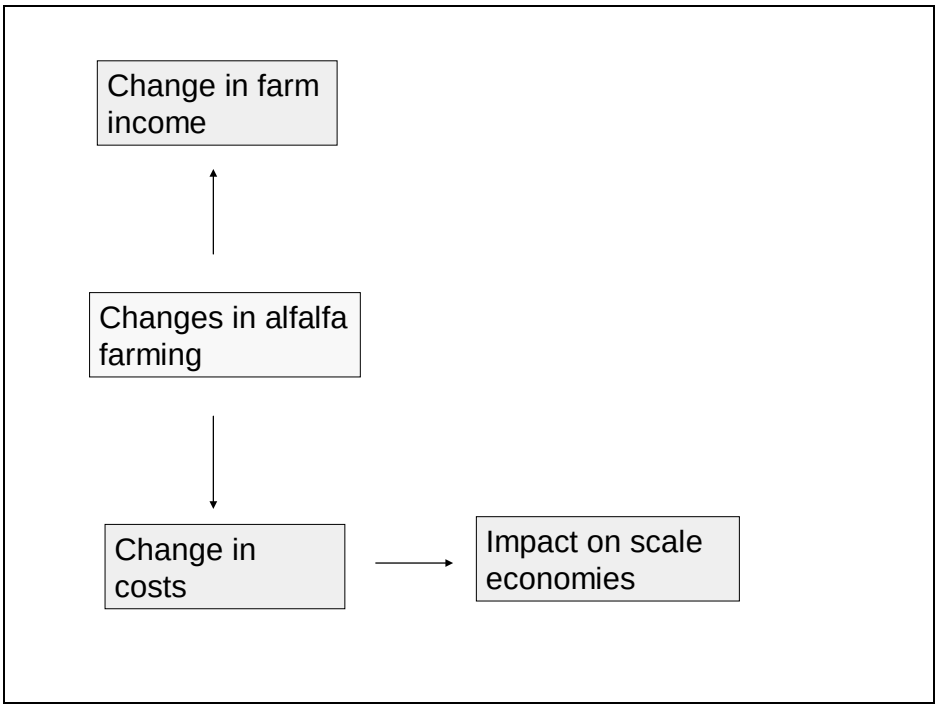

Figure K-1: Changes in alfalfa farming

Change in alfalfa farming could imply more or less use of various inputs and higher or lower yields of alfalfa hay and seed. This leads to changes in the costs of producing alfalfa and potential impacts on economies of scale. It also results in changes in farm income.

Changes in costs of producing alfalfa could also have implications for the use of labor. We have not included analysis of this here for two reasons: a) the literature and cost studies we found largely omit information on the use of farmers own or family labor; b) we found little to no reference on changes in the use of own or hired labor in the adoption of GT alfalfa.

For this analysis we assume no growth in glyphosate resistant weeds has yet followed from the increased use of glyphosate.

The second source of change in alfalfa farming is the growth in GT weeds that is expected from the increased use of glyphosate over time. This has implications not only for alfalfa farming but also for farming of other crops rotated with alfalfa, so we include the analysis of impacts on other crops as well.

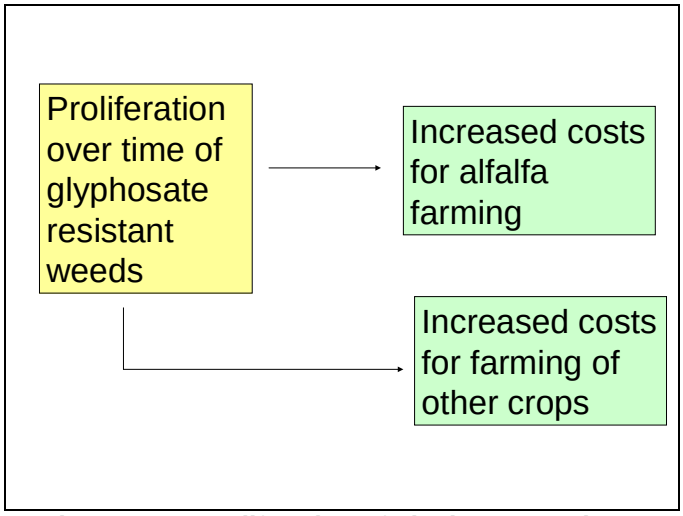

Figure K-2: Proliferation of glyphosate resistant weeds

1.2.2 Data and Information Sources

Most of the information on alfalfa production comes from documents published by university cooperative extension services. Some of these documents are peer-reviewed before publishing and others were presented at specialized conferences. Other sources of information and data include academic journals, producer associations, specialized internet portals and magazines and government official data sources.

2.0 Changes in Alfalfa Farming for Forage

2.1 Conventional Alfalfa Farming For Forage

Harvested acreage of alfalfa hay (dry) was in 2007 almost 21.7 million acres generating some 72.6 million tons of hay at an average yield of 3.35 tons per acre (USDA NASS, 2008)[1]. Statistics for acreage of alfalfa used as haylage (alfalfa baled at a higher moisture content than dry hay) are not available for all states except in the Agricultural Census, but based on the 2007 census and more recent United States Department of Agriculture (USDA) National Agriculture Statistics Service (NASS) data available for 18 states, haylage acreage should account for an additional 10-15 percent in alfalfa acreage grown for forage. It is the fourth crop in acreage in the United States (USDA NASS, 2008).

Alfalfa is grown for forage in almost all of the U.S. states and farming conditions vary considerably depending on climate, rainfall, soil fertility, weed and disease prevalence, whether it is seeded in fall or in spring, for dairy or other use, among other factors. In a study conducted between 1988 and 2002 on pesticide use in alfalfa, Hower et al (1999) differentiate between four distinct regions of alfalfa farming: North Central, West, Northeast and South. The North Central region presented the highest acreage of alfalfa followed by the West. Together these two regions had 90 percent of the alfalfa acreage in the country. The West, however, presented the highest yields, relatively high prices, most seeding done in fall and relatively high rates of insecticide and herbicide use, while the North Central region presented the lowest yields, lowest prices, most seeding done in spring and the lowest rates of insecticide and herbicide use. According to this report, only 8.1 percent of alfalfa hay acreage in the North Central region was treated with herbicides, while in the West 50 percent of acreage was treated with herbicides.

Rogan and Fitzpatrick (2004) follow the regionalization adopted by the USDA-Plant Variety Protection Office and the National Alfalfa and Miscellaneous Legume Variety Review Board that divides alfalfa production in seven regions: Southeast, East Central, North Central, Great Planes, South West, Winterhardy Intermountain and Moderately Winterhardy Intermountain. More than half of the alfalfa forage acreage is grown in the North Central region. This region tends to use winterhardy varieties, harvest 2-5 times a year, has yields lower than national average and often uses companion crops to control weeds during establishment of alfalfa. A similar characterization is done of the East Central region. In contrast, in the Southwest region some non-dormant varieties are used allowing for 8-11 harvests a year Rogan and Fitzpatrick (2004). In some locations in California, yields can reach 14 tons per acre (Klonsky et al., 2007)

Klonsky et al (2007) characterize alfalfa as being a relatively low risk crop, valued by farmers for its cash flow properties, often harvested 2-7 times per year, while waiting for the harvest of other crops. It is also valued as a rotational crop since it has beneficial properties on the soil (Putnam et al., 2007).

Klonsky et al. (2007) summarize average costs from various cost studies done for alfalfa by the University of California-Davis (UC-Davis), in collaboration with the University of California

[1] This includes alfalfa hay mixtures.

(UC) Cooperative Extension, for several parts of California. Throughout the state, major sources of variation in costs are irrigation and land values. Harvesting costs also vary considerably depending on the number of harvests per year allowed by the local climate. Putnam et al (2007) consider the limitation of water supply as being the main determinant factor of the future of alfalfa production in California.

2.1.1 Cost Studies

There are several cost studies done by university cooperative extension services available both for production of alfalfa hay and alfalfa haylage.

The University of Nevada conducted multiple cost studies for alfalfa hay production. A 1998 study in Humboldt County (Kettle et al. 1999b) found costs associated with 500 acres of alfalfa hay using center pivot irrigation. The study found irrigation power to be the highest cost component (22.3%) of total variable costs of production. Chemical weed control accounted for 10.7 percent of total operating costs. These figures differed only slightly from a 1996 cost study for costs associated with 960 acres of alfalfa (Myer et al., 1997). The study also found irrigation to be the highest cost component (26.8%), and found slightly lower costs associated with chemical weed control (9.2%).

A 2006 study conducted in Pershing County, Nevada (Breazeale et al., 2006) calculated costs for alfalfa hay stand establishment and production for farms with 750 acres of alfalfa cultivation. For stand establishment, the study results show no component accounting for a significant amount of the operating costs; fuel and lube, fertilizer, and maintenance together accounted for 42 percent of total operating costs. Herbicide use during stand establishment comprised 4.8 percent of operating costs. For hay production, the study shows maintenance (19.6 %), fuel and lube (18.9%), hired labor (17.9%), and operator labor (16.4%) accounting for more than 70 percent of operating costs. Herbicide use accounts for 7.5 percent of operating costs during production.

A 2003 Ohio State University Extension alfalfa haylage production budget (The Ohio State University Extension, 2003) estimated costs for different yields of alfalfa haylage for a four year stand. The study found chemical use (Bathyroid, Poast, and Butyrac) to be the highest cost component of operating costs. The proportion of the budget in chemical use decreased with yield; for a yield of 8 tons per acre chemical use accounted for 21.9 percent of operating costs, for a yield of 13 tons per acre chemical use accounted for 18.1 percent of operating costs. A 2007 Virginia Cooperative Extension alfalfa haylage cost study (Virginia Cooperative Extension, 2007) found fertilizer use to be the highest operating cost component (41.4%) of operating costs for a 9 ton yield. Herbicide use accounted for 14.6 percent of total operating costs.

We detail two other cost studies below, one for California, the other for Wisconsin, in an attempt to better illustrate some of the varying local conditions in alfalfa production.

The most recent cost study we found comes from the UC Cooperative Extension with sample costs for establishing and producing conventional alfalfa in a 50 acre extension in the San Joaquin Valley (Frate et al., 2008). Table K-1 below summarizes the costs for establishing alfalfa. Total cultural (land preparation and plant growing) costs include land preparation,

fertilizers, planting and irrigation. Cash overhead costs are the costs for insurance, office expenses and taxes. Non-cash costs are capital recovery costs for land, the irrigation system and the equipment. The seeding rate is assumed to be 30 lbs/acre. We show the line items for seeds and herbicides, more details are found in the publication.

Table K-1. Establishment Costs, $/acre

Seeds	90.00
Herbicides	32.00
Other	314.00
TOTAL CULTURAL COSTS	436.00
Interest on operating capital @ 6.75%	10.00
TOTAL OPERATING COSTS PER ACRE	446.00
Cash overhead costs	85.00
CASH COSTS PER ACRE	531.00
Non-cash costs/ acre	294.00
TOTAL COSTS PER ACRE	825.00

Source: Frate et al., 2008

Table K-2 shows how establishment costs per acre vary with changes in seed and herbicide costs. The first column shows the increase assumed for seed costs or for herbicide costs. The second and third columns show the impact on establishment costs when it is seed costs that increase 10, 20, 30 or 40 percent, and the fourth and fifth columns show the impact on establishment costs when it is herbicide costs that face a similar increase.

Table K-2 shows that seed costs have a greater weight than herbicide costs in determining total establishment costs, under the conditions of the UC Cooperative Extension Study.

Table K-2. Sensitivity of Establishment Costs to Changes in Seed and Herbicide Costs

Percent increase in input costs	Establishment costs when seed costs increase		Establishment costs when herbicide costs increase	
	$	% Change	$	% Change
0	825.0		825.0	
10%	834.0	1.09%	828.2	0.39%
20%	843.0	2.18%	831.4	0.78%
30%	852.0	3.27%	834.6	1.16%
40%	861.0	4.36%	837.8	1.55%

Source: based on previous table

Table K-3 incorporates establishment costs into total costs of producing alfalfa by assuming annual cost recovery of cash establishment costs spread over a 4 year life of stand. Cultural costs now include herbicides, insecticides, fertilization and irrigation. Income from alfalfa hay sales is also incorporated and seven harvests are assumed in a year. The UC Cooperative Extension Study assumed a yield of 8 tons per acre, average of yields between 5 and 11 tons per acre obtained under these conditions in the San Joaquin Valley. The table shows positive returns over operating costs, but negative returns when overhead and capital costs are included.

Table K-3. Total Production Costs and Returns, $/acre

Sales (8 tons/acre at $185/ton of premium)	1,480
Herbicides	71.00
Other cultural costs	294.00
Harvest costs (7x)	310.00
Interest on operating capital @ 6.75%	10.00
Total operating costs/acre	685.00
Return over operating costs	795.00
Cash overhead costs	165.00
Annual cost recovery: alfalfa establishment	147.00
Annual cost recovery: other	549.00
Total costs/acre	1,546.00
Return over total costs	-66.00

Source: Frate et al., 2008

Table K-4 shows how returns per acre vary with changes in seed and herbicide costs, as well as changes in yields or hay prices. As in table K-2, the first column represents the percent increase assumed if a given factor is affecting returns. In this case: seed costs, herbicide costs or the yield multiplied by the price of alfalfa hay. The remaining columns show the impact on returns when the percent increase assumed is applied to seed costs, herbicide costs, yields or the price of alfalfa hay.

The table shows that the influence of herbicide costs now surpasses that of seeds on total costs, since now herbicides are also used during production. The table also shows, however, that under the conditions of the UC Cooperative Extension Study, yields and hay prices are far more important than seed and herbicide costs in determining returns.

Table K-4. Sensitivity of Returns to Changes in Costs, Yields and Hay Prices

Percent Increase	Seed Costs		Herbicide Costs		Yields or Hay Prices	
	$	% change	$	% change	$	% change
0%	-66		-66		-66	
10%	-68.49	3.77%	-73.99	12.11%	82	224.24%
20%	-70.49	6.80%	-81.97	24.20%	230	448.48%
30%	-73.48	11.33%	-89.96	36.30%	378	672.73%
40%	-75.97	15.11%	-97.94	48.39%	526	896.97%

Source: based on previous table

The Integrated Pest and Crop Management Portal of the University of Wisconsin Plant Sciences outreach programs posts a “Roundup Ready Alfalfa Calculator” elaborated by Dan Undersander (http://ipcm.wisc.edu/WCMNews/tabid/53/EntryID/208/Default.aspx). Table K-5 shows the results of this calculator for conventional hay, as presented on the Web site. We include the results for Roundup Ready® alfalfa further below. Values are those that the portal feels “are

accurate estimates of the costs, use patterns, and yield throughout Wisconsin." However the numbers are not supposed to be representative of every farmer, and the calculator is offered so that each farmer can plug in their numbers and see the results.

Table K-5. Establishment and Production Cost of Conventional Alfalfa, units/acre

Seed cost/50 lb bag ($)	$200.00
Pounds of seed per acre	12
Technology fee/bag ($/bag)	$0.00
Yield in seeding year (t/a DM)	3.50
Herbicide cost ($/acre/application)	$20.00
Herbicide application cost ($/acre)	$10.00
Number of herbicide applications	1
Value of ease of Roundup® use ($/acre)	$0.00
Yield depression from pursuit/raptor (t/a DM)	0.30
Expected stand life (yrs including seeding year)	3
Value of hay (per ton DM)	$100.00
Fixed costs per acre per year	$180.00
Harvesting costs per acre per harvest	$35.00
Number of harvests	2
Seeding Year Production Costs/Results	
Seed cost (prorated + tech fee) per acre*	$16.00
Total seed and herbicide cost per ton of hay	$14.38
Total cost per ton of hay seeding year	$85.80
Profit per acre - seeding year	$49.69

Source: Integrated Pest Crop Management, University of Wisconsin

The University of Wisconsin portal also presents some sensitivity analysis. We extend their analysis to include herbicide costs and the price of alfalfa hay, since these variables could potentially differ between conventional and GT alfalfa, as argued in section 2.2 below. We use the numbers for the seeding year above to have an idea of the changes in profit for percent changes in seed costs, herbicide costs and the price of hay. Table K-6 shows the results for a conventional alfalfa hay field. The first column represents the percent increase assumed in a given factor affecting returns. The remaining columns show the impact on per acre profit when the percent increase assumed is applied to seed costs, herbicide costs or the price of alfalfa hay.

Table K-6. Sensitivity of Profit per Acre to Costs and Prices

% Increase	Seed Costs	Herbicide Costs	Price of Alfalfa Hay
0	49.69	49.69	49.69
10	47.94	47.50	84.69
20	46.19	45.31	119.69
30	44.44	43.13	154.69
40	42.69	40.94	189.69

Source: Elaborated from numbers in table above.

While a 40 percent increase in seed costs and herbicide costs have a less than proportional impact on profit, a 40 percent increase in alfalfa hay prices will more than triple the profit per acre. What this means is that reductions in the costs of herbicides are less important in the farmer's choice of adopting GT alfalfa or conventional alfalfa for hay than the possibility of obtaining higher quality alfalfa hay.

As percentage changes in yield also seem to have a high impact on returns, it could be argued that farmers of conventional alfalfa face a tradeoff between pursuing higher yields of alfalfa of lower quality, by harvesting a shared alfalfa-weed mix, or pursuing higher prices of alfalfa with lesser weed content. In fact, it seems that differences in prices between high quality and low quality alfalfa hay are highest in times of average low prices (Holin, 2008). In those seasons it could be worth favoring quality over yield. In years when average prices are high, favoring yields could pay off.

2.1.2 Scale Economies

Some insight on the potential link between alfalfa varieties and economies of scale is provided by the exercise below in which we compare costs for a 300 acre alfalfa hay farm with those of a 50 acre alfalfa hay farm, under similar circumstances, as made possible by two studies from the UC Cooperative Extension (Frate et al., 2008; Mueller et al., 2008).

The UC Cooperative Extension Service produced a similar study to that of the 50 acre farm in San Joaquin Valley for a 300 acre farm in the same region (Mueller et al., 2008). Most of the assumptions are the same such as seeding rate and price received per ton of premium hay; other aspects were adapted to production on a larger scale. These include:

- yields are assumed to be 9 tons per acre, where the additional ton (compared to the 8 tons per acre of the 50 acre farm) is the equivalent in haylage of 3.03 green tons with 30 percent dry matter. This additional ton is sold at $46.67 (roughly the difference between hay and harvest costs, divided by three);
- land preparation costs are lower per acre, making establishment costs per acre lower in the 300 acre farm than in the 50 acre farm;
- insurance and property taxes are higher for the entire farm, but lower per acre.
- the life of stands is assumed to be three years instead of four.

Table K-7 below summarizes the total costs and returns for establishing and producing alfalfa on a 300 acre farm in the San Joaquin Valley, as compared to a 50 acre farm in the same region.

Even with a shorter life of stand and higher operating costs per acre, returns per acre are higher for the 300 acre farm due to: a) lower overhead and capital recovery costs, including lower land preparation costs in establishing alfalfa stands (economies of scale on the size of land); and b) increased yields. In the 50 acre and 300 acre studies compared above, the higher per acre land preparation costs for the 50 acre farm seem to originate from a greater reliance of custom operators.

Table K-7. Total Production Costs and Returns, $/acre

	300 acre farm	50 acre farm
Sales	*1620a*	*1480*
Herbicides	71.00	71.00
Other cultural costs	294.00	294.00
Harvest costs (7x hay; 2x haylage)	322.00b	310.00
Interest on operating capital @ 6.75%	11.00	10.00
Total operating costs per acre	*708.00*	*685.00*
Return over operating costs	**912.00**	**795.00**
Cash overhead costs	122.00c	165.00
Annual cost recovery: alfalfa establishment	173.00d	147.00
Annual cost recovery: other	359.00e	549.00
Total costs per acre	*1,362.00*	*1,546.00*
Return over total costs	**258.00**	**-66.00**

Source: Mueller et al., 2008. a. Eight tons hay, one ton haylage; b. Seven hay harvests, two haylage; c. Lower liability insurance and property taxes per acre; d. Establishment costs/ acre are actually lower for 300 acre farm thanks to reduced land preparation costs, but divided over shorter three year life of stand; e. Lower land cost recovery.

What this analysis suggests is that any alfalfa variety that is more demanding of land preparation will likely be more attractive to larger farmers, while alfalfa varieties that allow for less expense in land preparation could be more accessible to smaller farmers than other varieties.

2.2 GT Alfalfa Hay Farming

Evidence of farming distinctions between GT alfalfa and conventional alfalfa come mostly from field trials and from those farmers that planted alfalfa during the window in which it was deregulated, between June of 2005 and March of 2007. During this period over 300,000 acres of GT alfalfa are estimated to have been planted (Putnam, 2007). Much of this latter type of evidence is anecdotal, in that it is based on the observation of one or a few GT alfalfa fields.

Canevari (2007) presents a small (non-random) survey with 24 growers in addition to a few consultants, seed and marketing dealers, and university faculty where the main aspect of GT alfalfa observed was the control of weeds with glyphosate, generally to the satisfaction of the users. According to this paper, GT alfalfa would reduce the costs of herbicides while improving the quality of alfalfa hay (lesser weed content). Miller et al. (2006) refers to field trials done at the University of Wyoming and University of Nebraska and suggest the main features of GT alfalfa are its "ease of use, flexibility, and broad spectrum weed control."

Individual farmers that had experimented with GT alfalfa after initial deregulation and that sent comments to the Animal and Plant Health Inspection Service's (APHIS) Notice of Intent to prepare an Environmental Impact Statement provide additional reports, including that of possible increase in yields (due to lesser stunting caused by use of other herbicides) and reduction in herbicide costs.

Reduced seeding rates or increased life of stands would have relevant impacts on costs because establishment costs would be reduced (per year of production). Van Deynze et al. (2004) suggested GT alfalfa could potentially increase the life of alfalfa stands but we have not found studies verifying this.

Given the economic relevance for alfalfa farming of yields and alfalfa hay quality evidenced in the cost studies reviewed above, we reviewed the literature for evidence of differences in those particular traits between GT alfalfa and non-GT alfalfa.

2.2.1 Differences in Yield

Alfalfa hay yield is influenced by a wide range of factors, including seed variety, proper planting and establishment, climate, soil and moisture conditions, and weed and insect control (Dixon et al., 2005). Hundreds of alfalfa varieties have been developed for use in North America. These varieties are adapted to the various major alfalfa production zones, and contain genes selected for high yield and resistance to diseases, insects, and nematodes (Van Deynze et al., 2004).

The focus here is on evaluating any systematic differences in yield between GT and conventional alfalfa varieties, holding constant the other factors that could influence yield. Rigorous assessment of the yields of different alfalfa varieties under actual farming conditions is generally not available. Instead, forage agronomists usually evaluate different varieties in the context of controlled variety trials at agricultural experiment stations.

Comparative yield data from a number of variety trials across the United States are given in table K-8. These results were selected for illustrative purposes, and do not necessarily represent the yield outcomes that would result from individual cultivar comparisons, or other locations and growing seasons.

Table K-8. Comparative Variety Trial Yield Results

Variety Trial Location and Date	Average Annual Yield, All GT Alfalfa Varieties (Tons/Acre)	Average Annual Yield, All Varieties (Tons/Acre)
Illinois (Freeport), 2007[1]	6.10	6.17
Iowa (Ames), 2007[2]	4.61	4.64
Kansas (Thomas Co.), 2007[3]	8.22	8.41
Nebraska (Havelock), 2006[4]	5.04	5.12
New York (Cobleskill), 2006[5]	2.6	2.9
South Dakota (Brookings Co), 2006[6]	3.81	3.86
Montana (Huntley), 2006[7]	6.24	6.18
Michigan (East Lansing) 2006[8]	5.48	5.03

1. Source: http://vt.cropsci.uiuc.edu/forage.html
2. Source: http://www.croptesting.iastate.edu/alfalfa/results/2007-alfalfa.xls
3. Source: http://kscroptests.agron.ksu.edu/07/07alf/7a-thi6.asp?Loc=thi6
4. Source: http://varietytest.unl.edu/alfalfa/2006/Roundup-Havelock2006table06.xls
5. Source: http://p brgen.cals.cornell.edu/programsandprojects/departmental/foragetest/alfalfa06.htm
6. Source: http://plantsci.sdstate.edu/forages/Alfalfa%20Trials/SD_Alfalfa_Trials.html

[7] Source: http://animalrangeextension.montana.edu/Articles/Forage/Main-varieties.htm
[8] Source: http://web1.msue.msu.edu/fis/research/past%20trials/08alfsum_%20tables.pdf

As revealed in table K-8 above, variety trial results do not indicate any systematic hay yield advantage or disadvantage for GT alfalfa hay cultivars. Dr. Daniel Putnam, a leading alfalfa research agronomist at UC-Davis, has been conducting variety trial testing of GT and other alfalfa cultivars throughout California. Putnam (2008) notes that in general, the yield performance of GT alfalfa cultivars (as a group) are no different than what could be expected from similar conventional lines of equal fall dormancy characteristics. Moreover, he notes that there are differences between conventional varieties that are due to fall dormancy, and due to the superiority of individual cultivars within a dormancy group, but the range of variation observed in conventional cultivars is similar to the range of variation observed in GT cultivars (Putnam, 2008).

A key factor influencing alfalfa hay yield under actual farming conditions is weed control during stand establishment (Dillehay and Curran, 2006). Weed management in alfalfa is critical during stand establishment to ensure a successful plant population. Alfalfa seedlings establish slowly and are very sensitive to competition for limited resources (Dillehay and Curran, 2006). Weed infestation during the establishment of an alfalfa hay crop increases weed seed reserves and decreases seedling vigor in an alfalfa stand (Van Deynze et al., 2004). Thus controlling weeds during the establishment year reduces stress on alfalfa, increases seedling weight and leaf numbers, and ultimately increases yields the following year (Stout et al., 1992). Van Deynze et al. (2004) note that weed control has an even more important impact on the forage quality of alfalfa hay, an issue that will be addressed in the next section.

One of the major incentives to plant GT alfalfa is to control weeds during establishment (Van Deynze et al., 2004). A weed management system in which glyphosate is applied at the proper alfalfa growth stage during stand establishment provides more than 95 percent control of nearly all weeds (Van Deynze et al., 2004; Dillehay and Curran, 2006). By way of comparison, Dillehay and Curran (2006) found somewhat weaker weed control using other herbicides such as Buctril, Butyrac, Pursuit, and Raptor. Application of glyphosate at the seedling stage will also normally cause a three to seven percent seedling mortality rate, due to the normal occurrence of a small number of GT alfalfa seeds lacking the gene for glyphosate tolerance. This is not considered a problem in actual practice, however, as it is common for more than 40 percent of seeds sown to fail to establish prior to the first or second cutting in a normal process of self thinning (Van Deynze et al., 2004).

The application of herbicides could also cause crop injury and seedling mortality. Van Deynze et al. (2004) and Dillehay and Curran (2006) found that glyphosate applications caused little to no alfalfa injuries that were evident by the time of the first cutting. By way of comparison, Van Deynze et al. (2004) report that Raptor and Pursuit plus Buctril tank mix treatments resulted in higher injury ratings, usually of less than 20 percent. Rankin (Undated) assumes a 6.67 percent conventional alfalfa hay yield reduction for crop injury based on conventional weed management systems. Rankin cites evidence from Wisconsin of no significant difference in total season yield between GT alfalfa with a glyphosate weed management system and conventional alfalfa hay production, but notes virtually the entire yield from the GT alfalfa system was alfalfa, while at least some of the yield from the conventional system was weeds.

Taken together, the evidence suggests that there is no intrinsic yield advantage in GT alfalfa cultivars over conventional cultivars. The evidence suggests a potential yield advantage for GT alfalfa using the glyphosate weed management system, particularly during stand establishment.

2.2.2 Differences in Quality

The forage quality of alfalfa is based on a large number of factors that are ultimately linked to its utility as an animal feed (Baker and Ball, 1998). Federal quality guidelines currently use percentage of crude protein and acid detergent fiber, relative feed value, and an evaluation of color, molds or weeds present (McWilliams et al., 2005). Alfalfa is then placed in five quality categories: supreme, premium, good, fair and low. Some states have adopted additional quality grading regulations. Dairy cattle and horses both tend to have high forage quality requirements (Van Deynze et al., 2004). Most weeds are lower in forage quality or palatability than alfalfa, and forage with high weed content can adversely affect milk production as well as animal growth and health (Van Deynze et al., 2004).

As noted in the preceding subsection, Van Deynze et al. (2004), Dillehay and Curran (2006), and Rankin (Undated) all report better weed control in GT alfalfa using the glyphosate weed management system. Glyphosate controls a broader spectrum of weeds and is more efficacious than most currently available herbicides and herbicide combinations during the critical stand establishment stage of alfalfa production (Van Deynze et al., 2004; Dillehay and Curran, 2006), and induces less crop injury in established stands (Van Deynze et al., 2004).

Conventional alfalfa hay varies in terms of weed content, and so it is difficult to make direct comparisons between GT and conventional alfalfa hay from a weed content standpoint. Quality grading assigns penalties based on weed and other contaminant content. Cummings et al. (2004) utilized an alfalfa hay pricing system in which each 15 percentage point increase in weed content above a benchmark 5 percent level resulted in a 10 percent reduction in the price of the alfalfa hay. Van Deynze et al. (2004) note that pure alfalfa hay is usually worth 20 to 50 percent more than weedy hay. Putnam (2008) argues that while the relative weed-free nature of GT alfalfa tends to give it a quality edge over conventional alfalfa, one cannot systematically attribute higher quality to GT alfalfa over conventional alfalfa, since sometimes conventional weed control systems can be quite effective.

The limited evidence presented here suggests that while there is the potential for higher quality forage from GT alfalfa, one cannot systematically assume higher quality attributable to GT alfalfa over conventionally produced alfalfa.

2.2.3 Scenarios

Based on the review above, we use the cost studies previously mentioned and ask what would happen under the same assumptions but with the use of GT seed, glyphosate, and under various scenarios of alfalfa hay quality. No differences in yield are assumed between GT alfalfa and non-GT alfalfa, and no additional differences in management systems are assumed.

These scenarios should not be interpreted as likely differentials in costs and returns between conventional and non-GT alfalfa in any particular setting, since the differences in management

systems between the two varieties are likely to involve other factors not taken into consideration in the scenarios (such as the time spent by farmers with weed control) and the impact of the deregulation of GT alfalfa on the prices paid for alfalfa of various qualities is ignored (this will be analyzed in a future Technical Report, since it is not part of the scope of the present report). However, given the importance of differences in seed, herbicide use and potentially in alfalfa forage quality between conventional and GT alfalfa, we feel these scenarios provide a useful illustration of what the potential cost and return implications could be of adoption of GT alfalfa for forage.

A note on removal costs: removal of GT alfalfa stands can be done both through mechanical and chemical methods and one source describes plowing as possibly the most common method for alfalfa stand removal (Orloff and Putnam, 1997) When herbicides are used for removal, glyphosate seems to be the most common (Canevari, 2004). However, glyphosate cannot be used to remove GT alfalfa stands.

Differences in removal costs of alfalfa stands are not considered in this exercise, because they are also not included in the cost studies used as comparison. Glyphosate as an herbicide in the removal of alfalfa stands apparently can be substituted by other herbicides. One study done by Mark Renz at the University of Wisconsin with various herbicides found that "all herbicides were effective at limiting resprouting of alfalfa at the appropriate rate and timing" (Renz, 2007). Canevari et al (2004) suggest a combination of 2, 4-D and Banvel (dicamba) was particularly effective. Miller et al (2006) suggest various options while alerting to the restrictions of these herbicides for future crop rotation.

Based on the existing literature, we consider the following values (sometimes ranges) for the scenarios.

a) GT alfalfa seed costs

GT alfalfa seeds were sold at US$6-7.50/lb during its deregulation period, according to various sources (http://www.purdue.edu/UNS/x/2007a/070323NeesAlfalfa.html; http://ipcm.wisc.edu/WCMNews/tabid/53/EntryID/208/Default.aspx; http://www.roundupreadyalfalfa.com/home.aspx?page=valuecalculator)[2], including its technology fee (trait premium). The technology fee for areas "east of the Rocky Mountains[3]" (http://www.farmandranchguide.com/articles/2005/08/31/ag_news/regional_news/news11.tx; http://www.soils.wisc.edu/extension/wfapmc/2006/pap/Undersander2.pdf) is US$125/50lb bag, that for those areas west of the Rocky Mountains US$150/50lb bag.

Seeding rates are those of the conventional alfalfa farming cost studies used as comparison.

b) Glyphosate costs

[2]One commenter to APHIS EIS NOI gives the value of US$6.50 (comment tracking # 803a981a).

Table K-9 below illustrates the glyphosate prices used in the scenarios area based on those reported by USDA NASS for the same year of the non-GT study being used:

Table K-9. Glyphosate Prices, 1998-2008, $/gallon

1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
56.30	45.50	43.30	44.50	43.50	43.30	39.70	33.80	29.30	28.90	40.50

USDA, NASS, Agricultural Prices, various years.

