



Finishing Hogs on Small Grains

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In a Nutshell

- Organic hogs typically grow slower and are less efficient than conventional hogs. High-fiber diets high in small grains are common in organic production but may be less efficient compared to corn-soybean diets.
- Tom Frantzen and family fed groups of similar hogs either an organic corn-based diet or a small grain diet where succotash replaced corn.
- Small grain-fed hogs grew less quickly and efficiently, but carcass price per lb was similar between diet groups, and feed price per lb was less for the small grain diet.

Key findings

- Feed consumption and cost was greater for small grain-fed hogs, while weight gain was lower.
- Small grain-fed hog carcasses were slightly smaller but of comparable quality to corn-fed hog carcasses.
- Hog feed is a viable use for small grains produced in organic crop rotations, as it is low-cost and produces comparable finished carcasses to corn-fed hogs.

Project Timeline
May - August 2014

Background

Efficiency and quality are driving forces in the pork industry, both conventional and organic. A proper nutrition program will promote fast weight gain with the least amount of feed waste, and will use feed that is affordable to grow or purchase. Many times, organic hog production ef-



Frantzen Family Farm hogs on small grains-based diet were assessed for finishing time, feed consumption, gain, and carcass quality.

iciency (measured in feed-to-gain ratio) is less than that for conventional production. Farmer-researchers in Practical Farmers of Iowa have begun exploring the causes of lower efficiency in organic hog production, and ways to improve the situation.

One such possible cause for lower efficiency in organic hog production is the use of feedstuffs high in fiber. Small grains, such as barley, wheat, and oats, are commonly fed in organic hog production and are higher in fiber than corn which is commonly fed in conventional hog production. Small grains take longer to digest than corn and have a lower energy concentration than corn, resulting in hogs that eat more and take longer to finish when fed a small grain-based diet (Sullivan et al. 2005, Boggess et al., ed. 2008). However, small grains in the diet offer

benefits such as improved gastrointestinal health, lowered incidence of ulcers, and firmer carcass fat (Sullivan et al. 2005, Boggess et al., ed. 2008). They often have higher protein and essential amino acid concentrations than corn, so may reduce the amount of soybean meal required. These small grains are also components of many long-term organic crop rotations, and as such are often available on organic farms (Mohler and Johnson, ed. 2009). Depending on the current markets, they also may be more affordable than corn as energy sources in the diet (Karwal 2014).

Tom Frantzen and family compared finishing hogs on corn-based and on small grain-based diets to quantify the differences in finishing time, feed consumption, gain, and carcass quality.

Materials and Methods

Tom split a group of 20 hogs into two groups of ten hogs each, balancing for sex and weight. The groups were housed in adjacent pens with access to outdoor concrete pads. A feeder shared by the pens was partitioned so that feed for the two groups could be kept separate. Both groups received organic corn and soybean meal-based starter diets (14.5% crude protein) until the start of the trial on May 14, 2014, when the diet of one group (small grain diet) was gradually shifted to replace corn with debarbed succotash—a mixture of oats, wheat, and barley. These were soaked at first, to make them more palatable. The other group (standard diet) was maintained on a corn-based diet. A protein supplement was provided free-choice to each pen.

Group weight was taken approximately every 30 days, and feed disappearance was determined by weighing feed before delivery, and noting the dates that feeders were refilled. Climate data was collected from the Iowa State Mesonet database, from the New Hampton weather station (approx. 13 miles from the farm).

Results and Discussion

Average hog weight and average daily gain (ADG) are displayed in **Table 1**.

The hogs on the small grain diet started out slightly lighter than those on the stan-

dard diet, but were heavier at the weigh date in June and had a higher ADG during the May-June period. At the July and August weigh dates, however, the hogs on the small grain diet had lower average weights and lower ADG during the June-July and July-August periods. “Would you believe that the small grains pigs actually had lower daily gains as the trial proceeded?” Tom remarked. While growth rate usually slows later in life, the ADG for the hogs on the small grain diet dropped rapidly throughout the trial. High-fiber diets, such as those high in small grains, are bulky and difficult for monogastrics to digest. Thus, hogs on these types of diets do not get as much energy per unit of feed, reducing growth rate. Normally animals will consume a greater amount of a low-energy diet to compensate, but because digestion is slowed, they are limited in how much feed they can physically consume. Still, the hogs fed the small grain diet reached acceptable market weight (around 250 lb) at the same time as the standard diet hogs.

Feed consumption and efficiency is shown in **Table 2**. Feed consumption is expressed as average daily feed intake (ADFI) per hog. ADFI per hog was calculated by dividing the total feed offered in each group’s feeder each month by the number of days in the month and the number of hogs in the group. Feed efficiency in hogs is commonly expressed as feed-to-gain ratio or feed conversion ratio (FCR), the amount of

feed required for the animal to put on one pound of body weight, calculated as ADFI / ADG. A lower value is better.

