



Effects of **Feeding Frequency** on Reproductive Performance and Stress Response in Gestating Sows

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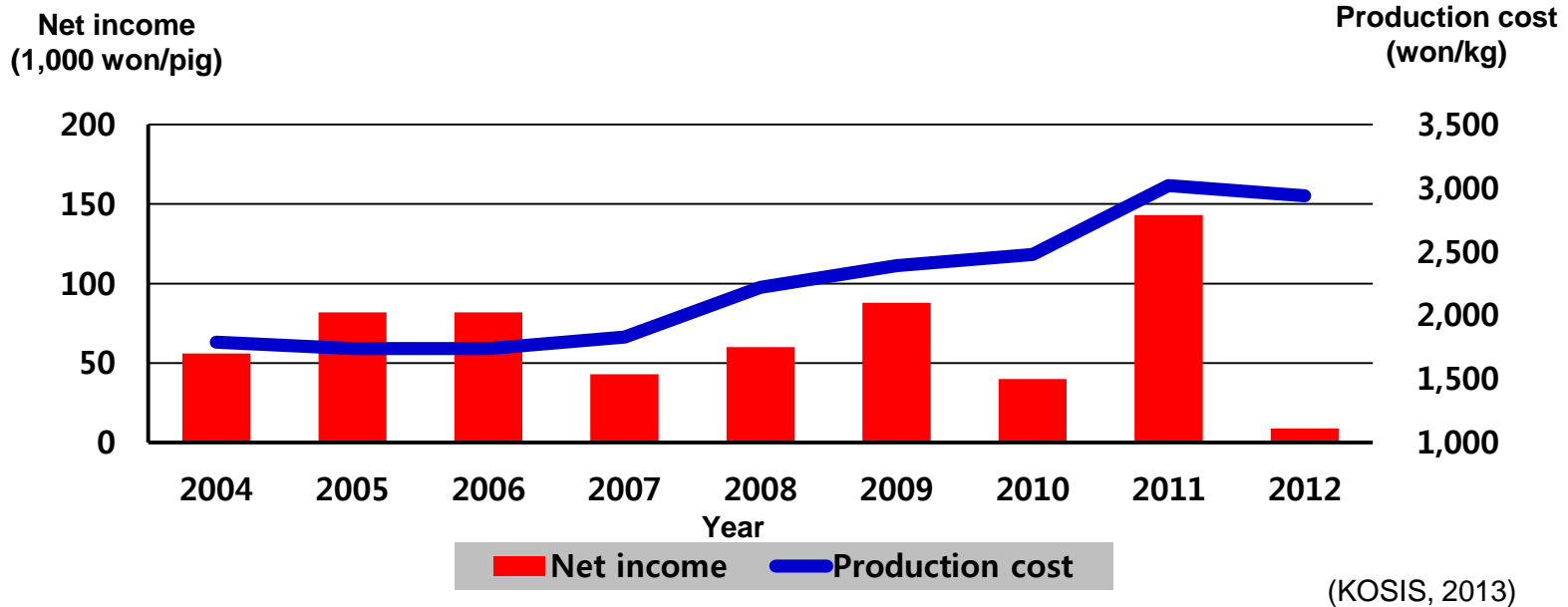


Figure 1. Trends of production cost and net income of Korean swine farm

Table 1. Changes of raising size per farm in swine industry

	2004	2014
Hog population, ×1,000 pigs	8,908	9,698
No. of farms	13,268	5,441
Average raising size, pigs/farm	671	1,782

(KOSIS, 2014)

- Unstable profitability
- Commercialized farming ↑
 - Promoting specialization
 - Having economy of scale
 - Ratio of hired labor ↑

● Background - Status of swine industry

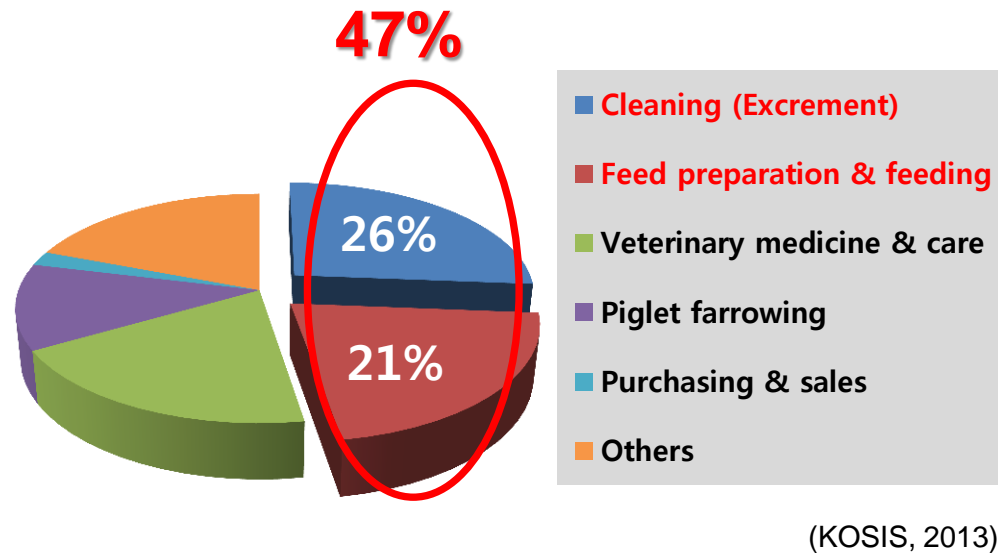
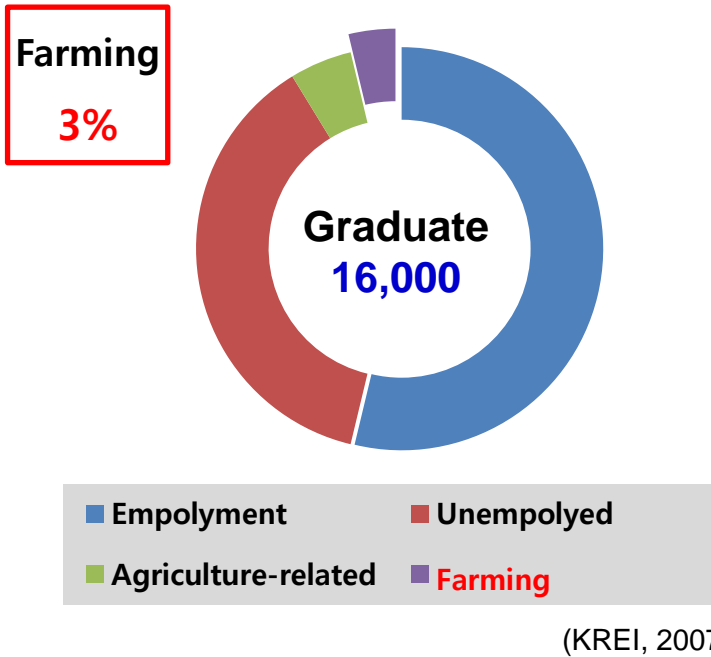


