



Weaning Age Impact on Piglet and Sow Performance

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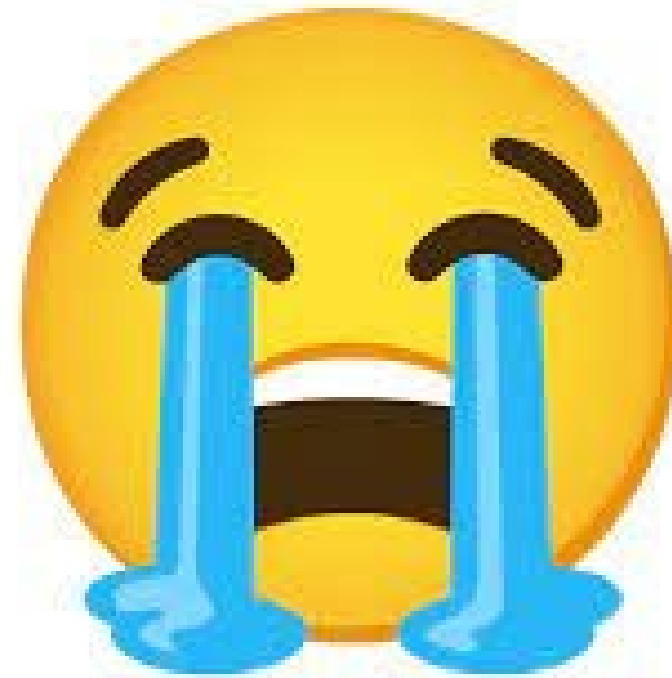
WEAN AGE A SHORT HISTORY

- Naturally, weaning happens gradually around 10 to 12 weeks of age.
- Reduce wean age gradually from 6 weeks to 4 weeks,
 - Acceptable practice in intensive swine production until 1990
 - Two important events happened:
 1. The development of medicated early weaning by Dr. Tom Alexander
 2. Significant advancements in swine nutrition
- Those two events propelled the rise of Segregated Early Weaning (SEW) as one of the leading production strategies of the 21st century

SEGREGATE EARLY WEANING

- Development of larger sow farms and the development of a more expanded production system sold on the assumptions that:
 1. Large early wean sow farm = Large amount of high-health pigs
 2. Litter size reduction offset by an increase in litter farrow per year.
 3. Increase utilization of the farrowing crate = reduce sow farm cost.
 4. If you have the correct diet and the correct environment, weaning age don't matter(>15 days)
 5. The higher health status of the younger weaned pig will outweigh the negative impact of early weaning.

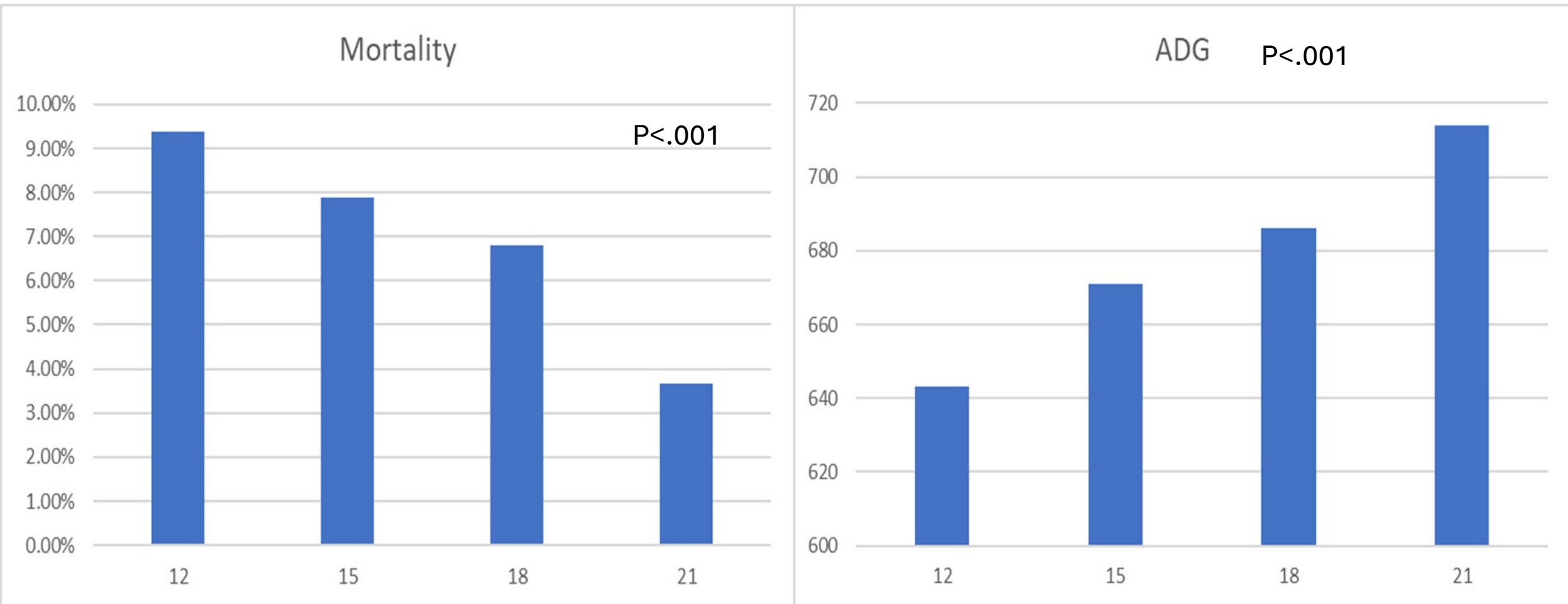
- SEW was the answer to long-term health and production stability!



FAILURE OF SEW

- SEW felt short of its initial promises!
- The principle was bastardized, stretched to the utmost limit, and broke
- While we can see some of the pitfalls and shortcuts that were taken and caused the failure on the health side
- We believe at the time that our understanding of the weaning age and its impact was well understood and accounted for.
- Work of Main et al. (2004) shows that we were wrong

EFFECT OF WEAN AGE ON WEAN TO FINISH PERFORMANCE (MAIN ET AL. 2004)



THE GI TRACT

- The GI tract mucosa plays several critical roles during the early life of the piglets.
- Absorption of nutrients
- Effective barrier to pathogens, toxins, and antigenic components in the gut.
- Balance immune development on food and microbial antigens

THE GI EPITHELIUM

- Single layer of epithelial cells lining
- Represents the most extensive contact between the host and the outside world
- Facilitates
 - The breakdown and uptake of nutrients
 - Massive amount of water movement
- Barrier to pathogens and antigens toxins
- The first line of defense.
 - Permeability barrier
 - Controlled by the tight junction
 - Intracellular intercellular membrane proteins.