In 2008, prices of glyphosate seem to have rebounded from a few years of reduced prices.

The number of glyphosate applications used in the scenarios is one or two per year at 22 ounces per acre. One application a year would then require 0.172 gallons and two applications would require 0.344 gallons. These volumes correspond to those used by several of the trials previously reviewed.

c) Weed content

In this exercise, we assume no glyphosate resistance and only glyphosate is used as an herbicide. We leave considerations regarding the potential need for additional herbicides for section 4, where we consider the impact of weed resistance to glyphosate. With one or two applications of glyphosate at 22 ounces per acre there is a range of possible results in terms of weed content in the final product, as reviewed above. Improvements in weed content are built into the scenarios as increases in the quality of hay (for example, from good to premium or to supreme) with reflections on prices, according to USDA available alfalfa hay prices for the relevant locality and year. We consider a range of scenarios, from no improvement at all in quality to improvements to supreme alfalfa hay quality.

Table K-10 is intended as an illustrative exercise regarding the possible impact of using GT alfalfa and is not applicable to all situations. It is based on the same circumstances assumed by the UC Cooperative Extension Study, while altering seed prices, herbicide use and hay prices.

Table K-10. Scenarios for GT Alfalfa

		1 Glyphosate Application		2 Glyphosate Applications	
	Conventional	GT (l)	GT (h)	GT (l)	GT (h)
Sales (8 tons per acre)	1480	1560	1480	1560	1480
Total operating costs per acre	685.00	619.16	620.88	624.32	627.76
Return over operating costs	795.00	940.84	859.12	935.68	852.24
Cash overhead costs	165.00	165.00	165.00	165.00	165.00
Annual cost recovery: alfalfa establishment	147.00	164.48	177.41	165.91	179.32
Annual cost recovery: other	549.00	549.00	549.00	549.00	549.00
Total costs per acre	1,546.00	1,497.64	1,512.29	1,504.23	1,521.08
Return over total costs	-66.00	62.36	-32.29	55.77	-41.08

Source: column two from Frate et al., 2008; other columns added.

Columns three and four assume one glyphosate application during the establishment year, columns five and six assume two. Low cost scenarios (l) assume seeds cost US$6/lb and glyphosate US$30/gallon, while the high cost scenarios (h) assume seeds cost US$7.50/lb and glyphosate US$40/gallon. Seed prices already incorporate the technology fee (trait premium) of US$ 150 per 50 lb bag. Each glyphosate application is assumed to use 22 ounces/acre. The high cost scenario also assumes GT alfalfa generated no benefits in terms of alfalfa quality. The low cost scenario assumes GT alfalfa improved alfalfa quality. Alfalfa that in the UC Cooperative Extension Study was assumed to be sold as premium quality will be sold, under the low cost scenario, as supreme quality. Prices are based on those of the USDA AMS, 2007 California Market Summary, where prices for alfalfa hay in the San Joaquin Valley averaged around US$18/ton for premium and US$195/ton for supreme qualities.

This result depends on the assumptions made regarding the use of herbicides. One way of relaxing these assumptions is by increasing the use of glyphosate applications. Six applications of glyphosate through the crop year at the high price scenario (or the equivalent addition in cost of other herbicides) would be required for GT alfalfa production costs to surpass those of conventional production, under these specific conditions.

Table K-11 shows the GT alfalfa results suggested by the Wisconsin study reviewed above, as well as extends the exercise to various additional scenarios regarding GT alfalfa. Again, it is intended only as an illustrative exercise regarding the possible impact of using GT alfalfa and is not applicable to all situations. It is based on the same circumstances assumed by Dan Undersander in his study, while altering seed prices, herbicide use and prices, and alfalfa hay prices in the indicated columns. Numbers are rounded to allow for space in table.

Table K-11. Scenarios for GT Alfalfa

				a		b		C	
	Conv.	**GT**	**GT***	**Conv.**	**GT**	**Conv.**	**GT**	**Conv.**	**GT**
Seed cost/ 50 lb bag ($)	$200	$250	$250	$200	$250	$200	$250	$200	$250
Pounds of seed per acre	12	12	12	12	12	12	12	12	12
Technology fee/bag ($/bag)	$0	$125	$125	$0	$125	$0	$125	$0	$125
Yield in seeding year (t/a DM)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Herbicide cost ($/acre/application)	$20	$6	$6	$20	$6	$20	$7	$20	$7
Herbicide application cost ($/acre)	$10	$10	$10	$10	$10	$10	$10	$10	$10
Number of herbicide applications	1	1	1	2	2	2	2	1	1
Value of ease of Roundup® use ($/acre)	$0	$0	$0.0	$0.0	$0.0	$0.0	$0.0	$0.00	$0
Yield depression from pursuit/raptor (t/a DM)	0.3	0.0	0.0	0.3	0.0	0.3	0.0	0.3	0.0
Expected stand life (yrs including seeding year)	3	3	3	3	3	3	3	3	3
Value of hay (per ton DM)	$100	$100	$100	$100	$100	$100	$100	$100	$110
Fixed costs per acre per	$180	$180	$180	$180	$180	$180	$180	$180	$180

Table K-11. Scenarios for GT Alfalfa

				a		b		C	
	Conv.	**GT**	**GT***	**Conv.**	**GT**	**Conv.**	**GT**	**Conv.**	**GT**
year									
Harvesting costs per acre per harvest	$35	$35	$35	$35	$35	$35	$35	$35	$35
Number of harvests	2	2	2	2	2	2	2	2	2
Seeding Year Production Costs/Results									
Seed cost (prorated + tech fee) per acre*	$16	$50	$30	$16	$50	$16	$50	$16	$50
Total seed and herbicide cost per ton of hay	$14	$19	$13	$23	$23	$23	$24	$14	$19
TOTAL COST PER TON OF HAY SEEDING YEAR	$86	$90	$85	$95	$95	$95	$95	$86	$91
PROFIT PER ACRE - SEEDING YEAR	**$50**	**$34**	**$54**	**$17**	**$18**	**$17**	**$16**	**$50**	**$68**

Source: first two data columns from Integrated Pest Crop Management, University of Wisconsin; remaining columns elaborated from the base numbers.
* Original numbers - shown in the first two columns - prorate seed cost over life of stand but leave full technology fee in seeding year. We maintain this assumption, except for in the third column where we prorate the technology fee as well.
a. Two herbicide applications.
b. Two herbicide applications and glyphosate at $40/ gallon
c. One application, glyphosate at $40/ gallon and improved hay quality: $110/ ton, a 10% increase in price. Data from various Midwestern markets[4] suggest $100/ ton was the price paid for good quality hay within the last year, while premium quality hay would go for 15-35% more, so the quality improvement assumed is quite modest.

In table K-10 we see an improvement in returns over total costs in all scenarios with the use of GT alfalfa. Depending on the specific scenario, the improvement is the result from lower herbicide costs, improved hay quality, or both. In table K-11 Dan Undersander's scenario of reduced GT profit per acre in the seeding year is dependent on not distributing the cost of the technology fee throughout the life of the stand. If this is done, GT alfalfa shows improved profit per acre, suggesting that even in Undersander's scenario, profit per acre would be higher for GT alfalfa in years following that of the seeding year. In the remaining scenarios, in two of the three cases, GT alfalfa increased profits in the seeding year, even if the cost of the technology fee were not distributed through the life of the stand.

2.3 Summary of Findings

Farming conditions for alfalfa forage vary considerably throughout the United States and we have not identified major cost elements that dominate farming costs under most circumstances. Percentage changes in yields or forage prices have a much greater impact on returns to alfalfa farming for forage than equivalent percent changes in any cost factors. Economies of scale in land preparation mean that technologies (seed varieties) that require more land preparation would be more attractive (and of larger benefit) to larger farms.

[4] Pipetone, Minnesotta, Hay and Straw Auction; Midwest Hay and Straw Auction, Maurice, Iowa.

GT alfalfa production for forage would have impacts on the cost of seed and the cost of herbicide use. There is also enough evidence to suggest possible benefits on the quality of hay that would presumably lead to higher sales prices. The exercises conducted above suggest that, under farming conditions similar to those described, alfalfa forage farmers aiming at maximizing returns during the time horizon of an alfalfa life stand would likely benefit financially from the adoption of GT alfalfa.

3.0 Changes in Alfalfa Seed Farming

3.1 Conventional Alfalfa Seed Farming

Unlike alfalfa hay production, alfalfa seed production is largely concentrated both geographically and in number of producers. The latest complete information on alfalfa seed production comes from the 2007 Census of Agriculture, when 121,467 acres of alfalfa seed were harvested producing approximately 62 million tons of seeds at an average productivity of approximately 510 lbs/acre. California was responsible for 31 percent of this production, Washington 17percent, and Idaho 15 percent, with over 60 percent of production concentrated in those three states and the remaining also highly concentrated in Western states (Nevada, Oregon, Wyoming, Montana, and Utah). Mueller (Undated a) suggests California's share of production has fallen in recent years and a larger share is coming from the Northwestern states. In 2007, production came from 806 farms. This means that farming conditions for alfalfa seed production are likely more homogeneous than alfalfa hay farming.

However, there still is some variation. Non-dormant varieties of seed tend to be grown in California while dormant varieties are mostly grown in the Pacific Northwest (Mueller 2005a). Varieties can be proprietary (grown under contract) or public, although almost all varieties today are developed and marketed by private breeding companies (Bouton, 1998). Seeds can also be certified or not.

Alfalfa seed acreage and production increased between 2007 and 2002, reversing the trend of decreases in alfalfa seed production in previous years. Mueller (2008) attributes reduction in alfalfa seed acreage in California to "changes in economics, environmental constraints, and regulatory issues." Mueller (Undated a) lists among difficulties of alfalfa seed farming in California scarcity of water for crop irrigation and lack of development of new chemicals for insect control due to high registration costs. However, between 2007 and 2002, California gained almost 10,000 acres of alfalfa seed production.

Some farmers grow alfalfa seed as an option to an already existing alfalfa hay stand, allowing the stand to go to seed at the end of the stand life or when there is little water. According to Mueller (2005b) this is the case of most of the seed produced in the Imperial Valley (California), about half of the non-certified seed produced in Utah and much of the dryland seed produced in Montana. This seed would typically not receive certification.

Despite this mixed purpose of many alfalfa fields that generate seeds, there are clear differences in best practices for managing alfalfa for forage and for seed. Dense stands produce higher forage yields but lesser seed yields than thinner stands – as when alfalfa is planted in rows as opposed to solid planting – and certain chemicals used in seed production limit the use of the field for forage (Mueller, 2008). Alfalfa seed farmers also have some costs that are not present in alfalfa hay farming: some insects are only of concern for alfalfa seed production (Mueller, Undated a) and costs with pollination (bees) are considerable since alfalfa is dependent on bees for pollination. Honey bees are cheaper than leafcutter bees or alkali bees but require a long season for pollination and are therefore only used in California. Leafcutter bees and alkali bees

are also more efficient pollinators, although more expensive (Mueller, 2008). Leafcutter bees also have "higher labor requirements, significant annual fluctuations in bee prices, the need for incubation, housing, and net material, as well as a greater sensitivity to pesticides" (Mueller, 2008).

With respect to weeds, the separation of weed seeds from alfalfa seeds after harvesting is costly and control of weeds in the fields is given preference over post-harvest screening and separation (Mueller Undated b). No primary or secondary noxious weeds are allowed for certified seed and dodder is of particular importance since it can be difficult to control (Mueller, 2008).

Another important difference between alfalfa hay and alfalfa seed production is that the quality of seed (germination, yield, dormancy and other varietal properties) is not readily observable at the moment of purchase and mechanisms come into place to offer clients (and breeding companies) assurance that seeds sold as pertaining to one variety or another will perform as expected. State Crop Improvement Associations – or sometimes Seed Grower Associations – provide certifications that seed production followed minimum standards such as isolation between different alfalfa varieties, absence of prohibited noxious weeds in the field, inspection of conditioning (separation) facilities, maintaining traceability of seed lots and seed testing.

Finally, an important cost in seed production is the seed itself. The development of crop varieties became a predominantly private activity in the past 30 years (Fernandez-Cornejo and Schimmelpfenning, 2004) and the Plant Protection Variety Act of the early 1970s simulated cultivar development in alfalfa (Bouton, 1998). Today almost all new alfalfa cultivars are proprietary.

We have not been able to identify the share of final seed prices represented by such contracts. This is an important aspect to be analyzed and will be dealt with to some extent in future Technical Reports where the possible consequences of supply and demand shifts in the seed market will be discussed. The cost studies reviewed below do seem to address the contracts between seed producers and seed breeding companies.

3.1.1 Cost Studies

One 1985 cost study for Fresno, California (Sheesley, 1985) found land rental to be the highest cost component (16.8%) of total annual production cost per acre, followed by irrigation (15.7%), harvesting costs (13.5% - including processing and certification), recovery of capital costs (10.9% - including stand establishment), insect control (9.6%) and pollination (6.7%).

Two cost studies for seed production are available from the University of Nevada Cooperative Extension (Kettle, Myer and Breazeale 1999a and Kettle, Myer and Breazeale 1999b). Both were done at the end of 1998, one assuming a 250 acre alfalfa seed farm in Pershing County, the other a 750 acre farm in Humboldt County. These studies show pollinators (bees) accounting for roughly 30 percent of annual production costs and insect control accounting for another 10 percent, with weed control costs below 10 percent of the total.

A more recent study is available for Imperial County, California, from the UC Cooperative Extension (Meister, 2004). This study assumes that seeds will be produced for one year from an existing stand of alfalfa hay, noting that "most alfalfa seed is produced from hay fields that will be rotated to another crop in the fall." Establishment costs are, therefore, absent in the study. Seeds are likely of a non-dormant variety and honey bees are used for pollination. Costs included are considered "typical" for the region, but an excel sheet is provided for farmers to not only fill in with their own costs by complement with additional line items that could have not been included in the study.

Table K-12 below shows the main cost items reported, with the last column showing the percentage total that each line item represents of the total costs.

Table K-12. Alfalfa Seed Production Costs

	$/acre	% of total costs
Irrigation	35.81	7.88%
Insect Control	77.00	16.95%
Pollination	84.00	18.49%
TOTAL GROWING PERIOD COSTS	196.81	43.32%
TOTAL HARVEST COSTS	108.18	23.81%
Land rent	115.00	25.31%
Cash Overhead	34.30	7.55%
TOTAL CASH OVERHEAD COSTS	149.30	32.86%
TOTAL CASH COSTS per ACRE	**454.29**	**100.00%**

Source: Meister, 2004

Pollination appears as the main operational cost followed by insect control. Overhead cash costs are a third of total and capital recovery costs are not included. Harvest costs are calculated at a 600 lb yield per acre. At a $1 market value per lb, returns over total cash costs would be $145.71 per acre. As in the case of alfalfa hay, returns are mostly affected by yield and sales price variations as shown in table K-13.

Table K-13. Sensitivity of Returns in Alfalfa Seed Production

	Insect control	Pollination	Irrigation	Yield*price
0*	145.71	145.71	145.71	145.71
10%	138.01	137.31	142.13	205.71
20%	130.31	128.91	138.55	265.71
30%	122.61	120.51	134.97	325.71
40%	114.91	112.11	131.39	385.71

Source: elaborated from the data in Meister 2004
*Initial scenario assumes a yield of 600 lb/ acre at $1/ lb.

A 2005 cost study is also available from the University of Idaho and the costs reported are considered typical for the southwestern part of the state (Rimbey et al., 2005). The study assumes a farm with 150 acres of alfalfa seed over a three year period (life of stand). Table K-14 summarizes the results. Pollination accounts for 25.1 percent of the operating costs, followed by

insecticides at 16.5 percent. Irrigation and herbicides are just below 10 percent of total operating costs each.

Table K-14. Returns to Alfalfa Seed Production, $/acre

	$/acre	% of total costs
GROSS RETURNS	875	
Pollination	160	17.46%
Insecticides and application	105.65	11.53%
Herbicides and application	59.36	6.48%
Irrigation	61.08	6.67%
OPERATING COSTS	637.36	69.55%
Land rent	44	4.80%
CASH OWNERSHIP COSTS (OVERHEAD)	210.98	23.02%
Amortized establishment	39.79	4.34%
NON-CASH OWNERSHIP COSTS (COST-RECOVERY)	68.01	7.42%
TOTAL COSTS	**916.35**	**100.00%**
Returns over operating costs	**237.64**	**25.93%**
Returns over total costs	**-41.35**	**17.40%**

Source: Rimbey et al, 2005

Table K-15 below shows how, again, yield and sales price of seeds have a much greater influence on returns than individual cost components.

Table K-15. Sensitivity of Returns in Alfalfa Seed Production

	Insect control	Pollination	Irrigation	Weed control	Yield*price
0	-41.35	-41.35	-41.35	-41.35	-41.35
10%	-51.92	-57.35	-47.46	-47.29	46.15
20%	-62.48	-73.35	-53.57	-53.22	133.65
30%	-73.05	-89.35	-59.67	-59.16	221.15
40%	-83.61	-105.35	-65.78	-65.09	308.65

Source: elaborated from data in Rimbey et al, 2005

3.2 GT Alfalfa Seed Farming

The main possible advantage of GT alfalfa for seed production is in weed control. Canevari (2007) notes that the possibility of controlling post-emergence dodder before seeding and without injury to alfalfa, “would be a significant breakthrough.” However, as noted in the cost studies above, weed control, although fundamental for seed acceptance in the market, is a lesser cost in seed production than other operational costs such as pollination and insect control.

Putnam (2007) notes that given the current concerns with gene flow, the seed industry met in 2007 to discuss more stringent isolation distances for GT alfalfa seed production. The current isolation standard for certified seeds is 165 feet, with tolerance of 10 percent of the field within

the isolation zone (Mueller, 2008). An increase in the isolation distance would have a cost impact on alfalfa seed production, since land rental is often a major cost component.

Our analysis of the impact of GT alfalfa on seed production is limited by lack of more information on breeder company – producer contracts. Benefits or costs to farmers in seed production would likely ultimately be determined by the contracts obtained with breeder companies. These contracts must provide sufficient financial returns to seed farmers so they will engage in the activity. However, bargaining conditions depend on market conditions of supply and demand and competition between varieties (and breeder companies) could be highly affected by GT deregulation. To the extent possible, we will revisit this issue when we analyze potential supply and demand impacts of GT deregulation in future reports, in case any insights can be drawn from that analysis.

3.3 Summary of Findings

Alfalfa seed production is relatively concentrated geographically in the Northwestern part of the country and benefits from specific climatic conditions. Land costs, pollination and insect control tend to be major cost factors with irrigation and herbicide also important depending on location.

The impacts of GT alfalfa adoption for seed production depend on conditions established by the breeder company – producer contracts, that in turn would likely be more or less favorable to producers depending on market (supply and demand) conditions.

4.0 Proliferation Over Time of Glyphosate-Resistant Weeds

The analysis done in sections 2 and 3, looks at short-term costs and returns of alfalfa farming and are limited to the life of stands. The choice a farmer faces of planting one or another crop must often consider costs and benefits beyond this time horizon. Farmers must, for example, take into consideration the long term value of their lands (soil fertility) as well as how crop rotation choices affect their expected long-term returns and exposure to risk, since some crops should not be substituted by others or even not be planted repeatedly on the same plot (alfalfa is an example due to autotoxicity). It is therefore important to include longer term considerations regarding the potential impact of GT alfalfa on the economics of alfalfa farming.

One long-term consideration is the limitation on crop rotation. Since GT alfalfa cannot be removed with glyphosate, other methods must be used, whether mechanical, chemical or a combination of these. Orloff and Putnam (1997) suggest plowing is actually the most common method for alfalfa stand removal. However, when herbicides are used for removal, glyphosate seems to be the most commonly used (Canevari, 2004). In our Technical Report *Effects of Glyphosate-Tolerant Weeds in Agricultural Systems* (appendix G), we note that potential substitutes for glyphosate in stand removal can limit the following crop of choice. This limitation can have a greater or lesser impact on long term farm profits depending on market circumstances (basically, what would be the crop of choice at a given point in time given expected returns).

Based on the comments to APHIS' Notice of Intent to prepare an Environmental Impact Statement, the long-term issue of greater concern, however, seems to be the impact of a potential increased presence of glyphosate resistant weeds over time, mostly through weed shift. Glyphosate is used to control weeds in GT alfalfa as well as in crops with which alfalfa is rotated (such as GT corn and GT soybeans). If the use of GT alfalfa leads to an increased presence of glyphosate resistant weeds, then glyphosate would have to be substituted or complemented in farming, not only for control of weeds in GT alfalfa fields, but also for the control of weeds in those crops with which it is rotated.

Based on the cost studies presented in section 2, an increase in the presence of glyphosate resistant weeds in alfalfa fields, requiring the use of other herbicides for control of such weeds, would have the impact of an increase in production costs. Whether the increase would surpass the current herbicide cost of conventional alfalfa would depend on the impact of any potential weed shifts on herbicide use and its cost..

There is some literature on the costs of herbicide use over time with adoption of GT crops. An increase in herbicide costs over time with adoption of GT crops would likely reflect cost effects of increased presence of GT resistant weeds. Brookes and Barfoot (2005) report that after 9 years of use of GT soybeans estimates of cost savings actually increased with savings mostly attributed to reduced herbicide costs. They also report continued cost savings with herbicides in the US after eight years of use of herbicide-tolerant cotton (mostly GT) and after six years of use of GT canola. On the other hand, Benbrook (2009) concluded that since 1996, the glyphosate rate of application per crop year has tripled in cotton farming, doubled in soybean farming, and

risen by 39 percent in corn farming in the United States. Benbrook attributes these trends primarily to the emergence of weeds resistant to glyphosate. Evidence of increased control costs associated with Glyphosate-resistant weeds also exists for other countries (see Binimelis et al 2009, e.g., for Argentina).

Fernandez-Cornejo and McBride (2002) noted that the literature on the economic impact of GT soybeans in the United States is mixed and some farmer surveys show reduced herbicide costs being offset by higher technology fees. The long-term impact of supply and demand and changes in technology fees would impact returns obtained by farmers with GT alfalfa adoption.

4.1 Summary of Findings

The increased returns expected for GT alfalfa farming in the short run might or might not continue with time. This depends on market considerations (including technological fees), limitations to crop rotation and cost impacts of any possible increased weed resistance over time.

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Appendix K-2. Literature Search

1.0 Literature Search Strategy

For cost studies on alfalfa hay and seeds, as well as for the evidence on traits of GT alfalfa as compared to conventional alfalfa varieties we searched:

a) Various university (and cooperative extension) linked alfalfa portals and alfalfa symposium proceedings including:

- The California Alfalfa Workgroup: http://alfalfa.ucdavis.edu/
- The University of California Alfalfa Seed Production Homepage: http://alfalfaseed.ucdavis.edu
- University of Wisconsin Forage Research and Extension: http://www.uwex.edu/ces/forage/
- Oklahoma Alfalfa Page (Oklahoma State University): http://alfalfa.okstate.edu/
- University of Nevada Cooperative Extension: http://www.unce.unr.edu/
- North American Alfalfa Improvement Conference: http://www.naaic.org
- 2007 37th California Alfalfa and Forage Symposium: http://alfalfa.ucdavis.edu/2007AlfalfaConference
- 2006 Western Alfalfa and Forage Conference: http://alfalfa.ucdavis.edu/2006AlfalfaConference
- San Joaquin University of California Cooperative Extension: http://cesanjoaquin.ucdavis.edu/Agriculture/Publications,_Research_Reports.htm

b) Producer related association Web sites:

- National Alfalfa and Forage Alliance: http://www.alfalfa.org/
- Nebraska Alfalfa Marketing Association: http://www.nebraska-alfalfa.com/
- Washington State Hay Growers Association: http://www.wa-hay.org

c) Specialized magazines:

- Western Farm Press: http://westernfarmpress.com/
- Hay and Forage Grower: http://hayandforage.com/

d) Search engines:

- www.scirus.com
- www.scholar.google.com

e) Academic journals including, but not limited to:

- The American Journal of Agricultural Economics
- Journal of Agricultural Economics
- Agronomy Journal
- Journal of Agronomy and Crop Science
- Journal of Agronomy

For information on the weed content of alfalfa hay, we took advantage of a search of specialized journals and databases previously done for other Technical Reports[5].

For data on alfalfa hay prices we used USDA's Agricultural Marketing Service and its Livestock and Grain Hay Reports.

The North American Alfalfa Improvement Conference has a page with links to alfalfa variety test Web sites in over 20 states: http://www.naaic.org/Resources/yields.htm.

[5] Search done for Technical Reports: Effects of Glyphosate-Tolerant Weeds in Agricultural Systems (appendix G) and Effects of Glyphosate-Tolerant Weeds in non-Agricultural Ecosystems (appendix H).

Appendix K-3. Likelihood of Benefits of GT Alfalfa Forage by County

The analysis presented in section 2 suggests GT alfalfa could offer benefits to alfalfa forage farmers in the form of increased quality of forage with decreased herbicide costs. In this appendix we attempt to identify those counties that would most likely benefit from GT alfalfa deregulation, based solely on these cost-return considerations. Any other costs and benefits of GT deregulation are not included in the exercise because they are not part of the scope of this report.

As this Technical Report has not addressed market (demand) restrictions to GT alfalfa (exports, for example), the exercise also abstracts of any demand considerations that could change the potential benefits to farmers of GT alfalfa adoption.

Within these constraints, we offer this exercise as an attempt to rank counties according to the short-term economic benefits accrued to farmers from GT adoption.

This exercise assumes the greater the acreage of farms producing alfalfa for forage and the greater the amount of herbicide used on those farms, the more likely farmers of that county would benefit from GT alfalfa deregulation. Herbicide use is seen as an indicator of benefits of GT alfalfa adoption for any of the following reasons: a) greater use of herbicides indicates weeds are a problem in need of management and GT alfalfa weed control is cheaper; or b) greater use of herbicides indicates markets demand cleaner alfalfa and GT alfalfa favors alfalfa hay with a lesser weed content; or c) both. As we cannot claim the same relevance of herbicide use as an indicator of benefit to alfalfa seed farms, this exercise does not include alfalfa seed acreage[6].

County level data on alfalfa acreage and on herbicide use is available from the 2007 Agricultural Census. The indicator used was built as follows:

1. We identified the share of farming acreage used for alfalfa forage (hay or haylage) in a county: likelihood that a randomly picked acre in the county is planted with alfalfa for forage (a);
2. We identified the share of farming acreage treated with herbicide in a county: likelihood that a randomly picked acre in the county was treated with herbicides in 2007 (b);
3. We excluded those counties with 0 alfalfa forage acreage[7];
4. We excluded those counties with non-disclosed data for alfalfa hay or herbicide use [8];

[6] Herbicides are more homogeneously used in seed production so this is less of a distinction between alfalfa farms than in forage. Additionally, we were not able to identify as clearly the benefits of GT alfalfa adoption by alfalfa seed farmers.
[7] This was done to differentiate from alfalfa farms with 0 herbicide use in (c)
[8] We did not do the same for lack of alfalfa haylage data since this would have excluded most counties. For the great majority of counties, alfalfa haylage acreage is a small fraction of hay acreage.

5. We multiplied (a) and (b), after the exclusions were made: likelihood that a randomly picked acre in the county will both be used for forage alfalfa and treated with herbicides (c);
6. We ranked counties according to (c).

The indicator is highly imperfect and counties highly ranked could presumably reflect herbicide use for other crops co-existing with alfalfa fields with little herbicide use (although, to the extent that weed presence is determined by local environmental conditions, there is likely a correlation between weed issues among crops planted next to each other).

The results are presented in the following pages. Blank cells represent undisclosed data (data withheld to protect identity of individual farms).

Among the top 100 counties, a considerable share is also found in Wisconsin, including the number one ranking county (Brown County, Wisconsin) where alfalfa acreage is high and the use of herbicide could be explained by the importance of dairy farms as consumers of high quality (lesser weed content) alfalfa. The relative scarcity of counties from California among the top ranked counties (with the notable exception of Imperial County) could be explained by the lesser acreage devoted to alfalfa in that state compared to states in the North Central region. If the rankings were done by value of production rather than by acreage, the results would presumably show a greater presence of counties in Western states among the top ranked, since yields in that region tend to be higher.

