The Economic Value of Feed Shrink on New York Dairy Farms

A Project Paper

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By

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Abstract

Dairy farms have become increasingly more expensive to operate, and with the cost of feed for cows as the single largest expense, it is crucial to examine the economics of feed shrink. Feed costs make up approximately 50% of operating costs on a dairy farm and are rarely monitored as they should be.

Feed shrink in the animal agriculture industry is defined as "lost resources that never had the potential for economic return" (Greene, 2014). Shrink disappearance can occur in both forages and purchased commodity ingredients. Disappearance shrink may be observed by contamination, poor fermentation and management of forages, wind or other weather-related disappearance, and pest animals. "Feeder" shrink is caused by employee error and inaccuracy of feed ingredient utilization at the time of feeding. Farm location, feed center size, and storage type all can have a significant effect on the amount of both disappearance and feeder shrink.

This project examined eleven New York dairy farms that agreed to have their businesses analyzed through an economic and operational lens. Farms ranged in size from 900 to 2000 milking and dry cows with a total exceeding 15,000. Each farm's feed center is unique in size and setup in which some consist of a mix of upright grain bins and commodity sheds whereas some had solely one or the other. It was observed that all farms in this study were concerned about shrink on their respective dairy but had never deeply examined its effect on their profitability.

This project aims to determine the economic value of shrink for purchased concentrate, commodities, and forages by storage type and as a whole. Once a value is identified, potential

solutions will be offered to each specific dairy if deemed necessary based on the data provided. To understand the impact and severity of feed shrink, farms allowed the observation and collection of data from feeding software (FeedWatch or TMR Tracker) and forage yield data sets. Feed mills and commodity distributors shared delivery data to each farm for each of the purchased ingredients. The data was collected during the window of June 1, 2023, to July 18, 2023. Feeder error may also lead to compromised cattle health and production losses which will further negatively impact farm profitability. While this is tied to shrink and the economics of shrink, it was not examined in this project.

The second aim of this project was to help client farms identify opportunities within individual ingredients to reduce shrink on their farms. This will be presented to each farm as a confidential report comparing their data to the rest of the study participants. This paper will discuss some of the individual farm's data and why they may have varying levels of shrink compared to peers.

The major findings from this 47-day study are as follows. All purchased feeds had an average of 5.42% combined total shrink in all storage types. All upright bins in this study had an average of 3.06% total shrink and an average of $1316 per farm during the study period. 3-sided commodity bays had an average of 8.06% total shrink and $5733 lost per farm. This amounts to an average cost of approximately $0.095/head/per day across all participant herds.

Biographical Sketch

Evan Rapp was born on January 14th, 2000, in Harrisburg, Pennsylvania. He was raised around dairy farming his whole life, often getting to ride in the tractors of the neighboring farm in Lancaster, Pennsylvania or playing in the barns at his grandparents' dairy in western New York. At the age of 5, his family moved to central New York where his older siblings all started working on neighboring dairy farms and eventually convinced him to work there too as his first high school job. After completing high school, Evan attended Delaware Valley University in Doylestown, Pennsylvania where he earned his Bachelor of Science studying Dairy Science and graduating in May of 2022. He then went on to Cornell University to pursue a Master of Professional Studies in Animal Science, with a concentration in Dairy Nutrition, graduating in December 2023. Evan has since begun his career working in the dairy industry alongside his father and Uncle as a Dairy Nutrition Consultant.

Dedication

This paper is dedicated to the men and women who continue to wake up each morning to be the backbone of our society. They work tirelessly to cultivate crops and raise livestock that feed our families and communities. A farmer's job is never done; they work long hours, rain or shine, to ensure that we have fresh produce and meat on our tables. We owe them a debt of gratitude for their efforts. To all the farmers out there, thank you for all that you do. Your hard work and commitment do not go unnoticed, and we appreciate all that you do.

Acknowledgments

I would like to thank the 11 client farms, the feed mills, and the commodity distributors for their dedication and patience throughout this study. I appreciate their willingness to share the data that was requested and answer any questions I had during this project. I would also like to acknowledge the support that I received from Dr. Thomas Overton (Cornell University) throughout this project.