THE GI IMMUNE SYSTEM

- Largest immune organ in the body
- Maintains a delicate balance between
 - Controlling the inflammatory response to antigenic substances
 - Reactiveness to infection by a pathogen or breach in the epithelial barrier.
 - This is critical for good GI health
 - Imbalance plays a significant role in GI inflammatory disorder.
- Several maternal and host mechanisms inhibit immune activation during early GI development,
- Importance of an immunosuppressive state for the good development of the immune system.

ENTERIC NERVOUS SYSTEM

- Plays a central role in gut and overall systemic health
- Two major neural ganglia in the muscle and submucosa
 - Which control motility and peristalsis.
- Plays a central role in
 - Gut motility
 - Suppression in absorption
 - Modulation of epithelial permeability.
 - Toxins can be sensed by sensory fiber
 - Initiate neural secretory reflexes
 - This Neuroimmune communication also plays a role in GI diseases
 - IBS, Increase in nerve mast-cell interaction = early wean pigs

IMPACT OF WEANING AGE ON GI TRACT DEVELOPMENT AND FUNCTION

- Weaning in commercial pig production is one of the most stressful events in a pig's life.
- Weaning is abrupt, occurring between 14 to 28 days of age.
- Sudden separation from the mother
- Drastic dietary change
- Compounded by other stress
- Coincides with declining passive immunity
- All those stresses disrupt the normal development processes of all the GI function

BREAKDOWN OF THE GI BARRIER FUNCTION

- Epithelial barrier breakdown:
 - Compared with age-match litter maid pigs
 - Early-weaned pigs show an increase in intestinal permeability (Moser et al. 2007)
 - Persist up to 9 weeks post-weaning (Smith et al., 2010) and even into adulthood (Pohl et al., 2017)
- GI immune barrier breakdown
 - following weaning, activation of the GI immune system (Hu et al., 2013)
 - Activation of mast cells
 - plays a critical role in intestinal barrier breakdown (Moser et al., 2007)

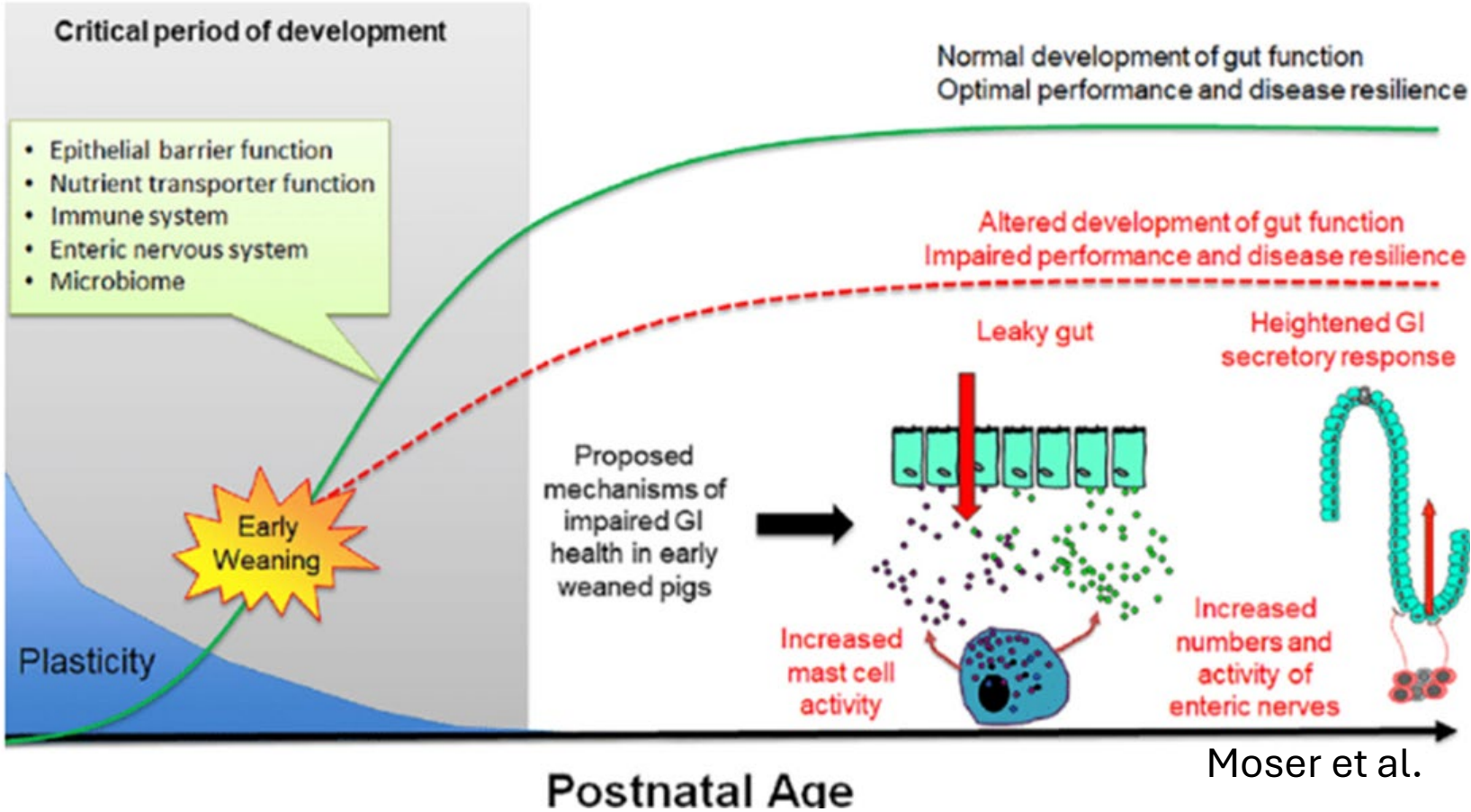
GI IMMUNE FUNCTION

- Early-weaning piglets have long-lasting functional changes in the GI immune function and disease susceptibility.
 - Increased susceptibility to enterotoxigenic E. coli challenge (Mclamb et al., 2013)
 - Lower immune response to stress later in life (Davis et al., 2006)
 - Compromised immune response
 - Mast cell Hyperplasia in the small and large intestines 2- and 9-week post-weaning(Mclamb et al. 2013) .
 - Still present in Adults (Pohl et al., 2017)
- As they age, late-weaning pigs see an expected decline in enteric neuron numbers
 - Early-weaning pigs do not show that reduction(Medland et al 2016).
 - Persistent upregulation of the enteric cholinergic system
 - More susceptible to hypersecretion
 - Increased vulnerability to enterotoxigenic E. coli.