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Wisconsin\Brown	81102	31942	35056	187167	35.80%	43.33%	15.5108%
California\Imperial	213794	127406		427349	29.81%	50.03%	14.9149%
Idaho\Jerome	86594	42265	10812	188753	28.12%	45.88%	12.9005%
Wisconsin\Calumet	72759	17330	23125	151659	26.67%	47.98%	12.7974%
Wisconsin\Kewaunee	70795	21439	33933	175449	31.56%	40.35%	12.7348%
Wisconsin\Manitowoc	104866	33608	38579	248238	29.08%	42.24%	12.2845%
Nevada\Esmeralda	5799	12114		24943	48.57%	23.25%	11.2913%
Wisconsin\Fond du Lac	161464	32834	40740	335745	21.91%	48.09%	10.5386%
Wisconsin\Outagamie	123605	24407	27812	247482	21.10%	49.95%	10.5385%
Wisconsin\Sheboygan	81956	21457	25732	191719	24.61%	42.75%	10.5218%
Wisconsin\Green	125391	40730	31904	306859	23.67%	40.86%	9.6723%
Wisconsin\Washington	54743	15263	12978	129790	21.76%	42.18%	9.1775%
New York\Genesee	82787	14764	20592	183539	19.26%	45.11%	8.6890%
Wisconsin\Shawano	88160	39061	33614	271718	26.75%	32.45%	8.6780%
Michigan\Missaukee	24973	12690	13119	88364	29.21%	28.26%	8.2545%
Wisconsin\Dodge	214064	33870	30828	412949	15.67%	51.84%	8.1216%
Idaho\Minidoka	138690	29381		226161	12.99%	61.32%	7.9667%
Ohio\Wayne	106635	26699	19122	248409	18.45%	42.93%	7.9183%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Wisconsin\Ozaukee	27035	7177	7408	70689	20.63%	38.24%	7.8909%
Pennsylvania\Lancaster	199696	40155	31107	425336	16.75%	46.95%	7.8662%
Wisconsin\Portage	119750	32179	18999	281575	18.18%	42.53%	7.7298%
Arizona\Yuma	131844	25789		210480	12.25%	62.64%	7.6749%
Wisconsin\Dane	259883	38492	44366	535756	15.47%	48.51%	7.5020%
Wisconsin\Clark	128881	48558	61774	440376	25.05%	29.27%	7.3323%
New York\Ontario	82320	16214	18892	198937	17.65%	41.38%	7.3022%
Idaho\Gooding	75078	33174	15138	223068	21.66%	33.66%	7.2894%
Wisconsin\Oconto	69041	23644	20866	205924	21.61%	33.53%	7.2469%
Wisconsin\Lafayette	141382	37054	23051	342617	17.54%	41.27%	7.2391%
Wisconsin\Marathon	136630	59852	63572	490628	25.16%	27.85%	7.0055%
New York\Wyoming	65995	15007	35401	218028	23.12%	30.27%	6.9982%
Wisconsin\Winnebago	75823	13902	10891	164014	15.12%	46.23%	6.9882%
Pennsylvania\Lebanon	55609	6328	9593	113486	14.03%	49.00%	6.8743%
Wisconsin\Waupaca	74421	26250	24448	234392	21.63%	31.75%	6.8675%
Idaho\Canyon	107028	40654	2118	260247	16.44%	41.13%	6.7590%
Wisconsin\Waukesha	48159	7980	2322	86602	11.90%	55.61%	6.6152%
Pennsylvania\Northampton	37668	6393	1781	68252	11.98%	55.19%	6.6096%
Pennsylvania\Union	21702	5508	6864	63795	19.39%	34.02%	6.5973%
New York\Cayuga	86483	22629	24824	249476	19.02%	34.67%	6.5938%
Wisconsin\St. Croix	117622	31539	21110	308275	17.08%	38.15%	6.5163%
Pennsylvania\Franklin	101405	15823	21785	242634	15.50%	41.79%	6.4779%
Wisconsin\Door	42894	16355	10635	134472	20.07%	31.90%	6.4023%
Wisconsin\Chippewa	106936	40677	33859	353491	21.09%	30.25%	6.3787%
Wisconsin\Pepin	35662	10380	10312	108426	19.08%	32.89%	6.2768%
New York\Wayne	67145	6853	19596	168471	15.70%	39.86%	6.2571%
Wisconsin\Marquette	47234	16345	7939	135914	17.87%	34.75%	6.2094%
Idaho\Jefferson	77758	80999	3418	325380	25.94%	23.90%	6.2000%
Wisconsin\Barron	108425	33529	26147	324196	18.41%	33.44%	6.1562%
Indiana\Elkhart	106408	10888	4532	163295	9.44%	65.16%	6.1534%
Michigan\Clinton	177511	12090	13390	271558	9.38%	65.37%	6.1334%
Michigan\Isabella	92493	20493	4893	196071	12.95%	47.17%	6.1077%
Wisconsin\Jefferson	129117	17594	10494	244238	11.50%	52.87%	6.0796%
Michigan\Muskegon	32174	6693	5030	79663	14.72%	40.39%	5.9433%
Wisconsin\Columbia	159434	24494	12539	316193	11.71%	50.42%	5.9056%
New York\Livingston	83142	14895	20200	222415	15.78%	37.38%	5.8984%
Michigan\Ogemaw	11172	11608	7740	60941	31.75%	18.33%	5.8203%
Idaho\Twin Falls	144224	68924	8963	439537	17.72%	32.81%	5.8145%
Pennsylvania\Blair	25363	7171	10268	87434	19.95%	29.01%	5.7858%
Iowa\Dubuque	140484	27849	11544	310817	12.67%	45.20%	5.7284%
Michigan\Newaygo	39410	17641	8090	133403	19.29%	29.54%	5.6981%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Michigan\Ionia	127429	14552	10854	238435	10.66%	53.44%	5.6946%
Michigan\Ottawa	73175	14306	8267	170539	13.24%	42.91%	5.6794%
Michigan\Sanilac	275435	23688	12177	417083	8.60%	66.04%	5.6786%
Pennsylvania\Berks	95817	16081	13078	222119	13.13%	43.14%	5.6630%
Ohio\Stark	62076	11775	5558	138061	12.55%	44.96%	5.6449%
Michigan\Kent	82802	12438	7266	170117	11.58%	48.67%	5.6377%
Wisconsin\Marinette	38673	16164	14087	144303	20.96%	26.80%	5.6182%
Michigan\Livingston	43441	9109	2897	96419	12.45%	45.05%	5.6101%
New York\Onondaga	42110	13934	16228	150499	20.04%	27.98%	5.6076%
Wisconsin\Pierce	93048	27961	16094	271178	16.25%	34.31%	5.5743%
Minnesota\Stearns	283035	65934	32666	708284	13.92%	39.96%	5.5629%
Wisconsin\Green Lake	69122	8710	7001	142757	11.01%	48.42%	5.3287%
Michigan\Lapeer	76439	18243	3294	176373	12.21%	43.34%	5.2922%
Wisconsin\Walworth	120436	13093	7547	217593	9.49%	55.35%	5.2502%
Wisconsin\Sauk	109242	36122	25786	358919	17.25%	30.44%	5.2498%
Michigan\Alpena	16649	17858	5320	85947	26.97%	19.37%	5.2240%
Washington\Franklin	237495	77441	3598	609046	13.31%	38.99%	5.1886%
Michigan\Montcalm	111577	20265	7100	242804	11.27%	45.95%	5.1791%
Michigan\Jackson	93073	15897	2461	182345	10.07%	51.04%	5.1388%
Michigan\Allegan	149055	16697	9299	275120	9.45%	54.18%	5.1193%
Michigan\Mason	26033	7128	4343	76446	15.01%	34.05%	5.1099%
Arizona\Maricopa	118576	75394	26160	485469	20.92%	24.43%	5.1094%
Wisconsin\Dunn	123655	35367	24921	382545	15.76%	32.32%	5.0942%
Wisconsin\Grant	182586	65051	38644	610914	16.97%	29.89%	5.0730%
Wisconsin\Rock	224276	18102	8636	344361	7.76%	65.13%	5.0569%
South Dakota\Yankton	176499	29048	594	322242	9.20%	54.77%	5.0383%
Pennsylvania\Cumberland	61951	11577	8496	157388	12.75%	39.36%	5.0202%
Nevada\Lincoln	9734	11039		46271	23.86%	21.04%	5.0188%
South Dakota\Clay	197236	17946		266697	6.73%	73.96%	4.9764%
Wisconsin\Kenosha	46546	5693	1906	84345	9.01%	55.19%	4.9719%
Minnesota\Winona	96444	27635	20436	305560	15.73%	31.56%	4.9655%
Indiana\LaGrange	76789	14888	1994	161709	10.44%	47.49%	4.9574%
New York\Seneca	50689	9509	6477	127972	12.49%	39.61%	4.9479%
Wisconsin\Waushara	64217	11379	5635	148969	11.42%	43.11%	4.9234%
Michigan\Mecosta	25239	21283	4008	114715	22.05%	22.00%	4.8506%
Illinois\Jo Daviess	139365	23172	4071	281457	9.68%	49.52%	4.7927%
Wisconsin\Wood	52742	22619	21713	221962	19.97%	23.76%	4.7459%
South Dakota\Bon Homme	155638	28997		308583	9.40%	50.44%	4.7394%
Minnesota\Carver	86329	9765	5903	169397	9.25%	50.96%	4.7137%
Wisconsin\Langlade	41638	8672	8365	122895	13.86%	33.88%	4.6969%
Ohio\Columbiana	41869	13152	6069	130952	14.68%	31.97%	4.6929%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Iowa\Winneshiek	139022	24548	8630	313762	10.57%	44.31%	4.6853%
Michigan\Iosco	10722	7702	2069	47731	20.47%	22.46%	4.5985%
California\Yolo	185024	57001		479858	11.88%	38.56%	4.5802%
Idaho\Lincoln	27084	23248		117377	19.81%	23.07%	4.5702%
Wisconsin\Racine	75744	6668	2086	120459	7.27%	62.88%	4.5696%
Wisconsin\Juneau	67862	12986	8978	181046	12.13%	37.48%	4.5474%
Illinois\Lake	19650	2757		34525	7.99%	56.92%	4.5450%
Washington\Grant	447587	117488	2580	1087952	11.04%	41.14%	4.5403%
Wisconsin\Polk	78749	30303	17775	288994	16.64%	27.25%	4.5333%
Illinois\Stephenson	248353	15042	5733	337932	6.15%	73.49%	4.5181%
California\Kings	278025	63840	10998	680662	10.99%	40.85%	4.4910%
Michigan\Washtenaw	80469	13970	1517	166881	9.28%	48.22%	4.4749%
Wisconsin\Eau Claire	57074	21335	11551	205375	16.01%	27.79%	4.4499%
Minnesota\Wabasha	96181	19127	12674	262263	12.13%	36.67%	4.4469%
Ohio\Ashland	68163	11653	3031	150534	9.75%	45.28%	4.4170%
Michigan\Grand Traverse	17572	9160	664	62577	15.70%	28.08%	4.4084%
Wisconsin\Buffalo	75769	33103	21623	307035	17.82%	24.68%	4.3985%
New York\Yates	30060	13473	9784	126118	18.44%	23.83%	4.3953%
Colorado\Rio Grande	47667	29401	103	178908	16.49%	26.64%	4.3938%
Iowa\Delaware	224019	15377	6457	333920	6.54%	67.09%	4.3867%
Michigan\Barry	66370	13845	4803	168172	11.09%	39.47%	4.3762%
Nebraska\Cuming	228441	23213	1276	360052	6.80%	63.45%	4.3153%
Ohio\Richland	69479	8829	4489	146580	9.09%	47.40%	4.3067%
Michigan\Shiawassee	143023	10525	4881	226509	6.80%	63.14%	4.2946%
Nebraska\Colfax	141733	12044	1583	213220	6.39%	66.47%	4.2483%
New York\Niagara	45449	10819	8025	142636	13.21%	31.86%	4.2096%
Pennsylvania\Mifflin	25060	8716	6166	94133	15.81%	26.62%	4.2088%
Minnesota\Goodhue	215174	20191	10559	396743	7.75%	54.24%	4.2036%
Nebraska\Washington	148229	12530	850	217306	6.16%	68.21%	4.2000%
Ohio\Medina	42607	6794	2148	95493	9.36%	44.62%	4.1780%
Pennsylvania\Lehigh	52099	4394	1287	84643	6.71%	61.55%	4.1312%
Pennsylvania\Chester	56776	13343	6897	166891	12.13%	34.02%	4.1258%
Wisconsin\Jackson	59144	23611	16001	238978	16.58%	24.75%	4.1022%
Minnesota\Wright	126706	18464	4208	265376	8.54%	47.75%	4.0791%
Wisconsin\La Crosse	43590	15981	9606	165368	15.47%	26.36%	4.0785%
Michigan\Ingham	113362	9469	2839	186209	6.61%	60.88%	4.0240%
Utah\Cache	47455	50741	2833	251550	21.30%	18.87%	4.0178%
Wisconsin\Vernon	74946	47496	20461	357090	19.03%	20.99%	3.9942%
Idaho\Boundary	21468	9988		73500	13.59%	29.21%	3.9691%
Minnesota\Fillmore	201452	31698	7502	446331	8.78%	45.14%	3.9641%
Wisconsin\Iowa	91206	37648	20151	364970	15.84%	24.99%	3.9576%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Michigan\Menominee	18847	13859	8566	103636	21.64%	18.19%	3.9351%
Pennsylvania\Lawrence	30309	7119	3921	92391	11.95%	32.81%	3.9200%
Indiana\Steuben	53518	6990	1230	106393	7.73%	50.30%	3.8864%
South Dakota\Douglas	117559	16158	553	225166	7.42%	52.21%	3.8748%
California\Riverside	102574	47418		354753	13.37%	28.91%	3.8648%
Wisconsin\Adams	48641	8475	2048	115343	9.12%	42.17%	3.8473%
Pennsylvania\Clinton	13546	3615	5209	56626	15.58%	23.92%	3.7277%
New York\Madison	32839	20466	19512	188320	21.23%	17.44%	3.7018%
Michigan\Genesee	70092	8773		129232	6.79%	54.24%	3.6819%
Minnesota\Washington	34640	6135	878	81237	8.63%	42.64%	3.6811%
Minnesota\Scott	50092	7348	2776	117551	8.61%	42.61%	3.6700%
Wisconsin\Trempealeau	83399	29707	21527	341370	15.01%	24.43%	3.6666%
Ohio\Holmes	46446	19645	7850	187658	14.65%	24.75%	3.6263%
Maryland\Washington	46071	5682	4404	114065	8.84%	40.39%	3.5714%
Nebraska\Cedar	264685	29750	614	474744	6.40%	55.75%	3.5659%
Minnesota\Benton	86625	11080	3146	185994	7.65%	46.57%	3.5623%
Pennsylvania\Juniata	26383	7592	5176	97681	13.07%	27.01%	3.5304%
Michigan\Midland	42483	5502	1322	90619	7.53%	46.88%	3.5303%
Minnesota\Chisago	43580	9491	1273	115280	9.34%	37.80%	3.5298%
Idaho\Madison	100975	15114	326	210630	7.33%	47.94%	3.5142%
Pennsylvania\Snyder	27733	8687	4024	100179	12.69%	27.68%	3.5126%
Ohio\Mercer	191240	11880	3812	293026	5.36%	65.26%	3.4950%
Iowa\Clayton	174731	25447	7916	408987	8.16%	42.72%	3.4851%
Wisconsin\Monroe	71291	37024	23202	351306	17.14%	20.29%	3.4789%
South Dakota\Davison	131716	19504	978	279524	7.33%	47.12%	3.4528%
Nebraska\Wayne	166662	15299	541	276578	5.73%	60.26%	3.4511%
Minnesota\Olmsted	148966	15622	4532	296039	6.81%	50.32%	3.4257%
Michigan\Eaton	134767	11077	1440	222215	5.63%	60.65%	3.4162%
Pennsylvania\Dauphin	36913	4420	2989	89533	8.28%	41.23%	3.4117%
Idaho\Butte	15615	31843		121176	26.28%	12.89%	3.3863%
Minnesota\Isanti	51580	9720	652	126202	8.22%	40.87%	3.3590%
South Dakota\Minnehaha	250625	21271	2507	421416	5.64%	59.47%	3.3557%
Michigan\Gratiot	192285	8442	5926	286937	5.01%	67.01%	3.3556%
Indiana\Noble	94633	7676	1339	159860	5.64%	59.20%	3.3383%
Michigan\Arenac	40626	4650	2688	94604	7.76%	42.94%	3.3309%
Michigan\Oceana	41145	10201	2049	123284	9.94%	33.37%	3.3162%
Pennsylvania\Centre	36057	12606	7527	148464	13.56%	24.29%	3.2935%
Iowa\Jackson	99037	25234	3889	296433	9.82%	33.41%	3.2823%
Michigan\Montmorency	3485	4460		21801	20.46%	15.99%	3.2703%
Iowa\Adair	157105	19882		311678	6.38%	50.41%	3.2154%
Nebraska\Scotts Bluff	127534	31590	855	360286	9.01%	35.40%	3.1877%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Illinois\McHenry	162310	9117		215584	4.23%	75.29%	3.1839%
Minnesota\Hennepin	28354	4391	560	66558	7.44%	42.60%	3.1689%
Indiana\Adams	133261	7394	475	182490	4.31%	73.02%	3.1488%
South Dakota\Hutchinson	321643	23966	1372	509775	4.97%	63.10%	3.1361%
California\San Joaquin	271636	56969	5782	737503	8.51%	36.83%	3.1339%
Illinois\Cook	4596	458		8198	5.59%	56.06%	3.1321%
Minnesota\Otter Tail	336883	62666	12294	898703	8.34%	37.49%	3.1266%
New York\Montgomery	17836	16998	10032	124556	21.70%	14.32%	3.1075%
Idaho\Teton	36360	12617	189	122478	10.46%	29.69%	3.1040%
Ohio\Tuscarawas	34716	11531	6599	142642	12.71%	24.34%	3.0934%
Idaho\Camas	13312	44382		138417	32.06%	9.62%	3.0837%
South Dakota\Grant	184776	18919	3123	363689	6.06%	50.81%	3.0792%
Nebraska\Thurston	116370	9654	866	199689	5.27%	58.28%	3.0701%
Nebraska\Douglas	56413	3518	325	84374	4.55%	66.86%	3.0453%
Iowa\Allamakee	73252	22491	8778	274844	11.38%	26.65%	3.0322%
Michigan\Kalamazoo	80797	6698	1125	144873	5.40%	55.77%	3.0116%
Pennsylvania\Bedford	41038	19168	13455	210990	15.46%	19.45%	3.0074%
Illinois\Winnebago	136235	6225	1200	183615	4.04%	74.20%	3.0003%
Michigan\Gladwin	13977	8723	1009	67634	14.39%	20.67%	2.9736%
Michigan\St. Clair	95597	7065	904	160482	4.97%	59.57%	2.9580%
Indiana\Marshall	127315	6152	1248	179016	4.13%	71.12%	2.9399%
Vermont\Addison	22103	13460	33226	187482	24.90%	11.79%	2.9357%
South Dakota\Codington	174728	22632		367107	6.16%	47.60%	2.9343%
Nebraska\Knox	169089	48576	1050	536457	9.25%	31.52%	2.9158%
Nebraska\Stanton	114278	13916	232	235686	6.00%	48.49%	2.9107%
Pennsylvania\Mercer	54428	10579	5196	171860	9.18%	31.67%	2.9070%
Iowa\Warren	97391	17018	365	241647	7.19%	40.30%	2.8992%
South Dakota\Turner	249366	14119	1905	371436	4.31%	67.14%	2.8963%
South Dakota\Sanborn	119245	24493		318254	7.70%	37.47%	2.8836%
Kansas\Barton	191137	45599	1466	558977	8.42%	34.19%	2.8791%
Michigan\Tuscola	214129	12118	3672	342729	4.61%	62.48%	2.8784%
Michigan\Wexford	6216	6224	618	38486	17.78%	16.15%	2.8714%
Iowa\Jones	210907	13127	1089	324003	4.39%	65.09%	2.8561%
Minnesota\Dakota	146456	8177	3592	246026	4.78%	59.53%	2.8476%
Iowa\Monroe	53071	19979	1722	201204	10.79%	26.38%	2.8449%
South Dakota\Charles Mix	278900	42202	2165	660519	6.72%	42.22%	2.8362%
Ohio\Portage	34799	4669	898	82759	6.73%	42.05%	2.8285%
Iowa\Johnson	183906	13927	1924	321139	4.94%	57.27%	2.8266%
Michigan\Calhoun	121273	10519	1550	227994	5.29%	53.19%	2.8157%
Minnesota\Houston	56711	21269	8342	244404	12.12%	23.20%	2.8113%
Wisconsin\Richland	38424	29942	17164	253776	18.56%	15.14%	2.8105%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Minnesota\Todd	99766	32561	7582	378734	10.60%	26.34%	2.7921%
Minnesota\Anoka	14575	4012		45987	8.72%	31.69%	2.7650%
Ohio\Lorain	66972	4650	1648	124100	5.07%	53.97%	2.7387%
Wisconsin\Taylor	49059	17181	15761	242932	13.56%	20.19%	2.7384%
Wisconsin\Burnett	17835	10356	3787	96168	14.71%	18.55%	2.7274%
Michigan\St. Joseph	130230	8147	1565	215425	4.51%	60.45%	2.7254%
Michigan\Macomb	36255	2887		61994	4.66%	58.48%	2.7234%
Michigan\Emmet	3760	10039	1237	39582	28.49%	9.50%	2.7061%
Pennsylvania\Northumberland	68840	4267	4284	147660	5.79%	46.62%	2.6998%
Iowa\Fayette	253150	14588	3873	417219	4.42%	60.68%	2.6848%
Pennsylvania\Perry	40968	7256	6261	144375	9.36%	28.38%	2.6567%
Ohio\Knox	87257	9991	1941	198244	6.02%	44.01%	2.6492%
Wisconsin\Rusk	25106	13867	13269	160534	16.90%	15.64%	2.6436%
Nebraska\Boone	217196	19950		405334	4.92%	53.58%	2.6374%
Nebraska\Pierce	174533	13760	1368	316773	4.78%	55.10%	2.6313%
Pennsylvania\Butler	27407	13545	2525	129850	12.38%	21.11%	2.6121%
Ohio\Shelby	141801	7374	1371	217969	4.01%	65.06%	2.6101%
Indiana\Wayne	104917	5937	744	164117	4.07%	63.93%	2.6024%
Nebraska\Dawson	243915	43137		640541	6.73%	38.08%	2.5645%
Kansas\Republic	214805	19734		406745	4.85%	52.81%	2.5622%
California\Tulare	368037	76413	18449	1168684	8.12%	31.49%	2.5562%
Minnesota\Morrison	108135	30929	12954	431346	10.17%	25.07%	2.5504%
Iowa\Wapello	70890	9283	593	166199	5.94%	42.65%	2.5346%
California\Merced	308598	82731	5578	1041115	8.48%	29.64%	2.5142%
Minnesota\Sherburne	50780	5560		106127	5.24%	47.85%	2.5068%
Pennsylvania\Westmoreland	33892	17134	3563	167489	12.36%	20.24%	2.5005%
New York\Orleans	51648	6504	2864	139764	6.70%	36.95%	2.4769%
Iowa\Madison	110380	17935		283393	6.33%	38.95%	2.4650%
South Dakota\Hanson	125501	9084	296	219023	4.28%	57.30%	2.4540%
South Dakota\Kingsbury	226653	22344	2276	477481	5.16%	47.47%	2.4476%
Idaho\Bonneville	119613	41382	190	453068	9.18%	26.40%	2.4224%
Michigan\Lenawee	215186	8872	4799	348611	3.92%	61.73%	2.4207%
Indiana\Fayette	60856	3209	189	92505	3.67%	65.79%	2.4166%
Idaho\Franklin	34405	33233	2258	224902	15.78%	15.30%	2.4141%
Kansas\Finney	322716	38844	4027	760110	5.64%	42.46%	2.3946%
Minnesota\Rice	113366	10362	3154	253094	5.34%	44.79%	2.3920%
North Dakota\Stark	264472	63043	330	837143	7.57%	31.59%	2.3916%
New York\Oneida	32794	16395	10524	192232	14.00%	17.06%	2.3889%
Ohio\Mahoning	23385	2648	1547	64082	6.55%	36.49%	2.3889%
Michigan\Hillsdale	139346	12489		269916	4.63%	51.63%	2.3887%
Michigan\Oakland	6110	3946	155	32504	12.62%	18.80%	2.3717%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
South Dakota\Aurora	184119	17065		364612	4.68%	50.50%	2.3634%
Pennsylvania\Cambria	16873	8807	2009	87924	12.30%	19.19%	2.3607%
Vermont\Grand Isle	2879	1188	1220	17138	14.05%	16.80%	2.3604%
Nebraska\Buffalo	284998	30942		612171	5.05%	46.56%	2.3531%
New York\Monroe	71222	5832		133041	4.38%	53.53%	2.3467%
New Jersey\Salem	44138	4756	166	96530	5.10%	45.72%	2.3315%
Nebraska\Howard	102789	17085	550	278876	6.32%	36.86%	2.3308%
Illinois\Carroll	192276	6977	1528	265153	3.21%	72.52%	2.3260%
Michigan\Alcona	4907	9764		45395	21.51%	10.81%	2.3250%
Illinois\Kane	140312	6124		192372	3.18%	72.94%	2.3219%
Iowa\Union	79457	12963	385	214618	6.22%	37.02%	2.3026%
Michigan\Presque Isle	11180	10364		71079	14.58%	15.73%	2.2934%
Maryland\Frederick	79213	6606	5205	202087	5.84%	39.20%	2.2909%
South Dakota\Beadle	338872	38312	1597	769855	5.18%	44.02%	2.2819%
Wisconsin\Lincoln	12358	8641	5261	86770	16.02%	14.24%	2.2818%
Michigan\Charlevoix	5607	6973		41418	16.84%	13.54%	2.2791%
Minnesota\Lincoln	164953	10559	700	286255	3.93%	57.62%	2.2665%
South Dakota\Moody	189283	10304		293395	3.51%	64.51%	2.2658%
Minnesota\Pennington	141091	16944		325292	5.21%	43.37%	2.2593%
Ohio\Logan	126498	6542	679	201306	3.59%	62.84%	2.2541%
Ohio\Ottawa	81407	3671		115145	3.19%	70.70%	2.2540%
South Dakota\Faulk	252087	33758		614607	5.49%	41.02%	2.2528%
South Dakota\Gregory	148475	64016	705	654445	9.89%	22.69%	2.2436%
South Dakota\Deuel	131954	15882	1217	317164	5.39%	41.60%	2.2430%
Minnesota\Mille Lacs	34712	6817	3270	124956	8.07%	27.78%	2.2425%
New York\Saratoga	11000	6613	5055	75660	15.42%	14.54%	2.2421%
South Dakota\Lake	202910	10956		314946	3.48%	64.43%	2.2412%
Idaho\Cassia	174040	53422		644740	8.29%	26.99%	2.2367%
Ohio\Summit	4021	1138	141	15166	8.43%	26.51%	2.2360%
Ohio\Auglaize	149433	4708	2037	213296	3.16%	70.06%	2.2155%
Michigan\Cass	110200	7072	193	190330	3.82%	57.90%	2.2101%
Michigan\Leelanau	16237	4227		55751	7.58%	29.12%	2.2082%
South Dakota\Brookings	226612	19123	1705	462579	4.50%	48.99%	2.2058%
Illinois\Clinton	195048	6503	1630	268441	3.03%	72.66%	2.2014%
Minnesota\Dodge	170156	4840	3088	248125	3.20%	68.58%	2.1911%
Pennsylvania\York	142432	9471	3646	292507	4.48%	48.69%	2.1836%
New York\Erie	28104	10310	6904	149356	11.53%	18.82%	2.1687%
Washington\Spokane	230886	36386	447	626329	5.88%	36.86%	2.1679%
Kansas\Pawnee	181516	25035	3260	487373	5.81%	37.24%	2.1622%
Indiana\Kosciusko	176724	5835	1876	251340	3.07%	70.31%	2.1572%
Colorado\Alamosa	26072	25522	283	176629	14.61%	14.76%	2.1565%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Illinois\Rock Island	129027	5118	207	178623	2.98%	72.23%	2.1534%
Pennsylvania\Schuylkill	42904	4357	2683	118501	5.94%	36.21%	2.1509%
North Dakota\Rolette	222818	30214	884	567850	5.48%	39.24%	2.1489%
South Dakota\McCook	232210	11207	1001	363408	3.36%	63.90%	2.1465%
Indiana\Allen	184421	5939	1544	254136	2.94%	72.57%	2.1368%
Utah\Weber	14604	16086	415	106247	15.53%	13.75%	2.1348%
Iowa\Poweshiek	187457	11139		312853	3.56%	59.92%	2.1334%
Minnesota\Douglas	102687	12598	1719	262695	5.45%	39.09%	2.1304%
South Dakota\Miner	129796	14753		300076	4.92%	43.25%	2.1266%
Iowa\Cass	197024	10626	268	317913	3.43%	61.97%	2.1237%
South Dakota\Hand	361092	46311	1188	898741	5.29%	40.18%	2.1234%
Wisconsin\Sawyer	8024	3062	2798	47093	12.44%	17.04%	2.1202%
North Dakota\Adams	213275	39030		626663	6.23%	34.03%	2.1197%
South Dakota\Hamlin	179952	10296	939	309740	3.63%	58.10%	2.1073%
Iowa\Clinton	293639	9694	1437	395585	2.81%	74.23%	2.0887%
Ohio\Montgomery	79958	2868	349	111000	2.90%	72.03%	2.0877%
Iowa\Lee	123223	8334	1208	238266	4.00%	51.72%	2.0711%
South Dakota\Clark	220436	23158	1044	508768	4.76%	43.33%	2.0611%
Iowa\Van Buren	69271	13928	640	221529	6.58%	31.27%	2.0563%
Illinois\Boone	98587	3920		137162	2.86%	71.88%	2.0542%
Wisconsin\Crawford	33569	24563	10100	238225	14.55%	14.09%	2.0504%
Kansas\Gray	241995	23247	2001	546118	4.62%	44.31%	2.0486%
Ohio\Darke	240429	8814	1643	350450	2.98%	68.61%	2.0471%
Michigan\Wayne	8432	738		17443	4.23%	48.34%	2.0452%
Ohio\Morrow	97583	4987	715	165023	3.46%	59.13%	2.0432%
Michigan\Huron	294112	13479		440967	3.06%	66.70%	2.0387%
Minnesota\Becker	131676	21940	2247	395858	6.11%	33.26%	2.0324%
Nebraska\Valley	112832	22676	147	356296	6.41%	31.67%	2.0285%
Ohio\Coshocton	42468	11917	2041	171084	8.16%	24.82%	2.0252%
Ohio\Carroll	19402	12111	2134	116853	12.19%	16.60%	2.0241%
Michigan\Osceola	9922	24336	6101	122166	24.91%	8.12%	2.0235%
Maryland\Cecil	40543	2908	695	85026	4.24%	47.68%	2.0206%
South Dakota\Union	202715	7753		278916	2.78%	72.68%	2.0203%
North Dakota\Mercer	119095	43828	180	509552	8.64%	23.37%	2.0186%
Indiana\Fulton	144504	4155	610	184847	2.58%	78.17%	2.0152%
Iowa\Iowa	175125	13319	371	345231	3.97%	50.73%	2.0116%
North Dakota\Oliver	99633	28744		377904	7.61%	26.36%	2.0053%
Iowa\Marion	104677	11328	248	246191	4.70%	42.52%	1.9992%
Pennsylvania\Somerset	30018	15642	12641	206651	13.69%	14.53%	1.9881%
Ohio\Preble	164137	5909	528	230616	2.79%	71.17%	1.9866%
Iowa\Davis	52283	16737	1401	218698	8.29%	23.91%	1.9827%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Iowa\Linn	208855	9693	932	335378	3.17%	62.27%	1.9729%
Nebraska\Butler	242151	10147	184	356151	2.90%	67.99%	1.9722%
Indiana\LaPorte	196854	4567	1987	256159	2.56%	76.85%	1.9662%
Nebraska\Sherman	77545	18329	134	270072	6.84%	28.71%	1.9629%
Michigan\Bay	131729	3698	1458	186256	2.77%	70.72%	1.9578%
South Dakota\Edmunds	292389	27401	1436	656678	4.39%	44.53%	1.9553%
North Dakota\Kidder	131031	83788		753284	11.12%	17.39%	1.9348%
New York\Tompkins	18024	4726	7953	108739	11.66%	16.58%	1.9327%
Indiana\Whitley	98794	3665		137082	2.67%	72.07%	1.9268%
Pennsylvania\Columbia	43874	4415	2180	122621	5.38%	35.78%	1.9244%
New York\Lewis	19495	9835	17761	167249	16.50%	11.66%	1.9233%
Ohio\Butler	52819	5577	290	127194	4.61%	41.53%	1.9155%
Minnesota\Roseau	210697	30811	923	591316	5.37%	35.63%	1.9122%
South Dakota\Tripp	248877	76438	2467	1014336	7.78%	24.54%	1.9086%
Indiana\Franklin	62526	4601	267	126322	3.85%	49.50%	1.9075%
Pennsylvania\Lycoming	35525	9077	4706	160456	8.59%	22.14%	1.9018%
Indiana\Porter	88151	2851		115047	2.48%	76.62%	1.8988%
North Dakota\McHenry	378760	57849	925	1082911	5.43%	34.98%	1.8983%
California\Fresno	643140	69290	9687	1636224	4.83%	39.31%	1.8972%
Illinois\Ogle	281258	8227	829	366470	2.47%	76.75%	1.8966%
North Dakota\McIntosh	169849	33648		549685	6.12%	30.90%	1.8914%
Iowa\Page	163947	8479		271128	3.13%	60.47%	1.8910%
Idaho\Payette	29537	15850	1818	166179	10.63%	17.77%	1.8897%
Minnesota\Kandiyohi	216791	11840	3323	417138	3.64%	51.97%	1.8892%
Michigan\Branch	149443	6431	1468	250134	3.16%	59.75%	1.8867%
Iowa\Adams	97825	9655	82	224882	4.33%	43.50%	1.8835%
Missouri\Nodaway	237677	22794	577	543224	4.30%	43.75%	1.8824%
Iowa\Jasper	283021	11690	483	427822	2.85%	66.15%	1.8823%
Indiana\DeKalb	98790	4438	478	160665	3.06%	61.49%	1.8814%
Indiana\Putnam	104043	5112		168446	3.03%	61.77%	1.8745%
Iowa\Appanoose	39253	18287	326	197904	9.41%	19.83%	1.8654%
Nebraska\Nance	105962	9015		226299	3.98%	46.82%	1.8653%
North Dakota\Emmons	273025	50672	1136	871766	5.94%	31.32%	1.8612%
Michigan\Van Buren	70106	7994	1089	185343	4.90%	37.83%	1.8537%
South Dakota\McPherson	107515	46056		518187	8.89%	20.75%	1.8441%
New Jersey\Warren	24363	2818	1425	74975	5.66%	32.49%	1.8390%
Pennsylvania\Indiana	30971	15129	5790	187711	11.14%	16.50%	1.8387%
Iowa\Bremer	181706	4952	1025	243057	2.46%	74.76%	1.8384%
New York\Herkimer	14016	14945	10674	140017	18.30%	10.01%	1.8316%
South Dakota\Roberts	286187	21618	848	592889	3.79%	48.27%	1.8291%
South Dakota\Brule	178344	23814	3683	518462	5.30%	34.40%	1.8244%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Minnesota\Clearwater	22576	29369	922	194190	15.60%	11.63%	1.8135%
Illinois\Henderson	122494	4100	182	170443	2.51%	71.87%	1.8055%
Ohio\Trumbull	51368	3205	2286	125136	4.39%	41.05%	1.8013%
Iowa\Montgomery	139653	6098	149	220463	2.83%	63.35%	1.7949%
Indiana\Marion	10983	485		17233	2.81%	63.73%	1.7937%
Pennsylvania\Crawford	56194	10246	6931	232093	7.40%	24.21%	1.7919%
North Dakota\Burleigh	216997	62447	1383	879542	7.26%	24.67%	1.7905%
Ohio\Geauga	9914	5165	600	56558	10.19%	17.53%	1.7867%
Pennsylvania\Adams	68853	4281	3601	174595	4.51%	39.44%	1.7803%
Iowa\Ida	199379	6342	289	272578	2.43%	73.15%	1.7794%
Michigan\Delta	8054	10472	2797	77762	17.06%	10.36%	1.7673%
Idaho\Ada	28454	20972	1778	191477	11.88%	14.86%	1.7656%
Iowa\Guthrie	195093	11015	338	354851	3.20%	54.98%	1.7590%
Nebraska\Dodge	242294	7748	553	338475	2.45%	71.58%	1.7556%
New York\Columbia	19634	6355	3798	106574	9.53%	18.42%	1.7551%
Nebraska\Platte	259385	11045	1188	425730	2.87%	60.93%	1.7507%
Iowa\Chickasaw	203409	5621	1545	289146	2.48%	70.35%	1.7435%
Illinois\Adams	210109	10806	788	374133	3.10%	56.16%	1.7403%
Minnesota\Meeker	203775	6564	2251	321781	2.74%	63.33%	1.7348%
Ohio\Sandusky	134031	4248		181337	2.34%	73.91%	1.7315%
Illinois\Knox	267973	8345	117	362951	2.33%	73.83%	1.7213%
Indiana\Wabash	147729	3631	1061	200689	2.34%	73.61%	1.7210%
Maryland\Harford	28141	2687	761	75166	4.59%	37.44%	1.7174%
Wisconsin\Florence	1849	3021	790	20264	18.81%	9.12%	1.7160%
Minnesota\Rock	193526	5940	958	279088	2.47%	69.34%	1.7139%
Kansas\Stafford	190826	21945	685	502229	4.51%	38.00%	1.7121%
Ohio\Champaign	141068	5089		204901	2.48%	68.85%	1.7099%
Michigan\Antrim	7863	8969	863	67351	14.60%	11.67%	1.7043%
Pennsylvania\Armstrong	16901	11806	3259	122275	12.32%	13.82%	1.7030%
North Dakota\Grant	237386	79198	1094	1058178	7.59%	22.43%	1.7022%
South Dakota\Walworth	159356	20749	302	444128	4.74%	35.88%	1.7007%
South Dakota\Jerauld	91246	20034		328624	6.10%	27.77%	1.6927%
Michigan\Otsego	3018	6143	175	33598	18.80%	8.98%	1.6892%
Illinois\Mercer	231346	6749	99	306306	2.24%	75.53%	1.6886%
Ohio\Miami	133522	4265	628	196943	2.48%	67.80%	1.6844%
Michigan\Oscoda	1215	2934	1346	17579	24.35%	6.91%	1.6828%
Michigan\Dickinson	2479	3490	709	24889	16.87%	9.96%	1.6804%
Indiana\Miami	128023	2988	1157	178030	2.33%	71.91%	1.6743%
Idaho\Fremont	76852	17469	544	288114	6.25%	26.67%	1.6677%
Idaho\Elmore	46543	38569	4452	346550	12.41%	13.43%	1.6673%
South Dakota\Marshall	181197	23530	2649	534178	4.90%	33.92%	1.6624%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
North Dakota\Eddy	149437	15343	426	376620	4.19%	39.68%	1.6613%
Iowa\Howard	174057	6289	1115	278635	2.66%	62.47%	1.6599%
Nebraska\Dakota	95513	4818		166555	2.89%	57.35%	1.6589%
Ohio\Licking	108667	7169	612	225792	3.45%	48.13%	1.6585%
Ohio\Fairfield	98322	4761	556	177772	2.99%	55.31%	1.6542%
Nevada\Lyon	25863	43451		260660	16.67%	9.92%	1.6540%
Iowa\Buchanan	270265	7030	911	360316	2.20%	75.01%	1.6531%
Minnesota\Le Sueur	150404	5282	1625	250696	2.76%	59.99%	1.6529%
North Dakota\Dickey	329868	24315		697526	3.49%	47.29%	1.6485%
Minnesota\Pipestone	129424	7620		244670	3.11%	52.90%	1.6474%
Michigan\Clare	5160	12022	2890	68356	21.82%	7.55%	1.6468%
Iowa\Ringgold	56619	19752	560	264886	7.67%	21.37%	1.6391%
Nebraska\Merrick	154676	6499		247927	2.62%	62.39%	1.6354%
South Dakota\Brown	569116	32865	882	1085020	3.11%	52.45%	1.6314%
Indiana\Hendricks	133458	3599		171741	2.10%	77.71%	1.6285%
Pennsylvania\Beaver	7664	7116	2430	67075	14.23%	11.43%	1.6261%
Nebraska\Lancaster	238172	11960	160	421409	2.88%	56.52%	1.6255%
South Dakota\Campbell	100870	24821	999	400871	6.44%	25.16%	1.6207%
Ohio\Ashtabula	53805	5695	2153	161698	4.85%	33.27%	1.6150%
Kansas\Rice	197934	13873	1097	428422	3.49%	46.20%	1.6144%
Iowa\Washington	173106	8818	1079	325836	3.04%	53.13%	1.6137%
Nebraska\Boyd	43299	23480		251747	9.33%	17.20%	1.6042%
South Dakota\Spink	442420	28985	743	907643	3.28%	48.74%	1.5965%
Iowa\Keokuk	151285	10526	133	318160	3.35%	47.55%	1.5930%
California\Solano	72462	28129		358225	7.85%	20.23%	1.5884%
Michigan\Alger	1463	2757	901	18357	19.93%	7.97%	1.5881%
Michigan\Berrien	92607	4894		169016	2.90%	54.79%	1.5865%
New York\Jefferson	33400	15005	17654	262331	12.45%	12.73%	1.5851%
North Dakota\Stutsman	507108	43353	996	1193231	3.72%	42.50%	1.5796%
Iowa\Muscatine	146202	5318		221904	2.40%	65.89%	1.5790%
Minnesota\Steele	165918	5043	1685	266199	2.53%	62.33%	1.5753%
Kansas\Dickinson	199738	21700	1012	536885	4.23%	37.20%	1.5738%
Ohio\Huron	137748	3658	1840	219369	2.51%	62.79%	1.5738%
Kansas\Sedgwick	227813	17347	592	510308	3.52%	44.64%	1.5693%
Nebraska\Seward	222228	7677	127	332597	2.35%	66.82%	1.5678%
North Dakota\Logan	135140	38629		577086	6.69%	23.42%	1.5675%
Missouri\Andrew	101176	8339	470	238559	3.69%	42.41%	1.5661%
Indiana\Fountain	137729	3580	465	188727	2.14%	72.98%	1.5641%
Indiana\St. Joseph	141677	2947	562	178674	1.96%	79.29%	1.5573%
Iowa\Jefferson	71727	8448		197301	4.28%	36.35%	1.5566%
New York\Clinton	19896	5828	11578	149219	11.66%	13.33%	1.5553%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Ohio\Fayette	163981	4117	365	218250	2.05%	75.13%	1.5430%
Minnesota\Kanabec	29219	9184	1438	141896	7.49%	20.59%	1.5415%
Nevada\Churchill	9600	25955	1786	131448	21.10%	7.30%	1.5413%
New York\Orange	12709	4425	3472	80990	9.75%	15.69%	1.5301%
Kansas\Kearny	164246	24239	873	519424	4.83%	31.62%	1.5287%
Kansas\Haskell	162987	14915		398805	3.74%	40.87%	1.5285%
Nebraska\Polk	186647	5924		269195	2.20%	69.34%	1.5258%
Illinois\Washington	267654	5585	1551	353903	2.02%	75.63%	1.5250%
Minnesota\Polk	683882	24050	2916	1099761	2.45%	62.18%	1.5248%
Ohio\Clark	106994	4477		177335	2.52%	60.33%	1.5232%
Iowa\Henry	133087	6288	278	239628	2.74%	55.54%	1.5218%
Indiana\Vermillion	92994	2866		132353	2.17%	70.26%	1.5215%
Minnesota\Red Lake	108362	6988		223469	3.13%	48.49%	1.5163%
Iowa\Audubon	186641	5927	381	279079	2.26%	66.88%	1.5116%
Iowa\Benton	258623	8925	448	400934	2.34%	64.51%	1.5080%
Iowa\Crawford	308585	9019	98	432351	2.11%	71.37%	1.5051%
North Dakota\Bowman	145053	53845		720756	7.47%	20.13%	1.5035%
Wisconsin\Washburn	16414	6452	3014	101862	9.29%	16.11%	1.4975%
Nebraska\Cass	184134	5906	505	280920	2.28%	65.55%	1.4959%
Ohio\Putnam	215274	4650	1733	303751	2.10%	70.87%	1.4893%
North Dakota\Ward	613972	26813	734	1066242	2.58%	57.58%	1.4877%
Indiana\Union	54438	1463		73249	2.00%	74.32%	1.4844%
Washington\Island	1763	1612	1024	17699	14.89%	9.96%	1.4835%
North Dakota\Sheridan	182405	19743	500	500070	4.05%	36.48%	1.4766%
Illinois\Will	176183	4086		220851	1.85%	79.77%	1.4759%
Wyoming\Teton	8963	4610		52930	8.71%	16.93%	1.4749%
Iowa\Clarke	30891	17129	203	190727	9.09%	16.20%	1.4718%
Pennsylvania\Montour	11964	2386	718	50252	6.18%	23.81%	1.4706%
Iowa\Tama	264709	10294		430855	2.39%	61.44%	1.4679%
Pennsylvania\Jefferson	9749	9196	2210	87043	13.10%	11.20%	1.4677%
Nebraska\Antelope	271299	14428		516521	2.79%	52.52%	1.4672%
New York\Rensselaer	9314	6511	4862	85034	13.37%	10.95%	1.4650%
Maryland\Kent	75587	2617	567	128220	2.48%	58.95%	1.4639%
Ohio\Union	151684	4170	441	218657	2.11%	69.37%	1.4629%
Michigan\Saginaw	212366	5488	1756	324407	2.23%	65.46%	1.4618%
North Dakota\Foster	219722	10633		399912	2.66%	54.94%	1.4608%
North Dakota\Pierce	276588	17752	52	581146	3.06%	47.59%	1.4581%
Indiana\Henry	129400	3427		174400	1.97%	74.20%	1.4580%
South Dakota\Lincoln	220417	6988	322	332762	2.20%	66.24%	1.4551%
Minnesota\Murray	265486	7880	2183	428869	2.35%	61.90%	1.4525%
Pennsylvania\Bucks	31959	1341	1275	75883	3.45%	42.12%	1.4519%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Idaho\Bingham	206645	56101	2279	912607	6.40%	22.64%	1.4485%
Iowa\Cedar	239828	6851		336885	2.03%	71.19%	1.4477%
Nevada\Pershing	28131	30625		244249	12.54%	11.52%	1.4441%
New Jersey\Gloucester	19205	1635		46662	3.50%	41.16%	1.4421%
New York\Steuben	52302	19575	18466	371932	10.23%	14.06%	1.4383%
Nebraska\Dixon	133917	6180	440	248506	2.66%	53.89%	1.4356%
Maryland\Carroll	62087	3469	1174	141934	3.27%	43.74%	1.4310%
Iowa\Lyon	234637	5246	1112	323054	1.97%	72.63%	1.4294%
Utah\Millard	61008	72244	2818	566692	13.25%	10.77%	1.4260%
Indiana\Hamilton	99217	2071	124	123600	1.78%	80.27%	1.4256%
Illinois\McDonough	220147	5776	340	307725	1.99%	71.54%	1.4219%
Minnesota\Sibley	217535	5780	1995	345738	2.25%	62.92%	1.4149%
Michigan\Monroe	148492	4105		207812	1.98%	71.45%	1.4115%
Ohio\Greene	111737	3130	190	162533	2.04%	68.75%	1.4043%
Minnesota\Wadena	26233	11036	1183	151212	8.08%	17.35%	1.4019%
Minnesota\Pope	174270	8487	1918	360095	2.89%	48.40%	1.3984%
Michigan\Benzie	4194	1345	131	21069	7.01%	19.91%	1.3945%
Pennsylvania\Huntingdon	19214	8204	7746	148289	10.76%	12.96%	1.3937%
Michigan\Manistee	5559	5300		46034	11.51%	12.08%	1.3903%
Iowa\Shelby	259458	6572	232	358376	1.90%	72.40%	1.3745%
Iowa\Carroll	258139	6676	145	358142	1.90%	72.08%	1.3727%
Iowa\Polk	198228	4305		249427	1.73%	79.47%	1.3717%
Nebraska\Saunders	265223	9032	405	427682	2.21%	62.01%	1.3684%
Minnesota\Clay	384818	13357		613819	2.18%	62.69%	1.3642%
North Dakota\Dunn	179409	81712	870	1043932	7.91%	17.19%	1.3595%
Ohio\Delaware	94830	2667	65	138140	1.98%	68.65%	1.3576%
Illinois\Peoria	180307	4785	272	259204	1.95%	69.56%	1.3571%
Nebraska\Burt	206203	4977		275041	1.81%	74.97%	1.3566%
Illinois\Henry	382943	7797	658	489903	1.73%	78.17%	1.3490%
Kansas\Reno	287479	27136	1430	780893	3.66%	36.81%	1.3467%
North Dakota\Morton	249881	69330	3819	1165098	6.28%	21.45%	1.3465%
Iowa\Lucas	27689	14216		171150	8.31%	16.18%	1.3438%
California\Mono	3548	7525		44610	16.87%	7.95%	1.3416%
North Dakota\Griggs	199410	11085		406115	2.73%	49.10%	1.3402%
Indiana\Cass	177114	3932		228199	1.72%	77.61%	1.3373%
Nebraska\Jefferson	187013	6775	801	325577	2.33%	57.44%	1.3366%
Ohio\Henry	170191	2983	1242	232238	1.82%	73.28%	1.3332%
Minnesota\Beltrami	22855	24381	1407	210833	12.23%	10.84%	1.3259%
Minnesota\Mower	264959	5772	3043	419889	2.10%	63.10%	1.3247%
Michigan\Schoolcraft	2913	3228		26697	12.09%	10.91%	1.3193%
Nebraska\Furnas	186103	14082		445844	3.16%	41.74%	1.3184%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Iowa\Wayne	54819	17561	210	273212	6.50%	20.06%	1.3051%
New York\Cortland	12435	7453	8829	124824	13.04%	9.96%	1.2994%
Iowa\Taylor	112007	9013	219	282637	3.27%	39.63%	1.2944%
South Dakota\Day	238192	16978	490	567218	3.08%	41.99%	1.2932%
Nebraska\Otoe	179518	7227	224	322146	2.31%	55.73%	1.2889%
Illinois\Brown	72068	3777	297	151058	2.70%	47.71%	1.2867%
North Dakota\Mountrail	425412	30757	1629	1036572	3.12%	41.04%	1.2822%
Ohio\Highland	119177	7351	468	269803	2.90%	44.17%	1.2801%
Kansas\Marion	183050	21078	1312	566309	3.95%	32.32%	1.2780%
West Virginia\Jefferson	22850	2395	510	72091	4.03%	31.70%	1.2772%
Ohio\Madison	173086	3866	669	247913	1.83%	69.82%	1.2771%
Nebraska\Adams	213969	5602		306373	1.83%	69.84%	1.2770%
Ohio\Crawford	160338	2763	1068	219566	1.74%	73.02%	1.2741%
Ohio\Williams	110060	3914	1312	212509	2.46%	51.79%	1.2736%
Iowa\Mahaska	144036	7126	555	295128	2.60%	48.80%	1.2702%
North Dakota\LaMoure	389626	15083	330	688012	2.24%	56.63%	1.2687%
Pennsylvania\Sullivan	2944	1857	1472	27821	11.97%	10.58%	1.2662%
Nebraska\Sarpy	75987	1519	165	100835	1.67%	75.36%	1.2585%
North Dakota\Williams	466234	35196		1144868	3.07%	40.72%	1.2519%
Minnesota\Lyon	254561	8004	993	428693	2.10%	59.38%	1.2462%
Ohio\Erie	58100	1514		84085	1.80%	69.10%	1.2441%
Nebraska\Greeley	83351	11504	387	282395	4.21%	29.52%	1.2428%
New York\Westchester	173	711	4502	8521	61.18%	2.03%	1.2421%
North Dakota\Bottineau	614263	21390		1028699	2.08%	59.71%	1.2416%
Kansas\Jewell	182455	14793	249	471240	3.19%	38.72%	1.2359%
Indiana\Parke	112417	3131	324	177343	1.95%	63.39%	1.2350%
Iowa\Sioux	347107	6660	1487	478697	1.70%	72.51%	1.2341%
Pennsylvania\Luzerne	16258	1827	1536	66577	5.05%	24.42%	1.2335%
Illinois\Madison	229189	4876	377	312936	1.68%	73.24%	1.2294%
Indiana\Hancock	137674	2619		171673	1.53%	80.20%	1.2234%
Indiana\Clark	39660	2161	148	86668	2.66%	45.76%	1.2192%
Illinois\Schuyler	107264	4886		207457	2.36%	51.70%	1.2177%
Ohio\Warren	46876	2305		94348	2.44%	49.68%	1.2138%
Nebraska\Clay	259430	6212		365099	1.70%	71.06%	1.2090%
Iowa\Dallas	215593	4943		297090	1.66%	72.57%	1.2074%
Indiana\Morgan	77058	2040		114136	1.79%	67.51%	1.2067%
California\Stanislaus	220704	28836	5045	788954	4.29%	27.97%	1.2013%
Colorado\Conejos	12375	50172	294	228700	22.07%	5.41%	1.1940%
Illinois\Warren	226666	4402	168	294907	1.55%	76.86%	1.1911%
Illinois\Fulton	236119	7275	187	385302	1.94%	61.28%	1.1868%
Indiana\Huntington	153154	3065		199070	1.54%	76.93%	1.1845%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Indiana\Harrison	62985	4262	244	154998	2.91%	40.64%	1.1813%
Kansas\McPherson	234586	12983	233	514818	2.57%	45.57%	1.1698%
Nebraska\Hall	185830	6784		328294	2.07%	56.60%	1.1697%
Pennsylvania\Venango	11616	2812	1413	64796	6.52%	17.93%	1.1689%
North Dakota\Ransom	207676	15640		527276	2.97%	39.39%	1.1683%
North Dakota\Burke	243396	15594		570560	2.73%	42.66%	1.1659%
Virginia\Rockingham	55682	7804	3549	233087	4.87%	23.89%	1.1636%
Iowa\Cherokee	216116	4807	510	314896	1.69%	68.63%	1.1588%
Oklahoma\Tillman	136497	18134		463943	3.91%	29.42%	1.1500%
Indiana\Rush	169890	3182		216890	1.47%	78.33%	1.1492%
Pennsylvania\Clearfield	5322	6292	2196	62721	13.53%	8.49%	1.1483%
South Dakota\Hyde	106216	24976		480989	5.19%	22.08%	1.1467%
Iowa\Woodbury	305556	7241	181	445554	1.67%	68.58%	1.1424%
Montana\Judith Basin	98503	79911	1475	838477	9.71%	11.75%	1.1403%
Indiana\Jay	136959	3004	223	197225	1.64%	69.44%	1.1362%
Iowa\Pottawattamie	340167	7875		485943	1.62%	70.00%	1.1344%
Iowa\Des Moines	113246	3427		184975	1.85%	61.22%	1.1343%
Colorado\Prowers	198485	61489		1037336	5.93%	19.13%	1.1342%
California\Colusa	170606	14900		474092	3.14%	35.99%	1.1310%
Illinois\Hancock	261827	6230	433	392898	1.70%	66.64%	1.1301%
Iowa\Scott	196775	3549		248646	1.43%	79.14%	1.1296%
Utah\Wayne	1858	11732	694	45222	27.48%	4.11%	1.1290%
Illinois\Marshall	160511	2853	88	204584	1.44%	78.46%	1.1279%
Illinois\Whiteside	316817	4990	856	405333	1.44%	78.16%	1.1273%
Nebraska\Nemaha	127083	3957	54	212686	1.89%	59.75%	1.1268%
Nebraska\Nuckolls	172413	6163		307096	2.01%	56.14%	1.1267%
New Jersey\Monmouth	14220	1498	38	44130	3.48%	32.22%	1.1216%
Kansas\Harvey	198861	5956	502	338598	1.91%	58.73%	1.1202%
Iowa\Marshall	233574	3930	1110	324270	1.55%	72.03%	1.1195%
North Dakota\McLean	575838	25997	279	1162923	2.26%	49.52%	1.1188%
North Dakota\Hettinger	279244	20069		707833	2.84%	39.45%	1.1185%
Nebraska\Saline	176727	5628		298304	1.89%	59.24%	1.1177%
Iowa\Decatur	42752	13543	110	228528	5.97%	18.71%	1.1176%
California\Madera	152691	29759	4040	679729	4.97%	22.46%	1.1170%
North Dakota\Divide	326200	17132		708034	2.42%	46.07%	1.1148%
Idaho\Kootenai	35499	5362		130851	4.10%	27.13%	1.1117%
California\Los Angeles	16992	7693		108463	7.09%	15.67%	1.1112%
New York\Chautauqua	42339	6570	8007	235858	6.18%	17.95%	1.1094%
Idaho\Lewis	149915	4469		245944	1.82%	60.95%	1.1076%
Colorado\Boulder	16530	11913	772	137668	9.21%	12.01%	1.1064%
Ohio\Fulton	125112	2396	594	183913	1.63%	68.03%	1.1060%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Minnesota\Mahnomen	83152	7884		243958	3.23%	34.08%	1.1015%
North Dakota\Wells	417451	15035		757008	1.99%	55.14%	1.0952%
Ohio\Muskingum	21325	13437	764	166448	8.53%	12.81%	1.0931%
Iowa\Mitchell	210746	3280	1189	294041	1.52%	71.67%	1.0893%
New Jersey\Cumberland	33894	1551		69489	2.23%	48.78%	1.0887%
Indiana\Tippecanoe	170803	2850	177	218301	1.39%	78.24%	1.0849%
Minnesota\Pine	26491	12248	5390	207629	8.49%	12.76%	1.0839%
Nebraska\Harlan	179333	7390		350947	2.11%	51.10%	1.0760%
Minnesota\Lac qui Parle	261941	6965		412051	1.69%	63.57%	1.0745%
Utah\Piute	2170	8870		42380	20.93%	5.12%	1.0717%
Iowa\Plymouth	341216	8017	371	517248	1.62%	65.97%	1.0698%
Indiana\Decatur	155816	2562	313	204702	1.40%	76.12%	1.0691%
Montana\Gallatin	108197	54242	5327	776868	7.67%	13.93%	1.0679%
Utah\Sevier	13629	25878	1099	185708	14.53%	7.34%	1.0661%
New Jersey	243360	20310	3234	733450	3.21%	33.18%	1.0651%
Minnesota\Swift	238827	5908	817	388442	1.73%	61.48%	1.0644%
New York\Otsego	13826	14617	9352	176481	13.58%	7.83%	1.0640%
Iowa\Black Hawk	214031	3447	493	282163	1.40%	75.85%	1.0592%
Indiana\Johnson	112943	1895		142181	1.33%	79.44%	1.0587%
Iowa\Mills	127956	3199		196840	1.63%	65.01%	1.0564%
Kansas\Rush	147512	11791		405912	2.90%	36.34%	1.0556%
Kansas\Edwards	161433	12595		439243	2.87%	36.75%	1.0539%
Iowa\Boone	244868	4694	39	332048	1.43%	73.74%	1.0512%
Ohio\Ross	88757	5057	866	223650	2.65%	39.69%	1.0510%
New York\Dutchess	10828	7738	2408	102360	9.91%	10.58%	1.0485%
Indiana\Wells	155834	2153	381	194602	1.30%	80.08%	1.0427%
Nebraska\Phelps	220500	5476		340291	1.61%	64.80%	1.0427%
Minnesota\Yellow Medicine	275692	6177	140	409223	1.54%	67.37%	1.0400%
Missouri\Scotland	77384	5123	2072	231697	3.11%	33.40%	1.0371%
Utah\Utah	40355	30197	403	345634	8.85%	11.68%	1.0337%
Iowa\Floyd	213379	3534	763	298459	1.44%	71.49%	1.0293%
Indiana\Ripley	92944	2427	352	159017	1.75%	58.45%	1.0215%
Pennsylvania\Carbon	6118	667		20035	3.33%	30.54%	1.0166%
South Dakota\Potter	222912	12155		516683	2.35%	43.14%	1.0149%
Ohio\Hancock	166106	2878	875	247981	1.51%	66.98%	1.0137%
Minnesota\Norman	308270	8620		512922	1.68%	60.10%	1.0100%
Illinois\Cumberland	97625	1747	420	144981	1.49%	67.34%	1.0065%
Nebraska\Custer	430466	59242	1659	1614280	3.77%	26.67%	1.0060%
New York\Franklin	13579	5839	6819	130852	9.67%	10.38%	1.0039%
Illinois\Monroe	122423	2598		178134	1.46%	68.73%	1.0023%
Ohio\Wood	196978	3852		275552	1.40%	71.48%	0.9993%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Kansas\Seward	152265	10290		395981	2.60%	38.45%	0.9992%
Montana\Flathead	32308	18783	726	251597	7.75%	12.84%	0.9957%
Iowa\Dickinson	174603	2921		226331	1.29%	77.14%	0.9956%
Washington\Kittitas	41643	8721		191087	4.56%	21.79%	0.9946%
South Dakota\Hughes	171203	9816		411199	2.39%	41.64%	0.9939%
Illinois\Douglas	217819	2928	191	261513	1.19%	83.29%	0.9934%
Iowa\Louisa	109393	3057	81	186007	1.69%	58.81%	0.9922%
Indiana\Delaware	126900	1863		154470	1.21%	82.15%	0.9908%
Oklahoma\Alfalfa	133542	21702	90	542813	4.01%	24.60%	0.9877%
Colorado\Saguache	33474	24327		287272	8.47%	11.65%	0.9868%
Nebraska\Gage	304607	9091	297	540226	1.74%	56.39%	0.9799%
Indiana\Randolph	178201	2950		231784	1.27%	76.88%	0.9785%
Nebraska\Johnson	68380	4403		175500	2.51%	38.96%	0.9775%
Illinois\Woodford	225230	3442	167	288400	1.25%	78.10%	0.9773%
North Dakota\McKenzie	242002	45683	920	1074656	4.34%	22.52%	0.9765%
Illinois\Jersey	142907	2450		189462	1.29%	75.43%	0.9754%
Idaho\Custer	6376	23590		124191	18.99%	5.13%	0.9752%
Pennsylvania\Fayette	16010	9338	2707	140688	8.56%	11.38%	0.9743%
Illinois\Jackson	140427	3166	327	224414	1.56%	62.57%	0.9740%
Iowa\Sac	266145	4209	585	363295	1.32%	73.26%	0.9667%
Nebraska\Thayer	207309	5743		351364	1.63%	59.00%	0.9644%
Minnesota\Cottonwood	263380	4794	523	381249	1.39%	69.08%	0.9635%
Maryland\Baltimore	27525	1922	223	78282	2.74%	35.16%	0.9635%
Ohio\Franklin	34911	974		59601	1.63%	58.57%	0.9572%
Nebraska\Webster	116647	7645		305507	2.50%	38.18%	0.9555%
New York\Schoharie	6189	9408	4660	95490	14.73%	6.48%	0.9549%
California\Glenn	160151	13851	360	489186	2.91%	32.74%	0.9511%
North Dakota\Benson	413321	13259		759341	1.75%	54.43%	0.9504%
Kansas\Cloud	152934	9058		383981	2.36%	39.83%	0.9395%
Missouri\Buchanan	95929	3649	168	197533	1.93%	48.56%	0.9384%
Minnesota\McLeod	151966	7887	4554	449655	2.77%	33.80%	0.9351%
Ohio\Pickaway	202548	3715	125	288905	1.33%	70.11%	0.9319%
Indiana\Jefferson	44878	2017	164	102514	2.13%	43.78%	0.9314%
South Dakota\Corson	170319	89144	507	1283038	6.99%	13.27%	0.9276%
New York\Schuyler	6648	2947	3196	66368	9.26%	10.02%	0.9272%
Minnesota\Kittson	237862	11453		542062	2.11%	43.88%	0.9271%
Washington\Walla Walla	292200	14772		682350	2.16%	42.82%	0.9271%
Idaho\Caribou	77970	21060		421373	5.00%	18.50%	0.9248%
Illinois\Menard	132173	1974		168594	1.17%	78.40%	0.9179%
Nebraska\Fillmore	253421	4737		362155	1.31%	69.98%	0.9153%
Illinois\Pike	223021	6064	163	389808	1.60%	57.21%	0.9140%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Iowa\Story	256720	4402		352240	1.25%	72.88%	0.9108%
Minnesota\Brown	219559	5209		354725	1.47%	61.90%	0.9089%
Montana\Pondera	299660	27044		944486	2.86%	31.73%	0.9085%
Iowa\Harrison	245613	4650	273	365071	1.35%	67.28%	0.9072%
Illinois\Lee	341304	3750	400	395624	1.05%	86.27%	0.9049%
New Jersey\Camden	2589	268		8760	3.06%	29.55%	0.9042%
Minnesota\Nobles	284116	4104	1571	422300	1.34%	67.28%	0.9041%
Michigan\Kalkaska	1345	3695		23464	15.75%	5.73%	0.9027%
Ohio\Perry	26280	3291		97965	3.36%	26.83%	0.9012%
Illinois\Moultrie	146527	1631	100	167791	1.03%	87.33%	0.9009%
Maryland\Howard	10027	440	334	29371	2.64%	34.14%	0.8997%
Indiana\Warren	155504	2220		195930	1.13%	79.37%	0.8993%
Ohio\Defiance	143455	2856	553	233213	1.46%	61.51%	0.8992%
Utah\Davis	5871	3715		49279	7.54%	11.91%	0.8981%
Illinois\Morgan	252133	3308	350	320512	1.14%	78.67%	0.8978%
North Dakota\Sargent	301061	7605		505015	1.51%	59.61%	0.8977%
Iowa\Hardin	229860	4485		339001	1.32%	67.81%	0.8971%
Kansas\Lincoln	125083	11753	1652	432479	3.10%	28.92%	0.8965%
Nebraska\Pawnee	82310	5159		217669	2.37%	37.81%	0.8962%
Nebraska\Hamilton	245024	3718		319115	1.17%	76.78%	0.8946%
Oklahoma\Grady	141890	22971	307	608373	3.83%	23.32%	0.8924%
Illinois\De Kalb	315166	3880		370772	1.05%	85.00%	0.8895%
Indiana\Monroe	12575	1799	223	53538	3.78%	23.49%	0.8871%
Kansas\Nemaha	165880	10179	664	450508	2.41%	36.82%	0.8862%
Indiana\Washington	95363	3156	550	199942	1.85%	47.70%	0.8841%
Ohio\Marion	135923	2458	320	206832	1.34%	65.72%	0.8827%
Minnesota\Stevens	236416	4324		340347	1.27%	69.46%	0.8825%
California\Sacramento	88706	9960	780	328593	3.27%	27.00%	0.8823%
Colorado\Weld	321831	109575	9951	2088715	5.72%	15.41%	0.8817%
Ohio\Seneca	168060	3340	448	269371	1.41%	62.39%	0.8773%
Colorado\Morgan	135939	32332	1829	728092	4.69%	18.67%	0.8760%
New York\Fulton	2282	2666	1718	33851	12.95%	6.74%	0.8731%
Indiana\Madison	173183	2381		217355	1.10%	79.68%	0.8728%
Kentucky\Shelby	39223	8946	408	205286	4.56%	19.11%	0.8706%
New York\Oswego	12166	4860	2315	100195	7.16%	12.14%	0.8695%
Indiana\Lake	105611	1358		128439	1.06%	82.23%	0.8694%
Nebraska\Kearney	228246	3997		324218	1.23%	70.40%	0.8679%
Pennsylvania\Montgomery	9403	1234	387	41908	3.87%	22.44%	0.8679%
Indiana\Boone	191271	1994	256	222706	1.01%	85.88%	0.8677%
Pennsylvania\Potter	9191	4091	3284	88457	8.34%	10.39%	0.8663%
Idaho\Bannock	41557	20926	652	321870	6.70%	12.91%	0.8656%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Michigan\Cheboygan	1972	8651	1262	47562	20.84%	4.15%	0.8642%
Utah\Sanpete	21072	35994	3705	311551	12.74%	6.76%	0.8618%
North Dakota\Barnes	566785	12374	119	907184	1.38%	62.48%	0.8604%
Utah\Beaver	10727	19908		158323	12.57%	6.78%	0.8520%
Idaho\Oneida	28535	28802	505	313775	9.34%	9.09%	0.8494%
Iowa\Monona	281554	4666		393600	1.19%	71.53%	0.8480%
Kansas\Saline	137639	11438		431209	2.65%	31.92%	0.8467%
Illinois\Randolph	165579	3044	227	252926	1.29%	65.47%	0.8466%
New York\Washington	27529	12640		202877	6.23%	13.57%	0.8454%
New York\Chenango	15044	9325	8269	177267	9.93%	8.49%	0.8423%
Missouri\Lewis	102772	4206	1375	261299	2.14%	39.33%	0.8401%
Montana\Teton	263268	42172		1152691	3.66%	22.84%	0.8356%
Pennsylvania\Fulton	11696	4363	3279	103516	7.38%	11.30%	0.8341%
Wisconsin\Bayfield	5280	9107	3415	89284	14.02%	5.91%	0.8294%
Missouri\Clark	92775	5423	752	262937	2.35%	35.28%	0.8286%
Illinois\Macoupin	283640	4110	425	394228	1.15%	71.95%	0.8277%
Maryland\Garrett	6903	7245	3681	95514	11.44%	7.23%	0.8267%
Indiana\Starke	105993	1841		153651	1.20%	68.98%	0.8265%
Illinois\Effingham	161509	2713	284	242009	1.24%	66.74%	0.8265%
Pennsylvania\Bradford	23902	12358	12220	266635	9.22%	8.96%	0.8263%
Illinois\Bond	177984	1985	353	224760	1.04%	79.19%	0.8237%
California\Kern	479518	85756	9768	2361765	4.04%	20.30%	0.8212%
Montana\Roosevelt	331221	52241		1451828	3.60%	22.81%	0.8209%
Ohio\Lucas	46177	703		62906	1.12%	73.41%	0.8203%
Minnesota\Waseca	166839	2467	699	254531	1.24%	65.55%	0.8153%
Oregon\Union	72767	26633		487584	5.46%	14.92%	0.8152%
Illinois\Shelby	286268	4033	212	387288	1.10%	73.92%	0.8102%
California\Siskiyou	48829	59216		597534	9.91%	8.17%	0.8098%
New York\Tioga	8048	4829	6608	106834	10.71%	7.53%	0.8065%
Nebraska\Madison	196825	12022		542363	2.22%	36.29%	0.8044%
Illinois\Tazewell	257021	3383		329268	1.03%	78.06%	0.8020%
North Dakota\Richland	686941	9127	432	905922	1.06%	75.83%	0.8001%
New York\St. Lawrence	31038	11305	19632	347246	8.91%	8.94%	0.7963%
New York\Cattaraugus	19436	6416	7356	183439	7.51%	10.60%	0.7955%
Kansas\Washington	205329	11476	145	548034	2.12%	37.47%	0.7945%
Indiana\Daviess	145501	1912	254	199367	1.09%	72.98%	0.7929%
Illinois\Fayette	200702	3455	149	303258	1.19%	66.18%	0.7865%
Kansas\Mitchell	173040	8674	270	444249	2.01%	38.95%	0.7842%
Colorado\Broomfield	880	348		6250	5.57%	14.08%	0.7840%
Oklahoma\Canadian	136055	14541	369	508771	2.93%	26.74%	0.7837%
Ohio\Hardin	170459	2914	118	256822	1.18%	66.37%	0.7836%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Indiana\Lawrence	29400	4721	105	134637	3.58%	21.84%	0.7827%
Illinois\Scott	85967	1661		135731	1.22%	63.34%	0.7751%
Minnesota\Freeborn	263180	4423		388488	1.14%	67.74%	0.7713%
Indiana\Switzerland	10899	1437	157	47461	3.36%	22.96%	0.7713%
Minnesota\Nicollet	182815	3164		273981	1.15%	66.73%	0.7706%
Nebraska\Richardson	153200	3919		279148	1.40%	54.88%	0.7705%
Kansas\Grant	152067	5760		337320	1.71%	45.08%	0.7698%
Minnesota\Redwood	406667	5044	759	553855	1.05%	73.42%	0.7693%
North Dakota\Renville	350868	6723		554345	1.21%	63.29%	0.7676%
Iowa\O'Brien	266226	3188	248	345774	0.99%	76.99%	0.7651%
California\Sutter	155045	6388		359802	1.78%	43.09%	0.7651%
Missouri\Marion	115306	3713		237016	1.57%	48.65%	0.7621%
Iowa\Greene	258587	3674		353516	1.04%	73.15%	0.7602%
New Jersey\Somerset	8271	954	25	32721	2.99%	25.28%	0.7563%
Kentucky\Meade	22148	4806	230	121448	4.15%	18.24%	0.7562%
Pennsylvania\Clarion	13149	7116	2918	132140	7.59%	9.95%	0.7556%
New York\Chemung	5173	2846	3348	65124	9.51%	7.94%	0.7555%
Indiana\Jackson	133245	2310	163	209293	1.18%	63.66%	0.7523%
South Dakota\Jones	78961	25627		519314	4.93%	15.20%	0.7503%
Iowa\Franklin	291369	3267	193	366609	0.94%	79.48%	0.7501%
Arizona\Pinal	150501	54495		1047112	5.20%	14.37%	0.7480%
Wyoming\Big Horn	39229	35845	724	438033	8.35%	8.96%	0.7477%
Iowa\Butler	232312	4196	345	375781	1.21%	61.82%	0.7471%
Iowa\Clay	239130	3313	38	328216	1.02%	72.86%	0.7439%
Indiana\Clay	110227	1612	51	157563	1.06%	69.96%	0.7384%
Delaware\Kent	114805	1635	306	173808	1.12%	66.05%	0.7376%
Kansas\Phillips	149228	12089		494990	2.44%	30.15%	0.7363%
Minnesota\Hubbard	19995	5348	510	126198	4.64%	15.84%	0.7355%
Kansas\Ottawa	113893	12259	54	437265	2.82%	26.05%	0.7335%
New York\Albany	3701	5541	1801	61030	12.03%	6.06%	0.7295%
Maryland\Montgomery	27907	743	446	67613	1.76%	41.27%	0.7258%
Idaho\Blaine	11873	22083	388	191949	11.71%	6.19%	0.7241%
South Dakota\Lawrence	7262	17738		133503	13.29%	5.44%	0.7227%
New York\Broome	6242	3462	5222	86613	10.03%	7.21%	0.7226%
North Dakota\Slope	133136	31965		768938	4.16%	17.31%	0.7198%
Ohio\Lake	4490	413		16065	2.57%	27.95%	0.7185%
Wisconsin\Ashland	2903	4977	2605	55370	13.69%	5.24%	0.7179%
Kentucky\Larue	28597	3868	70	125432	3.14%	22.80%	0.7158%
Michigan\Lake	1042	2575	560	21376	14.67%	4.87%	0.7149%
Idaho\Owyhee	44907	48409	3165	569305	9.06%	7.89%	0.7146%
Iowa\Worth	164056	2225	101	231605	1.00%	70.83%	0.7114%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Kansas\Clay	141545	5606	583	350949	1.76%	40.33%	0.7113%
Ohio\Allen	126888	1756	206	187238	1.05%	67.77%	0.7101%
Montana\Daniels	256997	19602	825	860238	2.37%	29.88%	0.7094%
Indiana\Blackford	71735	706		84626	0.83%	84.77%	0.7072%
Iowa\Fremont	166656	2543		245299	1.04%	67.94%	0.7043%
Illinois\Stark	147154	1375		169775	0.81%	86.68%	0.7020%
Indiana\Howard	130459	1247	159	162281	0.87%	80.39%	0.6965%
Utah\Iron	36706	45230	459	492235	9.28%	7.46%	0.6922%
Montana\Sheridan	394189	19749		1065503	1.85%	37.00%	0.6857%
Missouri\Knox	80905	3341	2100	253679	2.14%	31.89%	0.6840%
South Dakota\Bennett	125228	30980		753263	4.11%	16.62%	0.6837%
Montana\Cascade	196747	65292	456	1379645	4.77%	14.26%	0.6796%
Vermont\Franklin	20397	2268	8524	180006	6.00%	11.33%	0.6794%
Kentucky\Hardin	53951	5916	269	222267	2.78%	24.27%	0.6754%
Indiana\Pulaski	180910	1734	278	232240	0.87%	77.90%	0.6749%
Indiana\Vigo	85931	1141	17	121454	0.95%	70.75%	0.6746%
Illinois\Kendall	142743	1315		166872	0.79%	85.54%	0.6741%
Minnesota\Lake of the Woods	11047	5721		96932	5.90%	11.40%	0.6726%
Kansas\Riley	65491	5094	432	231960	2.38%	28.23%	0.6726%
Ohio\Washington	13323	6563	1187	124069	6.25%	10.74%	0.6708%
Washington\Benton	216247	12412		632636	1.96%	34.18%	0.6706%
Nebraska\York	257068	3121		346137	0.90%	74.27%	0.6696%
Illinois\Calhoun	26102	1975		87938	2.25%	29.68%	0.6666%
Kansas\Geary	33172	4428		148465	2.98%	22.34%	0.6664%
Missouri\Harrison	90533	10714	317	388353	2.84%	23.31%	0.6622%
Kansas\Ford	229968	11521		634240	1.82%	36.26%	0.6586%
Indiana\Grant	146233	1839		202138	0.91%	72.34%	0.6582%
Kansas\Sumner	294614	10764	394	709865	1.57%	41.50%	0.6524%
Washington\Adams	374027	20982		1098487	1.91%	34.05%	0.6504%
Kansas\Decatur	160063	9457		483134	1.96%	33.13%	0.6485%
Indiana\Dearborn	17461	1574	35	65830	2.44%	26.52%	0.6483%
Ohio\Clinton	145819	2112		218493	0.97%	66.74%	0.6451%
Indiana\Newton	159943	1459		190432	0.77%	83.99%	0.6435%
Missouri\Atchison	215979	2747		304035	0.90%	71.04%	0.6418%
Missouri\Pike	146548	5633	407	373142	1.62%	39.27%	0.6357%
Illinois\La Salle	524115	4617	399	643291	0.78%	81.47%	0.6353%
Oregon\Klamath	46634	61859		675127	9.16%	6.91%	0.6329%
Montana\Fergus	239114	158137		2446047	6.47%	9.78%	0.6320%
Ohio\Jefferson	3583	7127	1381	69468	12.25%	5.16%	0.6317%
Illinois\Coles	204821	1795	207	254869	0.79%	80.36%	0.6313%
Maryland\Caroline	75354	1145	292	131277	1.09%	57.40%	0.6283%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Illinois\Bureau	389175	3693		478389	0.77%	81.35%	0.6280%
South Dakota\Lyman	269826	21977	214	976457	2.27%	27.63%	0.6280%
Kentucky\Oldham	9222	2447		60024	4.08%	15.36%	0.6263%
Missouri\DeKalb	68613	6137	50	260472	2.38%	26.34%	0.6257%
Colorado\Logan	218403	36713		1132299	3.24%	19.29%	0.6254%
Minnesota\Traverse	223300	2725	281	327627	0.92%	68.16%	0.6253%
North Dakota\Cass	839187	8017		1038930	0.77%	80.77%	0.6233%
Iowa\Grundy	262795	2363		315968	0.75%	83.17%	0.6220%
North Dakota\Nelson	264602	7113		550121	1.29%	48.10%	0.6219%
Kansas\Stanton	160814	4499	2126	414184	1.60%	38.83%	0.6210%
Ohio\Van Wert	201535	1482	390	246497	0.76%	81.76%	0.6209%
Iowa\Hancock	290999	2684	91	361006	0.77%	80.61%	0.6196%
Illinois\Iroquois	572067	4573	364	677803	0.73%	84.40%	0.6148%
Oklahoma\Washita	168781	12700		591031	2.15%	28.56%	0.6136%
Washington\Clallam	1319	1633	774	22822	10.55%	5.78%	0.6096%
Illinois\Greene	184546	2463		273088	0.90%	67.58%	0.6095%
Oregon\Umatilla	371489	34341		1447321	2.37%	25.67%	0.6090%
Minnesota\Renville	410652	4395	1285	619734	0.92%	66.26%	0.6073%
Vermont\Bennington	2272	1931	1638	36580	9.76%	6.21%	0.6060%
Indiana\Montgomery	233991	2339		301279	0.78%	77.67%	0.6030%
Delaware\New Castle	36305	744		66981	1.11%	54.20%	0.6021%
South Dakota\Buffalo	50928	10296	1174	312068	3.68%	16.32%	0.5998%
Montana\Lincoln	4831	3341		51885	6.44%	9.31%	0.5996%
Indiana\Bartholomew	128965	1285		166356	0.77%	77.52%	0.5988%
Illinois\Cass	112742	1597		173543	0.92%	64.96%	0.5978%
Pennsylvania\Tioga	13899	8336	6228	184108	7.91%	7.55%	0.5972%
Iowa\Buena Vista	273845	2861		362553	0.79%	75.53%	0.5960%
Pennsylvania\Erie	45451	2201	1708	173125	2.26%	26.25%	0.5928%
Minnesota\Wilkin	329471	3249		424976	0.76%	77.53%	0.5927%
Nebraska\Gosper	112811	2669		225572	1.18%	50.01%	0.5917%
Missouri\Daviess	99938	6469		330911	1.95%	30.20%	0.5904%
Ohio\Wyandot	156944	1729	80	219631	0.82%	71.46%	0.5886%
South Dakota\Sully	353978	6121		608976	1.01%	58.13%	0.5842%
Minnesota\Grant	196724	2961	102	321501	0.95%	61.19%	0.5830%
Idaho\Power	118937	9961		451198	2.21%	26.36%	0.5819%
Indiana\Orange	42449	1300		97411	1.33%	43.58%	0.5816%
Ohio\Brown	106519	3133		240389	1.30%	44.31%	0.5775%
Iowa\Palo Alto	269608	2360	306	353332	0.75%	76.30%	0.5757%
Oklahoma\Grant	169195	13621		633052	2.15%	26.73%	0.5751%
Kansas\Smith	165786	7253		457429	1.59%	36.24%	0.5747%
Indiana\Greene	91516	1642	165	169750	1.06%	53.91%	0.5739%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Indiana\Floyd	7344	450		23997	1.88%	30.60%	0.5739%
Colorado\Montrose	25194	22978	500	321056	7.31%	7.85%	0.5738%
Oklahoma\Kay	198327	6991		492178	1.42%	40.30%	0.5724%
Nebraska\Lincoln	362583	38790	1577	1601185	2.52%	22.64%	0.5709%
Colorado\Sedgwick	96982	5170		296695	1.74%	32.69%	0.5696%
Minnesota\Koochiching	2142	7315	754	55109	14.64%	3.89%	0.5691%
Nebraska\Franklin	111088	4345		291515	1.49%	38.11%	0.5680%
Idaho\Latah	157203	4156	121	344472	1.24%	45.64%	0.5666%
Vermont	86442	31769	67504	1233313	8.05%	7.01%	0.5642%
Indiana\Owen	28288	1536		87813	1.75%	32.21%	0.5635%
Oklahoma\Kingfisher	147964	12149		566212	2.15%	26.13%	0.5607%
South Dakota\Meade	179202	150760	1761	2208880	6.90%	8.11%	0.5602%
Colorado\Adams	273807	9723	299	701575	1.43%	39.03%	0.5575%
Missouri\St. Charles	86802	1303	260	156136	1.00%	55.59%	0.5565%
Nebraska\Box Butte	220134	10254	1122	670815	1.70%	32.82%	0.5565%
Oklahoma\Oklahoma	25326	5565	45	159823	3.51%	15.85%	0.5562%
Missouri\Worth	19348	6561	52	151802	4.36%	12.75%	0.5552%
Kansas\Pottawatomie	96954	10063	426	428601	2.45%	22.62%	0.5536%
Virginia\Augusta	43271	9145	1323	286195	3.66%	15.12%	0.5530%
Montana\Mineral	2117	1332		22654	5.88%	9.34%	0.5495%
Ohio\Paulding	169486	2105		255564	0.82%	66.32%	0.5462%
Illinois\Grundy	171545	1476		215474	0.69%	79.61%	0.5453%
Kansas\Marshall	219101	8172	740	599022	1.49%	36.58%	0.5442%
Ohio\Hamilton	5323	463		21290	2.17%	25.00%	0.5437%
Indiana\Jennings	82580	1176	82	138331	0.91%	59.70%	0.5429%
New Jersey\Sussex	5680	3243	809	65242	6.21%	8.71%	0.5407%
Indiana\Shelby	178223	1188	80	205432	0.62%	86.76%	0.5355%
Pennsylvania\Forest	795	624	150	10728	7.21%	7.41%	0.5347%