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Introduction

Dairy farms have become increasingly more expensive to operate, and with the cost of feed as the single highest expense, it is crucial to examine the economics of feed shrink. Feed costs make up approximately 50% of operating costs (Kertz, 1998) on a dairy farm and are rarely tracked as closely as they should be. With rising feed costs, producers are starting to be conscientious of their losses due to shrink.

Feed shrink in the animal agriculture industry is defined as "lost resources that never had the potential for economic return" (Greene, 2014). Shrink can occur in both forages and purchased feed commodities. It can be broken down into two forms: disappearance and "feeder" error. Disappearance shrink may be observed by contamination, fermentation, and management of forages, field loss, wind or other weather-related events, and pest animals (birds and rodents) (Harner et al., 2011). "Feeder" shrink is caused by employee error and inaccuracy of utilization of feed ingredients at the time of feeding. Farm location, feed center size, and storage type can all have a significant effect on the amount of both disappearance and feeder shrink.

This project examined 11 New York dairy farms that agreed to have their businesses analyzed through an economic and operational lens. Farms ranged in size from 900 to 2000 milking and dry cows with a total study enrollment exceeding 15,000. Each farm's feed center is unique in size and setup such that some consist of a combination of upright grain bins and commodity sheds while some had solely one or the other. Purchased feedstuffs on farm included lactating and non-lactating premixed concentrates (High cow, Late lactation, Fresh cow, Prefresh), corn meal, canola meal, candy or bakery byproduct, soybean meal, ground roasted soybeans, rumen bypass soy protein meals (Promax, Aminomax), and or bulk load minerals as well. Table 1 shows some commonly observed shrink values. Forages included corn silage and hay crop silage. All herds had bunker silos in which forages were stored, however; only 1 herd had trustworthy forage yield data. It was observed that all farms in this study were concerned about shrinkage on their respective dairy but had never deeply audited their business in such a way to truly understand its effect on their profitability.

Table 1- Commonly observed shrink percentages by storage — Table adapted from Kertz 1998

Ingredient	open, uncovered piles	covered, three-sided bays	closed, upright bins
Bakery waste	8-16	5-10	-
Concentrates	4-5	4-5	2-4
Dry meals	5-10	3-8	2-4
Dry grains	5-8	4-7	2-4

This project aims to determine the economic cost of shrink for purchased concentrates and commodities. This value is also going to compare the difference in shrink among three-sided commodity sheds and upright grain bins. Once a value is identified, potential solutions will be offered to each specific dairy if deemed necessary based on the data provided.

All farms have anecdotally observed shrink on their respective operations and perceive it as a problem. However, they have not accurately measured it in the past and therefore are not aware of the extent of the issue and whether mitigation approaches are warranted.

Limitations of Study

The main objective of this study is to identify shrink in all purchased ingredients and forages on all client farms. However, only one herd had accurate and trustworthy sources of forage yield data by use of scale weights. Therefore, forage shrink was not assessed.

Materials and Methods

To understand the impact and severity of feed shrink, farms allowed the observation and collection of data from feeding software FeedWatch (Valley Ag software Visalia, California) or TMR Tracker (Topcon Fort Atkinson, Wisconsin). Farms also allowed feed mills and commodity distributors to release delivery data to each farm for each of the purchased ingredients. The data was collected for the period of June 1 to July 18, 2023. Feeder error may also lead to compromised cattle health and production losses which will further negatively impact farm profitability. While this is tied to shrink and the economics of shrink, it was not examined in this project.

For the on-farm portion of data collection, a starting and ending tonnage was determined for each ingredient which was needed to set a 'zero' point. Of the 11 herds in the study group, 7 had a mixture of both storage types for purchased feeds. 2 herds had only upright grain bins and 2 farms had only three-sided commodity sheds. The 'Ingredient and Premix Usage Deviation' report on the feed software was used to obtain feeding records. The deviation report shows the specific ingredient, the total call weight of what should have been fed, and the actual loaded weight. This report also shows the percentage and weight deviations for each ingredient.

For the farm-specific economics of shrink, specific farm ingredient purchase prices were not shared. To keep economic data comparable farm to farm, a set pricelist of current spot market values was used on all farms regardless of any contracted pricing. From these data, the economic value of shrink could be determined for each ingredient. Table 2 below shows the spot market value for commodities and the average value for concentrated feeds.

