

The PNW Hay Market*

by

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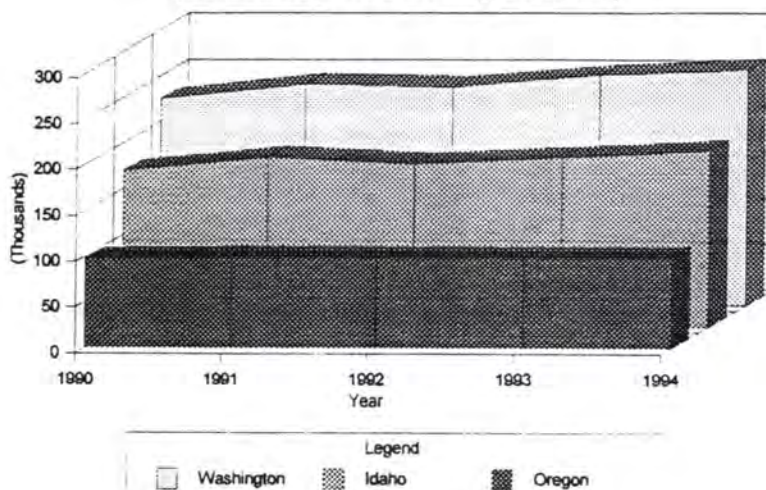
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good quality alfalfa hay or mixed grass hay to their dry cows. The number of dairy cattle in Washington has also steadily increased over the past few years, especially in the Central region of the state, near Sunnyside. Dairy cattle numbers in Oregon have remained fairly constant over the past few years.

Figure 2. PNW Dairy Cows

(Source: ID, OR & WA Ag Statistics)



Horses are also large consumers of forages. According to a 1989 survey conducted by the Idaho Horse Council, horse numbers in Idaho are increasing and this trend is expected to continue. This survey puts the number of horses in Idaho at 184,900 (Table 1) an increase of 14 percent from the 1984 estimate. Based on an estimate from the Washington Horse Council, the number of horses in Washington is approximately 175,921. Horses are fed a variety of forages, dependent upon their owner's preferences. This range of forages includes good to high quality alfalfa hay and all types of grass forages.

Table 1. Horses in Idaho (Source: Carlson, et al.)

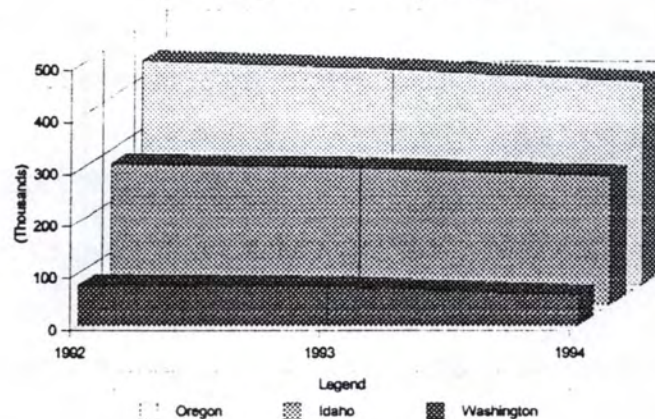
Year	Horses
1984	162,600
1989	184,900
1991	188,953 *
1992	193,006 *
1993	203,161 *

* Estimated

Sheep numbers have decreased substantially in Idaho as well as across the Pacific Northwest (Figure 3). The majority of Idaho's sheep population is in the Eastern and South Central areas of the state. Sheep chiefly consume alfalfa hay, however this hay may vary from feeder to high quality.

Figure 3. PNW Sheep

(Source: ID, OR & WA Ag Statistics)



While exotic animals such as elk and raptures also consume some forages, the volume is quite small when compared to other animals. An adult elk will consume about eight pounds of grass hay per day. The preferred types of grass hay are timothy and orchard grass. Dr. Carl Melina, President of the Idaho Venison Council, estimates

the number of elk raised by breeders in Idaho to be about 800 head. 300 head are currently estimated to be raised in Oregon, and none in Washington.

