Whole-Hog Value Calculator

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Introduction

Increasing numbers of pork producers are considering owning their product further than the packer's gate. Much of this impetus comes from increasing farm-cutout or farm-retail margins. However, many producers are not aware of the potential variability in product, price, and ultimately profits that occurs in the packing and processing sector. Furthermore, due to the variability that occurs in item weights and other specifications, there are minimum numbers of live animals that are necessary to keep facilities operational. Thus, producers interested in further processing need some way to predict the amount of product associated with a given number of hogs. That is why the Whole Hog Value Calculator (WHVC) was developed.

Model Development

The Whole-Hog Value Calculator was developed to assist producers and others when determining the whole hog value of a group of hogs. It uses data provided by users to simulate the live weights and resulting product weights for hams, loins, boston butts, picnics, bellies, jowls, and byproducts. Users enter the number of hogs, the percentage of barrows, the average live weight, the minimum weight, and the maximum weight of the group of hogs. The user can then enter prices or use the default values for various wholesale cuts and byproducts.

The model was developed using Microsoft Excel. Visual Basic is used extensively within the model to calculate and store the numerous weights and values. Currently, the program requires sizable memory capacity. Hopefully, the program can be refined to use memory more efficiently. Until then, it is recommended that potential users have a minimum of 156K RAM and 500 mhz processor speed. Although the program will operate on computers with less than these specifications, performance in terms of processing speed is greatly reduced.

Once all the necessary information is entered the user clicks on the *Run Simulation* button to begin the calculations. The weights are produced using a random number generator based on a normal distribution centered about the mean. The maximum and minimum weights representing the upper and lower bounds are used to truncate the distribution at plus or minus two standard deviations. Weights are then divided into the four deviations (plus two and minus two) with 68 percent of the values divided evenly between plus one and minus one, and 27

percent divided evenly between the other two deviations. Since it is unlikely users will know the standard deviation for the weights of hogs, a standard deviation is assumed.

Once the weights are generated, prediction equations are used to estimate pounds of pork product per carcass from various wholesale cuts. The wholesale cuts used and their associated IMPS designations are shown in Table 1: Ham 401, Picnic 405, Boston Butt 406, Belly 409, Loin 410, Spareribs 416, and Jowl 419. The prediction equations were obtained from the National Pork Board Database and are available upon request.

Table 1. Specific Wholesale Cuts ,their Associated IMPS Designation, and the Values Used from USDA-AMS Pork Report

Wholesale Cut/IMPS Designation	Item as Reported in USDA Pork Report
Ham 401	Ham, Bone-in- Trim Spec 1
Picnic 405	Picnic, Smoker Trim, Regular Shank
Boston Butt 406	Boston Butt, Bone-in, ¼" Trim
Belly 409	Belly, Seedless, Skinless
Loin 410	Loin, Bone-in, ¼" Trim
Spareribs 416	Sparerib, Fresh
Jowl 419	Pork Jowl

The weight of each wholesale cut is estimated on a per carcass basis using the prediction equations. After this, the weight is divided by two (number of sides in a carcass) giving the expected weight per item. Once the individual item weight is calculated, the appropriate price is assigned and a value is calculated. After the value for the item is calculated it is multiplied by 2, yielding the total value for that cut on a carcass basis.

For instance, the total pounds of Ham 401 for a carcass may be calculated as 45 pounds; however, after dividing 45 by 2, the actual individual ham weight is 22.5 pounds. The price for 20-23 pound hams is $59/cwt. This gives a value of $13.28 per ham or $26.55 per carcass.

Because prices for the wholesale cuts are often not reported by IMPS number, it is necessary to use the descriptions from the USDA-Pork Report. The wholesale cuts and their associated pork report definitions are given in Table 1.

In addition to predicting the weight and value of specific wholesale cuts, byproduct weights and values are also calculated. The equations for the wholesale weights are from Gralapp-Gonzalez and Goodwin (GGG). The prices for the byproducts are also the same prices used by GGG.