Table 2- Ingredient density and pricing	Density values adapted from Kertz 1998	
Ingredient	Density lb./ft3	$/ ton
Aminomax	36	490
Bakery Waste	35.5	220
Bulk Mineral	72	975
Canola meal	32.5	425
Corn meal	40	220
Promax	38.75	575
Roasted soybean	40	600
Soybean meal 47.5%	41	565
Lactating grain mix*	52	675
Low cow Grain mix*	52	600
Prefresh grain mix*	52	750
fresh cow grain mix*	52	725

*= highly variable based on ingredients used

After all data from on-farm, feeding software, and feed mills and distributors were collected, a Microsoft Excel spreadsheet was used to compile and compare the data. Table 3 below shows an example of the spreadsheet section for a farm in this study.

The data in the columns labeled ‘Fed (t)’ and the ‘Feed out’ percent and ton errors were derived from the ‘Ingredient and premix Usage Deviation” report. The ‘Start’ and ‘Ending’ tons were calculated on the farm. The ‘Purchased’ was collected from the feed mills and commodity distributors.

The ‘Disappearance’ section was calculated by adding the starting tonnage and the delivered amount then subtracting the tons that were fed out to create a theoretical ending tonnage. This theoretical ending is the amount that should have been left over after feeding and delivery calculations if there was no disseverance shrink. Then the actual measured ending tonnage was subtracted to give a ‘%’ and a ‘tons’ disappeared, or the disappearance shrink caused by weather, pests animals, etc.

Using the final feed out and disappearance shrink values that were calculated, graphs and charts were created to compare storage types and economics of individual ingredients within each farm. This data was also used to calculate a total weighted average shrink and economic loss value to then be compared to the herds in the group.

Table 3	Data Collection by Farm						
Farm	**Ingredient**	**Storage Type**	Start	Amount fed	theoretical ending	actual ending	purchased
1	Lactating mix	**Bay**	9.672	244.06	54.612	52.49	289
	Chocolate	**Bay**	26.838	60.47	25.968	23.56	59.6
	Prefresh mix	**Bin**	1.3	15.1	3.2	3.15	17
2	Candy	**Bin**	27.44	188.9	46.91	46.59	208.37
	Canola	**Bin**	15.68	21.87	15.05	14.92	21.24
	Lactating mix	**Bay**	9.67	95.78	35.29	32.92	121.4
	Prefresh mix	**Bay**	24.47	107.91	27.82	24.91	111.26
3	Canola	**Bin**	30	264.16	8.44	8.16	242.6
	Lactating mix	**Bay**	8	123.74	32.91	32.12	148.65
4	Bulk lactating mineral	**Bay**	20.37	33.38	17.23	17.11	30.24
	Aminomax	**Bin**	30.33	55.99	4.16	4.02	29.82
	Canola	**Bin**	17.42	69.37	6.62	6.05	58.57
	Soybean Meal	**Bin**	4.54	71.16	24.8	24.5	91.42
	Corn meal	**Bin**	16.67	162.85	32.38	30.94	178.56
5	High cow mix	**Bin**	26.7	168.04	21.06	20.1	162.4
	low cow mix	**Bin**	27.7	67.44	20.68	20.5	60.42
	Fresh cow mix	**Bin**	12.26	14.57	10.29	10.2	12.6
	Prefresh mix	**Bin**	5.32	24.72	4.8	4.8	24.2
	Canola	**Bin**	36.4	187.57	23.43	22.17	174.6
6	Corn meal	**Bay**	57.35	344.48	16.52	14.7	303.65
	Canola	**Bay**	25.8	110.54	33.96	31.5	118.7
	Chocolate	**Bay**	27.9	118.135	26.355	25.5	116.59
	Roasted beans	**Bay**	10.3	122.4	7.3	6.98	119.4
	High cow mix	**Bay**	31.58	121.23	15.95	15.25	105.6
	Low cow Mix	**Bay**	25.73	73.14	20.19	19.25	67.6
	Prefresh Mix	**Bay**	8.9	17.08	8.72	8.35	16.9
7	Promax	**Bin**	25.1	162	16.3	15.86	153.2
	Lactation mix	**Bin**	39.81	205.26	20.6	19.92	186.05
	Cornmeal	**Bin**	18.84	387.56	27.98	27.1	396.7
	Canola	**Bin**	25.84	99.2	21.74	20.56	95.1
	Fresh cow mix	**Bin**	6	35.67	6.21	6.05	35.88
	Prefresh mix	**Bin**	9	32.14	3.84	3.76	26.98
8	Canola	**Bay**	16.8	243.8	31.620	29.36	258.6
	Corn meal	**Bay**	51.83	243.775	227.575	224.78	419.52
	Roasted soy	**Bay**	20.23	168.94	29.88	28.45	178.59
	Mineral	**Bay**	24.36	114.45	29.76	29	119.85
9	Corn meal	**Bin**	17.53	62.85	13.78	13.65	59.1
	Canola	**Bin**	3.92	18.18	7.14	7.12	21.4
	Chocolate	**Bin**	4	19.01	8.89	8.85	23.9
	Lactating mix	**Bay**	22.68	369.8	16.38	14.93	363.5
	Promax	**Bay**	41.46	150.73	15.33	13.79	124.6
	Fresh cow mix	**Bay**	35.99	109.85	13.74	12.79	87.6
	Prefresh mix	**Bay**	29.48	179.53	26.3	25.75	176.35
10	Canola	**Bay**	9.36	94.53	33.47	30.96	118.64
	Corn Meal	**Bay**	8.64	281.94	19.82	17.64	293.12
	Candy	**Bay**	4.62	95.38	29.41	28.45	120.17
	lactating mix	**Bin**	15.68	262.82	24.42	24.35	271.56
	Prefresh mix	**Bin**	7.84	25.35	5.03	5.03	22.54
11	Corn Meal	**Bin**	13.4	59.19	16.01	15.95	61.8
	Chocolate	**Bin**	6.65	70.73	28.02	27.92	92.1
	Canola	**Bin**	12.72	41.425	16.245	16.245	44.95
	Promax	**Bay**	44.8	160.37	35.99	34.15	151.56
	Bulk lactating mineral	**Bay**	17.69	57.36	22.81	21.98	62.48