Llamas also consume some grass hay when not grazing during the summer months. An adult llama will consume five or six pounds of grass hay per day. The preferred type of hay is orchard grass or other grass hays since alfalfa hay is too rich for llamas. According to Dave Rittersbacher, an Idaho llama breeder and member of the Western Idaho Llama Association, most of the llama population in the state of Idaho is concentrated in the Southwest area of the state, near Boise. According to a survey taken in 1993 by the Western Idaho Llama Association, 1000 llamas are owned or managed by residents of Southwestern Idaho.

Emus will eat about two pounds of feed per day, but substantially less during breeding season. However, the amount of forage found in emu feed is very small and they tend to be fed a complete ration containing ingredients ranging from catfish food to wheat, corn and some forage.

Outfitters are a type of commercial horse operation. Recently, legislation was passed in Idaho requiring horses that travel into state wilderness areas to be fed only "certified weed free" hay in order to prevent the spread of noxious weeds. While this legislation may increase demand for certified weed free hay, some outfitters might decide to feed cubed hay instead, which is already certified weed free and more convenient to pack than baled hay.

The Domestic Hay Market in Northern Idaho and Eastern Washington

Northern Idaho contains about ten percent of the state's beef cows, but less than one percent of the dairy cows in the state (Figures 4 and 5). About four percent of Idaho sheep are found in Northern Idaho and twenty eight percent of the horses (Figure 6).

1994 Idaho Beef Cows

By Region

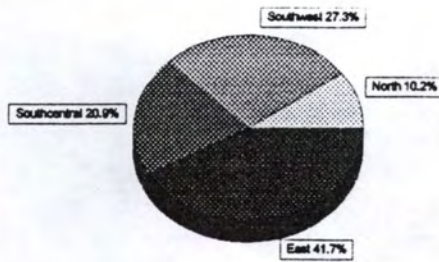


Figure 4.

1994 Idaho Dairy Cows

By Region

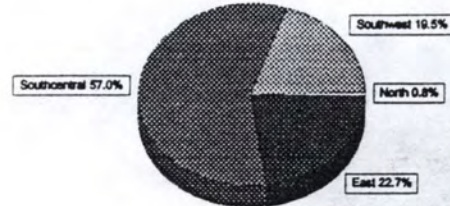


Figure 5.

1994 Idaho Sheep

By Region

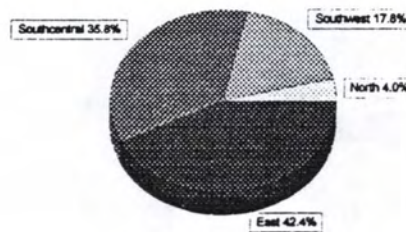


Figure 6.

Northeastern and Southeastern Washington, when combined, contain over twenty percent of the state's beef cows, but only four percent of the dairy cows in Washington (Figures 7 and 8). Over fifteen percent of Washington sheep are found in Northeastern and Southeastern Washington (Figure 9).

1994 Washington Beef Cows

By Region

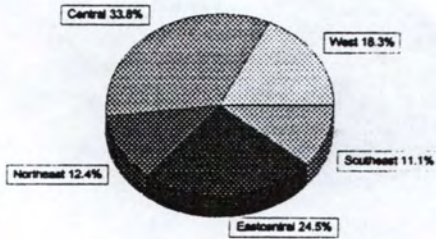


Figure 7.

1994 Washington Dairy Cows

By Region

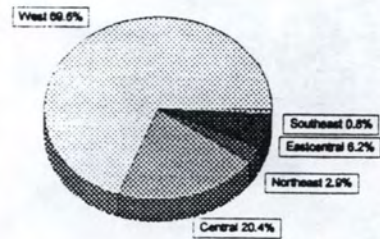


Figure 8.