Once the individual weights and values are calculated on a per carcass basis the aggregate numbers are reported in the summary sheet. Values reported in the summary sheet include the total live weight, total wholesale weight and value, and total byproduct weight and their corresponding dollar value. The wholesale cut weights and values are then broken out by weight class if applicable. To give producer an idea of the type of volume under consideration, each item's weight is reported in terms of 40,000 truckloads. An example printout is shown in Figure 1.

Application

The model is applied to two different scenarios to demonstrate the differences that can arise in values. Two different average weights are assumed, 250 and 260 pounds. The specific weights and parameters are given in Table 2.

Table 2. Assumptions Used in Whole Hog Value Analysis

Item	250 Pounds	260 Pounds
Number of hogs	200	
Sex Split	50% barrows/50% gilts	
Average live weight	250	260
Minimum weight	230	230
Maximum weight	270	270
Average Back Fat (BF)	.70 inches/17.78 mm	.75 inches/19.05 mm
Average Loin Depth (LD)		2.35 inches/59.69 mm

Both of these weights were analyzed using the four combinations of yield and measurement method. For presentation purposes, only the results for the Fat-O-Meater (FOM) are given. Results from the ruler are available on request.

Readers should be aware that because of the variation introduced by the random number generator, the actual average weights may not necessarily be the exact average weight entered by the user. Actual averages should be within .7 pound of the average entered by the user.

Review of the results (Table 3) shows the impact of yield and weight on pounds of wholesale cuts and the value of these cuts. An increase of 10 pounds per hog in the Yield 1 group increases the pounds of wholesale cuts by 1,192 pounds and 1,144 pounds for Yield 2. The differences in values are $921 and $848 respectively.

The impact of yields is also apparent as the differences between Yield 1 and Yield 2 hogs is 1,589 pounds and 1,541 for the 250 and 260 pound pigs, respectively. The average value difference is $1,198 or $6.15 per head.

number of hogs	200										
min wt	230		**Total Live Weight**					52,433			
max wt	280		**Total Primal Weight**					**33,400**			
avg wt	**250**		**Total Primal Value**				**$**	**27,702**			
yield class	2		**Average Value/Hd - Primals**				**$**	**138.51**			
Measurement	1										
			Total Byproduct Weight					**14,950**			
			Total Byproduct Value				**$**	**2,362**			
			Average Value/Hd - Byproducts				**$**	**11.81**			

Primal Values Primal	Total Pounds	Total Value	Average Weight	Average Value	Ave. Price $/Cwt.	Minimum Weight	Minimum Value	Maximum Weight	Maximum Value	Number of Cuts	Truckloads
Boston Butt 406	3,951	3,556	19.753	$ 17.78	$ 90.00	18.298	$ 16.47	20.630	$ 18.57		0.079
- 1/4" Trim 5-10# Boston Butt	3,951	3,556	19.753	$ 17.78	$ 90.00						0.079
Loin 410	9,354	10,851	46.772	$ 54.26	$ 116.00	40.744	$ 47.26	50.547	$ 58.63		0.187
- 1/4" Trim Loin 21#DN-LGHT	289	335		$ 47.90	$ 116.00					14.00	0.006
- 1/4" Trim Loin 21#UP-MED	9,065	10,516		$ 54.49	$ 116.00					386.00	0.181
- WHLE BNLS LOINS 9-13#	7,112	12,746	35.561	$ 63.73	$ 179.21						0.142
- TENDERLOIN 1.25/DN#	418	1,178	2.088	$ 5.89	$ 282.00						0.008
Picnic 405	4,292	1,931	21.460	$ 9.66	$ 45.00	18.910	$ 8.51	23.010	$ 10.35		0.086
- Smkr Trm, SS, combo	4,292	1,931	21.460	$ 9.66	$ 45.00						0.086
Spareribs 416	1,421	2,075	7.105	$ 10.37	$ 146.00	6.391	$ 9.33	7.440	$ 10.86		0.028
Ham 401	9,415	5,330	47.073	$ 26.65	$ 56.62	41.071	$ 24.23	50.157	$ 28.09		0.188
- BONE-IN 17-20# TRIM SPEC 1	0	0		$ -	$ -					0.00	0.000
- BONE-IN 20-23# TRIM SPEC 1	1,708	1,008		$ 25.83	$ 59.00					78.00	0.034
- BONE-IN 23-27# TRIM SPEC 1	7,707	4,316		$ 26.81	$ 56.00					322.00	0.154
BELLY, SEEDLESS	4,291	3,776	21.455	$ 18.88	$ 88.00	17.279	$ 15.21	23.921	$ 21.05		0.086
- SKINLESS, SQUARED 9-11#	4,291	3,776		$ 18.88	$ 88.00					400.00	0.000
- SKINLESS, SQUARED 11-13#	0	0		$ -	$ -					0.00	0.000
- SKINLESS, SQUARED 13-15#	0	0		$ -	$ -					0.00	0.000
- SKINLESS, SQUARED 15-17#	0	0		$ -	$ -					0.00	0.000
Sknd JOWLS	676	183		$ 0.91	$ 27.00	2.883	$ 0.78	3.710	$ 1.00		0.014