Analysis Data

The resulting data, as seen in Table 4, shows the feed shrink data for each farm and ingredient. Some ingredients may have a ‘0’ in the ‘disappearance’ headers and this is due to the disappearance shrink being so minor that it could not be calculated. Farm 8 made a premixed lactating blend on the farm, but the total premix made was not tracked so a disappearance shrink value was not calculated for that ingredient. Under the ‘$ lost’ column, ingredients with a ‘+’ symbol had a net underfed rate to animals and therefore had a higher retained feed value than a disappearance value giving the impression that money was gained.

Ingredients fed out of three-sided commodity bays saw an average total shrink of 8.06% with a range of 2.23 to 23.82 %. Ingredients stored and fed out of upright bins saw an average of 2.47% and a range of 0 to 10.03% shrink. Shrink from feeder error accounts for nearly 82% of all shrink in upright bins and approximately 66% in three-sided commodity sheds. The average economic loss for all commodity sheds across the study was $1,875 with a range of $250 to $7200. The average loss of upright bins was $938 with a range of $22 to $5915.

Table 4- Calculated shrink by farm and ingredient

Farm		Storage type	shrink (%) Feed out	Disappearance	Total	shrink (tons) Feed out	Disappearance	Total	% feeder error of total	$ lost
1	Lactating mix	Bay	3	2.35	5.35	7.11	0.81	7.92	89.77	-5366
	Chocolate	Bay	8.53	9.27	17.8	4.75	2.41	7.16	66.34	-1575
	Prefresh mix	Bin	7.76	0	7.76	-1.26	0	-1.26		+945
2	Candy	Bay	9.43	6.72	16.15	8.25	2.37	10.62	77.68	-2336
	Canola	Bay	13.36	10.46	23.82	13.73	2.91	16.64	82.51	-7072
	Lactating mix	Bin	0.91	0.68	1.59	1.71	0.32	2.03	84.24	-1370
	Prefresh mix	Bin	2	0.86	2.86	0.43	0.13	0.56	76.79	-420
3	Canola	Bay	2.99	1.96	4.95	1.05	0.63	1.68	62.5	-714
	Lactating mix	Bin	0.41	3.31	3.72	1.07	0.28	1.35	79.26	-911
4	Bulk lactating mineral	Bay	6.52	0.46	6.98	2.04	0.08	2.12	96.23	-2045
	Aminomax	Bin	2.35	3.37	5.72	1.29	0.14	1.43	90.21	-700
	Canola	Bin	1.12	2.57	3.69	-1.28	0.17	-1.11		+471
	Soybean Meal	Bin	2.98	1.21	4.19	2.06	0.3	2.36	87.29	-1333
	Corn meal	Bin	1.26	0.62	1.88	2.03	0.2	2.23	91.03	-490
5	High cow mix	Bin	0.63	1.04	1.67	-1.07	0.22	-0.85		+573
	low cow mix	Bin	1.12	0.87	1.99	0.75	0.18	0.93	80.65	-558