1994 Washington Sheep

By Region

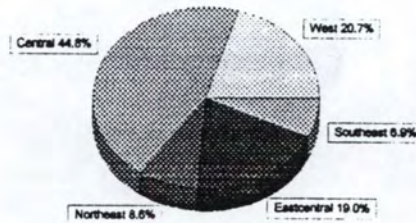


Figure 9.

The Export Hay Market

In addition to domestic use, export of forages to foreign countries is a growing area. Currently, forages from the Pacific Northwest are exported to Japan, Taiwan, and Korea. These forages include: alfalfa hay and cubes, timothy hay, oat hay, sudangrass hay, perennial ryegrass, and Kentucky bluegrass straw. These forages are exported from the United States in the form of double compressed bales, hay cubes, or pellets (Ford).

The United States and Canada are the primary suppliers of forages to Japan. In 1993, the United States supplied 1.717 mmt or 84% of Japan's hay and cube imports for the year (Table 2). Canada supplies almost all of Japan's alfalfa pellet imports. In 1994, Japan imported approximately 80,000 tons of timothy hay from the Pacific Northwest (Ford a.).

Table 2. 1993 Hay and Cube Imports to Japan (Source: Ford)

	Metric Tons	Percentage
USA	1,717,708	84.3
Canada	206,454	10.1
Total	2,038,542	100

The Pacific Northwest produces approximately 55% of the U.S. hay exported to Japan. Export hay accounts for about 11.3% of the forage production in the Pacific Northwest (Ford).

Japan closely monitors its imported forages and checks imports when they arrive. Sample containers from each shipment are unloaded at the Plant Protection and Quarantine Yard (PPQ) where they are tested for gas residues from fumigation. If the gas residues are above specified levels, the products must be aerated. Then the PPQ checks for pests and prohibited items which may host the Hessian fly (an insect pest which Japan is concerned about). Prohibited items include wheat or barley plants, wheat or barley straw, and Agropyron grasses. If the samples do not pass PPQ testing, the whole shipment must be either destroyed or returned to the selling country. Once the samples pass the PPQ testing, they are sold to Japanese farmers. After the farmers buy the forage products, they can file a claim against the producer and hay broker for: lack of quality, misrepresentation of product, foreign matter contamination, moisture and/or mold damage, or a market claim (price dislocation). These claims can be expensive to settle. (Ford).

The Korean market for alfalfa and other forage imports is beginning to develop.

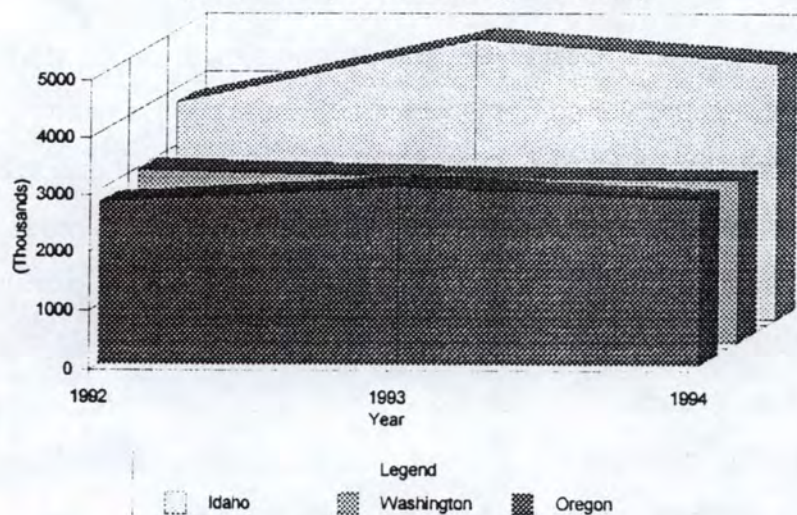
Until recently, the Korean government had a very restrictive policy concerning forage imports. Alfalfa could only be imported by obtaining a government permit, which was a difficult process. In 1993, the military tax on imported forages was dropped and import duties on forages were drastically reduced. Canada currently provides most of Korea's imported hay products because they have the lowest bid price, which they obtain by sacrificing quality. It is anticipated that Korea will not become a large importer of United States hay in the near future, but a market for US forages should develop in the coming years as their demand for higher quality forages increases (Ford).