MAST CELLS

- Required for host defense and wound healing,
- Excessive activation of mast cells is a central mechanism in allergy, asthma, and IBS in humans (Hamilton et al., 2016)
- Early wean pigs show
 - Higher mast cell activation
 - Intestinal mast cell hyperplasia that is still evident nine weeks post-weaning (Moser et al., 2007; Smith et al., 2010)
- This is a significant factor in increasing gut permeability (Moser et al., 2007).

IMPACT OF WEANING AGE ON GI TRACT DEVELOPMENT AND FUNCTION



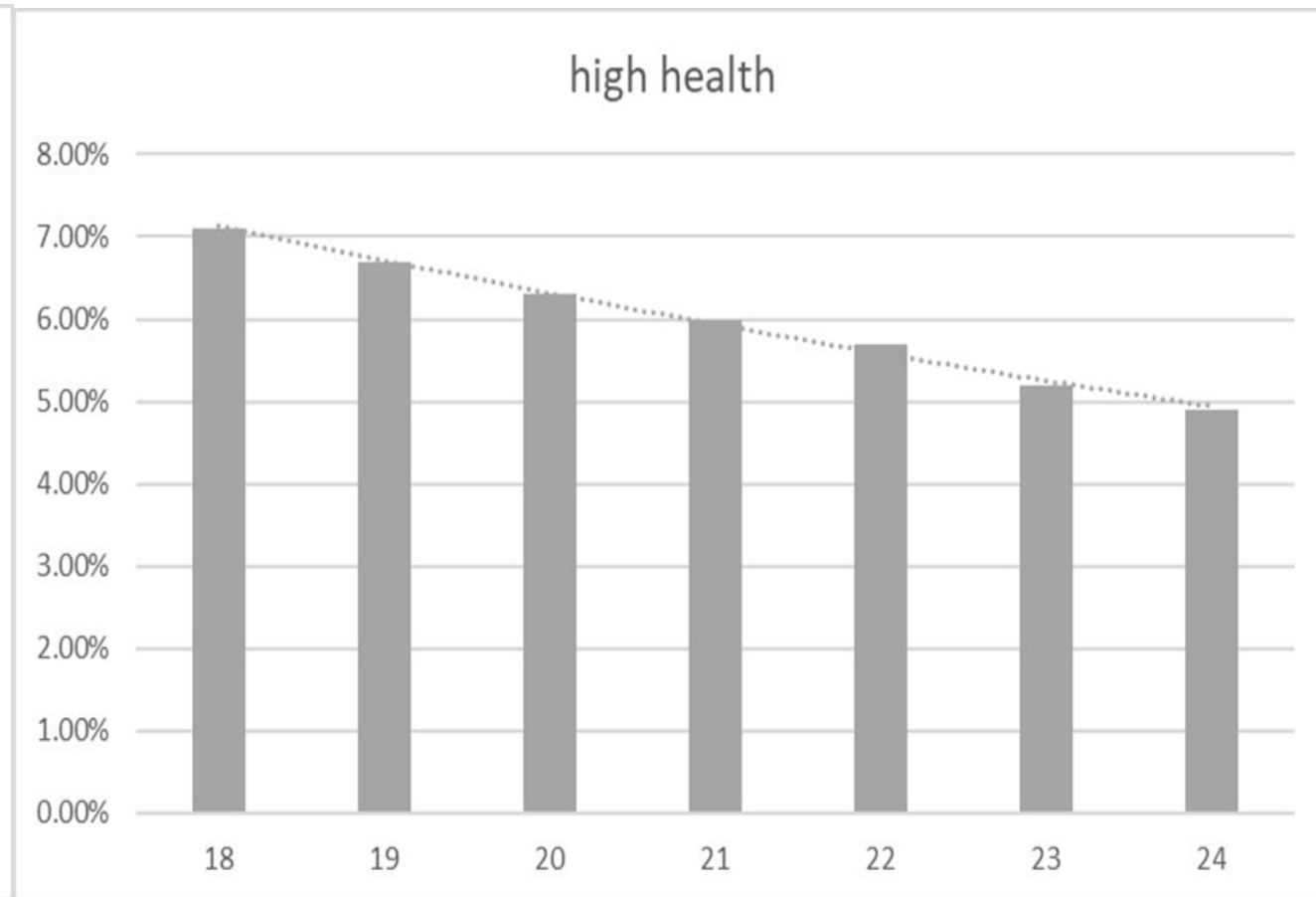
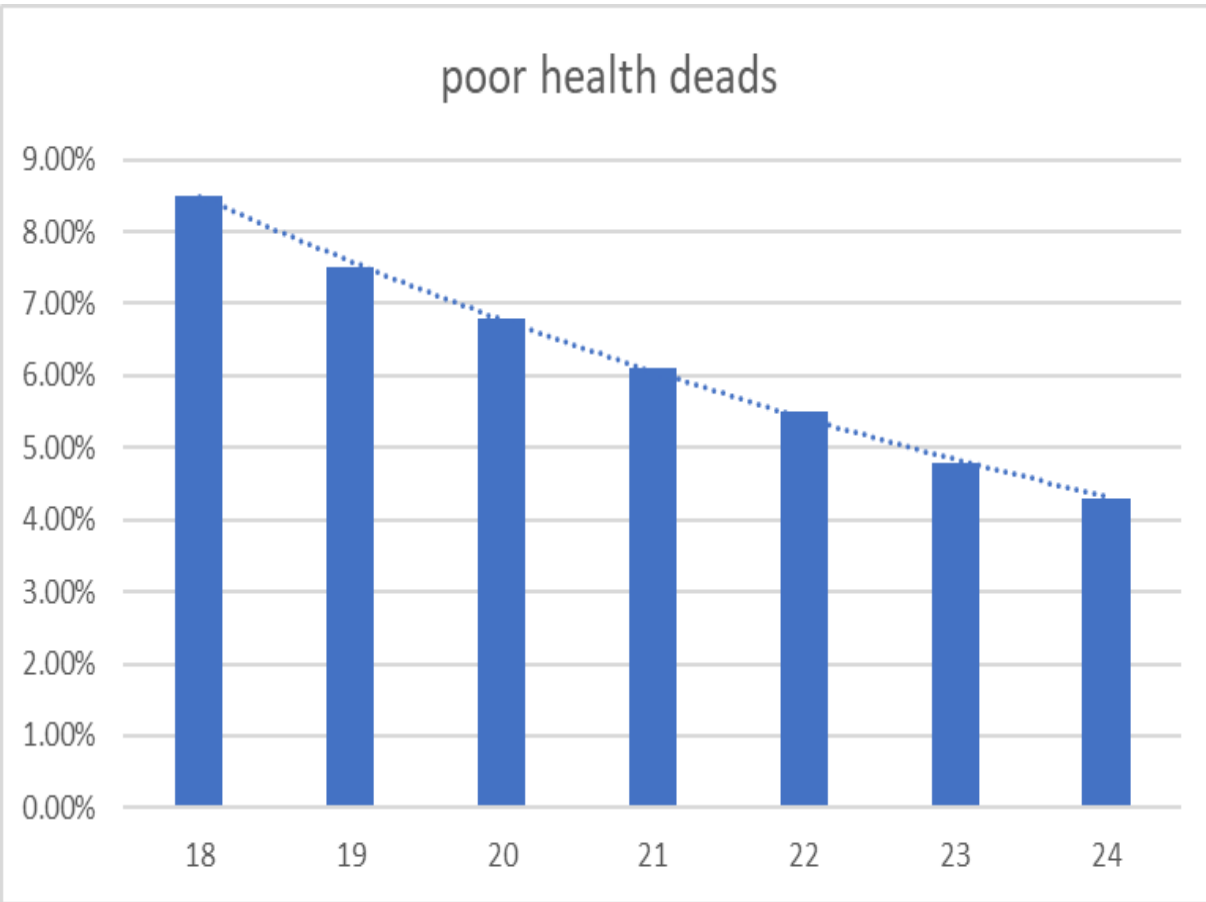
WEAN AGE IMPACT ON POST-WEANING PERFORMANCE:

- Main et al. showed linear improvement of both gain and livability in two different trials as wean age increased
- Similar findings were observed in three subsequent control Studies (Smith et al., 2008; Faccin et al., 2020; Faccin et al., 2020b).
- Corroborated by extensive data group analysis (Rosero et al., 2016)
- robust evidence of the impact of wean age on grow-finish performance.

Linear improvement associated with an increase in weaning age

study	Main et al. 2004	Smith et al. 2008	Faccin et al. 2020	Faccin et al. 2020 b
wean age range (days)	12 to 21	15 to 20	18.5 to 24.5	19 to 28
wean weight gr	257	300	220	250
D 42 post-weaning weight KG	0.93	0.62	0.928	0.802
Wean to finish ADG gr/day	9.9		11.1	13
Wean to finish Mortality	0.47%	0.10%		0.77%
WT sold per pig Wean Kg	1.8		0.71	2.21

Impact of wean age on mortality for different health status



LACTATION LENGTH IMPACT ON THE SOW PERFORMANCE

- Several retrospective studies look at the impact of weaning age on service interval and subsequent litter size
 - In most, the wean-to-service interval was a good predictor of litter size
 - Lactation length was another predictor of litter size
- The general linear assumption
 - 1-day increase of lactation length = .1 piglet total born.
- Some control studies have shown minimum to no effect of lactation length on following litter size (Smith et al., 2008).
- Other management strategies Can impact WSI and affect the impact of lactation length on litter size

PUTTING IT ALL TOGETHER (THE ECONOMIC MODEL)

- What is the optimum wean age for my farm or my operation?
- Partial budgeting
 - Compare the costs and benefits of alternatives faced by a farm business.
 - It focuses only on the changes in income and expenses resulting from implementing a specific alternative.
 - All aspects of farm profits that are unchanged by the decision can be safely ignored.
 - Like in most models, the value of partial budget analysis depends upon the quality of the information used for the analysis
- **Garbage is in, garbage is out!**

Linear change per day of age/lactation

Parameter	Impact per days
Wean to service interval	-.167 days
Conception rate	.167%
Fall out rate	-.083%
Total born	0.1 piglet
Stills & mummies	.033%
Prewaning mortality	.167%
Lactation feed intake	.1 kg
Weaning weight	250 gr
Quantity of Prestarter Kg	-250 gr
Weight at the exit of the nursery (42 days)	800 gr
Wean to finish the mortality	-.33%
Weight sold at market	1.75 kg

Economic assumption

Feed cost per US ton

Gestation	200 \$
Lactation	235 \$
Prestarter	850 \$
Nursery1	640 \$
Nursery2	300 \$
Nursery3	240 \$
Finisher 1	210 \$
Finisher 2	200 \$
Finisher 3	190 \$
Finisher 4	185 \$

Inventory value

Wean Pig	\$ 50
Feeder pig	\$60
Market pig	\$170
Gilt	\$230
Sow	\$300

Other cost and revenue

Sow farm	
New Construction	\$ 4000
Labor cost per sow per year	\$ 130
Breeding and genetic cost /yr	\$ 100
Nursery place	
New Construction	\$300
contract nursery cost per yr	\$ 38
Finisher Space	
New Construction	\$450.00
Contract finisher cost per yr	\$ 45
Carcass price per 100 lbs	\$ 80

MODEL ASSUMPTION

- In this partial budgeting model, we will look at two options for 3200 farrow to finish the system currently weaning at an average age of 18 days:
- Option A:
 - Increase weaning age from 18 to 21 days by increasing farrow crate efficiency
 - reducing downtime by one day
 - Increasing transfer in the farrowing room from 110 to 112 days of gestation
 - Weaning twice a week
- Option B:
 - Increasing the weaning age from 18 to 21 days
 - and adding 66 extra farrow crates.
 - The 66 crates addition will cost \$396,000
 - with financing and will be amortized over seven years, making it an extra cost of \$20.50 per sow per year.
- Option C
 - Increasing the weaning age from 18 to 24 days
 - Combining options A & B

