



total corn grain demand for one market pig is 11.7 bushels (equation 1).

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#### Equation 1.

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$$9.8 \text{ bu corn} + \frac{32 \text{ lb co-products}}{17 \text{ lb co-products/bu corn}} = 11.7 \text{ bu}$$

The second method for summarizing corn use is based on mass of feedstuffs directly fed to livestock. For example each market pig is assumed to consume a total of 580.8 lbs of corn grain and co-products (equation 2).

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#### Equation 2.

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$$9.8 \text{ bu corn} \times 56 \text{ lb/bu corn} + 32 \text{ lb} = 580.8 \text{ lb}$$

These totals are then compared to the actual corn grain production for the state of Iowa during the modeled year (USDA, 2011) and the estimated corn used by Iowa biofuel refineries in 2010 (RFA, 2011).

### Results and discussion

The Iowa livestock and poultry corn use calculator was used to model corn grain use during 2010 and results are summarized in table 4. In 2010, approximately 620,488,000 bushels of corn grain were fed to livestock directly. Another 199,389,000 bushels of corn grain were first processed into ethanol and co-products before being fed to livestock. Actual corn production by the state of Iowa totaled 2,153,250,000 bushels (USDA, 2011) with a little more than 50 percent (1,136,785,714 bushels) refined into biofuels (RFA, 2011). Swine was by

far the largest single animal user of corn in the state of Iowa. Beef cattle was the largest user of biofuel co-products under typical use assumptions. If the use of biofuel co-products was maximized in livestock diets, swine would be the largest user of both corn grain and biofuel co-products. Feeding the maximum amount of co-products to livestock and poultry would require harvesting 1,174,687,000 bushels of corn grain. This is 3 percent more corn grain than was processed into biofuel in 2010, but still less than 55 percent of the total Iowa corn crop in 2010. The model results demonstrate that Iowa grows adequate corn grain for current feed and fuel uses within the state boundaries under current conditions.

### Acknowledgments

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### Literature Cited

- Ellis, S., W. Edwards, J. Lawrence, and A. Johanns. 2010. Livestock enterprise budgets for Iowa—2010. FM 1815. Iowa State University Extension, Ames, IA.
- RFA. 2011. Feeding the world: The role of the U.S. Ethanol industry in food and feed production. Renewable Fuels Association, Washington, D.C.
- USDA. 2011. 2011 Iowa agricultural statistics. USDA-National Agricultural Statistics Service, Iowa Field Office, Des Moines, IA.
- USGC. 2007. DDGS user handbook. U.S. Grains Council, Washington, D.C. Available online: [http://www.grains.org/images/stories/DDGS\\_user\\_handbook/DDGS%20Handbook%20FULL.pdf](http://www.grains.org/images/stories/DDGS_user_handbook/DDGS%20Handbook%20FULL.pdf). Accessed: January 23, 2012.

**Table 1. Livestock and poultry poulation for Iowa 2006 - 2010<sup>1</sup>.**

Livestock Category	2006	2007	2008 (1,000 head)	2009	2010
Grain fed cattle marketed	1,743	1,860	1,915	1,897	2,023
Beef cows and heifers	1,140	1,160	1,115	1,065	985
Cattle on farm slaughter	4	4	4	4	4
Cattle deaths	185	185	195	170	165
Milk cows and heifers	320	330	325	345	340
Pigs marketed	32,938	34,233	38,802	40,461	37,430
Pigs on farm slaughter	11	11	11	11	11
Pig deaths	2,070	2,470	2,680	2,640	2,470
Swine litters farrowed	1,845	1,935	2,050	1,950	1,890
Lambs marketed	261	264	246	183	176
Lambs on farm slaughter	1	1	1	1	1
Breeding sheep	165	165	162	145	145
Sheep and lamb deaths	33	35	33	29	31
Chickens <sup>2</sup>	61,605	64,958	65,429	65,972	66,118
Turkeys <sup>3</sup>	8,400	8,700	9,000	9,000 <sup>3</sup>	9,000 <sup>3</sup>

1 From 2011 Iowa Agricultural Statistics, USDA-National Agricultural Statistics Service.

2 Excludes commercial broilers.

3 Not reported for 2009 and 2010, values presented are authors's estimates.

**Table 2. Modeled scenarios for corn use by Iowa livestock and poultry.**

	Current <sup>1</sup>		None <sup>3</sup>	Max Co-products <sup>4</sup>	
	Grain, bu	Co-products, lb DDGS <sup>2</sup>		Grain, bu	Co-products, lb DDGS
Grain fed cattle marketed	52.0	1,050	70.8	52.0	1,915
Beef cows and heifers	4.0	0	4.0	4.0	0
Cattle on farm slaughter	52.0	1,050	70.8	52.0	1,915
Cattle deaths	13.0	263	17.7	9.2	479
Milk cows and heifers	104.0	0	104.0	12.1	5,148
Pigs marketed	9.8	32	10.4	8.0	136
Pigs on farm slaughter	9.8	32	10.4	8.0	136
Pig deaths	2.5	8	2.6	2.0	34
Swine litters farrowed	17.1	0	17.1	13.3	213
Lambs marketed	5.2	0	5.2	5.2	0
Lambs on farm slaughter	5.2	0	5.2	5.2	0
Breeding sheep	3.8	0	3.8	3.8	0
Sheep and lamb deaths	1.3	0	1.3	1.3	0
Chickens <sup>5,6</sup>	0.9	0	0.9	0.7	10
Turkeys <sup>6</sup>	0.8	0	0.8	0.7	8

1 From Livestock enterprise budgets for Iowa–2010. FM 1815 ISU Extension

2 1 lb of dried distillers grains with solubles (DDGS) = 2 lb modified distillers grains with solubles (MDGS)

3 1 lb of DDGS = feed value of 1 lb of corn grain

4 Biofuel co-products fed at levels approaching the maximum practical limit—amounts of co-products that have been demonstrated to support typical growth and performance without adverse impacts on product quality, animal health, or feed management for each class of livestock (USGC, 2007).

5 Excludes commercial broilers

6 M. Persia, personal communication

**Table 3. Practical limit of co-product inclusion<sup>1</sup>.**

Class of livestock	Co-product inclusion
Grain fed cattle	40% of ration dry matter
Milk cows and heifers	20% of ration dry matter
Market pigs	20% of diet
Layers	15% of diet
Turkeys	10% of diet

1 Based on peer reviewed experiments, field studies, and extension recommendations as summarized by USGC (2007).

**Table 4. Estimated corn use for feeding livestock, poultry, and to generate co-products fed to livestock, 2010.**

Livestock category	Level of Co-Product Use in Livestock Diets				
	None	Typical		Max co-products	
	Direct fed, 1,000 bu	Direct fed, 1,000 bu	Direct fed, 1,000 bu	Biorefined, 1,000 bu	Direct fed, 1,000 bu
Beef cattle	150,372	111,489	127,750	79,646	232,985
Dairy cattle	35,360	35,360	0	4,114	102,960
Swine	428,127	405,416	71,639	329,605	328,149
Sheep and lambs	1,517	1,517	0	1,517	0
Poultry	66,706	66,706	0	52,583	43,128
Subtotal	682,082	620,488	199,389	467,465	707,222
Total corn use, 1,000 bu	682,082		819,877		1,174,687

Actual 2010 Iowa corn grain production, bu 2,153,250,000

Estimated 2010 corn grain use by Iowa biorefineries, bu 1,136,785,714

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