Hay Production in the Pacific Northwest

Hay production in the Pacific Northwest has been fairly steady over the past three years. Idaho produces a larger volume of hay than does Oregon or Washington (Figure 10). Of the total hay produced in the Pacific Northwest, the majority is alfalfa hay while other types of grass hay comprise the remainder. Most of Idaho's hay production is concentrated in Eastern and Southcentral Idaho.

Figure 10. PNW All Hay Production

(Source: ID, OR & WA Ag Statistics)



Hay Production in Northern Idaho and Eastern Washington (The Palouse)

Currently, only slightly over four percent of Idaho's alfalfa hay is grown in Northern Idaho (Figure 11). By comparison, Northern Idaho grows considerably more hay of other types, which includes timothy (Figure 12). In Washington, the Northeast and southeast region combined produce about 16 percent of the state's alfalfa crop and about the same percent of the state's production of other hay (Figures 13 and 14).

1993 Idaho Alfalfa Hay Production

By Region

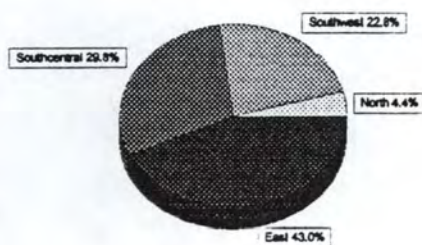


Figure 11.

1992 Idaho Other Hay Production

By Region

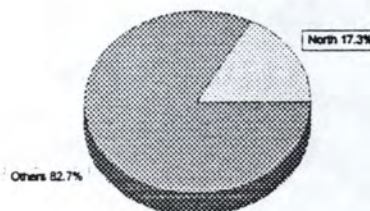


Figure 12.

1993 Washington Alfalfa Production

By Region

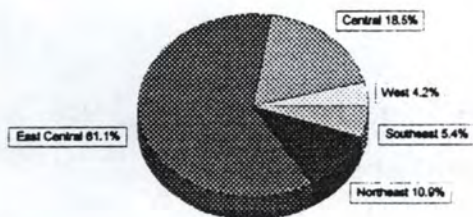


Figure 13.

1993 Washington Other Hay

By Region

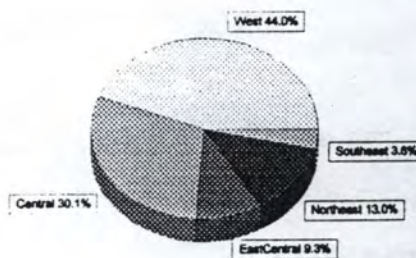


Figure 14.

Predicting the Demand for Timothy Hay

An attempt was made to develop an equation for predicting the demand for timothy hay. Demand as a dependent variable was assumed to be equal to the production of "other hay" in Idaho as measured by Idaho Agricultural statistics. No data is kept on timothy hay separate from other types of hay other than alfalfa. Independent variables included the price of "all hay" lagged one year (as 40 years of price observations were available for this variable, compared to only 5 for the price of "other hay"), the acreage of winter wheat planted in Northern Idaho, and the number of horses in Idaho (as this number was not available for Washington).

The estimated equation was:

$$\text{TIMPROD} = 504.08 + 4.99 \text{ LAGHYPRI} + .0000078 \text{ LAGWHTAC} - 0.0012 \text{ HORSE}$$

(1.82)
(1.80)
(0.013)
(-0.69)

R² = .29

Where:

- TIMPROD = Total tons of "Other Hay" produced in Idaho.
- LAGHYPRI = The price of "All Hay" in Idaho, lagged one year.
- LAGWHTAC = The number of acres planted to Winter Wheat in Northern Idaho, lagged one year.
- HORSE = The number of horses in Idaho (estimated)

The equation did not produce a very good statistical fit, as measured by the R². This indicates that 29 percent of the variability in timothy production can be explained by the variables included in the equation. In addition, the only variable which was statistically significant (at the 5 percent level), was LAGWHTAC the number of winter wheat acres lagged one year. Even though LAGHYPRI was not statistically significant, it did have the correct sign (as last year's hay price increases, farmers plant more hay this year). However, the sign on HORSE would seem to be incorrect, as it is assumed

that as horse numbers increase, more hay is produced. The estimated equation shows an inverse relation.