	Fresh cow mix	Bin	2.09	0.87	2.96	-0.31	0.09	-0.22		-159
	Prefresh mix	Bin	0.12	0	0.12	0.03	0	0.03		-22.5
	Canola	Bin	0.73	5.38	6.11	1.37	1.26	2.33	52.09	-535
6	Corn meal	Bay	1.54	11.02	12.56	5.25	1.82	7.07	74.26	-1555
	Canola	Bay	0.28	7.24	7.52	0.31	2.46	2.77	11.19	-1177
	Chocolate	Bay	2.88	3.24	6.12	3.2	0.86	4.06	78.82	-893
	Roasted beans	Bay	3.92	4.38	8.3	4.62	0.7	5.32	86.84	-3192
	High cow mix	Bay	2.88	4.39	7.27	3.4	0.7	4.1	82.93	-2767
	Low cow Mix	Bay	2.99	3.22	6.21	2.12	0.65	2.77	76.53	-1662
	Prefresh Mix	Bay	0.7	4.24	4.94	0.12	0.37	0.49	24.49	-367
7	Promax	Bin	6.6	2.7	9.3	10.03	0.44	10.47	95.8	-5915
	Lactation mix	Bin	0.15	2.04	2.19	0.33	0.42	0.75	44	-506
	Cornmeal	Bin	0.51	1.82	0.51	3.15	0.88	4.03	78.16	-886
	Canola	Bin	5.2	1.7	6.9	4.91	0.37	5.28	92.99	-2244
	Fresh cow mix	Bin	1.91	2.58	4.49	-0.61	0.16	-0.45		-356
	Prefresh mix	Bin	0.92	2.08	3	0.29	0.08	0.37	78.38	-277
8	Canola	Bay	2.72	7.16	9.88	6.62	2.27	9.88	70.35	-4199
	Corn meal	Bay	2	4.79	6.79	12.15	0.76	12.91	94.11	-2840
	Roasted soy	Bay	11.88	2.55	14.43	2.55	0.76	3.31	77.04	-1986
	Bulk lactating mineral	Bay	3.78	0.85	4.63	0.28	0.28	0.56	50	-546
	Premix (made on farm)	Bay	3.2		3.2	20		20	100	-7223
9	Corn meal	Bay	0.08	8.85	8.93	-0.3	1.45	1.15		-253
	Canola	Bay	0.38	7.7	8.08	-0.57	1.8	1.23		-522
	Chocolate	Bay	0.24	6.91	7.15	-0.27	0.95	0.68		-149.6
	Lactating mix	Bay	0.14	2.09	2.23	0.25	0.55	0.8		-540
	Promax	Bin	0.28	0.94	1.22	-0.18	0.13	-0.05		+28
	Fresh cow mix	Bin	0.53	0	0.53	-0.1	0	-0.1		+72.5
	Prefresh mix	Bin	0.62	0	0.62	-0.12	0	-0.12		+90
10	Canola	Bay	0.25	7.5	7.75	-0.246	2.51	2.264		-960
	Corn Meal	Bay	0.47	11	11.47	1.33	2.18	3.51	37.89	-772
	Candy	Ba	1.86	3.26	5.12	-1.81	0.96	-0.85		+187
	lactating mix	Bin	1	0.29	1.29	-2.66	0.07	-2.59		+1748
	Prefresh mix	Bin	2.86	0	2.86	-0.76	0	-0.76		+570
11	Corn Meal	Bay	1.33	5.11	6.44	2.1	1.84	3.94	53.3	-866
	Chocolate	Bay	1.82	3.64	5.46	1.03	0.83	1.86	55.38	-409
	Canola	Bin	0.91	0.37	1.28	0.53	0.06	0.59	89.8	-250
	Promax	Bin	0.28	0.36	0.64	0.2	0.1	0.3	66.67	-172
	Bulk lactating mineral	Bin	1.45		1.45	0.59		0.59		-339

A breakdown of cost per day and cost per head per day was also included in Table 5 below. The average total cost of shrink per day was $122 with a range of $34 to $353. This makes the average cost/head/day approximately $0.095 with a range of $0.02 to $0.27.