Figure 1a. Sample Printout from Whole Hog Value Calculator

Byproducts	Total Weight	Price	Total Value	Average Weight	Average Value/Hog
Total Byproduct Value	**14,949.638**		**2,362.02**		**$ 11.81**
Bone	5,278.674	$ 3.77	$ 199.01	26.393	$ 1.00
Blood	1,834.332	$ 18.00	$ 330.18	9.172	$ 1.65
Belly Skin	1,678.101	$ 22.19	$ 372.37	8.391	$ 1.86
Tail	51.737	$ 28.60	$ 14.80	0.259	$ 0.07
Fore Feet	372.862	$ 19.91	$ 74.24	1.864	$ 0.37
Hind Feet	442.524	$ 17.00	$ 75.23	2.213	$ 0.38
Trachea	17.969	$ -	$ -	0.090	$ -
Lungs	348.000	$ 1.75	$ 6.09	1.740	$ 0.03
Heart, unslashed	183.366	$ 22.20	$ 40.71	0.917	$ 0.20
Heart, slashed	183.398	$ 22.06	$ 40.46	0.917	$ 0.20
Liver	716.732	$ 15.86	$ 113.67	3.584	$ 0.57
Spleen	84.000	$ 4.50	$ 3.78	0.420	$ 0.02
pancreas	67.659	$ 84.00	$ 56.83	0.338	$ 0.28
Esophagus	25.945	$ -	$ -	0.130	$ -
Stomach	277.634	$ 45.89	$ 127.41	1.388	$ 0.64
Stomach, w/o pepsin lining	193.742	$ 41.50	$ 80.40	0.969	$ 0.40
Pepsin lining	77.886	$ 87.50	$ 68.15	0.389	$ 0.34
Small intestine	681.319	$ -	$ -	3.407	$ -
Large Intestine	590.254	$ 35.70	$ 210.72	2.951	$ 1.05
Bung	65.808	$ 77.00	$ 50.67	0.329	$ 0.25
Urinary Bladder	17.934	$ 2.22	$ 0.40	0.090	$ 0.00
Uterus	66.000	$ 65.34	$ 43.12	0.330	$ 0.22
Ovaries	4.000	$ 12.50	$ 0.50	0.020	$ 0.00
Kidneys	139.719	$ 17.12	$ 23.92	0.699	$ 0.12
Leaf Fat	601.784	$ 9.32	$ 56.09	3.009	$ 0.28
Skirt Meat	129.270	$ 46.00	$ 59.46	0.646	$ 0.30
Hanging Tender	81.684	$ 26.67	$ 21.79	0.408	$ 0.11
Head, w/o Inner Ear Chambers	2,766.958	$ 48.00	$ 1,328.14	13.835	$ 6.64
Ears, w/o Inner Ear Chambers	237.475	$ 60.00	$ 142.49	1.187	$ 0.71
Ear base, Left & Rt.	132.000	$ 15.00	$ 19.80	0.660	$ 0.10
Outer Ear, Left & Rt.	105.739	$ 81.81	$ 86.50	0.529	$ 0.43
Facemask	386.031	$ 20.00	$ 77.21	1.930	$ 0.39
Snout	85.816	$ 31.52	$ 27.05	0.429	$ 0.14
Lower Lip	76.000	$ 13.00	$ 9.88	0.380	$ 0.05
Pate Meat	110.134	$ 25.00	$ 27.53	0.551	$ 0.14
Temple Meat	25.230	$ 71.00	$ 17.91	0.126	$ 0.09
Head Meat	41.845	$ 50.00	$ 20.92	0.209	$ 0.10
Cheek Meat	131.623	$ 56.54	$ 74.42	0.658	$ 0.37
Salivary Glands	24.000	$ 23.12	$ 5.55	0.120	$ 0.03
Tongue, Tip On	112.000	$ 55.07	$ 61.68	0.560	$ 0.31
Tongue, Tip Off	106.000	$ 57.00	$ 60.42	0.530	$ 0.30
Pork Meat	94.000	$ -	$ -	0.470	$ -
Tongue Cartilage	8.000	$ 2.20	$ 0.18	0.040	$ 0.00
Brain	46.000	$ 48.11	$ 22.13	0.230	$ 0.11