Other Uses For Hay Equipment

Once the investment in hay equipment has been made, another use for this equipment would be to bale the wheat straw available on the Palouse. The amount of straw available from wheat, barley, and oats in Northern Idaho is shown in Tables 3 and 4 below. There are several potentially large markets for this straw.

Table 3. Northern Idaho and Eastern Washington Straw Availability from Wheat, Barley, and Oats (Source: Patterson, et al.)*

Region	Harvested Acres	Total Grain Produced (bu.)	Total Residue Produced (tons)	Total Available Straw (tons)
Northern Idaho	512,000	31,762,000	1,167,229	583,614
North Eastern Washington	675,200	32,078,000	1,147,543	573,771
East Central Washington	5,520,700	239,000,000	10,443,523	5,221,761
South Eastern Washington	4,207,700	214,000,000	8,228,364	4,114,182

* Figures are average of 1990-93.

**Table 4. Northern Idaho and Eastern Washington Straw Availability
from Wheat (Source: Patterson, et al.)***

Region	Harvested Acres	Total Grain Produced (bu.)	Total Residue Produced (tons)	Total Available Straw (tons)
Northern Idaho	362,500	22,949,000	966,558	483,279
North Eastern Washington	458,000	20,349,000	848,838	424,419
East Central Washington	5,023,500	215,892,500	9,844,599	4,922,300
South Eastern Washington	3,474,500	168,473,000	7,066,651	3,533,326

* Figures are average of 1990-93.

Erosion Control

A current market for wheat straw is for use in erosion control products. Bon Terra America, a producer of erosion control materials, is located in Moscow, Idaho. This firm processes between 1000 - 1500 tons of straw each year (Bon Terra). Bon Terra is one of the three largest U.S. firms in the area of erosion control, and the only one located in the Pacific Northwest. Using straw, coconut fibers, or a blend of the two products, they produce an "Erosion Control Revegetation Mat" (ECRM). These mats are placed on sloping land in order to keep the soil from eroding away while new vegetation develops. Most of the ECRMs are purchased by federal, state, or local

governments in an attempt to clean up certain areas. The mats can be placed anywhere except for National Parks because of the possibility of importing seeds from noxious weeds. Peter L. Vaughn, Sales Manager of Bon Terra America, expects the future demand for straw from the erosion control industry to remain fairly stable in the United States. But he believes future demand can be expected to increase in foreign countries as more nations decide to clean up their highly erosive areas.

Particle Board Manufactured From Straw

Another possible use for straw bales would be to supply straw to a strawboard manufacturing plant. Strawboard is particle board produced from straw rather than from wood chips. While strawboard is not a new product, it is becoming an increasingly popular potential alternative to particle board. Increasing demand for particle board, coupled with cutbacks in the forest products industry, have led people to explore new ways to manufacture particle board. Straw is a renewable source of fiber.

PrimeBoard, Inc., located in Wahpeton, North Dakota, became the first company in the U.S. to produce straw board from wheat straw. They began production in June of 1995. They plan to purchase more than \$2 million of wheat straw from farmers annually.

Estimates for a medium-sized particle-board manufacturing plant, indicate that it would use about 50,000 tons of straw annually. Such a facility would employ 30 to 35 employees. The North Dakota company PrimeBoard pays farmers \$10/ton for straw laying in the windrows, not baled; \$25/ton if the farmer bales the straw; and \$30/ton when the farmer bales and hauls to their plant (Pierce).