Table 5 Cost Analysis by Farm

Farm	Milking and dry	% bays	% bins	cost/day	cost/hd/day
1	1000	5.81	0	$ -127.57	$ -0.13
2	1300	19.98	2.22	$ -238.26	$ -0.18
3	1475	4.95	3.72	$ -34.57	$ -0.02
4	900	6.98	3.87	$ -87.17	$ -0.10
5	1670	-	1.63	$ +8.47	$ +0.01
6	1500	7.06	-	$ -247.09	$ -0.16
7	1850	-	4.4	$ -216.68	$ -0.11
8	1300	6.6	-	$ -353.06	$ -0.27
9	1750	6.6	0.79	$ -27.11	$ -0.02
10	1250	8.11	2.07	$ +16.45	$ +0.01
11	950	5.95	1.12	$ -43.32	$ -0.05
average	1357	8.06	2.47	$ -122.72	$ - 0.0948

Table 6 shows some average disappearance rates of ingredients from this study. Canola meal, corn meal, and concentrate mix experienced an average of 5.16, 8.15, and 3.26% respectively in commodity bay storage. The same three ingredients had an average of 2.5, 0.81, and 1.21% disappearance in upright bins. Bakery by-product, an item that cannot be stored in an upright bin, experienced a 5.5% disappearance in this study. Bulk minerals showed an average of 0.66% in bays but did not show any measurable disappearance in bins.

Table 6- Average Disappearance Rates (%) by Ingredient		
Ingredient	Commodity bay	Upright bin
Aminomax	-	3.37
Bakery Waste	5.51	-
Bulk Mineral	0.66	0
Canola meal	5.16	2.5
Corn meal	4.12	0.81
Promax	-	1.21
Roasted soybean	3.47	-
Soybean meal 47.5%	-	1.21
Lactating grain mix	3.26	0.91

Discussion

Lower-density and high-usage ingredients such as canola meal, corn meal, and bakery byproducts all had higher rates of disappearance (Table 5). Items with a high usage rate are subject to increased disappearance rates due to a higher quantity of handling events increasing the opportunity for more displacement to occur. This is especially apparent in commodity-type storage where wind and pest animals can easily remove and displace feed.

The data in Table 4 show how rates between commodity sheds and upright bins differ greatly. Farm 2 had the highest feed-out error for the two products they stored in a commodity shed. The canola meal on this farm was fed out to a total of 107.9 tons and had an alarming 13.36% (13.73 t) loss to feed out error and 10.46% (2.91 t) to disappearance. This amounts to over $7,000 in the 47-day study window and $55,000 per year. A 1% decrease in shrink saves approximately $2,308 a year but a 15-percentage point (65%) decrease would reach the average shrink for commodity sheds and would save $34,600 a year. Likewise, candy byproduct had a total feed out of 95.78 tons and saw a 9.43% (8.25 t) feed-out error and a 6.7% (2.7 t) disappearance amounting to around $2,300 in this study window or almost $18,000/ year. A 1% shrink on candy saves $1,125/ year but an 8-percentage point (50%) decrease saves roughly $9,000/ year. As for the upright bins on this farm, the lactating concentrate mix had a total feed out of 188.9 tons with a 0.91% (1.71 t) feeder error and 0.68% (0.32 t) disappearance amounting to $1,370 for the study or $10,639/year. This farm sits on an open, windy hilltop with the commodity shed facing south.

Farm 3 is a similar situation to farm 2 being that they have a mix of grain bins storing the lactating concentrate mix and a large "3.5-sided" commodity storage area. Canola is stored in the commodity building and had a total feed out of 123.74 tons with a 2.99% (1.0 t) feeder error and 1.96% (0.63 t) of disappearance amounting to $714 during the study or $5500/year. Lactating concentrate is stored in an upright grain bin and had a total feed out of 264.16 tons with a 0.41% (1.07 t) feeder error and 0.28 tons of disappearance equaling $911 during the study or $7074/year. Farm 3 sits in a flat, open, windy landscape about a mile from Lake Ontario.