Both ADFI and FCR tend to increase as animals get larger. Larger animals consume more feed, but their greater size means that more feed nutrients go to maintaining that size than to further growth. Thus, larger, older animals are less efficient at gaining weight than younger animals. Hogs on the standard diet had lower ADFI and FCR through most of the study, suggesting that they were more efficiently utilizing feed nutrients. ADFI and FCR for the hogs fed the small grain diet increased drastically throughout the feeding period, because of the lower energy density of the diets. The hogs fed the small grain diet increased their intake levels each month to try and compensate for the lower energy concentration of the diet. Tom also noted in July: “For the past 5 days I have measured 9 lb of consumption per head per day [in the small grain diet pen]. This is 7.5 lb of grain and 1.5 lb of supplement. Pigs on the [standard diet] side continue to be at 6.25 lb/hog/d.” Throughout the trial, the hogs on the small grain diet ate more protein supplement compared to the hogs on the standard diet. The hogs fed the small grain diet should not have been deficient in protein as small grains have higher concentrations of protein and essential amino acids compared to corn. While the corn and supplement in the standard diet contained about 14.5% crude protein, the succotash and supplement made the average small grain diet contain 19.2% crude protein. This is far above the hogs’ needs, and suggests that the supplement may have been more palatable or more easily digestible than the small grains.

Carcass data for six hogs fed the small grain diet and eight hogs fed the standard diet was provided by the locker when they were harvested. Results are shown in **Table 3**. Yield is expressed as the carcass weight as a percent of the liveweight. A higher number is better, indicating more meat and salable product.

Table 1

Weight and average daily gain (ADG) of hogs fed either a standard corn diet or a small grain diet

Date	Average weight (lb/hog)		ADG (lb/d)	
	Standard diet	Small grain diet	Standard diet	Small grain diet
5/14/2014	68	62	--	--
6/18/2014	122	133	1.54	2.03
7/29/2014	210	200	2.15	1.63
8/29/2014	264	242	1.74	1.35
Average	--	--	1.83	1.68

Table 2

Average daily feed intake (ADFI) and feed conversion ratio (FCR) of hogs fed either a standard corn diet or a small grain diet

	ADFI (lb/d/hog)		FCR	
	Standard diet	Small grain diet	Standard diet	Small grain diet
June	4.14	4.27	2.68	2.11
July	6.08	8.59	2.83	5.26
August	6.89	7.99	3.95	5.93
Average	5.70	6.95	3.16	4.43

Table 3

Average daily feed intake (ADFI) and feed conversion ratio (FCR) of hogs fed either a standard corn diet or a small grain diet

	Standard diet	Small grain diet
Live weight (lb/hog)	268	251
Carcass weight (lb/hog)	202	188
Yield	75.33	74.82
% Lean	57.00	57.67
Carcass value (\$/lb)	1.78	1.78
Carcass value (\$/hog)	355.07	334.09

Carcasses of hogs on the small grain diet were lighter and yielded less, but were about the same leanness as hogs on the standard diet. Hogs on the small grain diet had lower 10th rib backfat depths as well (data not shown). Carcass value per lb did not differ between hogs fed different diets, but because carcasses of the hogs on the standard diet were heavier, they were worth more as a whole. Tom took some of the remaining hogs to a smaller locker, which did not provide data like this. Still, he said that the “locker called back and had me go to look at the carcasses. Small grain carcass was a lot fattier.” Whether due to harvesting differences between the lockers or because of individual animal variation, a difference was noted in carcass quality.

While not the main intent of the study, Tom provided some of his costs of production (Table 4).

Conclusions and Next Steps

Tom and his family demonstrated that replacing corn with debearded small grains produces market hogs of acceptable size and quality within a normal finishing time. Hogs fed the small grain diet were slightly smaller than their corn-fed counterparts, but yielded well at the locker. While their feed costs were slightly higher, this may be corrected by limiting the amount of protein supplement included in the future in the small grain diet.

Next, Tom plans to test for effects of apple cider vinegar (ACV) in hog diets. Few studies examine the claims of better gain and health when animals are supplemented with ACV, so a side-by-side trial will be undertaken with hogs supplemented or not supplemented with ACV.

PFI Cooperators’ Program

PFI’s Cooperators’ Program gives farmers practical answers to questions they have about on-farm challenges through research, record-keeping, and demonstration projects. The Cooperators’ Program began in 1987 with farmers looking to save money through more judicious use of inputs. If you are interested in conducting an on-farm trial contact Stefan Gailans @ 515-232-5661 or stefan@practicalfarmers.org.

Table 4

Selected costs of production of hogs fed either a standard corn diet or a small grain diet

	Standard diet	Small grain diet
Total feed used (lb)	6077	7562
Feed cost (\$/lb)	0.25	0.21
Total feed cost (\$)	1553.22	1590.66
Total costs (\$)	2885.602	2795.222
Income (\$)	3477.683	3203.268
Return (\$/hog)	59.21	40.80
Cost of gain (\$/lb)	0.80	0.89



Frantzen Family Farm hogs on corn-based diet.

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