The first step in establishing a strawboard plant in Northern Idaho is to conduct a feasibility study. A feasibility study will be started in Idaho County, Idaho this fall. Depending on the results of this study and funding, there may be a strawboard plant operating in Northern Idaho in the near future.

Summary

From a supply standpoint, recent total hay production in the Pacific Northwest has been fairly constant. On the demand side there have been some changes in livestock numbers that are resulting in some shift in "product" mix in terms of type of hay demanded. Beef cow numbers have remained relatively steady, but sheep numbers have declined significantly. Dairy cow numbers are up substantially in Idaho, and somewhat in Washington, while remaining constant in Oregon. Horse numbers are up in Washington and Idaho.

Table 5 shows demand for the years 1992-94, based on livestock numbers and appropriate consumption figures for each specie, in each state. Table 6 takes this total demand by state and breaks it down into demand by region based upon livestock numbers in each region as discussed earlier.

The result is that the demand for good quality alfalfa has risen due to the increased dairy population. The demand for lower quality alfalfa and grass hays such as timothy is also under some upward pressure, as hay that would have gone for beef feed in the past is now being diverted to dairy feed, combined with increasing horse numbers. This is offset somewhat by the decline in sheep numbers.

Specifically, if we assume that horse numbers in Idaho and Washington are growing at about 2 1/2 percent per year (the approximate average growth for the past 3 to 4 years), this translates into approximately 5100 horses/year in Idaho and 4800 horses/year in Washington. At a consumption rate of roughly 20 lbs./day of hay, this calculates to be an increase of 36,135 tons/year. Since timothy hay tends to be the forage of choice to feed among horse owners, demand growth can be expected to fall in this range.

Table 5. PNW Forage Demand 1992-1994

State	# Hd. '92	Tons	# Hd. '93	Tons	# Hd. '94	Tons
ID						
Beef	552000	1597074	510000	1475558	502000	1452412
Dairy	178000	838825	185000	871813	193000	909513
Sheep	273000	102239	265000	99243	250000	93625
Horse	193006	704472	203161	741538	203800	743870
Elk	NA*		NA*		800	3.2
Llamas	NA*		NA*		1000	3
Emus	NA*		NA*		NA*	
TOTAL		3242610		3188150		3199425
WA						
Beef	402000	1163087	369000	1067609	388000	1122581
Dairy	238000	1121575	251000	1182838	257000	1211113
Sheep	78000	29211	75000	28088	58000	21721
Horse	176000	642400	184800	674520	194040	708246
Elk	NA*		NA*		NA*	
Llamas	NA*		NA*		NA*	
Emus	NA*		NA*		NA*	
TOTAL		2956273		2953054		3063661
OR						
Beef	590000	1707018	565000	1634686	605000	1750416
Dairy	100000	471250	100000	471250	100000	471250
Sheep	433000	162159	415000	155418	390000	146055
Horse	NA*		NA*		NA*	
Elk	NA*		NA*		NA*	
Llamas	NA*		NA*		NA*	
Emus	NA*		NA*		NA*	
TOTAL		2340426		2261354		2367723

*NA = Not available

Table 6. Hay Consumption by Region

<u>Idaho</u>	<u>Tons '92</u>	<u>%</u>	<u>Tons '93</u>	<u>%</u>	<u>Tons '94</u>	<u>%</u>
North	385,043	11.89	383,912	12.06	382,328	11.97
Southwest	779,799	24.09	761,050	23.92	761,619	23.85
Southcentral	1,010,549	31.22	1,011,407	31.78	1,026,584	32.15
Southeast	1,061,771	32.80	1,025,841	32.24	1,022,902	32.03
TOTAL*	3,237,162		3,182,211		3,193,433	
<u>Washington</u>	<u>Tons '92</u>	<u>%</u>	<u>Tons '93</u>	<u>%</u>	<u>Tons '94</u>	<u>%</u>
West	1,320,708	44.67	1,361,702	46.11	1,406,986	45.93
Central	699,251	23.65	682,186	23.10	707,055	23.08
Northeast	307,741	10.41	304,005	10.30	317,840	10.37
East Central	424,284	14.35	407,689	13.81	425,073	13.88
Southeast	204,331	6.91	197,357	6.68	206,619	6.74
TOTAL*	2,956,314		2,952,939		3,063,572	

* Totals may not agree with Table 5 due to rounding.