Kentucky\Christian	137562	4114	543	346450	1.34%	39.71%	0.5337%
Illinois\St. Clair	240932	2076		306533	0.68%	78.60%	0.5323%
Oregon\Washington	63837	1285	74	127984	1.06%	49.88%	0.5296%
Michigan\Luce	586	702		8819	7.96%	6.64%	0.5289%
Kansas\Kingman	107290	11529	3158	546231	2.69%	19.64%	0.5281%
New York\Ulster	9442	2014	1138	75205	4.19%	12.56%	0.5262%
Maryland\St. Mary's	24598	1007		68648	1.47%	35.83%	0.5256%
Iowa\Osceola	195134	1696		251161	0.68%	77.69%	0.5246%
Illinois\McLean	569087	4195		675984	0.62%	84.19%	0.5224%
Oklahoma\Garvin	74455	17535	36	500804	3.51%	14.87%	0.5216%
Wisconsin\Price	6747	4371	3734	102407	7.91%	6.59%	0.5214%
Oregon\Yamhill	68881	1781	693	180846	1.37%	38.09%	0.5211%
Montana\Richland	190142	44729		1279300	3.50%	14.86%	0.5197%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Idaho\Bear Lake	11788	22934	820	233112	10.19%	5.06%	0.5153%
Minnesota\Blue Earth	293851	2651	364	415326	0.73%	70.75%	0.5136%
Kansas\Norton	157221	8639	564	531248	1.73%	29.59%	0.5127%
Virginia\Stafford	3849	520		19816	2.62%	19.42%	0.5097%
Illinois\Perry	142019	1436		200354	0.72%	70.88%	0.5080%
Indiana\Carroll	158239	1187		192334	0.62%	82.27%	0.5078%
Illinois\Sangamon	395593	3228	206	518153	0.66%	76.35%	0.5060%
Nebraska\Keith	161324	10582		581567	1.82%	27.74%	0.5047%
Kentucky\Mason	7702	12057	720	139814	9.14%	5.51%	0.5034%
Indiana\Clinton	214543	1519		255314	0.59%	84.03%	0.4999%
Missouri\Jackson	55354	1749		139190	1.26%	39.77%	0.4997%
Idaho\Idaho	120969	14264	152	590927	2.44%	20.47%	0.4994%
Utah\Salt Lake	17343	3324		107477	3.09%	16.14%	0.4991%
Illinois\Livingston	518890	3580	219	628502	0.60%	82.56%	0.4990%
Kentucky\Nelson	29710	5989	473	196225	3.29%	15.14%	0.4986%
Washington\Lincoln	404343	14545		1090178	1.33%	37.09%	0.4948%
Oregon\Lake	36956	64174		692778	9.26%	5.33%	0.4941%
California\Modoc	38303	45890		597740	7.68%	6.41%	0.4920%
Kentucky\Lincoln	13386	9474	2192	178315	6.54%	7.51%	0.4911%
Michigan\Mackinac	673	2650	761	21698	15.72%	3.10%	0.4876%
Illinois\Saline	73070	917		117233	0.78%	62.33%	0.4875%
Nebraska\Morrill	135558	26228	2970	902005	3.24%	15.03%	0.4865%
Colorado\Pitkin	1536	2574		28539	9.02%	5.38%	0.4854%
South Dakota\Haakon	143765	44691		1151144	3.88%	12.49%	0.4849%
Pennsylvania\Wyoming	5319	4210	1318	77957	7.09%	6.82%	0.4838%
North Dakota\Pembina	451355	4515		649281	0.70%	69.52%	0.4834%
Indiana\White	255481	1906		318110	0.60%	80.31%	0.4812%
Indiana\Warrick	71142	815		109932	0.74%	64.71%	0.4798%
Connecticut\Hartford	11367	968	235	53504	2.25%	21.25%	0.4777%
North Dakota\Golden Valley	96884	16022		570210	2.81%	16.99%	0.4774%
Illinois\Montgomery	258399	2002	216	347765	0.64%	74.30%	0.4739%
Iowa\Cerro Gordo	267319	2010		336732	0.60%	79.39%	0.4739%
Massachusetts\Hampshire	7450	1094	673	52756	3.35%	14.12%	0.4730%
Nebraska\Red Willow	146366	6441		446479	1.44%	32.78%	0.4729%
Texas\El Paso	26849	4858	145	168556	2.97%	15.93%	0.4728%
Iowa\Humboldt	216204	1596		270227	0.59%	80.01%	0.4725%
Pennsylvania\Monroe	5420	740		29165	2.54%	18.58%	0.4715%
Kansas\Pratt	177008	6123		480162	1.28%	36.86%	0.4701%
Iowa\Winnebago	168922	1749		251523	0.70%	67.16%	0.4670%
New Jersey\Morris	2197	615		17028	3.61%	12.90%	0.4660%
Montana\McCone	252879	20625		1060883	1.94%	23.84%	0.4634%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Indiana\Martin	32139	542		61331	0.88%	52.40%	0.4631%
Virginia\Clarke	9767	1668	517	67919	3.22%	14.38%	0.4626%
Indiana\Sullivan	132976	1094		177368	0.62%	74.97%	0.4624%
Kansas\Leavenworth	54832	2969	232	194854	1.64%	28.14%	0.4623%
Idaho\Washington	26893	29866		417092	7.16%	6.45%	0.4617%
Wisconsin\Vilas	1160	392		9942	3.94%	11.67%	0.4600%
Colorado\Delta	13294	21832	214	252530	8.73%	5.26%	0.4596%
Missouri\Holt	146331	1725	33	236901	0.74%	61.77%	0.4584%
Iowa\Calhoun	267288	2197		359434	0.61%	74.36%	0.4545%
Kentucky\Todd	88411	1766	245	197976	1.02%	44.66%	0.4536%
Minnesota\Faribault	348232	1952	717	453761	0.59%	76.74%	0.4514%
Indiana\Posey	169827	1016	80	204004	0.54%	83.25%	0.4472%
Oregon\Multnomah	9362	238	149	28506	1.36%	32.84%	0.4459%
Montana\Wibaux	55929	19272		492554	3.91%	11.35%	0.4443%
Oklahoma\McClain	50009	10022		336852	2.98%	14.85%	0.4417%
Illinois\Mason	206968	1586		273362	0.58%	75.71%	0.4393%
Illinois\Putnam	44166	390		62705	0.62%	70.43%	0.4381%
Ohio\Adams	26100	5547	128	183961	3.08%	14.19%	0.4377%
Iowa\Pocahontas	294576	1392	558	362404	0.54%	81.28%	0.4374%
Kansas\Rooks	165489	8316		561251	1.48%	29.49%	0.4369%
Kentucky\Bourbon	13213	10700	529	184323	6.09%	7.17%	0.4367%
Ohio\Clermont	41621	1143		104691	1.09%	39.76%	0.4341%
Virginia\Page	10756	1445	225	64387	2.59%	16.71%	0.4333%
Kansas\Rawlins	190652	7613	286	590628	1.34%	32.28%	0.4317%
Nebraska\Holt	319464	29629	2105	1532629	2.07%	20.84%	0.4316%
Idaho\Gem	13486	10747	878	190757	6.09%	7.07%	0.4308%
Virginia\Loudoun	17681	4839	98	142452	3.47%	12.41%	0.4302%
North Dakota\Towner	358833	4399		607330	0.72%	59.08%	0.4280%
North Dakota\Grand Forks	513778	5654		825552	0.68%	62.23%	0.4262%
Missouri\Lafayette	179263	2634	306	352916	0.83%	50.79%	0.4232%
Maryland\Anne Arundel	9299	388		29244	1.33%	31.80%	0.4219%
Illinois\Edgar	294466	1507	256	352535	0.50%	83.53%	0.4177%
Missouri\Gentry	51561	6007	158	275935	2.23%	18.69%	0.4175%
Missouri\Shelby	126917	2431	311	289182	0.95%	43.89%	0.4161%
Connecticut\Litchfield	6522	2661	2210	87412	5.57%	7.46%	0.4158%
West Virginia\Berkeley	8672	2423	278	75102	3.60%	11.55%	0.4153%
Illinois\Macon	252605	1386		290603	0.48%	86.92%	0.4146%
Michigan\Marquette	1208	3103		30092	10.31%	4.01%	0.4139%
Montana\Broadwater	45277	20608		474892	4.34%	9.53%	0.4137%
Montana\Ravalli	17438	15037	1223	262872	6.19%	6.63%	0.4103%
New Jersey\Burlington	34401	876		85790	1.02%	40.10%	0.4095%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Illinois\Jefferson	132745	1661		232531	0.71%	57.09%	0.4078%
Delaware\Sussex	184089	1308	298	269464	0.60%	68.32%	0.4072%
Wyoming\Lincoln	11724	39848	892	342630	11.89%	3.42%	0.4069%
Kansas\Douglas	89647	1874	320	220636	0.99%	40.63%	0.4040%
Pennsylvania\Washington	8961	16278	3767	211053	9.50%	4.25%	0.4033%
Washington\Whatcom	25890	791	847	102584	1.60%	25.24%	0.4030%
Illinois\De Witt	166321	955		198680	0.48%	83.71%	0.4024%
Kansas\Sheridan	201802	5393		522052	1.03%	38.66%	0.3993%
New Jersey\Hunterdon	20390	1546	412	100027	1.96%	20.38%	0.3990%
Ohio\Pike	18012	1337	99	80636	1.78%	22.34%	0.3978%
South Dakota\Perkins	130815	101477		1829157	5.55%	7.15%	0.3968%
Missouri\Montgomery	104474	2272	58	248070	0.94%	42.11%	0.3956%
Kentucky\Woodford	13543	3948	185	119087	3.47%	11.37%	0.3947%
Nevada\Humboldt	44197	51041		756313	6.75%	5.84%	0.3944%
Iowa\Emmet	195888	1255		249779	0.50%	78.42%	0.3940%
Texas\Lamb	226749	4999	1995	634703	1.10%	35.73%	0.3937%
Iowa\Hamilton	264625	1781		346552	0.51%	76.36%	0.3924%
Montana\Stillwater	66382	43459		857474	5.07%	7.74%	0.3924%
Illinois\Kankakee	337001	1701	29	385808	0.45%	87.35%	0.3917%
Kansas\Hamilton	162930	6510	2428	610864	1.46%	26.67%	0.3903%
Michigan\Baraga	1249	738	347	18644	5.82%	6.70%	0.3899%
Ohio\Harrison	4495	6173	1381	93342	8.09%	4.82%	0.3897%
Missouri\Clinton	84746	2508	80	237447	1.09%	35.69%	0.3890%
Oregon\Morrow	258892	18269		1104250	1.65%	23.45%	0.3879%
Kansas\Osborne	130776	5233		420136	1.25%	31.13%	0.3877%
Montana\Valley	312582	51908	732	2061260	2.55%	15.16%	0.3873%
South Dakota\Pennington	96557	55621	663	1185055	4.75%	8.15%	0.3870%
Missouri\Audrain	250425	2685	68	424880	0.65%	58.94%	0.3819%
Indiana\Jasper	269019	1644		340339	0.48%	79.04%	0.3818%
Virginia\Goochland	13151	1020		59292	1.72%	22.18%	0.3816%
Indiana\Benton	235007	837	347	270810	0.44%	86.78%	0.3794%
Missouri\Perry	63714	3163	233	238893	1.42%	26.67%	0.3791%
Virginia\Hanover	34849	914		91789	1.00%	37.97%	0.3781%
Oklahoma\Custer	124205	9835		568728	1.73%	21.84%	0.3777%
Kansas\Ellsworth	68967	7288		365046	2.00%	18.89%	0.3772%
Kansas\Crawford	96162	4295	300	342349	1.34%	28.09%	0.3770%
Ohio\Scioto	22934	1657	52	102025	1.68%	22.48%	0.3765%
Missouri\Ralls	101546	2230		245509	0.91%	41.36%	0.3757%
South Dakota\Jackson	101726	51461		1184156	4.35%	8.59%	0.3733%
Illinois\Vermilion	379936	1807	235	457375	0.45%	83.07%	0.3709%
Virginia\Shenandoah	20889	3200	327	141286	2.50%	14.78%	0.3691%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Indiana\Gibson	181769	1041	43	231082	0.47%	78.66%	0.3690%
Washington\Klickitat	49069	26515	477	601216	4.49%	8.16%	0.3664%
Oregon\Clackamas	58998	1371	682	182743	1.12%	32.28%	0.3627%
Missouri\Boone	68699	3175	355	258734	1.36%	26.55%	0.3623%
Missouri\Livingston	117745	2827	107	309024	0.95%	38.10%	0.3618%
Kentucky\Fayette	17960	3214	509	135969	2.74%	13.21%	0.3617%
Minnesota\Crow Wing	7939	6660	84	121716	5.54%	6.52%	0.3614%
Oklahoma\Cleveland	25092	3482	196	159816	2.30%	15.70%	0.3613%
South Dakota\Todd	49035	55694		869445	6.41%	5.64%	0.3613%
Oregon\Hood River	11080	236		26952	0.88%	41.11%	0.3600%
Kentucky\Spencer	7058	2720		73289	3.71%	9.63%	0.3574%
Washington\Whitman	682373	8456		1271141	0.67%	53.68%	0.3571%
Missouri\Cass	92031	2075	2062	326609	1.27%	28.18%	0.3569%
Nevada\Nye	3011	9787		90868	10.77%	3.31%	0.3569%
Colorado\Mesa	18649	26158	389	372511	7.13%	5.01%	0.3568%
Kansas\Atchison	104365	2108	92	254101	0.87%	41.07%	0.3556%
Kentucky\Ballard	58864	733		110199	0.67%	53.42%	0.3553%
Oregon\Marion	163706	1740	305	307647	0.66%	53.21%	0.3537%
Massachusetts\Berkshire	4423	1245	2268	66352	5.29%	6.67%	0.3529%
Kansas\Brown	203864	1971	110	346758	0.60%	58.79%	0.3528%
Illinois\Massac	42297	670		89693	0.75%	47.16%	0.3523%
Kansas\Morris	87031	6901		413558	1.67%	21.04%	0.3512%
South Dakota\Ziebach	113107	34754		1058403	3.28%	10.69%	0.3509%
Illinois\Logan	268789	1338		320356	0.42%	83.90%	0.3504%
Oregon\Malheur	82551	58166		1170664	4.97%	7.05%	0.3504%
Utah\Juab	15381	15445		260444	5.93%	5.91%	0.3502%
Minnesota\Watonwan	194661	1095	205	269094	0.48%	72.34%	0.3495%
New York\Essex	1616	3333	2115	50226	10.85%	3.22%	0.3490%
Nebraska\Dawes	56876	44100		848753	5.20%	6.70%	0.3482%
Missouri\Platte	75964	1462		178656	0.82%	42.52%	0.3480%
Nebraska\Hitchcock	134867	3113		347924	0.89%	38.76%	0.3468%
Iowa\Webster	321006	2222		453930	0.49%	70.72%	0.3462%
Maryland\Queen Anne's	81331	804	110	146927	0.62%	55.35%	0.3443%
Indiana\Ohio	3110	511		21500	2.38%	14.47%	0.3438%
Minnesota\Jackson	291443	1883		400531	0.47%	72.76%	0.3421%
Oklahoma\Jackson	173669	4420		474502	0.93%	36.60%	0.3409%
Missouri\Lincoln	97131	1775	396	248858	0.87%	39.03%	0.3405%
Oklahoma\Garfield	190667	7838		663431	1.18%	28.74%	0.3395%
Minnesota\Aitkin	9412	4688	1648	132672	4.78%	7.09%	0.3388%
Kansas\Jefferson	90632	2278	767	285803	1.07%	31.71%	0.3379%
Connecticut\New London	6545	1708	363	63380	3.27%	10.33%	0.3374%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Massachusetts\Bristol	2601	1464	517	39252	5.05%	6.63%	0.3344%
New York\Delaware	7128	7211	5639	165572	7.76%	4.31%	0.3341%
Montana\Fallon	42672	73050	1635	978818	7.63%	4.36%	0.3326%
Kansas\Hodgeman	173945	5280		525754	1.00%	33.08%	0.3323%
Missouri\Macon	84670	5852	247	394372	1.55%	21.47%	0.3320%
South Dakota\Mellette	40256	43478	415	729778	6.01%	5.52%	0.3318%
Kansas\Gove	209645	4870	701	593622	0.94%	35.32%	0.3314%
New Jersey\Cape May	2216	95		7976	1.19%	27.78%	0.3309%
Kentucky\Fleming	9240	11323	445	181608	6.48%	5.09%	0.3297%
Kansas\Doniphan	135323	1464	32	247815	0.60%	54.61%	0.3296%
Kentucky\Henry	9972	7022	29	146399	4.82%	6.81%	0.3281%
Colorado\Yuma	341307	17062		1334453	1.28%	25.58%	0.3270%
Kentucky\Mercer	6339	9722	595	141437	7.29%	4.48%	0.3269%
Montana\Chouteau	664137	25519		2277842	1.12%	29.16%	0.3266%
Colorado\Larimer	36595	20052	1348	489819	4.37%	7.47%	0.3264%
Vermont\Rutland	5987	4746	4538	130580	7.11%	4.58%	0.3260%
New York\Allegany	8274	5081	3873	150832	5.94%	5.49%	0.3256%
Washington\Skagit	34793	254	847	108541	1.01%	32.06%	0.3252%
Illinois\Franklin	147884	852	98	207877	0.46%	71.14%	0.3251%
Kentucky\Barren	33323	6316	495	264717	2.57%	12.59%	0.3239%
Oregon\Deschutes	6440	8165	141	129369	6.42%	4.98%	0.3196%
Missouri\Grundy	67502	2535		231995	1.09%	29.10%	0.3179%
Kentucky\Simpson	32708	1379		119122	1.16%	27.46%	0.3179%
Missouri\Barton	137682	2810		349319	0.80%	39.41%	0.3171%
Nebraska\Kimball	133274	6617		527611	1.25%	25.26%	0.3168%
Oklahoma\Comanche	141703	5384	140	497502	1.11%	28.48%	0.3163%
Texas\Wilbarger	102570	10509	1071	613873	1.89%	16.71%	0.3152%
Illinois\Ford	230103	1001		270720	0.37%	85.00%	0.3143%
Colorado\Douglas	17116	6466	106	189210	3.47%	9.05%	0.3142%
Kansas\Lyon	110028	6196	205	473679	1.35%	23.23%	0.3139%
Kansas\Ellis	134595	6314	128	526202	1.22%	25.58%	0.3131%
Pennsylvania\Cameron	298	228	44	5092	5.34%	5.85%	0.3126%
North Dakota\Steele	294175	1716		401959	0.43%	73.19%	0.3124%
Pennsylvania\Elk	1223	2033	785	33258	8.47%	3.68%	0.3116%
Kentucky\Trigg	43485	1313		135685	0.97%	32.05%	0.3101%
Vermont\Orleans	10128	1395	3778	130308	3.97%	7.77%	0.3085%
North Dakota\Walsh	484281	4016		795415	0.50%	60.88%	0.3074%
Nebraska\Perkins	290402	3294		558405	0.59%	52.01%	0.3068%
Missouri\Caldwell	55492	3458		250108	1.38%	22.19%	0.3068%
Maryland\Charles	16935	492		52147	0.94%	32.48%	0.3064%
Ohio\Vinton	2315	1792		36811	4.87%	6.29%	0.3061%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Idaho\Clearwater	9596	1544		69568	2.22%	13.79%	0.3061%
Idaho\Lemhi	4917	21478	818	189644	11.76%	2.59%	0.3048%
Kansas\Trego	121434	4623		429588	1.08%	28.27%	0.3042%
Ohio\Guernsey	7338	7081	748	137584	5.69%	5.33%	0.3035%
Michigan\Houghton	899	1543	340	23643	7.96%	3.80%	0.3028%
South Dakota\Dewey	96913	65514		1449585	4.52%	6.69%	0.3022%
Montana\Lake	35661	33618	766	637306	5.40%	5.60%	0.3019%
Illinois\Christian	373555	1616	12	449512	0.36%	83.10%	0.3010%
Vermont\Chittenden	4786	1904	2450	83382	5.22%	5.74%	0.2997%
Missouri\Monroe	97851	2035	510	288293	0.88%	33.94%	0.2996%
Washington\Chelan	16789	1561		93883	1.66%	17.88%	0.2973%
Colorado\Dolores	10518	8545		173872	4.91%	6.05%	0.2973%
North Dakota\Traill	441501	1990		543650	0.37%	81.21%	0.2973%
Montana\Liberty	347346	6982		904327	0.77%	38.41%	0.2965%
Iowa\Wright	259669	1222		327728	0.37%	79.23%	0.2954%
Kentucky\Hart	13204	8027	127	191047	4.27%	6.91%	0.2950%
Colorado\Phillips	205251	2661		431154	0.62%	47.61%	0.2938%
Kentucky\Bullitt	6684	1147		51148	2.24%	13.07%	0.2931%
Missouri\Cape Girardeau	111377	1784	625	302631	0.80%	36.80%	0.2930%
North Dakota\Ramsey	463004	3104	125	714525	0.45%	64.80%	0.2928%
Kansas\Anderson	117675	3227	126	367192	0.91%	32.05%	0.2926%
Idaho\Bonner	5816	4298	180	94380	4.74%	6.16%	0.2924%
New Mexico\Dona Ana	55104	18295	125	589373	3.13%	9.35%	0.2922%
Oklahoma\Noble	118997	5315		466947	1.14%	25.48%	0.2901%
Montana\Glacier	294683	28397		1700179	1.67%	17.33%	0.2895%
Montana\Dawson	184445	29735		1378564	2.16%	13.38%	0.2886%
Iowa\Kossuth	460251	2196	69	601517	0.38%	76.52%	0.2881%
Virginia\Wythe	9322	6141	1638	159126	4.89%	5.86%	0.2864%
Kansas\Woodson	56523	3437		261607	1.31%	21.61%	0.2839%
Missouri\Greene	18858	7702	176	231988	3.40%	8.13%	0.2760%
Kansas\Cowley	124068	7338		575584	1.27%	21.56%	0.2748%
Kansas\Allen	74057	2630		267409	0.98%	27.69%	0.2724%
Nebraska\Dundy	169834	5662		594834	0.95%	28.55%	0.2718%
Indiana\Knox	278180	1041		327267	0.32%	85.00%	0.2704%
Kansas\Harper	86579	5955	1276	481291	1.50%	17.99%	0.2703%
Wyoming\Park	55248	37844		881736	4.29%	6.27%	0.2689%
New Jersey\Ocean	1925	135		9833	1.37%	19.58%	0.2688%
Minnesota\Itasca	3346	6278	669	93274	7.45%	3.59%	0.2672%
Oklahoma\Major	83813	8079	400	517334	1.64%	16.20%	0.2655%
Montana\Hill	551870	13796		1697232	0.81%	32.52%	0.2643%
Nebraska\Deuel	91657	2243		278915	0.80%	32.86%	0.2643%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Idaho\Adams	8428	6953		148996	4.67%	5.66%	0.2640%
Nebraska\Hayes	121726	4178	280	453818	0.98%	26.82%	0.2635%
Kentucky\Nicholas	3976	8008		110198	7.27%	3.61%	0.2622%
Missouri\Warren	50358	1121		146798	0.76%	34.30%	0.2620%
Indiana\Vanderburgh	54612	248		71927	0.34%	75.93%	0.2618%
Illinois\Jasper	185820	832		243451	0.34%	76.33%	0.2609%
Maine\Androscoggin	3966	500	1198	50844	3.34%	7.80%	0.2605%
Illinois\Union	45394	742	117	122362	0.70%	37.10%	0.2604%
Kansas\Sherman	305463	3679		657942	0.56%	46.43%	0.2596%
Kansas\Jackson	84049	3141	370	339291	1.03%	24.77%	0.2563%
Missouri\Jefferson	11621	1432	436	92225	2.03%	12.60%	0.2552%
Connecticut\Windham	6839	631	717	60136	2.24%	11.37%	0.2549%
Missouri\Ray	86588	2504		291798	0.86%	29.67%	0.2546%
Washington\Stevens	21364	32477	1121	531082	6.33%	4.02%	0.2545%
Missouri\Linn	67965	3955	109	330072	1.23%	20.59%	0.2535%
Pennsylvania\Lackawanna	1976	1233	788	39756	5.08%	4.97%	0.2527%
Missouri\Schuyler	13324	4145	250	152378	2.88%	8.74%	0.2522%
Missouri\Howard	92309	2087		276590	0.75%	33.37%	0.2518%
Kentucky\Caldwell	39628	1293		142770	0.91%	27.76%	0.2514%
Oklahoma\Blaine	132180	6525		585908	1.11%	22.56%	0.2512%
Kansas\Graham	145659	4425	133	514815	0.89%	28.29%	0.2505%
Oklahoma\Kiowa	127804	6226		564592	1.10%	22.64%	0.2496%
Kansas\Miami	81796	2873		307083	0.94%	26.64%	0.2492%
Nebraska\Cheyenne	227062	6248		754598	0.83%	30.09%	0.2491%
Indiana\Scott	38248	250		62041	0.40%	61.65%	0.2484%
Missouri\Jasper	63986	2431	160	258815	1.00%	24.72%	0.2475%
Kentucky\Logan	109473	1762	129	289931	0.65%	37.76%	0.2463%
Virginia\Madison	16309	1031	560	102757	1.55%	15.87%	0.2457%
Wyoming\Goshen	75118	58944	1788	1368342	4.44%	5.49%	0.2437%
Kansas\Russell	104882	4560		443550	1.03%	23.65%	0.2431%
Montana\Blaine	234414	53439	2672	2330605	2.41%	10.06%	0.2422%
Montana\Park	36382	38637		762753	5.07%	4.77%	0.2416%
Illinois\Crawford	157618	643		205356	0.31%	76.75%	0.2403%
Missouri\Callaway	72845	3253	183	322929	1.06%	22.56%	0.2400%
Idaho\Benewah	51723	1093		153591	0.71%	33.68%	0.2396%
Washington\Yakima	156824	37363	4069	1649281	2.51%	9.51%	0.2389%
Utah\Box Elder	80969	49161	2174	1320177	3.89%	6.13%	0.2385%
New Jersey\Mercer	8588	131		21730	0.60%	39.52%	0.2383%
Washington\Pend Oreille	4501	1603		55109	2.91%	8.17%	0.2376%
Montana\Toole	335804	8782		1115019	0.79%	30.12%	0.2372%
Indiana\Spencer	86634	616		150244	0.41%	57.66%	0.2364%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Kansas\Meade	162737	5268		602281	0.87%	27.02%	0.2363%
Massachusetts	41313	9921	5416	517879	2.96%	7.98%	0.2362%
Nevada\Lander	11645	23245		339091	6.86%	3.43%	0.2354%
Kentucky\Warren	49827	3204	104	265126	1.25%	18.79%	0.2345%
Oregon\Wallowa	31946	19777	658	527957	3.87%	6.05%	0.2342%
Illinois\Champaign	479029	1475		550481	0.27%	87.02%	0.2332%
Minnesota\Cass	8760	6774	828	169160	4.49%	5.18%	0.2327%
Kansas\Franklin	87644	2057	543	313546	0.83%	27.95%	0.2318%
Rhode Island\Bristol	247	26		1665	1.56%	14.83%	0.2317%
Missouri\Mercer	33711	2543	243	201417	1.38%	16.74%	0.2315%
Pennsylvania\Susquehanna	6522	4867	4012	158218	5.61%	4.12%	0.2313%
Oklahoma\Caddo	174135	7456		749918	0.99%	23.22%	0.2309%
California\Lassen	24595	19752		459126	4.30%	5.36%	0.2305%
Montana\Missoula	19932	9158		281893	3.25%	7.07%	0.2297%
Illinois\Marion	166683	936		260679	0.36%	63.94%	0.2296%
Colorado\Eagle	7918	4405		124044	3.55%	6.38%	0.2267%
Missouri\Christian	13041	5913	254	189177	3.26%	6.89%	0.2247%
Missouri\Saline	221231	1696	349	449410	0.46%	49.23%	0.2240%
Nebraska\Garfield	33868	8824		365685	2.41%	9.26%	0.2235%
Illinois\Hamilton	150031	714		219873	0.32%	68.24%	0.2216%
Illinois\Pulaski	68607	330		101189	0.33%	67.80%	0.2211%
Virginia\Prince William	6347	375		32816	1.14%	19.34%	0.2210%
Kansas\Wilson	116227	2106		333202	0.63%	34.88%	0.2205%
Maryland\Worcester	59990	450		110847	0.41%	54.12%	0.2197%
Missouri\Clay	34837	1303		143853	0.91%	24.22%	0.2194%
Washington\Clark	11306	431	760	78359	1.52%	14.43%	0.2193%
North Dakota\Cavalier	652326	2564		873377	0.29%	74.69%	0.2193%
Kentucky\Boone	4635	2302	329	74750	3.52%	6.20%	0.2182%
Montana\Yellowstone	134243	41666	465	1615769	2.61%	8.31%	0.2166%
Pennsylvania\McKean	2239	1202	458	41466	4.00%	5.40%	0.2162%
Utah\Garfield	1362	9738	893	81866	12.99%	1.66%	0.2160%
Kentucky\Marion	11358	4566	341	160684	3.05%	7.07%	0.2159%
Ohio\Meigs	4932	1820	819	77755	3.39%	6.34%	0.2153%
Florida\Gilchrist	5865	1855		71098	2.61%	8.25%	0.2152%
California\Contra Costa	12485	3696		146993	2.51%	8.49%	0.2136%
Tennessee\Robertson	78638	1392		227298	0.61%	34.60%	0.2119%
Missouri\Franklin	49008	3322	559	299730	1.29%	16.35%	0.2117%
New Jersey\Atlantic	12729	153		30372	0.50%	41.91%	0.2111%
Connecticut\Middlesex	1605	363		16623	2.18%	9.66%	0.2108%
Colorado\Routt	35752	16731		533014	3.14%	6.71%	0.2105%
Indiana\Tipton	133551	432		165875	0.26%	80.51%	0.2097%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Missouri\Randolph	43155	2260	114	221647	1.07%	19.47%	0.2085%
Kansas\Stevens	215758	2445		503439	0.49%	42.86%	0.2081%
Virginia\Culpeper	17707	1457		111370	1.31%	15.90%	0.2080%
Connecticut\New Haven	2637	1560	75	45684	3.58%	5.77%	0.2066%
Kentucky\Harrison	7417	6957	326	161777	4.50%	4.58%	0.2064%
Nebraska\Chase	234238	2695		555971	0.48%	42.13%	0.2042%
Montana\Jefferson	22682	13747		391248	3.51%	5.80%	0.2037%
Texas\Castro	196955	3323		567255	0.59%	34.72%	0.2034%
Missouri\Chariton	155054	1827	105	384499	0.50%	40.33%	0.2026%
Montana\Petroleum	31115	26304	400	640707	4.17%	4.86%	0.2024%
Maryland\Somerset	26325	264	15	60255	0.46%	43.69%	0.2023%
Maine\Kennebec	3932	618	2867	82457	4.23%	4.77%	0.2015%
Colorado\Otero	24335	31811	288	624123	5.14%	3.90%	0.2005%
Montana\Carbon	36111	34963		793628	4.41%	4.55%	0.2005%
Maine\Penobscot	10474	1193	1298	114607	2.17%	9.14%	0.1986%
Ohio\Morgan	3158	6239	328	102271	6.42%	3.09%	0.1983%
Virginia\Frederick	9512	2009		98278	2.04%	9.68%	0.1979%
Kansas\Cheyenne	152080	4309		576831	0.75%	26.36%	0.1969%
South Dakota\Butte	52756	46953	1493	1140405	4.25%	4.63%	0.1965%
Vermont\Caledonia	2636	1244	3752	81946	6.10%	3.22%	0.1961%
Indiana\Brown	2819	200		16959	1.18%	16.62%	0.1960%
Kentucky\Henderson	112387	642	24	195706	0.34%	57.43%	0.1954%
Illinois\Wayne	215590	1001		333255	0.30%	64.69%	0.1943%
Kansas\Shawnee	91998	896		206243	0.43%	44.61%	0.1938%
North Carolina\Forsyth	10218	358		43593	0.82%	23.44%	0.1925%
Nebraska\Frontier	142862	3031		475252	0.64%	30.06%	0.1917%
Pennsylvania\Allegheny	1503	1727	109	38023	4.83%	3.95%	0.1909%
North Dakota\Sioux	25925	38491	725	730306	5.37%	3.55%	0.1906%
Kentucky\Russell	8970	1839		93039	1.98%	9.64%	0.1906%
Kansas\Butler	177145	6389	250	787290	0.84%	22.50%	0.1897%
Indiana\Dubois	103489	608		182175	0.33%	56.81%	0.1896%
Missouri\Bates	125736	2508	876	473781	0.71%	26.54%	0.1896%
Washington\Snohomish	13268	632	211	76837	1.10%	17.27%	0.1894%
Illinois\Clark	183687	584		238706	0.24%	76.95%	0.1883%
Rhode Island	7121	1035	166	67819	1.77%	10.50%	0.1859%
Montana\Silver Bow	5283	3585		101081	3.55%	5.23%	0.1854%
Missouri\Putnam	24090	5717		272655	2.10%	8.84%	0.1853%
Virginia\Fauquier	29557	2696	397	222486	1.39%	13.28%	0.1847%
Kentucky\Trimble	2448	3136	51	65098	4.90%	3.76%	0.1841%
Pennsylvania\Warren	5239	2520	963	99582	3.50%	5.26%	0.1840%
North Dakota\Billings	26555	36360		724532	5.02%	3.67%	0.1839%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Colorado\Costilla	13889	21281		401147	5.31%	3.46%	0.1837%
Kansas\Montgomery	94833	1896		313947	0.60%	30.21%	0.1824%
Virginia\Botetourt	6573	1750	384	87913	2.43%	7.48%	0.1815%
Massachusetts\Franklin	5189	1432	759	79465	2.76%	6.53%	0.1800%
Missouri\Lawrence	36440	4218	913	322822	1.59%	11.29%	0.1794%
Kentucky\Scott	5834	5270	658	139044	4.26%	4.20%	0.1789%
California\Plumas	5035	5118		120253	4.26%	4.19%	0.1782%
New York\Greene	1272	2553	197	44328	6.20%	2.87%	0.1780%
Kansas\Scott	227232	1592		453296	0.35%	50.13%	0.1761%
Wisconsin\Forest	572	3254	256	33805	10.38%	1.69%	0.1757%
Kentucky\Daviess	143015	808		256922	0.31%	55.66%	0.1751%
Missouri\Moniteau	43958	1690	657	242946	0.97%	18.09%	0.1748%
Colorado\Kit Carson	351785	9076		1352319	0.67%	26.01%	0.1746%
Oklahoma\Murray	29991	2254		197022	1.14%	15.22%	0.1741%
Missouri\Adair	38752	3518		279855	1.26%	13.85%	0.1741%
New York\Schenectady	378	1683		19129	8.80%	1.98%	0.1739%
Massachusetts\Essex	1608	485	346	27834	2.99%	5.78%	0.1725%
Arizona\Greenlee	1900	1126		35267	3.19%	5.39%	0.1720%
Utah\Emery	4057	17488	243	204775	8.66%	1.98%	0.1715%
Washington\Columbia	130409	1284		313307	0.41%	41.62%	0.1706%
Ohio\Athens	5070	2264		82182	2.75%	6.17%	0.1700%
Kansas\Coffey	87674	2038		324827	0.63%	26.99%	0.1693%
Kentucky\Jefferson	3643	484		32296	1.50%	11.28%	0.1690%
California\Butte	158149	1349	142	373786	0.40%	42.31%	0.1688%
Missouri\Dade	61820	2070		276229	0.75%	22.38%	0.1677%
Missouri\Stone	13603	1678	148	121792	1.50%	11.17%	0.1675%
Colorado\Arapahoe	40801	2583		251812	1.03%	16.20%	0.1662%
Oklahoma\Logan	64539	3878	320	403810	1.04%	15.98%	0.1662%
Nebraska\Keya Paha	24600	15767		483450	3.26%	5.09%	0.1660%
Kansas\Wabaunsee	56909	6150	276	470474	1.37%	12.10%	0.1652%
Missouri\Cooper	87732	1497	221	302429	0.57%	29.01%	0.1648%
Montana\Deer Lodge	2480	4150		79335	5.23%	3.13%	0.1635%
Kansas\Osage	124337	1831	45	380156	0.49%	32.71%	0.1614%
Vermont\Windham	2642	247	1326	50764	3.10%	5.20%	0.1613%
Oklahoma\Greer	51130	4437		375447	1.18%	13.62%	0.1609%
Colorado\Washington	307375	9810		1375742	0.71%	22.34%	0.1593%
Illinois\Clay	142230	493		209834	0.23%	67.78%	0.1593%
Massachusetts\Middlesex	1896	884	76	33893	2.83%	5.59%	0.1584%
Maryland\Prince George's	9574	224		37005	0.61%	25.87%	0.1566%
Virginia\Smyth	10116	2325	183	127307	1.97%	7.95%	0.1565%
Texas\Dawson	237466	2072	50	568036	0.37%	41.80%	0.1562%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Kansas\Comanche	41718	6392	598	432378	1.62%	9.65%	0.1560%
Kansas\Neosho	71687	2109	140	321520	0.70%	22.30%	0.1560%
Oklahoma\Beckham	76018	5527		519503	1.06%	14.63%	0.1557%
Kentucky\Union	125321	501		200839	0.25%	62.40%	0.1557%
Wyoming\Washakie	21954	15631		469804	3.33%	4.67%	0.1555%
Montana\Lewis and Clark	47246	31028		971240	3.19%	4.86%	0.1554%
Utah\Washington	8606	5031	447	174192	3.14%	4.94%	0.1554%
Montana\Wheatland	43837	22600	1230	822253	2.90%	5.33%	0.1545%
Maine\Aroostook	84666	1602	970	375568	0.68%	22.54%	0.1544%
Oregon\Benton	51736	390		114558	0.34%	45.16%	0.1537%
Illinois\Piatt	244238	449		267265	0.17%	91.38%	0.1535%
Montana\Phillips	151992	40426	66	2006068	2.02%	7.58%	0.1529%
Oregon\Polk	86371	342	148	166663	0.29%	51.82%	0.1524%
Kansas\Ness	178974	2939	332	619948	0.53%	28.87%	0.1523%
Kentucky\Powell	3007	542		32763	1.65%	9.18%	0.1518%
Ohio\Cuyahoga	152	84		2910	2.89%	5.22%	0.1508%
Colorado\Elbert	68587	28279		1,134,199	2.49%	6.05%	0.1508%
Illinois\White	236153	562		296989	0.19%	79.52%	0.1505%
Missouri\Ste. Genevieve	29202	1829		188794	0.97%	15.47%	0.1498%
Nebraska\Banner	58271	3992		394906	1.01%	14.76%	0.1492%
Kentucky\Bracken	3995	3456	321	100660	3.75%	3.97%	0.1489%
Colorado\Bent	34459	33184		877142	3.78%	3.93%	0.1486%
Indiana\Pike	47780	168		73612	0.23%	64.91%	0.1481%
Virginia\Orange	13032	1130	111	104606	1.19%	12.46%	0.1478%
California\Yuba	44751	850		160898	0.53%	27.81%	0.1469%
South Dakota\Stanley	119086	10430		921110	1.13%	12.93%	0.1464%
Vermont\Orange	5147	631	2299	101645	2.88%	5.06%	0.1460%
Minnesota\Carlton	1728	6849	1205	97897	8.23%	1.77%	0.1452%
Kentucky\Washington	8589	4379	112	162993	2.76%	5.27%	0.1452%
Missouri\Pettis	122005	1130	853	408932	0.48%	29.84%	0.1447%
Maine	129544	10089	10036	1347566	1.49%	9.61%	0.1436%
Texas\Robertson	117743	2500	25	455308	0.55%	25.86%	0.1434%
Vermont\Washington	1884	973	1859	61029	4.64%	3.09%	0.1433%
Utah\Wasatch	862	7189		65935	10.90%	1.31%	0.1425%
Virginia\Sussex	29711	264		74224	0.36%	40.03%	0.1424%
Kansas\Barber	77104	6510	386	611493	1.13%	12.61%	0.1422%
Colorado\Montezuma	22045	30799	903	704261	4.50%	3.13%	0.1409%
Virginia\Franklin	18838	1601	469	166592	1.24%	11.31%	0.1405%
Kansas\Thomas	374546	1621		657471	0.25%	56.97%	0.1405%
Oklahoma\Harmon	59936	2416		322222	0.75%	18.60%	0.1395%
Nebraska\Wheeler	50838	3547		360200	0.98%	14.11%	0.1390%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Missouri\Carroll	164580	1336		401536	0.33%	40.99%	0.1364%
Oklahoma\Haskell	46995	2442		290260	0.84%	16.19%	0.1362%
Virginia\Montgomery	6133	1451	316	89411	1.98%	6.86%	0.1356%
Kansas\Clark	64115	4954		485996	1.02%	13.19%	0.1345%
Oregon\Baker	30181	22057	480	711809	3.17%	4.24%	0.1342%
Oklahoma\Woods	71193	13060		833775	1.57%	8.54%	0.1337%
Louisiana\St. Landry	132474	43	851	298369	0.30%	44.40%	0.1330%
South Dakota\Harding	59543	56869		1596101	3.56%	3.73%	0.1329%
Kentucky\Jessamine	3023	2808		80116	3.50%	3.77%	0.1323%
Kentucky\Bath	4783	4586		129057	3.55%	3.71%	0.1317%
Montana\Big Horn	157772	70177		2899620	2.42%	5.44%	0.1317%
Texas\Hartley	175544	6195		910965	0.68%	19.27%	0.1310%
Colorado\Rio Blanco	26605	7340		386577	1.90%	6.88%	0.1307%
Oklahoma\Bryan	76736	4071		490688	0.83%	15.64%	0.1297%
Montana\Golden Valley	27481	21207		671764	3.16%	4.09%	0.1291%
Kansas\Chase	28199	4674		319921	1.46%	8.81%	0.1288%
Louisiana\Caddo	48104	205	407	151215	0.40%	31.81%	0.1287%
Missouri\Johnson	96603	1923	465	424446	0.56%	22.76%	0.1281%
Ohio\Monroe	2399	4559	701	99306	5.30%	2.42%	0.1280%
Virginia\Washington	12925	3397	514	198850	1.97%	6.50%	0.1278%
Kentucky\Pulaski	16876	3609	426	231781	1.74%	7.28%	0.1268%
Missouri\Newton	39780	1522	398	245892	0.78%	16.18%	0.1263%
West Virginia\Mason	8938	2041	421	132227	1.86%	6.76%	0.1259%
Montana\Sweet Grass	21518	38484		812759	4.73%	2.65%	0.1254%
Colorado\Garfield	5899	23802		335331	7.10%	1.76%	0.1249%
Ohio\Hocking	4179	526		41992	1.25%	9.95%	0.1247%
Missouri\Vernon	95640	2583	107	455844	0.59%	20.98%	0.1238%
Virginia\Spotsylvania	5463	475	139	52230	1.18%	10.46%	0.1230%
Kentucky\Franklin	4241	1686		76306	2.21%	5.56%	0.1228%
Michigan\Roscommon	35	791		4759	16.62%	0.74%	0.1222%
Kentucky\Clinton	8284	1210		91097	1.33%	9.09%	0.1208%
Missouri\Morgan	23677	1873	521	216641	1.11%	10.93%	0.1208%
Maryland\Wicomico	31941	323		92852	0.35%	34.40%	0.1197%
New Mexico\Curry	112669	7532	750	887491	0.93%	12.70%	0.1185%
Illinois\Wabash	87383	176		114361	0.15%	76.41%	0.1176%
Kentucky\McLean	79557	258	49	144193	0.21%	55.17%	0.1175%
Virginia\Rockbridge	9431	1968	400	138315	1.71%	6.82%	0.1167%
Kentucky\Webster	71164	393		154999	0.25%	45.91%	0.1164%
Missouri\Stoddard	255280	963		461275	0.21%	55.34%	0.1155%
Kentucky\Calloway	66782	429		157761	0.27%	42.33%	0.1151%
Tennessee\Sullivan	6421	1171	35	82104	1.47%	7.82%	0.1149%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Montana\Carter	48162	68447		1698363	4.03%	2.84%	0.1143%
Kansas\Wyandotte	7849	47		18107	0.26%	43.35%	0.1125%
Illinois\Gallatin	155333	248		185753	0.13%	83.62%	0.1116%
California\Sierra	869	1064		28782	3.70%	3.02%	0.1116%
Oregon\Jefferson	35997	15175	397	708974	2.20%	5.08%	0.1115%
Montana\Madison	51727	47830	832	1506824	3.23%	3.43%	0.1109%
New York\Suffolk	10727	122		34404	0.35%	31.18%	0.1106%
Kentucky\Metcalfe	7731	3193		149491	2.14%	5.17%	0.1105%
North Carolina\Davidson	18395	501		91475	0.55%	20.11%	0.1101%
Colorado\Baca	231566	8015		1300876	0.62%	17.80%	0.1097%
Missouri\Polk	22875	4680	1141	350293	1.66%	6.53%	0.1085%
Missouri\Barry	31484	2294	584	289626	0.99%	10.87%	0.1080%
Oklahoma\Muskogee	86971	1735		374372	0.46%	23.23%	0.1077%
Kansas\Kiowa	91890	2252		440473	0.51%	20.86%	0.1067%
Oregon\Linn	160511	829	110	376483	0.25%	42.63%	0.1063%
North Carolina\Burke	6041	148		29068	0.51%	20.78%	0.1058%
Virginia\Pulaski	4739	936	325	75457	1.67%	6.28%	0.1050%
Kentucky\Taylor	12646	1031	135	118712	0.98%	10.65%	0.1046%
Oklahoma\Tulsa	17690	1016		131154	0.77%	13.49%	0.1045%
Arkansas\Benton	58740	1058	94	254608	0.45%	23.07%	0.1044%
Massachusetts\Worcester	5176	1753	504	106357	2.12%	4.87%	0.1033%
Missouri\Cole	19373	1539	199	180840	0.96%	10.71%	0.1030%
Nebraska\Sheridan	75805	31224	865	1540316	2.08%	4.92%	0.1025%
Wyoming\Platte	57528	30497		1308165	2.33%	4.40%	0.1025%
Maine\Somerset	5896	664	1492	111371	1.94%	5.29%	0.1025%
Missouri\Webster	10322	5682	1618	271206	2.69%	3.81%	0.1024%
New Hampshire\Rockingham	1128	790	221	33570	3.01%	3.36%	0.1012%
California\Ventura	67367	1001		259055	0.39%	26.00%	0.1005%
North Carolina\Rowan	38818	346		115942	0.30%	33.48%	0.0999%
North Carolina\Yadkin	26379	418		105170	0.40%	25.08%	0.0997%
Kentucky\Boyle	4044	2186		94233	2.32%	4.29%	0.0996%
Kansas\Labette	111309	1221		371115	0.33%	29.99%	0.0987%
New Hampshire\Merrimack	2824	895	559	64642	2.25%	4.37%	0.0983%
Kentucky\Grayson	18572	2475		216492	1.14%	8.58%	0.0981%
Oklahoma\Payne	48621	2560		356765	0.72%	13.63%	0.0978%
Louisiana\Washington	12089	702	66	97687	0.79%	12.38%	0.0973%
Virginia\Carroll	5829	1886	649	123678	2.05%	4.71%	0.0966%
Arizona\Cochise	33332	19621		824226	2.38%	4.04%	0.0963%
Oregon\Tillamook	3379	326	80	37780	1.07%	8.94%	0.0961%
Michigan\Iron	792	932		27731	3.36%	2.86%	0.0960%
Oklahoma\Texas	210802	6611		1205978	0.55%	17.48%	0.0958%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Oklahoma\Pawnee	50694	1667		297621	0.56%	17.03%	0.0954%
North Carolina\Mecklenburg	3754	93		19135	0.49%	19.62%	0.0953%
Ohio\Jackson	3687	1150	185	71869	1.86%	5.13%	0.0953%
Virginia\King and Queen	25827	104		53125	0.20%	48.62%	0.0952%
Indiana\Perry	15702	270	30	70409	0.43%	22.30%	0.0950%
Kansas\Johnson	18447	423	247	114202	0.59%	16.15%	0.0948%
Arkansas\Perry	13651	366		72681	0.50%	18.78%	0.0946%
Missouri\Dunklin	238702	410		325095	0.13%	73.43%	0.0926%
Alabama\DeKalb	60246	832	18	235246	0.36%	25.61%	0.0925%
Colorado\La Plata	18140	16193	367	570189	2.90%	3.18%	0.0924%
Tennessee\Washington	8866	1285	179	118595	1.23%	7.48%	0.0923%
Colorado\Moffat	32160	19818	150	836564	2.39%	3.84%	0.0918%
Oregon\Jackson	12765	4127	115	244055	1.74%	5.23%	0.0909%
Kentucky\Allen	13750	1816		166663	1.09%	8.25%	0.0899%
Kansas\Bourbon	47779	1825	185	327534	0.61%	14.59%	0.0895%
Alabama\Blount	26628	719	50	151282	0.51%	17.60%	0.0895%
North Carolina\Iredell	23397	730		138416	0.53%	16.90%	0.0891%
Wyoming\Fremont	33763	85550		1800538	4.75%	1.88%	0.0891%
Kentucky\Breckinridge	26537	2375	138	274473	0.92%	9.67%	0.0885%
Arkansas\Lafayette	30491	276		97628	0.28%	31.23%	0.0883%
Kentucky\Marshall	20939	401		97712	0.41%	21.43%	0.0879%
Kansas\Linn	57162	954	117	265319	0.40%	21.54%	0.0870%
Texas\Falls	154609	396	711	445217	0.25%	34.73%	0.0863%
Oklahoma\McCurtain	47523	2094		339615	0.62%	13.99%	0.0863%
Washington\Thurston	6770	307	515	80617	1.02%	8.40%	0.0856%
West Virginia\Ohio	695	1167		30804	3.79%	2.26%	0.0855%
New Jersey\Middlesex	8315	36		18717	0.19%	44.42%	0.0854%
Virginia\Bland	3329	1335	340	80786	2.07%	4.12%	0.0854%
Oklahoma\Cimarron	169971	5390		1044528	0.52%	16.27%	0.0840%
Virginia\Warren	2958	644		47635	1.35%	6.21%	0.0840%
Alabama\Madison	66399	418	79	199294	0.25%	33.32%	0.0831%
South Carolina\Horry	46146	482		163622	0.29%	28.20%	0.0831%
Nebraska\Logan	24763	4430		363453	1.22%	6.81%	0.0830%
Kentucky\Carlisle	51512	147		95713	0.15%	53.82%	0.0827%
Oklahoma\Wagoner	64585	878		262702	0.33%	24.58%	0.0822%
Tennessee\Coffee	41141	389		139945	0.28%	29.40%	0.0817%
Illinois\Richland	162339	206		202860	0.10%	80.03%	0.0813%
Missouri\Sullivan	31043	2428	490	333986	0.87%	9.29%	0.0812%
Oklahoma\Choctaw	52607	1634		326300	0.50%	16.12%	0.0807%
Oklahoma\Sequoyah	38152	968	170	231943	0.49%	16.45%	0.0807%
Kansas\Cherokee	146126	579		324383	0.18%	45.05%	0.0804%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Oklahoma\Mayes	68107	1157		313131	0.37%	21.75%	0.0804%
Kentucky\Green	8309	1944	101	145493	1.41%	5.71%	0.0803%
Virginia\Floyd	3991	3051	276	128872	2.58%	3.10%	0.0799%
New Mexico\Eddy	27054	35072	1069	1107912	3.26%	2.44%	0.0797%
Texas\Henderson	47697	1481	178	318452	0.52%	14.98%	0.0780%
Kentucky\McCracken	24160	183		75341	0.24%	32.07%	0.0779%
Kentucky\Ohio	40262	548		168602	0.33%	23.88%	0.0776%
Tennessee\Carter	4327	196	82	39374	0.71%	10.99%	0.0776%
Oregon\Lane	60042	737	41	245531	0.32%	24.45%	0.0775%
Montana\Musselshell	37041	26499		1133030	2.34%	3.27%	0.0765%
Kentucky\Campbell	1351	1105	159	47335	2.67%	2.85%	0.0762%
Virginia\Amelia	13031	489		91456	0.53%	14.25%	0.0762%
Oklahoma\Pottawatomie	47217	2510		395065	0.64%	11.95%	0.0759%
Kentucky\Clark	5525	2981	74	149201	2.05%	3.70%	0.0758%
Illinois\Lawrence	134530	212		194035	0.11%	69.33%	0.0758%
Wyoming\Crook	23475	77829	443	1569912	4.99%	1.50%	0.0746%
Minnesota\St. Louis	1898	8191	479	148689	5.83%	1.28%	0.0744%
Kentucky\Edmonson	7172	968		96641	1.00%	7.42%	0.0743%
Texas\Moore	147607	1538		553348	0.28%	26.68%	0.0741%
Washington\Okanogan	44751	23253	790	1205229	1.99%	3.71%	0.0741%
New Hampshire	15200	5373	5456	471911	2.29%	3.22%	0.0739%
Montana\Treasure	21596	7278		461790	1.58%	4.68%	0.0737%
Montana\Prairie	29243	14352	426	767508	1.93%	3.81%	0.0734%
Nebraska\Garden	70933	11324		1048554	1.08%	6.76%	0.0731%
Missouri\Benton	24450	1316	155	222303	0.66%	11.00%	0.0728%
Rhode Island\Washington	3146	140		24651	0.57%	12.76%	0.0725%
Washington\Lewis	10575	638	548	131554	0.90%	8.04%	0.0725%
Minnesota\Martin	337786	1771		910687	0.19%	37.09%	0.0721%
Kentucky\Rockcastle	2877	2038		90435	2.25%	3.18%	0.0717%
Missouri\Osage	24531	2007	561	297477	0.86%	8.25%	0.0712%
Kentucky\Owen	3318	4980	361	157932	3.38%	2.10%	0.0710%
Virginia\Richmond	19656	50		37359	0.13%	52.61%	0.0704%
Oregon\Gilliam	163660	2312		733387	0.32%	22.32%	0.0703%
Montana\Sanders	5966	13685		341913	4.00%	1.74%	0.0698%
North Carolina\Surry	21198	426		114491	0.37%	18.51%	0.0689%
Texas\Lubbock	211689	864		515741	0.17%	41.05%	0.0688%
Texas\Hill	172372	680	414	524907	0.21%	32.84%	0.0684%
Texas\Leon	77384	2568	257	569101	0.50%	13.60%	0.0675%
Texas\Washington	59088	1299		338384	0.38%	17.46%	0.0670%
Montana\Granite	7054	8720		302973	2.88%	2.33%	0.0670%
California\Tehama	35762	5289		532206	0.99%	6.72%	0.0668%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Kentucky\Casey	6530	3477	274	191609	1.96%	3.41%	0.0667%
Oklahoma\Stephens	66212	2222		469700	0.47%	14.10%	0.0667%
Indiana\Crawford	3797	360		45401	0.79%	8.36%	0.0663%
Idaho\Valley	1957	1304		62044	2.10%	3.15%	0.0663%
New Hampshire\Cheshire	1782	531	332	48241	1.79%	3.69%	0.0661%
Kentucky\Montgomery	2991	2523		106957	2.36%	2.80%	0.0660%
Michigan\Ontonagon	388	920	680	30830	5.19%	1.26%	0.0653%
Oregon\Clatsop	1575	185		21198	0.87%	7.43%	0.0648%
New Hampshire\Grafton	2555	999	1537	99964	2.54%	2.56%	0.0648%
Kentucky\Hickman	85387	127		129752	0.10%	65.81%	0.0644%
Virginia\Greene	1085	570		31013	1.84%	3.50%	0.0643%
Kentucky\Monroe	11714	1499	189	175766	0.96%	6.66%	0.0640%
Oklahoma\Le Flore	62691	1973	241	466406	0.47%	13.44%	0.0638%
Kentucky\Adair	8929	2448	75	187981	1.34%	4.75%	0.0638%
Kentucky\Wayne	15911	815		142827	0.57%	11.14%	0.0636%
Ohio\Belmont	1379	6927	746	129106	5.94%	1.07%	0.0635%
Missouri\Scott	140154	236		228379	0.10%	61.37%	0.0634%
Tennessee\Hamblen	8588	355		69383	0.51%	12.38%	0.0633%
Texas\Lamar	86899	1464	514	521001	0.38%	16.68%	0.0633%
Kentucky\Gallatin	779	922		33816	2.73%	2.30%	0.0628%
New Hampshire\Strafford	611	681		25744	2.65%	2.37%	0.0628%
Tennessee\Jefferson	10663	607		101585	0.60%	10.50%	0.0627%
Nebraska\Sioux	34770	30061		1292053	2.33%	2.69%	0.0626%
Oklahoma\Lincoln	79117	1509	371	487858	0.39%	16.22%	0.0625%
New Hampshire\Coos	2007	182	623	50895	1.58%	3.94%	0.0624%
Kentucky\Garrard	1818	4907	160	121673	4.16%	1.49%	0.0622%
North Carolina\Wake	24281	184		84956	0.22%	28.58%	0.0619%
Virginia\Giles	4530	584		65487	0.89%	6.92%	0.0617%
Texas\Foard	36880	2359		375790	0.63%	9.81%	0.0616%
North Carolina\Buncombe	4376	593	138	72087	1.01%	6.07%	0.0616%
North Carolina\Alexander	10201	181		54959	0.33%	18.56%	0.0611%
Virginia\Grayson	6930	978	665	136752	1.20%	5.07%	0.0609%
Kentucky\Jackson	3262	1273		82614	1.54%	3.95%	0.0608%
Arkansas\Washington	44611	1442	16	327225	0.45%	13.63%	0.0607%
Montana\Meagher	21538	18583		812412	2.29%	2.65%	0.0606%
Missouri\Bollinger	31323	580	255	207881	0.40%	15.07%	0.0605%
Texas\Hood	25994	951	32	205672	0.48%	12.64%	0.0604%
Missouri\Howell	18392	4578	204	385188	1.24%	4.77%	0.0593%
Maryland\Calvert	7363	56		26443	0.21%	27.84%	0.0590%
Missouri\Hickory	8117	1564		146764	1.07%	5.53%	0.0589%
Nevada\Eureka	16186	22340		783440	2.85%	2.07%	0.0589%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Maryland\Allegany	957	821		36643	2.24%	2.61%	0.0585%
Oklahoma\Ottawa	48556	680		237986	0.29%	20.40%	0.0583%
Illinois\Hardin	3076	227		34733	0.65%	8.86%	0.0579%
New York\Sullivan	1240	500	686	50443	2.35%	2.46%	0.0578%
New Mexico\Roosevelt	99766	8435	4492	1494051	0.87%	6.68%	0.0578%
Tennessee\Obion	155096	236		251844	0.09%	61.58%	0.0577%
Oklahoma\Dewey	60195	3325		588951	0.56%	10.22%	0.0577%
Nebraska\Loup	10418	6958		354688	1.96%	2.94%	0.0576%
Texas\Denton	64395	848	248	350274	0.31%	18.38%	0.0575%
Vermont\Windsor	2235	1108	1259	95972	2.47%	2.33%	0.0574%
Missouri\Laclede	9493	4136	899	288630	1.74%	3.29%	0.0574%
Idaho\Boise	738	1471		43672	3.37%	1.69%	0.0569%
Kentucky\Pendleton	2794	2745	504	126368	2.57%	2.21%	0.0568%
Texas\Collin	67700	562	148	290831	0.24%	23.28%	0.0568%
Wisconsin\Douglas	522	5034	710	72686	7.90%	0.72%	0.0568%
Texas\Bailey	99232	1290		476176	0.27%	20.84%	0.0565%
Wyoming\Sheridan	17562	45376	2625	1224625	3.92%	1.43%	0.0562%
Texas\Gray	51181	2846		509367	0.56%	10.05%	0.0561%
Kentucky\Livingston	13700	561		117011	0.48%	11.71%	0.0561%
Virginia\Russell	9690	1170	158	151564	0.88%	6.39%	0.0560%
North Carolina\Stanly	39815	153		104517	0.15%	38.09%	0.0558%
Utah\Tooele	5965	5951		252848	2.35%	2.36%	0.0555%
Maine\Lincoln	595	755	82	29999	2.79%	1.98%	0.0553%
California\San Bernardino	13868	9345	1169	514234	2.04%	2.70%	0.0551%
New Hampshire\Hillsborough	1310	517	544	50238	2.11%	2.61%	0.0551%
Montana\Powell	14053	17602		670354	2.63%	2.10%	0.0550%
Kentucky\Robertson	1301	1061	54	51468	2.17%	2.53%	0.0548%
Tennessee\Greene	16371	1588	169	229204	0.77%	7.14%	0.0548%
Virginia\Lee	5670	1229	105	117776	1.13%	4.81%	0.0545%
North Carolina\Catawba	18898	149		71906	0.21%	26.28%	0.0545%
Florida\Okaloosa	10206	231		65874	0.35%	15.49%	0.0543%
Maine\Oxford	3402	492	261	68719	1.10%	4.95%	0.0542%
Virginia\Tazewell	4839	1783	859	153677	1.72%	3.15%	0.0541%
Kentucky\Crittenden	21317	648		160116	0.40%	13.31%	0.0539%
Oregon\Josephine	1649	463		37706	1.23%	4.37%	0.0537%
West Virginia\Preston	3966	2124	1000	152276	2.05%	2.60%	0.0534%
Tennessee\Montgomery	31159	393		151461	0.26%	20.57%	0.0534%
West Virginia\Monroe	4204	1590	650	132859	1.69%	3.16%	0.0533%
Maine\Waldo	2043	570	644	68219	1.78%	2.99%	0.0533%
Illinois\Pope	10936	180		60809	0.30%	17.98%	0.0532%
Kentucky\Muhlenberg	25986	406		140834	0.29%	18.45%	0.0532%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Missouri\Butler	128819	259		250653	0.10%	51.39%	0.0531%
Kansas\Logan	131184	1291		566569	0.23%	23.15%	0.0528%
Oklahoma\Roger Mills	43517	6267		719356	0.87%	6.05%	0.0527%
Florida\Suwannee	19424	755		167493	0.45%	11.60%	0.0523%
Oklahoma\Nowata	65586	996		354636	0.28%	18.49%	0.0519%
Tennessee\Blount	15089	333		98403	0.34%	15.33%	0.0519%
Wyoming\Laramie	65378	22606		1691648	1.34%	3.86%	0.0516%
Oregon\Columbia	4990	345		57758	0.60%	8.64%	0.0516%
West Virginia\Greenbrier	4313	1874	1874	176995	2.12%	2.44%	0.0516%
Missouri\McDonald	24571	711	122	199780	0.42%	12.30%	0.0513%
Ohio\Gallia	4025	1632	102	116945	1.48%	3.44%	0.0510%
Oklahoma\Harper	56775	3421		616947	0.55%	9.20%	0.0510%
Ohio\Noble	1843	1799	408	89298	2.47%	2.06%	0.0510%
Kentucky\Grant	1622	3836	277	114965	3.58%	1.41%	0.0505%
Alabama\Colbert	36243	231		128905	0.18%	28.12%	0.0504%
Kentucky\Carroll	1057	1665	267	63708	3.03%	1.66%	0.0503%
Alabama\Cullman	60169	299	142	229791	0.19%	26.18%	0.0503%
Kentucky\Butler	22253	683		173965	0.39%	12.79%	0.0502%
Pennsylvania\Wayne	1860	1526	804	92939	2.51%	2.00%	0.0502%
Kentucky\Estill	1340	1564		64780	2.41%	2.07%	0.0499%
Virginia\Scott	6463	1685	134	153881	1.18%	4.20%	0.0496%
Missouri\St. Francois	5183	1212		112551	1.08%	4.61%	0.0496%
Maine\York	2210	646	137	59335	1.32%	3.72%	0.0492%
Oklahoma\Carter	59527	1339		402831	0.33%	14.78%	0.0491%
Virginia\Nelson	3309	791		73149	1.08%	4.52%	0.0489%
Vermont\Lamoille	1493	674	133	49749	1.62%	3.00%	0.0487%
Maine\Cumberland	901	931	510	51727	2.79%	1.74%	0.0485%
Virginia\Patrick	4531	676		80027	0.84%	5.66%	0.0478%
Montana\Garfield	88346	30927		2391958	1.29%	3.69%	0.0478%
Tennessee\Gibson	148070	39	226	286769	0.09%	51.63%	0.0477%
North Carolina\Cleveland	23136	275		115637	0.24%	20.01%	0.0476%
Washington\Garfield	113339	394		308212	0.13%	36.77%	0.0470%
Montana\Powder River	18099	68080		1620068	4.20%	1.12%	0.0469%
Texas\Delta	38672	214		132841	0.16%	29.11%	0.0469%
Missouri\Henry	71016	775		345019	0.22%	20.58%	0.0462%
Montana\Beaverhead	16533	42828		1239068	3.46%	1.33%	0.0461%
Kansas\Wallace	111884	760		429533	0.18%	26.05%	0.0461%
Oregon\Crook	14851	17975		761548	2.36%	1.95%	0.0460%
Alabama\Etowah	15816	258		94201	0.27%	16.79%	0.0460%
Tennessee\Lawrence	42385	496	119	238318	0.26%	17.79%	0.0459%
South Carolina\Lancaster	5141	378		65210	0.58%	7.88%	0.0457%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
North Carolina\Haywood	4408	326		56212	0.58%	7.84%	0.0455%
Arkansas\Craighead	232268	222		336919	0.07%	68.94%	0.0454%
Oregon\Wasco	91917	4451		949462	0.47%	9.68%	0.0454%
Texas\Childress	41113	1756		399383	0.44%	10.29%	0.0453%
North Carolina\Cabarrus	21219	95		66780	0.14%	31.77%	0.0452%
Oklahoma\Cotton	74217	813		366651	0.22%	20.24%	0.0449%
North Carolina\Watauga	3262	286		45782	0.62%	7.13%	0.0445%
South Carolina\Newberry	13781	328		100796	0.33%	13.67%	0.0445%
Utah\Kane	3962	1443		113417	1.27%	3.49%	0.0444%
Kansas\Lane	115069	613		401399	0.15%	28.67%	0.0438%
Virginia\King William	19258	48		46065	0.10%	41.81%	0.0436%
Missouri\St. Clair	31908	740	218	265009	0.36%	12.04%	0.0435%
Utah\Morgan	4122	9406	115	301095	3.16%	1.37%	0.0433%
Georgia\Gordon	16031	165		79128	0.21%	20.26%	0.0422%
North Carolina\McDowell	2488	89		22968	0.39%	10.83%	0.0420%
Kansas\Greenwood	61298	2536		608891	0.42%	10.07%	0.0419%
Tennessee\Hawkins	8679	1032	65	151042	0.73%	5.75%	0.0417%
Tennessee\Sumner	21259	659		183419	0.36%	11.59%	0.0416%
Oklahoma\Craig	81576	1066		457292	0.23%	17.84%	0.0416%
Oklahoma\Creek	31281	1853	39	377437	0.50%	8.29%	0.0415%
Tennessee\Cheatham	9139	180		63122	0.29%	14.48%	0.0413%
Tennessee\Johnson	2073	377		43543	0.87%	4.76%	0.0412%
North Carolina\Alamance	13690	231		87888	0.26%	15.58%	0.0409%
Michigan\Chippewa	1000	3575	424	98967	4.04%	1.01%	0.0408%
Missouri\Douglas	11494	1879	395	254283	0.89%	4.52%	0.0404%
Oklahoma\McIntosh	47017	519		246730	0.21%	19.06%	0.0401%
North Carolina\Ashe	11349	379	36	108452	0.38%	10.46%	0.0400%
Tennessee\McMinn	11126	214	325	122502	0.44%	9.08%	0.0400%
Alabama\Limestone	92621	241		237188	0.10%	39.05%	0.0397%
West Virginia\Brooke	175	538		15408	3.49%	1.14%	0.0397%
Oklahoma\Ellis	41904	4878		718058	0.68%	5.84%	0.0396%
Tennessee\Maury	31119	650		226404	0.29%	13.74%	0.0395%
Kentucky\Rowan	1683	585		49963	1.17%	3.37%	0.0394%
Missouri\Dallas	8865	1607	603	222900	0.99%	3.98%	0.0394%
Texas\Randall	90649	1223	205	575076	0.25%	15.76%	0.0391%
Texas\Marion	3777	185		42270	0.44%	8.94%	0.0391%
Massachusetts\Barnstable	880	12		5233	0.23%	16.82%	0.0386%
Kentucky\Graves	105860	280		277881	0.10%	38.10%	0.0384%
Tennessee\Grainger	7542	402	27	91862	0.47%	8.21%	0.0383%
Kansas\Chautauqua	25270	1358	74	308232	0.46%	8.20%	0.0381%
Louisiana\East Baton Rouge	8941	220		72165	0.30%	12.39%	0.0378%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
North Carolina\Montgomery	4934	138		42523	0.32%	11.60%	0.0377%
Missouri\Wright	7075	3647	653	284271	1.51%	2.49%	0.0376%
Texas\Rockwall	5254	100		37433	0.27%	14.04%	0.0375%
Nebraska\Brown	50015	3281		661606	0.50%	7.56%	0.0375%
Washington\Douglas	179347	1624		883094	0.18%	20.31%	0.0373%
North Carolina\Guilford	21918	157		96519	0.16%	22.71%	0.0369%
Oklahoma\Hughes	61617	1166		441040	0.26%	13.97%	0.0369%
Colorado\San Miguel	2614	3181		150947	2.11%	1.73%	0.0365%
Washington\Asotin	40446	673		273860	0.25%	14.77%	0.0363%
Texas\Smith	41914	610	180	302359	0.26%	13.86%	0.0362%
Missouri\Texas	20107	2271		355194	0.64%	5.66%	0.0362%
Tennessee\Henry	62904	215		193416	0.11%	32.52%	0.0362%
Utah\Carbon	2857	5786	86	215557	2.72%	1.33%	0.0361%
Colorado\Lincoln	205370	3432		1400054	0.25%	14.67%	0.0360%
Missouri\Crawford	9455	1225	98	186999	0.71%	5.06%	0.0358%
Tennessee\Marshall	11771	652	44	151583	0.46%	7.77%	0.0357%
Tennessee\Franklin	39163	189		144252	0.13%	27.15%	0.0356%
Texas\Williamson	169472	612		541618	0.11%	31.29%	0.0354%
Louisiana\Rapides	67047	165		177300	0.09%	37.82%	0.0352%
Virginia\Louisa	5732	377		78512	0.48%	7.30%	0.0351%
Oregon\Lincoln	2616	130		31179	0.42%	8.39%	0.0350%
Montana\Custer	37996	41624		2127013	1.96%	1.79%	0.0350%
South Carolina\York	10039	536		124176	0.43%	8.08%	0.0349%
Virginia\Dinwiddie	22315	97		78840	0.12%	28.30%	0.0348%
Tennessee\Rhea	4325	183	71	56182	0.45%	7.70%	0.0348%
North Carolina\Lincoln	18231	67		59360	0.11%	30.71%	0.0347%
Oklahoma\Seminole	25602	850		250751	0.34%	10.21%	0.0346%
Texas\Carson	135961	735		537445	0.14%	25.30%	0.0346%
Alabama\Lauderdale	39161	390	65	227692	0.20%	17.20%	0.0344%
Texas\Grayson	73242	503	245	400414	0.19%	18.29%	0.0342%
Kentucky\Kenton	400	1419	124	42544	3.63%	0.94%	0.0341%
Kentucky\Anderson	1535	1610	94	87617	1.94%	1.75%	0.0341%
California\Sonoma	50199	925	981	530895	0.36%	9.46%	0.0339%
Tennessee\Weakley	123759	179		255550	0.07%	48.43%	0.0339%
Texas\Hardeman	52735	874		370113	0.24%	14.25%	0.0336%
Texas\Lee	63046	419	145	325643	0.17%	19.36%	0.0335%
Oklahoma\Beaver	112639	3786		1128871	0.34%	9.98%	0.0335%
Missouri\Gasconade	19980	755		212641	0.36%	9.40%	0.0334%
Tennessee\Lauderdale	84901	145		192232	0.08%	44.17%	0.0333%
Kentucky\Madison	4756	3334		218194	1.53%	2.18%	0.0333%
Texas\Limestone	79380	1072		505846	0.21%	15.69%	0.0333%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Tennessee\Claiborne	9277	484	72	124757	0.45%	7.44%	0.0331%
Missouri\Oregon	14007	1351		239390	0.56%	5.85%	0.0330%
Texas\Milam	163378	408	174	538678	0.11%	30.33%	0.0328%
Virginia\Bedford	7548	1806	147	212237	0.92%	3.56%	0.0327%
Virginia\Cumberland	2685	172	220	56817	0.69%	4.73%	0.0326%
North Carolina\Rutherford	5262	268		65898	0.41%	7.99%	0.0325%
Texas\Dallam	184494	1538		936886	0.16%	19.69%	0.0323%
Nebraska\Rock	49433	2605		631940	0.41%	7.82%	0.0322%
Texas\Cherokee	45134	535	83	294383	0.21%	15.33%	0.0322%
Pennsylvania\Greene	2065	3170	339	150203	2.34%	1.37%	0.0321%
Oklahoma\Rogers	61796	606	107	371349	0.19%	16.64%	0.0320%
Alabama\Morgan	32465	255		161531	0.16%	20.10%	0.0317%
Arkansas\Scott	8170	360		96465	0.37%	8.47%	0.0316%
Tennessee\Shelby	43316	62		92299	0.07%	46.93%	0.0315%
West Virginia\Morgan	735	215		22440	0.96%	3.28%	0.0314%
Texas\Fannin	69271	919	84	473853	0.21%	14.62%	0.0309%
Virginia\Powhatan	2442	112		29792	0.38%	8.20%	0.0308%
Texas\Martin	127741	505		457990	0.11%	27.89%	0.0308%
Texas\Ellis	101110	575	21	442656	0.13%	22.84%	0.0308%
North Carolina\Harnett	47396	81		111770	0.07%	42.40%	0.0307%
Missouri\Miller	13676	1352		245500	0.55%	5.57%	0.0307%
Tennessee\Dyer	114784	151		238614	0.06%	48.10%	0.0304%
South Dakota\Custer	12896	8523		601129	1.42%	2.15%	0.0304%
South Carolina\Lexington	24082	103		90324	0.11%	26.66%	0.0304%
North Carolina\Rockingham	15280	272		117113	0.23%	13.05%	0.0303%
Texas\Hidalgo	164466	962		722582	0.13%	22.76%	0.0303%
North Carolina\Davie	11638	127		69872	0.18%	16.66%	0.0303%
California\Shasta	9333	4894	36	390812	1.26%	2.39%	0.0301%
California\Amador	4956	1613		163482	0.99%	3.03%	0.0299%
Oklahoma\Woodward	63660	2879		783200	0.37%	8.13%	0.0299%
Virginia\Halifax	8932	1167	82	193683	0.64%	4.61%	0.0297%
Arkansas\Lincoln	93178	110		186024	0.06%	50.09%	0.0296%
Oregon\Douglas	24126	1928		396984	0.49%	6.08%	0.0295%
West Virginia	108454	28465	8734	3697606	1.01%	2.93%	0.0295%
Tennessee\Tipton	82632	103		170182	0.06%	48.56%	0.0294%
Ohio\Lawrence	1914	480	175	65740	1.00%	2.91%	0.0290%
Tennessee\Putnam	11277	276		103679	0.27%	10.88%	0.0290%
Texas\Wise	49013	1013	144	442753	0.26%	11.07%	0.0289%
West Virginia\Hardy	8176	542	96	134357	0.47%	6.09%	0.0289%
Texas\Camp	9401	144		68552	0.21%	13.71%	0.0288%
Kentucky\Lee	315	782		29419	2.66%	1.07%	0.0285%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Missouri\Phelps	5180	1623	76	175849	0.97%	2.95%	0.0285%
West Virginia\Pendleton	5185	1086	495	169876	0.93%	3.05%	0.0284%
Alabama\Lawrence	59180	236		222401	0.11%	26.61%	0.0282%
Utah\Duchesne	9576	33357	719	1076470	3.17%	0.89%	0.0282%
Virginia\Charlotte	6031	585	144	125531	0.58%	4.80%	0.0279%
Kentucky\Hopkins	52478	11	124	159366	0.08%	32.93%	0.0279%
North Carolina\Graham	141	102		7182	1.42%	1.96%	0.0279%
Oklahoma\Delaware	52691	352	149	308970	0.16%	17.05%	0.0277%
California\Inyo	7160	3273		292552	1.12%	2.45%	0.0274%
Texas\Bell	109626	401	65	431945	0.11%	25.38%	0.0274%
Alabama\Marshall	36905	162	15	154548	0.11%	23.88%	0.0273%
Kentucky\Laurel	2410	841	349	102489	1.16%	2.35%	0.0273%
Texas\Gonzales	112984	1032		654077	0.16%	17.27%	0.0273%
New Hampshire\Belknap	387	384		23378	1.64%	1.66%	0.0272%
Texas\Burleson	72654	487		361022	0.13%	20.12%	0.0271%
Texas\McLennan	177453	429		529621	0.08%	33.51%	0.0271%
Montana\Rosebud	55733	35367		2714024	1.30%	2.05%	0.0268%
Alabama\Calhoun	11876	130		76201	0.17%	15.59%	0.0266%
Texas\Van Zandt	62383	651	85	415983	0.18%	15.00%	0.0265%
Texas\Collingsworth	60048	1160		512537	0.23%	11.72%	0.0265%
North Carolina\Bladen	46004	92		127171	0.07%	36.17%	0.0262%
North Carolina\Yancey	1643	177		33431	0.53%	4.91%	0.0260%
North Carolina\Randolph	22363	251		147316	0.17%	15.18%	0.0259%
Washington\Grays Harbor	6366	108	468	119267	0.48%	5.34%	0.0258%
Oregon\Sherman	161529	421		514004	0.08%	31.43%	0.0257%
Texas\Floyd	188056	535		627686	0.09%	29.96%	0.0255%
Arizona\Mohave	18053	10374		858392	1.21%	2.10%	0.0254%
Virginia\Chesterfield	3431	34		21527	0.16%	15.94%	0.0252%
Colorado\Jefferson	1908	1061	80	93294	1.22%	2.05%	0.0250%
North Carolina\Chatham	14329	189		104171	0.18%	13.76%	0.0250%
Alabama\Jackson	53819	271		242850	0.11%	22.16%	0.0247%
Virginia\Appomattox	2733	520		75874	0.69%	3.60%	0.0247%
Virginia\Fluvanna	2783	211		48883	0.43%	5.69%	0.0246%
Virginia\Pittsylvania	18684	887	102	274289	0.36%	6.81%	0.0246%
Tennessee\Bradley	10376	215		95602	0.22%	10.85%	0.0244%
Tennessee\Warren	29707	210		160583	0.13%	18.50%	0.0242%
Oregon\Harney	11331	45514		1461508	3.11%	0.78%	0.0241%
South Dakota\Shannon	43706	9094	660	1333708	0.73%	3.28%	0.0240%
Mississippi\Yazoo	137515	220		355528	0.06%	38.68%	0.0239%
North Carolina\Wilkes	11949	241		109970	0.22%	10.87%	0.0238%
Arkansas\Madison	27364	585		259540	0.23%	10.54%	0.0238%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Virginia\Roanoke	1312	154		29214	0.53%	4.49%	0.0237%
North Carolina\Caldwell	4411	57		32593	0.17%	13.53%	0.0237%
Texas\Upshur	19015	310	178	198131	0.25%	9.60%	0.0236%
Virginia\Mecklenburg	12500	422	43	157317	0.30%	7.95%	0.0235%
West Virginia\Raleigh	1561	283		43401	0.65%	3.60%	0.0235%
Missouri\Wayne	7808	337		106055	0.32%	7.36%	0.0234%
New Mexico\Valencia	4886	12201	24	505682	2.42%	0.97%	0.0234%
Texas\Austin	46501	482	77	333928	0.17%	13.93%	0.0233%
Colorado\El Paso	11377	7772		616418	1.26%	1.85%	0.0233%
Texas\Franklin	18828	220		133528	0.16%	14.10%	0.0232%
Arkansas\Hempstead	26057	395		210571	0.19%	12.37%	0.0232%
South Carolina\Pickens	3313	184		51264	0.36%	6.46%	0.0232%
Tennessee\Van Buren	4886	57		34844	0.16%	14.02%	0.0229%
Nebraska\Blaine	11238	3995		443257	0.90%	2.54%	0.0229%
Texas\Brazoria	74728	787	67	528957	0.16%	14.13%	0.0228%
Kentucky\Lewis	1822	2652	38	146761	1.83%	1.24%	0.0228%
Arkansas\Miller	50348	138		174931	0.08%	28.78%	0.0227%
Oklahoma\Osage	119464	2902	250	1290680	0.24%	9.26%	0.0226%
Georgia\Morgan	11356	170		92433	0.18%	12.29%	0.0226%
Utah\Rich	3210	9270		363567	2.55%	0.88%	0.0225%
West Virginia\Pocahontas	2717	821	404	121878	1.01%	2.23%	0.0224%
Texas\Ochiltree	181900	412		579476	0.07%	31.39%	0.0223%
North Carolina\Jackson	2643	15		13338	0.11%	19.82%	0.0223%
West Virginia\Summers	1450	462	83	59628	0.91%	2.43%	0.0222%
Alabama\Mobile	27604	104		113653	0.09%	24.29%	0.0222%
Virginia\Amherst	2327	743		88430	0.84%	2.63%	0.0221%
Arkansas\Nevada	7830	120		65215	0.18%	12.01%	0.0221%
Tennessee\Cannon	20328	148		116720	0.13%	17.42%	0.0221%
North Carolina\Stokes	7097	255		91014	0.28%	7.80%	0.0218%
Virginia\Albemarle	6195	881		158314	0.56%	3.91%	0.0218%
South Carolina\Orangeburg	96609	144	42	287524	0.06%	33.60%	0.0217%
Texas\Caldwell	54927	327	39	304737	0.12%	18.02%	0.0216%
South Carolina\Aiken	21527	255		159312	0.16%	13.51%	0.0216%
West Virginia\Mineral	1017	992	292	77957	1.65%	1.30%	0.0215%
Virginia\Lunenburg	3260	137	317	83232	0.55%	3.92%	0.0214%
Tennessee\Williamson	18250	305		161851	0.19%	11.28%	0.0212%
Colorado\Archuleta	3179	1476		149584	0.99%	2.13%	0.0210%
Alabama\Walker	7527	138		70382	0.20%	10.69%	0.0210%
Arkansas\White	81932	433		411404	0.11%	19.92%	0.0210%
Arkansas\Carroll	24712	496		242506	0.20%	10.19%	0.0208%
Texas\Wharton	219675	359		615851	0.06%	35.67%	0.0208%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Washington\Pierce	4493	105		47677	0.22%	9.42%	0.0208%
Colorado\Crowley	6330	6671		451225	1.48%	1.40%	0.0207%
Virginia\Brunswick	8780	177		86700	0.20%	10.13%	0.0207%
Kentucky\Whitley	1372	673	137	73414	1.10%	1.87%	0.0206%
Utah\Summit	4754	7361	70	414928	1.79%	1.15%	0.0205%
North Carolina\Wayne	93975	67		175265	0.04%	53.62%	0.0205%
Arkansas\Crawford	16636	174		119227	0.15%	13.95%	0.0204%
Kansas\Wichita	174627	314		519858	0.06%	33.59%	0.0203%
Virginia\Buckingham	2429	499		77293	0.65%	3.14%	0.0203%
Louisiana\Livingston	3040	60		29987	0.20%	10.14%	0.0203%
Texas\Madison	50076	302		273109	0.11%	18.34%	0.0203%
Texas\Parker	29915	889	428	441575	0.30%	6.77%	0.0202%
Texas\Willacy	123392	187		338048	0.06%	36.50%	0.0202%
Tennessee\Monroe	9130	189		92570	0.20%	9.86%	0.0201%
Tennessee\Grundy	8124	45		42668	0.11%	19.04%	0.0201%
Arkansas\Pope	29519	159		153693	0.10%	19.21%	0.0199%
Missouri\Maries	7532	1349	175	240376	0.63%	3.13%	0.0199%
Tennessee\Carroll	55798	114		179703	0.06%	31.05%	0.0197%
Missouri\Ozark	13853	859		247815	0.35%	5.59%	0.0194%
Oklahoma\Cherokee	38482	302		246421	0.12%	15.62%	0.0191%
Tennessee\Sevier	5038	121		56449	0.21%	8.92%	0.0191%
Kansas\Elk	30359	630		316707	0.20%	9.59%	0.0191%
Virginia\Campbell	7118	527		140359	0.38%	5.07%	0.0190%
Tennessee\Giles	32433	350	51	261411	0.15%	12.41%	0.0190%
Arkansas\Boone	30539	365		242042	0.15%	12.62%	0.0190%
Oklahoma\Love	39775	328		261875	0.13%	15.19%	0.0190%
Texas\Anderson	46327	393	94	346142	0.14%	13.38%	0.0188%
Virginia\Prince Edward	3902	326		82329	0.40%	4.74%	0.0188%
North Carolina\Moore	12663	95		80075	0.12%	15.81%	0.0188%
Texas\Travis	35720	360		262481	0.14%	13.61%	0.0187%
Colorado\Pueblo	13165	11185	562	910566	1.29%	1.45%	0.0187%
Tennessee\Humphreys	15376	126	42	118412	0.14%	12.99%	0.0184%
Tennessee\Loudon	10273	106		77040	0.14%	13.33%	0.0183%
Georgia\Greene	3578	156		55334	0.28%	6.47%	0.0182%
Mississippi\Lafayette	9760	244		114378	0.21%	8.53%	0.0182%
Oklahoma\Washington	45889	203		226568	0.09%	20.25%	0.0181%
Florida\Washington	5462	178		73836	0.24%	7.40%	0.0178%
Georgia\Franklin	16810	70		81364	0.09%	20.66%	0.0178%
North Carolina\Johnston	88707	75		194090	0.04%	45.70%	0.0177%
Texas\Fayette	91707	396	220	565708	0.11%	16.21%	0.0177%
Arkansas\Clark	9798	120		81808	0.15%	11.98%	0.0176%