	Control 18 days	OPTION A 21 days Increase efficiency	OPTION B 21 days increase Far crate	OPTION C 24 days increase FC & eff		
barn capacity		dynamic inventory		dynamic inventory		dynamic inventory
total gestation crate space	1250	1250	0	1250	0	1250
total gestation pen space	1750	1750	0	1800	50	1800
total farrowing crate	534	534	0	600	66	600
total space	3534	3534	0	3650	116	3650
space efficiency in gestation	92%	95%	2%	92%	0%	95%
intervention cost per sow per year		\$ -	\$ -	\$ 20.60	\$ 20.60	\$ 20.30
interval and gestation performance						
batch interval (days)	7	7	0	7	0	7
%over farrowing	0%	0%	0%	0%	0%	0%
wean age	18	21	3	21	3	24
open crate days	7	4	-3	7	0	4
wean to service interval	6	5.50	-0.5	5.50	-0.5	5.00
conception rate	92.0%	92.5%	0.5%	92.50%	0.5%	93%
Farrowing rate	88.0%	88.5%	0.5%	88.5%	0.5%	89.0%
targer farrow per batch	149.52	149.52	0	150.00	0	150.00
Litter per sow per year	2.3960	2.3594	-0.037	2.3594	-0.04	2.3240
total born	15.5	15.80	0.3	15.80	0.30	16.10
Stills & mummies	9.0%	9.10%	0%	9.10%	0%	9.20%
Born alive	14.105	14.36	0.26	14.36	0.26	14.62
preweaning mortality	13.00%	13.50%	0.50%	13.50%	0.50%	14.00%
wean per litter	12.27	12.42	0.15	12.42	0.15	12.57
PSY	29.40	29.31	-0.09	29.31	-0.09	29.22
average daily lactation itake Kg	6.00	6.30	0.30	6.30	0.30	6.60
gestation feed per sow per year	885.15	867.49	-17.66	867.49	-17.66	850.37
lactation feed per sow per year	258.76	312.15	53.39	312.15	53.39	368.12
feed cost per sow per year	\$ 244.31	\$ 254.66	\$ 10.35	\$ 254.66	\$ 10.35	\$ 265.78
inventory	3245	3295	50	3306	61	3356
max inventory	3,287	3,357	71	3,395	108	3,468
PIG WEAN PER YEAR	95,410	96,592	1,181	96,902	1,491	98,063
price per pig	\$ 50.00	\$ 50.00	-	\$ 50.00	0	\$ 50.00
wean pig revenue	\$ 4,770,512	\$ 4,829,581	\$ 59,069	\$ 4,845,085	\$ 74,574	\$ 4,903,139
feed cost	\$ 792,798	\$ 839,178	\$ (46,380)	\$ 841,872	\$ (49,074)	\$ 892,052
breeding herd cost per sow	\$ 324,507	\$ 329,531	\$ (5,024)	\$ 330,589	\$ (6,082)	\$ 335,630
inventory cost	\$ 421,859	\$ 428,391	\$ (6,532)	\$ 429,766	\$ (7,907)	\$ 436,318
Treatment cost	0	\$ -	\$ -	\$ (68,101.34)	\$ (68,132.81)	\$ (68,132.81)
difference in total profit lost			\$ 1,133	\$ (56,591)	\$ (60,342)	\$ (60,342)
per pig			\$ 0.01	\$ (0.58)	\$ (0.62)	\$ (0.62)
per sow			\$ 0.34	\$ (17.12)	\$ (17.98)	\$ (17.98)
difference in total profit lost if inventory remain stable			\$ (0.52)	\$ (1.17)	\$ (1.72)	\$ (1.72)

SOW FARM IMPACT

- The two options show a similar pig per sow per year
 - Lower litter per year is somewhat offset by the higher total born
- In higher wean age options, maintaining the number of litter farrow per week, by increasing the sow inventory slightly, combined with the increase of pig wean per litter allows the farm total throughput to increase.
- This increased revenue is offset by the increased feed cost mainly associated with the increased lactation length and, to a lesser extent, the inventory increase.
- We also incurred an added cost on breeding herds and labor for the higher inventory.
- Overall, option A Wean pig cost is even while option B and C increases it by \$0.60, due to the cost of extra lactation feed and farrowing crates
- If the sow inventory remain the same and weekly litter farrow go down
 - Increase wean pig cost \$.75 to \$1.00

GROWING PIG IMPACT

- We then continue to run those two options into the growing phase using two models,
 - fixed time with variable marketing weight
 - fixed weight with variable growing time.
- For both options, we assume 75% of the mortality gain is recuperated in the nursery phase while 25% is captured in the finisher phase
- The increased weaning weight also allows a reduction of pre-starter usage

Option fix time and maximum weight

Pig entry assumption

# pig weaned		94639	95853	1214	96161	1522	97355	2716
Price isowean	\$/pig	\$ 50.00	\$ 50.01	\$ 0.01	\$ 50.58	\$ 0.58	\$ 50.62	\$ 0.62
wean age		18.00	21.00	3	21.00	3	24.00	6
Total value	\$	\$ 4,731,950.00	\$ 4,793,608.53	\$ 61,658.53	\$ 4,863,823.38	\$ 131,873.38	\$ 4,928,110.10	\$ 196,160.10

Nursery		18 days	21 days eff	21 days Far crate	24 days FC& eff	per day			
# pigs entered		94,639	95,853	1,214.00	96,161.00	1,522.00	97,355.00	2,716.00	
Mortality %	%	4.00%	3.34%	-0.66%	3.34%	-0.66%	2.68%	-1.32%	-0.22%
# pigs sold		90853	92652	1,798.07	92949	2,096	94746	3,892.45	
Weanin weight	lbs/pig	12.68	14.33	1.65	14.33	1.65	15.99	3.31	0.55
ADG moyen	lb/day	0.880	0.966	10%	0.966	10%	1.053	20%	
Days	day	42.0	42.0	0.0	42.0	0.0	42.0	0.0	
End weight	lbs/pig	49.72	55.01	5.29	55.01	5.29	60.31	10.58	1.76
FE		1.40	1.43	2.00%	1.43	2.00%	1.47	5.00%	
Diet cost	\$/kg	0.410 \$	0.395 \$	-0.015 \$	0.395 \$	-0.015 \$	0.378 \$	-0.032 \$	
Qte feed	kg/pig	23.52	26.35	2.83	26.35	2.83	29.55	6.03	
Feed cost	\$/pig	\$ 9.64	\$ 10.41	\$ 0.76	\$ 10.41	\$ 9.64	\$ 11.17	\$ 1.53	
Feed cost dead	\$/pig	3.18 \$	3.43 \$	0.25 \$	3.43 \$	3.18 \$	3.69 \$	0.50 \$	
Total feed cost	\$	\$ 864,071	\$ 953,221	\$ 89,150	\$ 956,284	\$ 92,213	\$ 1,048,578	\$ 184,507	
med vet cost	\$/pig	\$ 3.00	\$ 3.00	\$ -	\$ 3.00	\$ -	\$ 3.00	\$ -	
total med vet cost	\$	\$ 272,560	\$ 277,955	\$ 5,394	\$ 278,848	\$ 6,287	\$ 284,238	\$ 11,677	
Barn-Fix and labor cost	\$/day/pig	\$ 0.12	\$ 0.12	0.00 \$	0.12 \$	0.00 \$	0.12 \$	0.00 \$	
Barn/fix cost	\$/pig	\$ 5.64	\$ 5.64	0.00 \$	\$ 5.64	0.00 \$	\$ 5.64	0.00 \$	
Total Barn/fix cost	\$	\$ 512,264	\$ 522,402	\$ 10,138	\$ 524,081	\$ 11,817	\$ 534,211	\$ 21,947	
Total Cost	\$	\$ 6,380,846	\$ 6,547,186	\$ 166,340	\$ 6,623,036	\$ 6,456,695	\$ 6,795,137	\$ 338,442	
Cost/pig	\$/pig	\$ 70.23	\$ 70.66	\$ 0.43	\$ 71.25	\$ 1.02	\$ 71.72	\$ 1.49	