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Appendix A

Annual Forage Consumption Calculations

Dairy Cows:

Assumptions-- 1400 lb. cow milking 25-30 lbs. per day; 305 day lactation with a DM intake of 21 kg. per day of which 55% is forage; 60 day dry period with a DM intake of 17 kg. per day of which 80% is forage.

Beef Cows:

Assumptions-- 1200 lb. superior milking cow; 205 day lactation with a DM intake of 26.4 lbs per day, 100% forage; 100 days mid gestation with a DM intake of 20.5 lbs per day, 100% forage; 60 days late gestation with a DM intake of 24 lbs per day, 100% forage.

Feeder Cattle:

Assumptions-- Medium framed steers and heifers; 165 days at 500 lbs and 1.0 lb. ADG for a daily DM intake of 12.3 lbs per day, 100% forage; 200 days at 700 lbs and 2.0 lb ADG for a daily DM intake of 16.8 lbs per day of which 50% is forage.

Replacement Heifers:

Assumptions-- Medium framed heifers; 183 days at 500 lbs and 1.0 lb ADG for a DM intake of 11.8 lbs per day; 182 days at 700 lbs and 1.0 lb ADG for a DM intake of 15.1 lbs per day; both diets are 100% forage.

Calves:

Assumptions-- Medium framed steer calves; 183 days at 300 lbs and 1.0 ADG for a DM intake of 8.4 lbs per day and 50% forage; 182 days at 500 lbs and 1.0 ADG for a DM intake of 12.3 lbs per day of which 100% is forage.

Bulls:

Assumptions-- 1600 lb bull, maintenance ration; 365 days at DM intake of 12.9 kg per day, 100% forage.

Ewes:

Assumptions-- 150 lb ewe suckling twins; 100 day lactation consuming 4% of body wt for a DM intake of 6 lbs per day, 75% forage; 265 days nonlactating and consuming 2% of body wt. for a DM intake of 3 lbs per day, 100% forage.

Rams:

Assumptions-- 220 lb ram, maintenance; 365 days consuming 3% of body wt, 100% forage.

Lambs:

Assumptions-- 100 days at 60 lbs consuming 4% of body wt, 50% forage; 100 days at 100 lbs consuming 4% of body wt, 100% forage.

Horses:

Assumptions-- Riding: 1100 lb horse, maintenance; 365 days with as-fed intake of 19 lbs per day. Draft: 2000 lb horse; 365 days with as-fed intake of 36.1 lbs per day.

Appendix B

Washington Horse Numbers Calculations

The number of horses in the state of Washington is not known. However, the number of registered horses in Washington was reported by the Washington Horse Council to be 96,000 horses. According to the Idaho Horse Council, the total number of horses in Idaho was 184,900 and the number of registered horses was 100,900.

Thus, the following calculation was used to compute the number of horses in Washington:

$(\text{Reg. ID Horses} / \text{Total Idaho Horses}) = \text{Percent of Total Horses Registered in Idaho}$

$\text{WA Registered Horses} / \text{Percent of Total Horses Registered in Idaho} = \text{Estimated Total WA Horse Numbers}$

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Washington

The following table shows the number of persons who were employed in the various occupations in the District of Columbia in 1900. The total number of persons employed was 134,000. The occupations are classified as follows: Agriculture, 1,000; Manufacturing, 10,000; Commerce, 10,000; Services, 10,000; Government, 10,000; Education, 10,000; Health, 10,000; Religion, 10,000; Amusement, 10,000; and Unemployed, 10,000.

Washington

Page 10. Horse Total...

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