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County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Mississippi\Pike	7958	119		73422	0.16%	10.84%	0.0176%
Texas\Panola	19679	298	124	217757	0.19%	9.04%	0.0175%
Mississippi\Panola	75997	122	44	269806	0.06%	28.17%	0.0173%
West Virginia\Wood	2021	516	162	88991	0.76%	2.27%	0.0173%
Virginia\Wise	431	147	50	22169	0.89%	1.94%	0.0173%
Alabama\Talladega	18106	135		119042	0.11%	15.21%	0.0172%
Kentucky\Wolfe	1023	554		57701	0.96%	1.77%	0.0170%
Virginia\Craig	900	325		41630	0.78%	2.16%	0.0169%
Texas\Cameron	111033	182	3	349479	0.05%	31.77%	0.0168%
Oklahoma\Okmulgee	48505	298		294324	0.10%	16.48%	0.0167%
Texas\Dickens	37540	1444		574273	0.25%	6.54%	0.0164%
Oklahoma\Atoka	52087	524		408444	0.13%	12.75%	0.0164%
Florida\Jackson	63926	247		311398	0.08%	20.53%	0.0163%
Tennessee\Bedford	26828	324		231206	0.14%	11.60%	0.0163%
Texas\Shelby	23909	266		197791	0.13%	12.09%	0.0163%
Oklahoma\Latimer	25427	290		213411	0.14%	11.91%	0.0162%
Colorado\Kiowa	253201	585		957937	0.06%	26.43%	0.0161%
Georgia\Pierce	22226	37		71750	0.05%	30.98%	0.0160%
Texas\Waller	31518	179	192	271004	0.14%	11.63%	0.0159%
South Carolina\Spartanburg	10926	175		109917	0.16%	9.94%	0.0158%
Tennessee\Rutherford	21021	203		164411	0.12%	12.79%	0.0158%
Tennessee\Campbell	1821	101		34174	0.30%	5.33%	0.0157%
Arkansas\Lawrence	134927	81		263615	0.03%	51.18%	0.0157%
Florida\Marion	25168	438		266571	0.16%	9.44%	0.0155%
Tennessee\Overton	13603	149		114800	0.13%	11.85%	0.0154%
Oklahoma\Pittsburg	67012	681		547050	0.12%	12.25%	0.0152%
North Carolina\Person	17493	84		98521	0.09%	17.76%	0.0151%
South Dakota\Fall River	15786	8596		949697	0.91%	1.66%	0.0150%
West Virginia\Randolph	3056	535		104441	0.51%	2.93%	0.0150%
Virginia\Bath	1735	125		38412	0.33%	4.52%	0.0147%
Arkansas\Conway	42435	119		187142	0.06%	22.68%	0.0144%
Tennessee\Houston	4952	64		47190	0.14%	10.49%	0.0142%
Georgia\Carroll	17287	76		96197	0.08%	17.97%	0.0142%
Virginia\Buchanan	199	62		9331	0.66%	2.13%	0.0142%
Texas\Dallas	16521	66		88010	0.07%	18.77%	0.0141%
Oklahoma\Okfuskee	39368	317		298814	0.11%	13.17%	0.0140%
Tennessee\Cumberland	9752	189	25	122554	0.17%	7.96%	0.0139%
Tennessee\Lincoln	63815	147		260874	0.06%	24.46%	0.0138%
Texas\Houston	63282	419		440462	0.10%	14.37%	0.0137%
Texas\Bowie	31412	243	126	291674	0.13%	10.77%	0.0136%
Texas\Karnes	74985	316		417484	0.08%	17.96%	0.0136%