Farms 2 and 3 are similar in size and used a similar amount of canola (107 tons and 112 tons, respectively) during the study. However, Farm 2 had a significantly higher disappearance rate (2.99 tons versus 1.07 tons). Farm 2 has outgrown its feed center including its commodity shed. This leaves a more than desirably sized pile out in front of the commodity shed that is uncovered and susceptible to increased disappearance. Farm 3 has an almost completely closed-off commodity storage area which has a doorway just big enough for a front-end loader to enter and maneuver inside to select the ingredient desired.

Recommendations

For farms with shrink values in commodity bay stored ingredients similar to Farm 2 described above, should consider the possibility of using an upright bin. It was observed that canola stored in commodity sheds had an average shrink of 8.01%, while in upright bins were 3.5% average shrink and 1.49% from feeder error. It was calculated that farm 2 lost approximately $7,000 (23.82%) on canola alone during the trial or approximately $55,000/ year. If this farm installs an upright grain bin to store canola in, reducing shrink approximately 20% from 23.82% to the average of 3.59% (the average shrink of canola in a bin), a potential of $46,690 could be saved. However, this assumes the farm has adequate electricity to run the motor. According to Farmer Boy Ag in Waterloo, NY, a 40-ton grain bin costs about $32,500 plus $125 for a yard of concrete and 4 hours of labor at $15/ hour to build a base for the bin. However, depending on where the bin is set up a significant amount of labor hours could be saved as feeding out of bins is usually a much faster task. This makes the pay back to install a bin less than a year.