Finisher fix Days		18 days	21 days increase efficiency		21 days increase farrow crate		24 days both		per day
# pigs entered		90,853	92,652	1,798.07	92,949	2,095.78	94,746	3,892.45	
Mortality %	%	4.00%	3.67%	-0.33%	3.67%	-0.33%	3.34%	-0.66%	-0.11%
% culled		1.50%	1.50%	0.00%	1.50%	0.00%	1.50%	0.00%	
# pigs sold		85857	87861	2,004.93	88144	2,287.25	90160	4,303.68	
Entry weight	lbs	49.72	55.01	5.29	55.01	49.72	60.31	10.58	
ADG average	g/day	920	946	102.82%	991	107.71%	1018	110.66%	
ADG average	lbs/days	2.02	2.08		2.18		2.24		
Days	day	110.0	110.0	0.0	105.0	0.0	105.0	0.0	
End weight	lbs/days	272.62	284.19	11.57	284.19	11.57	295.75	23.13	3.86
FE		2.65	2.70	0.05	2.70	0.05	2.75	0.10	
Diet cost	\$/kg	0.212 \$	0.212 \$	0.000 \$	0.212 \$	0.000 \$	0.212 \$	0.000 \$	
Qte feed	kg/pig	268.18	280.94	12.76	280.94	268.18	293.98	25.80	
Feed cost	\$/pig	\$ 56.72	\$ 59.42	\$ 2.70	\$ 59.42	\$ 56.72	\$ 62.18	\$ 5.46	
Total feed cost	\$	\$ 5,011,732	\$ 5,363,085	\$ 351,353	\$ 5,380,318	\$ 5,028,965	\$ 5,748,600	\$ 719,634	
medvet cost	\$/pig	\$ 3.00	\$ 3.00	\$ -	\$ 3.00	\$ 3.00	\$ 3.00	\$ -	
Total medvst cost cost	\$	\$ 257,570	\$ 263,584	\$ 6,015	\$ 264,431	\$ 258,416	\$ 270,481	\$ 12,064	
Barn-Fix and labor cost	\$/day/pig	\$ 0.14	\$ 0.14	0.00 \$	0.14 \$	0.00 \$	0.14 \$	0.00 \$	
Barn/fix and labor cost	\$/pig	\$ 15.07	\$ 15.07	-	\$ 15.07	-	\$ 15.07	\$ 15.07	
Total Barn/fix & labor cost	\$	\$ 1,293,728	\$ 1,323,939	\$ 30,211	\$ 1,328,193	34,465.37	\$ 1,358,578	\$ 1,324,113	
Carcass yield	%	79.00%	79.00%	0.00%	79.00%	0.00%	79.00%	0.00%	
Carcass weight	lbs	215.57	224.71	9.15	224.71	9.15	233.86	18.29	
price per lbs	\$/lbs	\$ 0.80	\$ 0.80	\$ -	\$ 0.80	\$ -	\$ 0.80	\$ -	
Revenu market	\$/pig	\$ 173.04	\$ 180.38	\$ 7.34	\$ 180.38	7.34	\$ 187.72	\$ 14.68	
Total value market	\$	14,932,894 \$	15,926,333 \$	993,439 \$	15,977,508 \$	1,044,615	17,004,617 \$	2,071,723 \$	
Total cost	\$	12,943,876 \$	13,497,795 \$	553,919 \$	13,595,978 \$	652,103	14,172,796 \$	1,228,920 \$	
Margin total	\$	1,989,018 \$	2,428,538 \$	439,520 \$	2,381,530 \$	392,512 \$	2,831,821 \$	842,803 \$	
Margin/pig entered	\$/pig	21.89 \$	26.21 \$	4.32 \$	25.62 \$	3.73 \$	29.89 \$	8.00 \$	
Margin/pig sold	\$/pig	23.17 \$	27.64 \$	4.47 \$	27.02 \$	3.85 \$	31.41 \$	8.24 \$	