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South Carolina\Lee	67006	40		141037	0.03%	47.51%	0.0135%
Tennessee\Smith	21976	99		127108	0.08%	17.29%	0.0135%
Florida\Pasco	16693	180		149963	0.12%	11.13%	0.0134%
Florida\Lafayette	5466	161		81277	0.20%	6.73%	0.0133%
Florida\Walton	21260	100		126841	0.08%	16.76%	0.0132%
Tennessee\White	27216	84		131652	0.06%	20.67%	0.0132%
Missouri\Washington	3006	826		137304	0.60%	2.19%	0.0132%
Oklahoma\Pushmataha	22304	497		290409	0.17%	7.68%	0.0131%
Missouri\Ripley	12789	193		137258	0.14%	9.32%	0.0131%
Louisiana\St. Helena	5697	62		52363	0.12%	10.88%	0.0129%
Texas\Polk	5125	208	224	131664	0.33%	3.89%	0.0128%
Tennessee\Knox	6074	144		82938	0.17%	7.32%	0.0127%
Texas\Hopkins	36505	371	155	390466	0.13%	9.35%	0.0126%
Massachusetts\Norfolk	224	76		11654	0.65%	1.92%	0.0125%
Mississippi\Amite	7187	110	100	109969	0.19%	6.54%	0.0125%
New Mexico\Chaves	34851	20207	1208	2454564	0.87%	1.42%	0.0124%
Kentucky\Magoffin	876	534		61620	0.87%	1.42%	0.0123%
New Mexico\Luna	16919	3103		653558	0.47%	2.59%	0.0123%
Texas\Wood	20232	332		233796	0.14%	8.65%	0.0123%
Tennessee\Anderson	3528	56		40135	0.14%	8.79%	0.0123%
California\Santa Clara	9027	1213		299866	0.40%	3.01%	0.0122%
Texas\Trinity	7052	205		108974	0.19%	6.47%	0.0122%
Texas\Donley	24040	1743		588947	0.30%	4.08%	0.0121%
Tennessee\Hancock	4523	98		60646	0.16%	7.46%	0.0121%
North Carolina\Gaston	4998	34		37561	0.09%	13.31%	0.0120%
Kentucky\Owsley	458	338		35857	0.94%	1.28%	0.0120%
Arkansas\Crittenden	196565	60		313688	0.02%	62.66%	0.0120%
Georgia\Jackson	14359	60		84869	0.07%	16.92%	0.0120%
West Virginia\Harrison	1705	495	375	111657	0.78%	1.53%	0.0119%
Texas\Guadalupe	68144	143	115	385015	0.07%	17.70%	0.0119%
West Virginia\Gilmer	1907	252		64033	0.39%	2.98%	0.0117%
Mississippi\Jackson	5154	39		41445	0.09%	12.44%	0.0117%
Alabama\Monroe	17243	95		118805	0.08%	14.51%	0.0116%
California\Placer	11816	170		132221	0.13%	8.94%	0.0115%
Colorado\Huerfano	3923	7774		518619	1.50%	0.76%	0.0113%
West Virginia\Braxton	2223	293	27	79437	0.40%	2.80%	0.0113%
Texas\Cass	14394	202	40	176645	0.14%	8.15%	0.0112%
Arkansas\Izard	16093	201		170415	0.12%	9.44%	0.0111%
North Carolina\Columbus	66293	39		152387	0.03%	43.50%	0.0111%
Arkansas\Sharp	16841	224		184105	0.12%	9.15%	0.0111%
Georgia\Coffee	55054	69		184947	0.04%	29.77%	0.0111%