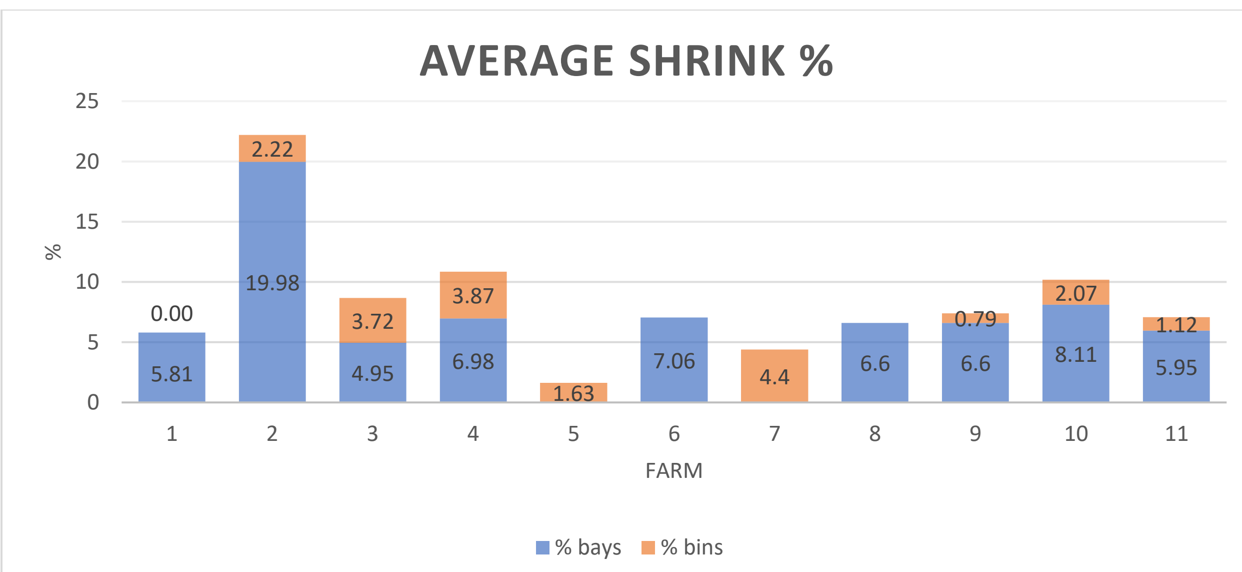
Comparison Report

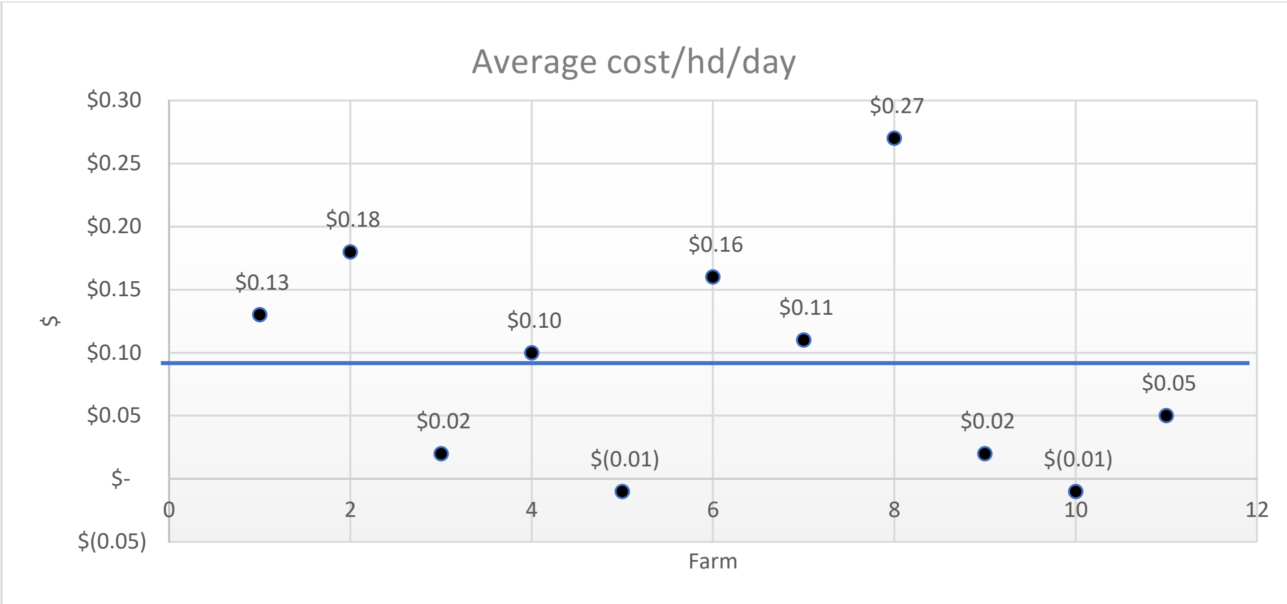
Each farm in this study will also receive a report of the findings of this study as well as a comparison to the other participant herds. The report includes the farm's collected data, graphical illustrations of the information presented in this paper, observations of their feeding operations, and recommendations on how to reduce shrink on this farm. An example using Farm 2 will be included below.

Farm	Ingredient	Storage Type	Start	Amount fed	theoretical ending	actual ending	purchased
2	Candy	Bin	27.44	188.9	46.91	46.59	208.37
	Canola	Bin	15.68	21.87	15.05	14.92	21.24
	Lactating mix	Bay	9.67	95.78	35.29	32.92	121.4
	Prefresh mix	Bay	24.47	107.91	27.82	24.91	111.26

			shrink (%)			shrink (tons)				
Farm	Ingredient	Storage type	Feed out	Disappearance	Total	Feed out	Disappearance	Total	% feeder error of total	$ lost
2	Candy	Bay	9.43	6.72	16.15	8.25	2.37	10.62	77.68	-2336
	Canola	Bay	13.36	10.46	23.82	13.73	2.91	16.64	82.51	-7072
	Lactating mix	Bin	0.91	0.68	1.59	1.71	0.32	2.03	84.24	-1370
	Prefresh mix	Bin	2	0.86	2.86	0.43	0.13	0.56	76.79	-420

Average Disappearance rates		
Ingredient	Commodity bay	Upright bin
Aminomax	-	3.37
Bakery Waste	5.51	-
Bulk Mineral	0.66	0
Canola meal	5.16	2.5
Corn meal	8.15	0.81
Promax	-	1.21
Roasted soybean	3.47	-
Soybean meal 47.5%	-	1.21
Lactating grain mix	3.26	0.91





Blue line represents the average ($.095/hd/d)

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