Figure 1b. Sample Printout from Whole Hog Value Calculator (continued)

Table 3. Live, Wholesale, and Byproduct Weights and Values for Example Weights

Item	250 Pounds		260 Pounds	
	Yield 1[a]	Yield 2	Yield 1	Yield 2
Total Live Weight	49,759	49,800	51,759	51,800
Total Wholesale Cut Weight	30,272	31,861	31,464	33,005
Total Wholesale Cut Value	$25,317	$26,582	$26,238	$27,430
Wholesale Value per Head	$126.58	$132.91	$131.19	$137.15
Total Byproduct Weight	14,950	14,950	14,715	14,715
Total Byproduct Value	$2,362	$2,362	$2,312	$2,312
Byproduct Value per Head	$11.81	11.81	$11.56	$11.56

[a] Yield 1 is 75% or less, Yield 2 is more than 75%

Wholesale Cuts

In addition to providing information on the total weight and value of wholesale cuts for a group, the WHVC also details the pounds and values for the different wholesale cuts (Table 4). For the 250 pound hogs yielding more than 75 percent the total wholesale weight is 31,861pounds and is valued at $26,582 or $132.91 per head.

Table 4. Specific Wholesale Cuts and Values for 250 and 260 Pound Hogs

Item	250 Pounds		260 Pounds	
	Yield 1	Yield 2	Yield 1	Yield 2
Boston Butt 406 Weight	3,593	3,831	3,724	3,913
Boston Butt 406 Value	$3,234	$3,448	$3,351	$3,521
Loin 410 Weight	8,458	8,943	8,759	9,259
Loin 410 Value	$9,812	$10,374	$10,161	$10,740
Picnic 405 Weight	3,898	4,107	4,045	4,239
Picnic 405 Value	$1,754	$1,848	$1,820	$1,908
Spareribs 416 Weight	1,352	1,379	1,393	1,404
Spareribs 416 Value	$1,974	$2,014	$2,034	$2,049
Ham 401 Weight	8,597	8,981	8,920	9,308
Ham 401 Value	$5,080	$5,224	$5,205	$5,321
Seedless Belly Weight	3,740	3,978	3,966	4,216
Seedless Belly Value	$3,291	$3,501	$3,490	$3,710
Skinned Jowls Weight	633	641	657	667
Skinned Jowls Value	$171	$173	$177	$180

Analyzing the contribution of the weights and values of the various cuts reveals some interesting facts. The weight of the shoulder (Boston butt, picnic, and jowl) accounts for 26.93 percent of the weight of the wholesale product but only 20.57 percent of the total wholesale value. Conversely, the loin contributes about 28.07 percent of the wholesale weight and 39.03 percent of the value for the group. On a poundage basis the most valuable cut in this analysis is the spareribs as they account for 4.33 percent of the weight and 7.58 percent of the value. The weight and value contributions are shown in Figure 2.