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Texas\Cooke	71051	302	19	455393	0.07%	15.60%	0.0110%
Georgia\Jefferson	36244	36		108932	0.03%	33.27%	0.0110%
North Carolina\Vance	8337	40		55091	0.07%	15.13%	0.0110%
Missouri\Cedar	14398	272		190528	0.14%	7.56%	0.0108%
Texas\Briscoe	59559	540		546734	0.10%	10.89%	0.0108%
Tennessee\Jackson	7437	82		75642	0.11%	9.83%	0.0107%
Georgia\Polk	5119	40		43869	0.09%	11.67%	0.0106%
Texas\Bastrop	74256	228	3	402079	0.06%	18.47%	0.0106%
Nebraska\Arthur	5529	3934		453615	0.87%	1.22%	0.0106%
Tennessee\Crockett	83621	28		149227	0.02%	56.04%	0.0105%
Arkansas\Polk	13943	134		133351	0.10%	10.46%	0.0105%
Texas\Hamilton	30285	415	337	470850	0.16%	6.43%	0.0103%
New Mexico\Quay	68071	3343		1489686	0.22%	4.57%	0.0103%
Missouri\Dent	4306	739		176601	0.42%	2.44%	0.0102%
Oklahoma\Pontotoc	35864	409		379236	0.11%	9.46%	0.0102%
Oklahoma\Adair	33114	190		249280	0.08%	13.28%	0.0101%
Kentucky\Clay	1400	189		51194	0.37%	2.73%	0.0101%
Mississippi\Pearl River	10865	170		135676	0.13%	8.01%	0.0100%
Tennessee\Hamilton	4204	71		54599	0.13%	7.70%	0.0100%
Oklahoma\Coal	27938	260		269401	0.10%	10.37%	0.0100%
Mississippi\Forrest	4704	44		45532	0.10%	10.33%	0.0100%
Washington\Jefferson	209	77		12717	0.61%	1.64%	0.0100%
Arkansas\Logan	38637	66		160380	0.04%	24.09%	0.0099%
North Carolina\Granville	8304	195		128366	0.15%	6.47%	0.0098%
Texas\Scurry	65724	402		519550	0.08%	12.65%	0.0098%
Texas\Tyler	3776	184		84253	0.22%	4.48%	0.0098%
Kentucky\Menifee	432	420		43110	0.97%	1.00%	0.0098%
Utah\Uintah	8488	36019	869	1799785	2.05%	0.47%	0.0097%
Texas\Morris	11908	45	14	85666	0.07%	13.90%	0.0096%
Kentucky\Greenup	1057	659	102	91853	0.83%	1.15%	0.0095%
South Carolina\Greenville	7972	61		72645	0.08%	10.97%	0.0092%
Texas\Grimes	70935	178	69	437140	0.06%	16.23%	0.0092%
Missouri\Camden	3015	632		144379	0.44%	2.09%	0.0091%
Alabama\Henry	38860	64		165699	0.04%	23.45%	0.0091%
Tennessee\Macon	11093	133		127801	0.10%	8.68%	0.0090%
South Carolina\Anderson	17938	150		173149	0.09%	10.36%	0.0090%
Texas\Harrison	14729	222	23	200875	0.12%	7.33%	0.0089%
West Virginia\Hampshire	2096	588	124	129190	0.55%	1.62%	0.0089%
Kentucky\Carter	1380	1015		125503	0.81%	1.10%	0.0089%
Wyoming\Uinta	7841	6251		742809	0.84%	1.06%	0.0089%
Texas\Hunt	50382	195	71	388422	0.07%	12.97%	0.0089%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
West Virginia\Cabell	943	212		47625	0.45%	1.98%	0.0088%
Maine\Hancock	3945	62		52749	0.12%	7.48%	0.0088%
Alabama\Covington	32994	106		200141	0.05%	16.49%	0.0087%
Tennessee\Trousdale	7318	23		44006	0.05%	16.63%	0.0087%
Texas\Cottle	26717	919		534519	0.17%	5.00%	0.0086%
Georgia\Cook	22780	16		65138	0.02%	34.97%	0.0086%
Alabama\Hale	9922	248		169287	0.15%	5.86%	0.0086%
Colorado\Custer	2093	777		137799	0.56%	1.52%	0.0086%
Texas\DeWitt	80725	320		549237	0.06%	14.70%	0.0086%
Arkansas\Faulkner	22910	135		190089	0.07%	12.05%	0.0086%
Florida\Alachua	21989	115		172843	0.07%	12.72%	0.0085%
Nebraska\McPherson	2153	3895		315210	1.24%	0.68%	0.0084%
Missouri\Pulaski	1863	681		123074	0.55%	1.51%	0.0084%
Florida\Santa Rosa	14721	28		70179	0.04%	20.98%	0.0084%
Tennessee\Roane	2617	88		52582	0.17%	4.98%	0.0083%
West Virginia\Grant	1113	350	526	108839	0.80%	1.02%	0.0082%
Maine\Sagadahoc	140	202		18616	1.09%	0.75%	0.0082%
Tennessee\Cocke	4847	69		64163	0.11%	7.55%	0.0081%
West Virginia\Nicholas	410	311	211	51332	1.02%	0.80%	0.0081%
North Carolina\Madison	1956	184		66734	0.28%	2.93%	0.0081%
West Virginia\Barbour	1033	646		91017	0.71%	1.13%	0.0081%
Kentucky\McCreary	351	52		15056	0.35%	2.33%	0.0081%
Wyoming\Campbell	9586	45631	277	2345915	1.96%	0.41%	0.0080%
Texas\Johnson	41893	170	39	331347	0.06%	12.64%	0.0080%
Texas\Navarro	90512	302		586936	0.05%	15.42%	0.0079%
Wyoming\Converse	15217	28914	262	2366020	1.23%	0.64%	0.0079%
Tennessee\Moore	5711	37		51814	0.07%	11.02%	0.0079%
Kentucky\Morgan	1609	812	94	136303	0.66%	1.18%	0.0078%
Alabama\Washington	6319	86		83610	0.10%	7.56%	0.0078%
Oregon\Grant	5023	8796	177	761541	1.18%	0.66%	0.0078%
Texas\Angelina	9252	110		115258	0.10%	8.03%	0.0077%
Texas\Bosque	36482	598	39	550995	0.12%	6.62%	0.0077%
California\Mendocino	18867	1218	278	608674	0.25%	3.10%	0.0076%
Alabama\Baldwin	62245	44		189815	0.02%	32.79%	0.0076%
Texas\Freestone	59984	148	54	399584	0.05%	15.01%	0.0076%
Tennessee\Hardeman	34557	48		147951	0.03%	23.36%	0.0076%
Alabama\Franklin	9992	150		140861	0.11%	7.09%	0.0076%
California\Napa	30092	125		223246	0.06%	13.48%	0.0075%
California\Santa Barbara	47128	841		727050	0.12%	6.48%	0.0075%
Arkansas\Cleburne	14033	90		129815	0.07%	10.81%	0.0075%
Tennessee\Union	2305	68		45917	0.15%	5.02%	0.0074%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Texas\Erath	45726	324	304	622923	0.10%	7.34%	0.0074%
Texas\Harris	22186	222		259039	0.09%	8.56%	0.0073%
North Carolina\Sampson	123790	61		321454	0.02%	38.51%	0.0073%
Texas\Bexar	34421	385		425909	0.09%	8.08%	0.0073%
Arkansas\Stone	10198	145		142397	0.10%	7.16%	0.0073%
Mississippi\Jones	11771	74		109837	0.07%	10.72%	0.0072%
North Carolina\Franklin	22912	40		112871	0.04%	20.30%	0.0072%
North Carolina\Mitchell	1541	24		22787	0.11%	6.76%	0.0071%
Tennessee\Fentress	6601	76		84371	0.09%	7.82%	0.0070%
Arkansas\Marion	9728	123		130445	0.09%	7.46%	0.0070%
Tennessee\Pickett	3607	28		37916	0.07%	9.51%	0.0070%
Tennessee\Lewis	1190	74		35566	0.21%	3.35%	0.0070%
West Virginia\Lincoln	360	202		32393	0.62%	1.11%	0.0069%
Alabama\Chilton	8644	79		100217	0.08%	8.63%	0.0068%
Mississippi\Tippah	20526	62		137434	0.05%	14.94%	0.0067%
West Virginia\Monongalia	294	614	185	59257	1.35%	0.50%	0.0067%
Nebraska\Cherry	42861	22021		3759629	0.59%	1.14%	0.0067%
Georgia\Irwin	61280	23		145432	0.02%	42.14%	0.0067%
Arkansas\Independence	61950	67		249653	0.03%	24.81%	0.0067%
South Carolina\Barnwell	22861	25		92679	0.03%	24.67%	0.0067%
Texas\Nacogdoches	20332	189	40	265131	0.09%	7.67%	0.0066%
Texas\Wheeler	34809	642		583522	0.11%	5.97%	0.0066%
Virginia\Highland	1583	244		76764	0.32%	2.06%	0.0066%
Texas\Lavaca	87769	236		566648	0.04%	15.49%	0.0065%
West Virginia\Jackson	1606	670		129466	0.52%	1.24%	0.0064%
West Virginia\Mercer	1211	154		53971	0.29%	2.24%	0.0064%
Oregon\Wheeler	9171	4006		757780	0.53%	1.21%	0.0064%
Texas\Comanche	45935	62	398	578943	0.08%	7.93%	0.0063%
Virginia\Nottoway	3486	76		65321	0.12%	5.34%	0.0062%
Tennessee\Wilson	21984	103		192920	0.05%	11.40%	0.0061%
Tennessee\Dickson	5647	207		139176	0.15%	4.06%	0.0060%
Kentucky\Elliott	585	428	30	66843	0.69%	0.88%	0.0060%
Texas\Montague	46898	319	10	507690	0.06%	9.24%	0.0060%
Tennessee\Hickman	8652	87		112187	0.08%	7.71%	0.0060%
Missouri\Taney	4211	161		106536	0.15%	3.95%	0.0060%
Wyoming\Natrona	11242	25269		2181451	1.16%	0.52%	0.0060%
Texas\Tarrant	9042	157		154377	0.10%	5.86%	0.0060%
Texas\Walker	22817	131		224050	0.06%	10.18%	0.0060%
Wyoming\Weston	4806	21847		1328294	1.64%	0.36%	0.0060%
Kentucky\Perry	66	102		10661	0.96%	0.62%	0.0059%
Texas\Medina	57332	471	100	748144	0.08%	7.66%	0.0058%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Alabama\Pickens	7882	126		130751	0.10%	6.03%	0.0058%
Texas\Liberty	29008	105	72	297855	0.06%	9.74%	0.0058%
Florida\Hernando	4964	36		56237	0.06%	8.83%	0.0057%
Kentucky\Cumberland	2273	265		103368	0.26%	2.20%	0.0056%
Kentucky\Lawrence	365	513	41	60220	0.92%	0.61%	0.0056%
Arkansas\Newton	5104	139		112985	0.12%	4.52%	0.0056%
Kentucky\Johnson	168	254		27766	0.91%	0.61%	0.0055%
Alabama\Marengo	9042	192		178157	0.11%	5.08%	0.0055%
Texas\Red River	48733	220		449525	0.05%	10.84%	0.0053%
California\San Diego	26680	183		303889	0.06%	8.78%	0.0053%
New Mexico\Torrance	13985	12152		1796048	0.68%	0.78%	0.0053%
Texas\Swisher	140112	119		563067	0.02%	24.88%	0.0053%
Texas\Victoria	85417	150		493823	0.03%	17.30%	0.0053%
Wyoming\Johnson	8942	21923		1946197	1.13%	0.46%	0.0052%
Tennessee\Morgan	2579	55		53335	0.10%	4.84%	0.0050%
West Virginia\Marshall	488	895	39	95814	0.97%	0.51%	0.0050%
Texas\Jasper	7201	63		95928	0.07%	7.51%	0.0049%
Texas\Rusk	20369	185	33	300900	0.07%	6.77%	0.0049%
Alabama\Tuscaloosa	12925	46		110588	0.04%	11.69%	0.0049%
Colorado\Las Animas	18375	12028	448	2179242	0.57%	0.84%	0.0048%
West Virginia\Putnam	1326	157		66416	0.24%	2.00%	0.0047%
Kentucky\Boyd	808	48		28738	0.17%	2.81%	0.0047%
West Virginia\Fayette	382	87		26677	0.33%	1.43%	0.0047%
Texas\Lipscomb	40813	369		571057	0.06%	7.15%	0.0046%
West Virginia\Calhoun	890	161		56006	0.29%	1.59%	0.0046%
Texas\Kaufman	64799	125		421803	0.03%	15.36%	0.0046%
Colorado\Fremont	748	5122	126	295893	1.77%	0.25%	0.0045%
Georgia\Walker	8069	28		71152	0.04%	11.34%	0.0045%
Wyoming\Sweetwater	4621	20607	700	1486395	1.43%	0.31%	0.0045%
Texas\Montgomery	15178	48	36	169914	0.05%	8.93%	0.0044%
Tennessee\Bledsoe	8406	44		92043	0.05%	9.13%	0.0044%
Oregon\Coos	3415	268		145675	0.18%	2.34%	0.0043%
Alabama\Crenshaw	7466	100		132385	0.08%	5.64%	0.0043%
Maine\Washington	3885	274		158459	0.17%	2.45%	0.0042%
Oklahoma\Jefferson	29583	303		460207	0.07%	6.43%	0.0042%
South Carolina\Greenwood	2810	75		70698	0.11%	3.97%	0.0042%
West Virginia\Lewis	2214	160		92160	0.17%	2.40%	0.0042%
Texas\Gillespie	26101	681		652940	0.10%	4.00%	0.0042%
Texas\Hardin	4081	84		91189	0.09%	4.48%	0.0041%
Alabama\Marion	10277	55		117206	0.05%	8.77%	0.0041%
West Virginia\Webster	121	45		11530	0.39%	1.05%	0.0041%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Nevada\Elko	14305	12076		2085135	0.58%	0.69%	0.0040%
Mississippi\Leake	8756	71		127443	0.06%	6.87%	0.0038%
Texas\Atascosa	37976	412		643594	0.06%	5.90%	0.0038%
West Virginia\Taylor	1138	96		53806	0.18%	2.12%	0.0038%
Mississippi\Madison	27872	66		222627	0.03%	12.52%	0.0037%
New Mexico\Santa Fe	3811	3070	39	569404	0.55%	0.67%	0.0037%
Alabama\Lamar	3117	83		84645	0.10%	3.68%	0.0036%
Missouri\Shannon	2235	197		110905	0.18%	2.02%	0.0036%
Mississippi\Tishomingo	3976	29		56764	0.05%	7.00%	0.0036%
Texas\Clay	58791	226	39	661617	0.04%	8.89%	0.0036%
Texas\Brown	28456	392		560065	0.07%	5.08%	0.0036%
Texas\Coryell	55406	153		488358	0.03%	11.35%	0.0036%
Wyoming\Sublette	2277	5485		599289	0.92%	0.38%	0.0035%
Texas\Jones	91555	124		573323	0.02%	15.97%	0.0035%
Missouri\Madison	2142	155		98229	0.16%	2.18%	0.0034%
Kentucky\Knox	1502	59		51115	0.12%	2.94%	0.0034%
Tennessee\Benton	7312	24		72522	0.03%	10.08%	0.0033%
Texas\Taylor	50066	199	21	579484	0.04%	8.64%	0.0033%
Nevada\Washoe	1860	4134		485893	0.85%	0.38%	0.0033%
Texas\Somervell	4696	47		82615	0.06%	5.68%	0.0032%
Texas\Hudspeth	13888	11711		2257579	0.52%	0.62%	0.0032%
Maine\Knox	1650	17		30100	0.06%	5.48%	0.0031%
West Virginia\Pleasants	151	135		25778	0.52%	0.59%	0.0031%
California\Monterey	125399	428		1327972	0.03%	9.44%	0.0030%
Texas\Wilson	75428	87		467187	0.02%	16.15%	0.0030%
Utah\San Juan	12929	5300	168	1546914	0.35%	0.84%	0.0030%
Texas\Jackson	143082	50		492580	0.01%	29.05%	0.0029%
Texas\Brazos	49734	45		275752	0.02%	18.04%	0.0029%
Georgia\Meriwether	6232	31		81489	0.04%	7.65%	0.0029%
West Virginia\Roane	1731	168	64	117517	0.20%	1.47%	0.0029%
California\Lake	7611	58		124199	0.05%	6.13%	0.0029%
Texas\Cochran	148228	46		489051	0.01%	30.31%	0.0029%
Arkansas\Baxter	9817	27		97150	0.03%	10.10%	0.0028%
Mississippi\Wilkinson	5126	70		113243	0.06%	4.53%	0.0028%
New Mexico\Lea	21907	6516	454	2365168	0.29%	0.93%	0.0027%
Louisiana\St. Tammany	1943	29		45506	0.06%	4.27%	0.0027%
Texas\Hays	9547	150		235568	0.06%	4.05%	0.0026%
South Carolina\Laurens	6054	72		130057	0.06%	4.65%	0.0026%
Tennessee\Scott	1010	24		31086	0.08%	3.25%	0.0025%
Tennessee\Clay	3257	46		77779	0.06%	4.19%	0.0025%
Texas\Eastland	28911	227		520132	0.04%	5.56%	0.0024%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Texas\Matagorda	121029	66		577594	0.01%	20.95%	0.0024%
California\San Benito	16438	489		579851	0.08%	2.83%	0.0024%
Washington\Ferry	3445	3866		749452	0.52%	0.46%	0.0024%
Florida\Leon	2425	80		90732	0.09%	2.67%	0.0024%
Alabama\Pike	13644	54		179175	0.03%	7.61%	0.0023%
Texas\Baylor	43369	153		547029	0.03%	7.93%	0.0022%
West Virginia\Marion	275	180	80	58015	0.45%	0.47%	0.0021%
Texas\Hemphill	15788	400		548746	0.07%	2.88%	0.0021%
Arizona\Graham	18277	1973		1345629	0.15%	1.36%	0.0020%
South Carolina\Kershaw	9566	15		85527	0.02%	11.18%	0.0020%
Florida\Polk	106760	54		549071	0.01%	19.44%	0.0019%
West Virginia\Wirt	167	187		41205	0.45%	0.41%	0.0018%
Mississippi\Kemper	3825	55	34	136134	0.07%	2.81%	0.0018%
Alabama\Montgomery	11866	75		223079	0.03%	5.32%	0.0018%
Texas\Runnels	105290	73		656204	0.01%	16.05%	0.0018%
Texas\Mitchell	61666	95		574995	0.02%	10.72%	0.0018%
Nebraska\Grant	4137	1040		495493	0.21%	0.83%	0.0018%
New Mexico\Socorro	3915	8699	298	1429970	0.63%	0.27%	0.0017%
Texas\Goliad	62936	60		469513	0.01%	13.40%	0.0017%
New Mexico\De Baca	3852	4923		1070531	0.46%	0.36%	0.0017%
Texas\Fort Bend	88575	26		382740	0.01%	23.14%	0.0016%
Texas\Culberson	9446	3065		1374032	0.22%	0.69%	0.0015%
West Virginia\Ritchie	536	236		90836	0.26%	0.59%	0.0015%
Virginia\Henry	1155	34		50779	0.07%	2.27%	0.0015%
New Mexico\Colfax	9344	7526		2152343	0.35%	0.43%	0.0015%
North Carolina\Caswell	6239	25		102299	0.02%	6.10%	0.0015%
Alabama\Geneva	24770	29		220676	0.01%	11.22%	0.0015%
Alabama\Choctaw	1217	36		55016	0.07%	2.21%	0.0014%
Tennessee\Wayne	4453	42		115307	0.04%	3.86%	0.0014%
Texas\Callahan	29939	52	67	532595	0.02%	5.62%	0.0013%
Wyoming\Carbon	4127	14065	124	2172544	0.65%	0.19%	0.0012%
Texas\Coleman	33247	178		699452	0.03%	4.75%	0.0012%
Texas\Lampasas	18091	114		416018	0.03%	4.35%	0.0012%
Texas\Starr	30682	160		652780	0.02%	4.70%	0.0012%
Texas\Reeves	3109	3940		1040344	0.38%	0.30%	0.0011%
New Mexico\Rio Arriba	2063	10691	984	1460186	0.80%	0.14%	0.0011%
New Mexico\Union	36605	1481		2192690	0.07%	1.67%	0.0011%
Texas\Mason	19248	165		536402	0.03%	3.59%	0.0011%
Texas\Tom Green	106744	87		923509	0.01%	11.56%	0.0011%
Florida\Sumter	7594	33		159789	0.02%	4.75%	0.0010%