Finisher fix Weight		18 days	21 days eff		21 days Far crate		24 days FC& eff	
# pigs entered		90,853	92,652	1,798.07	92,949	2,095.78	94,746	3,892.45
Mortality %	%	4.00%	3.67%	-0.33%	3.67%	-0.33%	3.34%	-0.66%
% culled		1.50%	1.50%	0.00%	1.50%	0.00%	1.50%	0.00%
# pigs sold		85857	87861	2,004.93	88144	2,287.25	90160	4,303.68
Entry weight	kg/pig	22.55	24.95	2.40	24.95	22.55	27.35	4.80
Entry weight	lbs/pig	49.72	55.01	5.29	55.01	49.72	60.31	10.58
ADG average	lbs/days	2.02	2.09	103.30%	2.09	103.30%	2.16	106.60%
Days	day	110.0	104.0	0.0	104.0	0.0	98.3	0.0
End weight	lbs/pig	272.25	272.25		272.25		272.25	
FE	kg/kg	2.65	2.65	0.00%	2.65	0.00%	2.65	0.00%
Diet cost	\$/kg	0.212 \$	0.212 \$	0.000 \$	0.212 \$	0.000 \$	0.212 \$	0.000 \$
Qte feed	kg/pig	268.18	261.82	(6.36)	261.82	(6.36)	255.46	(12.72)
Feed cost	\$/pig	\$ 56.72	\$ 55.38	\$ (1.35)	\$ 55.38	\$ (1.35)	\$ 54.03	\$ (2.69)
Total feed cost	\$	\$ 5,011,732	\$ 4,998,177	\$ (13,555)	\$ 5,014,238	\$ 2,505	\$ 4,995,450	\$ (16,283)
medvet cost	\$/pig	\$ 3.00	\$ 3.00	\$ -	\$ 3.00	\$ -	\$ 3.00	\$ -
total med vet cost		\$ 257,570	\$ 263,584	\$ 6,015	\$ 264,431	\$ 6,862	\$ 270,481	\$ 12,911
Barn-Fix cost	\$/day/pig	\$ 0.14	\$ 0.14	0.00 \$	\$ 0.14	0.00 \$	0.14 \$	0.00 \$
Barn/fix cost	\$/pig	\$ 15.07	\$ 14.24	(0.83)	\$ 14.24	15.07	\$ 13.47	(1.60)
Total Barn/fix cost	\$	\$ 1,293,728	\$ 1,251,250	\$ (42,478)	\$ 1,255,271	\$ (38,457)	\$ 1,214,015	\$ (79,713)
Carcass yield	%	79.00%	79.00%	0.00%	79.00%	0.00%	79.00%	0.00%
Carcass Weight	lbs/pig	215.08	215.08	-	215.08	-	215.08	-
Carcass price (market)	\$/lbs	\$ 0.80	\$ 0.80	\$ -	\$ 0.80	\$ -	\$ 0.80	\$ -
Revenu market	\$/pig	\$ 173.04	\$ 173.04	\$ -	\$ 173.04	\$ 173.04	\$ 173.04	\$ -
Total value market	\$	14,932,894 \$	15,281,336 \$	348,442 \$	15,330,438 \$	397,545 \$	15,680,871 \$	747,978 \$
Total cost	\$	12,943,876 \$	13,060,198 \$	116,322 \$	13,156,975 \$	213,100 \$	13,275,082 \$	331,206 \$
Margin total	\$	1,989,018 \$	2,221,138 \$	232,120 \$	2,173,463 \$	184,445 \$	2,405,789 \$	416,771 \$
Margin/pig entered	\$/pig	21.89 \$	23.97 \$	2.08 \$	23.38 \$	1.49 \$	25.39 \$	3.50 \$
Margin/pig sold	\$/pig	23.17 \$	25.28 \$	2.11 \$	24.66 \$	1.49 \$	26.68 \$	3.52 \$

ECONOMIC MODEL SUMMARY

- The combination of increased sow inventory and reduced mortality allows the farm to market 2000 more pigs in option A and 3800 pigs in option B.
- In the fixed-time options
 - The improvement in gain increases the market live weight by 5.25 and 10.5 kg, respectively
 - The increase in weight and pig marketed are driving the increase in revenue by nearly \$400,000 (\$4.14 per pig) for option A and 728,000 (\$7.68) for option B.
- In the fixed-weight options,
 - The overall financial benefit is significantly reduced, at roughly \$250,000 (\$2.68) and \$450,000 (\$4.72).
- Value of higher wean age increase if
 - Increase throughput by maintaining litter target
 - Limited in finisher space
 - Feed cost are relatively low and or market price is high
- Farrow to wean farm need to capture some of the value for the extra age of weight of the pig to be worthed

What happen if we increase
wean age by reducing inventory

	Control 18 days	OPTION A 21 days by reducing sow inventory	
barn capacity		dynamic inventory	
total gestation crate space	1250	1250	0
total gestation pen space	1750	1750	0
total farrowing crate	534	534	0
total space	3534	3534	0
space efficiency in gestation	93%	95%	2%
intervention cost per sow per year		\$ -	\$ -
interval and gestation performance			
batch interval (days)	7	7	0
%over farrowing	0%	0%	0%
wean age	18	21	3
open crate days	7	7	0
wean to service interval	6	5.50	-0.5
conception rate	92.0%	92.5%	0.5%
Farrowing rate	88.0%	88.5%	0.5%
targer farrow per batch	149.52	133.50	-16
Litter per sow per year	2.3960	2.3594	-0.037
total born	15.5	15.80	0.3
Stills & mummies	9.0%	9.10%	0%
Born alive	14.105	14.36	0.26
preweaning mortality	13.00%	13.50%	0.50%
wean per litter	12.27	12.42	0.15
PSY	29.40	29.31	-0.09
average daily lactation itake Kg	6.00	6.30	0.30
gestation feed per sow per year	885.15	867.49	-17.66
lactation feed per sow per year	258.76	312.15	53.39
feed cost per sow per year	\$ 244.31	\$ 254.66	\$ 10.35
inventory	3245	2942	-303
max inventory	3,287	3,357	71
PIG WEAN PER YEAR	95,410	86,243	(9,168)
price per pig	\$ 50.00	\$ 50.00	-
wean pig revenue	\$ 4,770,512	\$ 4,312,126	\$ (458,386)
feed cost	\$ 792,798	\$ 749,266	\$ 43,532
breeding herd cost per sow	\$ 324,507	\$ 294,224	\$ 30,282
inventory cost	\$ 421,859	\$ 382,492	\$ 39,367
Treatment cost	0	\$ -	-
difference in total profit lost		\$	(345,205)
per pig		\$	(4.00)
per sow		\$	(117.33)

# pig weaned		94639	85500	-9139
Price isowean	\$/pig	\$ 50.00	\$ 54.00	\$ 4.00
wean age		18.00	21.00	3
Total value	\$	\$ 4,731,950.00	\$ 4,617,000.00	\$ (114,950.00)
Nursery		18 days	21 days eff	
# pigs entered		94,639	85,500	(9,139.00)
Mortality %	%	4.00%	3.34%	-0.66%
# pigs sold		90853	82644	(8,209.14)
Weanin weight	lbs/pig	12.68	14.33	1.65
ADG moyen	lb/day	0.880	0.966	10%
Days	day	42.0	42.0	0.0
End weight	lbs/pig	49.72	55.01	5.29
FE		1.40	1.43	2.00%
Diet cost	\$/kg	0.410 \$	0.395 \$	-0.015 \$
Qte feed	kg/pig	23.52	26.35	2.83
Feed cost	\$/pig	\$ 9.64	\$ 10.41	\$ 0.76
Feed cost dead	\$/pig	\$ 3.18 \$	\$ 3.43 \$	\$ 0.25 \$
Total feed cost	\$	\$ 864,071	\$ 850,264	\$ (13,807)
med vet cost	\$/pig	\$ 3.00	\$ 3.00	\$ -
total med vet cost		\$ 272,560	\$ 247,933	\$ (24,627)
Barn-Fix and labor cost	\$/day/pig	\$ 0.12	\$ 0.12	\$ 0.00 \$
Barn/fix cost	\$/pig	\$ 5.64	\$ 5.64	\$ 0.00 \$
Total Barn/fix cost	\$	\$ 512,264	\$ 465,978	\$ (46,286)
Total Cost	\$	\$ 6,380,846	\$ 6,181,175	\$ (199,670)
Cost/pig	\$/pig	\$ 70.23	\$ 74.79	\$ 4.56