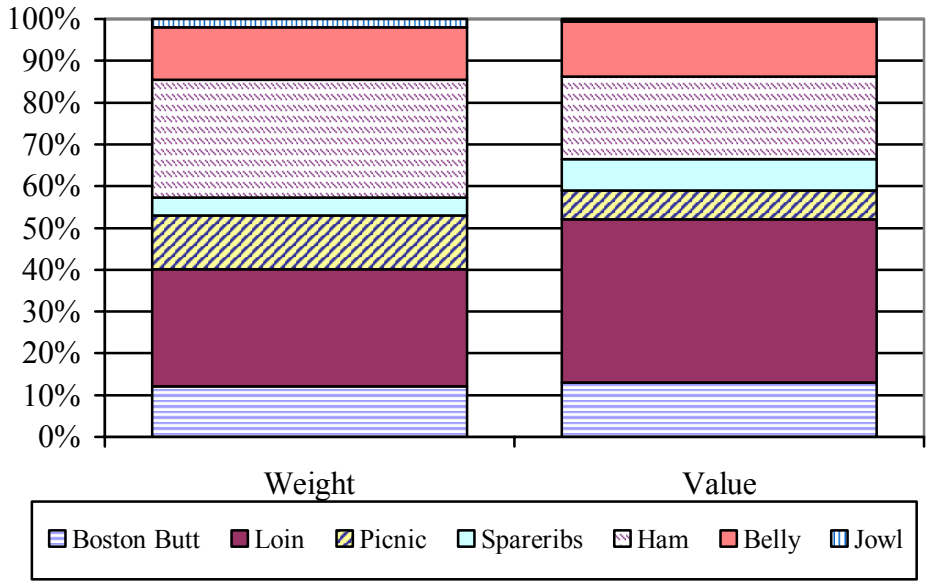

Figure 2. Contribution of Weights and Value to the Wholesale Total

In addition to specifying the weight and value of each wholesale product, some cuts are also broken down by weight. This is important because three wholesale cuts loin 410, ham 401, and seedless bellies; have prices that are dependent on the size of the cut. The distribution of their weights and values is shown in Table 5.

It is easy to see from this table that weight and yield can have considerable effects on the distribution of weights and values. To further illustrate this point, the distribution of ham weights and values is plotted in Figure 3. Notice that as weight and yield increases, the distribution shifts to the right including more loins and hams in the heavier classes. The result is an increase in revenues even though the heavier hams bring a lower price.

Byproduct Information

The revenue from byproducts and variety meats is where many packing and processing firms often make their money. To aid producers in planning for this revenue source, weights and values for byproducts are also reported on the summary page (Figure 1). Since the price for

these products is usually not dependent on individual weights, only the totals for each product are given.