Table K-16. Alfalfa Forage Using Herbicide

County	Acres Using Herbicide	Harvested Acres of Alfalfa Hay	Harvested Acres Alfalfa Haylage	Acres in Farm	% of Farm Acres in Alfalfa Forage (a)	% of Farm Acres Using Herbicide (b)	(c) = (a) x (b)
Texas\Jefferson	29858	36		333255	0.01%	8.96%	0.0010%
Alabama\Barbour	14617	26		199129	0.01%	7.34%	0.0010%
California\Humboldt	2382	997	370	597477	0.23%	0.40%	0.0009%
Texas\Jack	16620	175		576091	0.03%	2.88%	0.0009%
Hawaii\Hawaii	45872	89		683819	0.01%	6.71%	0.0009%
Wyoming\Albany	4309	6972		1856054	0.38%	0.23%	0.0009%
Alabama\Sumter	4428	62		180931	0.03%	2.45%	0.0008%
Missouri\Iron	722	56		69801	0.08%	1.03%	0.0008%
Texas\Blanco	13047	87		395667	0.02%	3.30%	0.0007%
Nebraska\Thomas	703	1523		424918	0.36%	0.17%	0.0006%
Texas\Palo Pinto	22811	77		551494	0.01%	4.14%	0.0006%
New Mexico\Otero	12409	573		1126432	0.05%	1.10%	0.0006%
Texas\Kendall	5919	102		342515	0.03%	1.73%	0.0005%
New Mexico\Sierra	3302	2346	75	1344339	0.18%	0.25%	0.0004%
New Mexico\Taos	100	8948	129	456932	1.99%	0.02%	0.0004%
New Mexico\Mora	508	6610	382	914549	0.76%	0.06%	0.0004%
Missouri\Reynolds	754	63		107281	0.06%	0.70%	0.0004%
New Mexico\Guadalupe	7881	1019		1405030	0.07%	0.56%	0.0004%
Texas\Presidio	7315	932		1559722	0.06%	0.47%	0.0003%
Nebraska\Hooker	360	1460		456758	0.32%	0.08%	0.0003%
Texas\Ward	548	658		432920	0.15%	0.13%	0.0002%
Texas\Maverick	2852	112		473683	0.02%	0.60%	0.0001%
Texas\Ector	1234	158		423919	0.04%	0.29%	0.0001%
Texas\La Salle	6434	60		649126	0.01%	0.99%	0.0001%
New Mexico\Grant	740	280		1213349	0.02%	0.06%	0.0000%
Arizona\Navajo	950	2694		4502752	0.06%	0.02%	0.0000%
New Mexico\McKinley	431	2509		3172899	0.08%	0.01%	0.0000%
New Mexico\Cibola	88	1184		1478697	0.08%	0.01%	0.0000%
New Mexico\San Juan		28587	52	1630556	1.76%	0.00%	0.0000%
Wyoming\Niobrara		12974		1449111	0.90%	0.00%	0.0000%
Wyoming\Hot Springs		9766		547084	1.79%	0.00%	0.0000%
Nevada\Clark		1742		88381	1.97%	0.00%	0.0000%
Minnesota\Cook		157		2402	6.54%	0.00%	0.0000%