Finisher fix Days		18 days	21 day Reduce inventory	
# pigs entered		90,853	82,644	(8,209.14)
Mortality %	%	4.00%	3.67%	-0.33%
% culled		1.50%	1.50%	0.00%
# pigs sold		85857	78372	(7,484.91)
Entry weight	lbs	49.72	55.01	5.29
ADG average	g/day	920	945	102.72%
ADG average	lbs/days	2.02	2.08	
Days	day	110.0	117.0	0.0
End weight	lbs/days	272.62	298.54	25.92
FE		2.65	2.78	104.91%
Diet cost	\$/kg	0.212 \$	0.212 \$	0.000 \$
Qte feed	kg/pig	268.18	307.37	39.19
Feed cost	\$/pig	\$ 56.72	\$ 65.01	\$ 8.29
Total feed cost	\$	\$ 5,011,732	\$ 5,233,976	\$ 222,243
medvet cost	\$/pig	\$ 3.00	\$ 3.00	\$ -
Total medvst cost cost	\$	\$ 257,570	\$ 235,115	\$ (22,455)
Barn-Fix and labor cost	\$/day/pig	\$ 0.14	\$ 0.14	0.00 \$
Barn/fix and labor cost	\$/pig	\$ 15.07	\$ 16.03	0.96
Total Barn/fix & labor cost	\$	\$ 1,293,728	\$ 1,256,093	\$ (37,635)
Carcass yield	%	79.00%	79.00%	0.00%
Carcass weight	lbs	215.57	236.06	20.49
price per lbs	\$/lbs	\$ 0.80	\$ 0.80	\$ -
Revenu market	\$/pig	\$ 173.04	\$ 189.49	\$ 16.45
Total value market	\$	14,932,894 \$	14,920,103 \$	-12,791 \$
Total cost	\$	12,943,876 \$	12,906,358 \$	-37,517 \$
Margin total	\$	1,989,018 \$	2,013,744 \$	24,726 \$
Margin/pig entered	\$/pig	21.89 \$	24.37 \$	2.47 \$
Margin/pig sold	\$/pig	23.17 \$	25.69 \$	2.53 \$

Finisher fix Weight		18 days	21 days reduce inventory	
# pigs entered		90,852	82,644	(8,208.18)
Mortality %	%	4.00%	3.67%	-0.33%
% culled		1.50%	1.50%	0.00%
# pigs sold		85856	78372	(7,484.00)
Entry weight	lbs/pig	49.72	55.01	5.29
ADG average	lbs/days	2.02	2.09	103.30%
Days	day	110.0	104.0	0.0
End weight	lbs/pig	272.25	272.25	
FE		2.65	2.65	0.00%
Diet cost	\$/kg	0.212 \$	0.212 \$	0.000 \$
Qte feed	kg/pig	268.18	261.82	(6.36)
Feed cost	\$/pig	\$ 56.72	\$ 55.38	\$ (1.35)
Total feed cost	\$	\$ 5,011,679	\$ 4,458,328	\$ (553,351)
medvet cost	\$/pig	\$ 3.00	\$ 3.00	\$ -
total med vet cost		\$ 257,567	\$ 235,115	\$ (22,452)
Barn-Fix cost	\$/day/pig	\$ 0.14	\$ 0.14	0.00 \$
Barn/fix cost	\$/pig	\$ 15.07	\$ 14.24	(0.83)
Total Barn/fix cost	\$	\$ 1,293,714	\$ 1,116,104	\$ (177,611)
Carcass yield	%	79.00%	79.00%	0.00%
Carcass Weight	lbs/pig	215.08	215.08	-
Carcass price (market)	\$/lbs	\$ 0.80	\$ 0.80	\$ -
Revenu market	\$/pig	\$ 173.04	\$ 173.04	\$ -
Total value market	\$	14,932,736 \$	13,630,812 \$	-1,301,924 \$
Total cost	\$	12,943,739 \$	11,990,722 \$	-953,017 \$
Margin total	\$	1,988,997 \$	1,640,089 \$	-348,907 \$
Margin/pig entered	\$/pig	21.89 \$	19.85 \$	-2.05 \$
Margin/pig sold	\$/pig	23.17 \$	20.93 \$	-2.24 \$

Reduce inventory to increase wean age

- Increase wean pig cost and sow farm revenue significantly by reducing through put
- Can be offset by increasing the number of lbs produce on the growing side
- Maybe justify if finishing space is limited and market weight subpar
- Economic loser in a fix weight situation

WEAN AGE HOW HIGH CAN WE GO?

- The control research data is primarily for pigs weaned between 12 and 25 days of age
- If we go outside those parameters, will the rate of improvement remain the same?
- Several published researches show, that the stress of weaning is less impactful and more transient as weaning age increase
- Rate of Improvement should start tapering off as wean age increases, but no data are currently available to determine when that inflection point happens.

CONCLUSION

- The GI tract is critical for nutrient absorption and immune regulation.
- Commercial weaning is a very stressful event that has a long-lasting effect on the GI immune barrier. Creating long-lasting issues locally in the GI tract but also systemically due to the resulting immune system impairment
- Research has shown that the impact of weaning age on zootechnical performance was
 - Throughout animal production life
 - Becoming less significant as weaning age increased.

CONCLUSION

- The Model shows that increasing the weaning age from 18 to 21 and 24 by improving crate efficiency and adding farrow crate capacity would increase both the farm's total revenue and the revenue per pig.
- Increase wean age by reducing sow inventory increase wean pig cost by reducing throughput that can be recapture if market weight can be increase significantly
- More research is needed to determine the linear improvement and economic benefit of increasing the weaning age above 28 days.