Table 5. Distribution of Wholesale Cut weights and Values by Style

Item	250 Pounds		260 Pounds	
	Yield 1	Yield 2	Yield 1	Yield 2
Loin 410				
¼" Trim Loin 21# DN-LGHT-weight	3,441	704	1,814	
¼" Trim Loin 21# DN-LGHT-value	$3,992	$817	$2,104	
¼" Trim Loin 21# UP-MED-weight	5017	8,239	6,945	9,259
¼" Trim Loin 21# UP-MED-value	$5,820	$9,557	$8,057	$10,740
Ham 401				
BONE-IN 17-20# TRIM SPEC 1-weight				
BONE-IN 17-20# TRIM SPEC 1-value				
BONE-IN 20-23# TRIM SPEC 1-weight	8,028	6,118	6,854	3,489
BONE-IN 20-23# TRIM SPEC 1-value	$4,736	$3,610	$4,044	$2,059
BONE-IN 23-27# TRIM SPEC 1-weight	372	2,862	2,065	5,818
BONE-IN 23-27# TRIM SPEC 1-value	$208	$1,603	$1,157	$3,258
Belly, Seedless				
SKINLESS, SQRD 9-11# weight	3,740	3,978	3,966	4,216
SKINLESS, SQRD 9-11# value	$3,291	$3,501	$3,490	$3,710
SKINLESS, SQRD 11-13# weight				
SKINLESS, SQRD 11-13# value				
SKINLESS, SQRD 13-15# weight				
SKINLESS, SQRD 13-15# value				
SKINLESS, SQRD 15-17# weight				
SKINLESS, SQRD 15-17# value				

Implications for Producers

The reported differences of these various scenarios may seem small, but the cumulative effect is considerable. The average difference value per head for the two weights is about $4.43. Thus, an operation with throughput of 25,000 head per week that miscalculated the average weight by 10 pounds could see a difference in revenue of $110,625 per week or more than $5.75 million. Furthermore, differences in the percentage of barrows purchased as well as weight distribution can have considerable impacts. Although the type of pigs being processed are really a given in any situation, it is imperative that producers have a good idea of the variation that exists in the processing sector before entering in a new business venture.

Summary

Producers considering owning their product past the packer's gate have many factors to consider. The weight range of live hogs as well as the distribution of weights within that range can have a tremendous impact on the amount of product that can be marketed. In addition to weights, yield grade can have a significant effect on revenues.

By combining prediction equations and user input, the WHVC estimates numbers, weights, and values for specific wholesale cuts and byproducts. By properly using this tool, producers should now be able to make more informed decisions concerning owning their product further down the value chain.

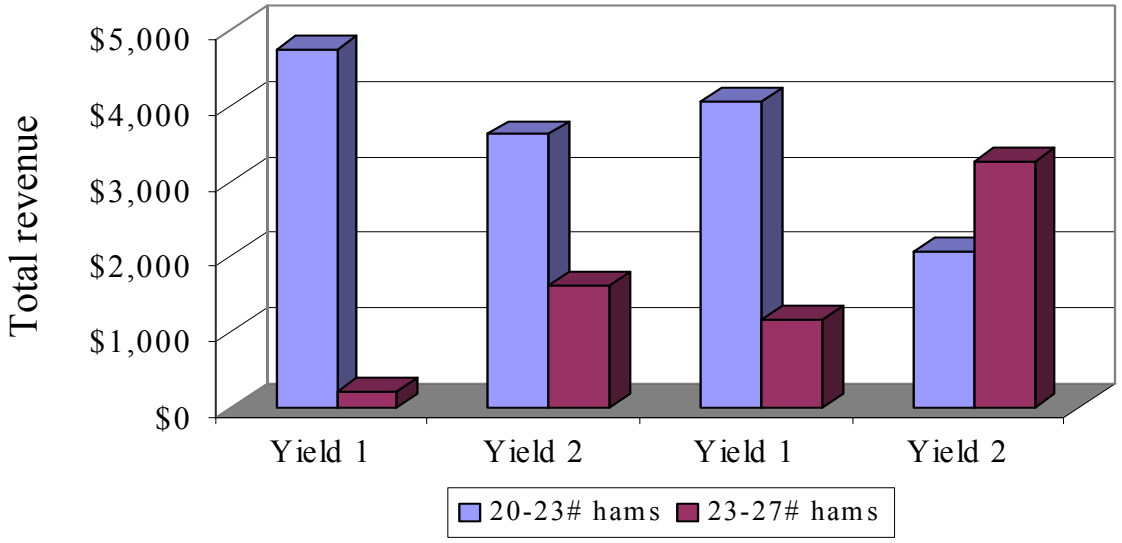

Figure 3. Distribution of Ham Values by Weight and Yield