Figure 2. Career choice of agricultural majors in Korean colleges and universities

Figure 3. Ratio of labor inputs in breeding sow

▶ Lack of the professionals ↑

▶ Feeding has greater proportion of the daily routines

→ { Daily feeding frequency ↓ → Working efficiency ↑

Precondition has to positively affect sow productivity

● Review of literatures – Effects of feeding frequency in gestating sows

▶ In gestating sows, feeding frequency ↓

→ **Active behaviors** ↓, **stereotypes** ↓ and **lying posture** ↑ (Robert et al., 2001)

▶ In gestating sows, feeding frequency ↓

→ **Active behavior (feeding)** ↓ (Holt et al., 2006)

▶ Omission of feeding can **decrease** the level of post-feeding **stereotypes**

(Brouns and Edwards, 1994)

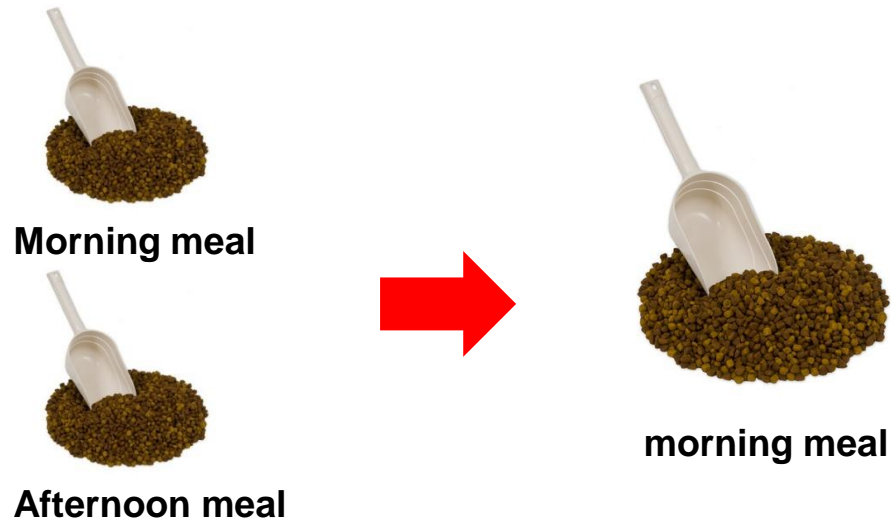
▶ Feeding frequency ↓

→ Sow **cortisol** level was **not decreased** (Farmer et al., 2002; Holt et al., 2006)

 **Lack of the study** about effect of feeding frequency on **sow productivity**

The **purpose** was to

investigate whether the **feeding frequency** has effects on **sow reproduction** and **stress responses**



● Experimental design

- ▶ **20** F1 gestating sow (Y×L) with **parity** of **2.8±0.41** (parity 2 or 3)
- ▶ Initiated after **confirming pregnancy** at **day 35.8±1.11** of gestation
- ▶ Body weight (BW) of **201.8±12.54 kg**, back fat thickness (BF) of **19±4.42 mm**
- ▶ Completely randomized design (CRD)
- ▶ Provided commercial diets

Treatment	Gestation			Lactation
1×	Once daily feeding (One feeding)	AM 08:00	2.4 kg for 3 rd parity 2.2 kg for 2 nd parity	Lactation diet <i>ad libitum</i>
2×	Twice daily feeding (Two feeding)	AM 08:00 PM 04:00	1.2 kg × 2 times for 3 rd parity 1.1 kg × 2 times for 2 nd parity	

Measurements

Gestation

- ▶ BW, BW gain, BF, BF change
- ▶ Salivary cortisol, Water consumption
- ▶ Sow behaviors



Sow behaviors	Stereotypes	Bar biting, sham chewing, nosing or licking the floor or feeder
	Activities	Standing and moving without stereotypes, feeding and drinking behaviors
	Inactivities	Lying, sitting

Lactation

- ▶ BW, BW gain, BF, BF change, ADFI
- ▶ Litter and piglet performances
- ▶ Colostrum and milk composition
- ▶ Weaning to estrus interval
- ▶ Immune parameters (IgG)



Sow performance in gestation

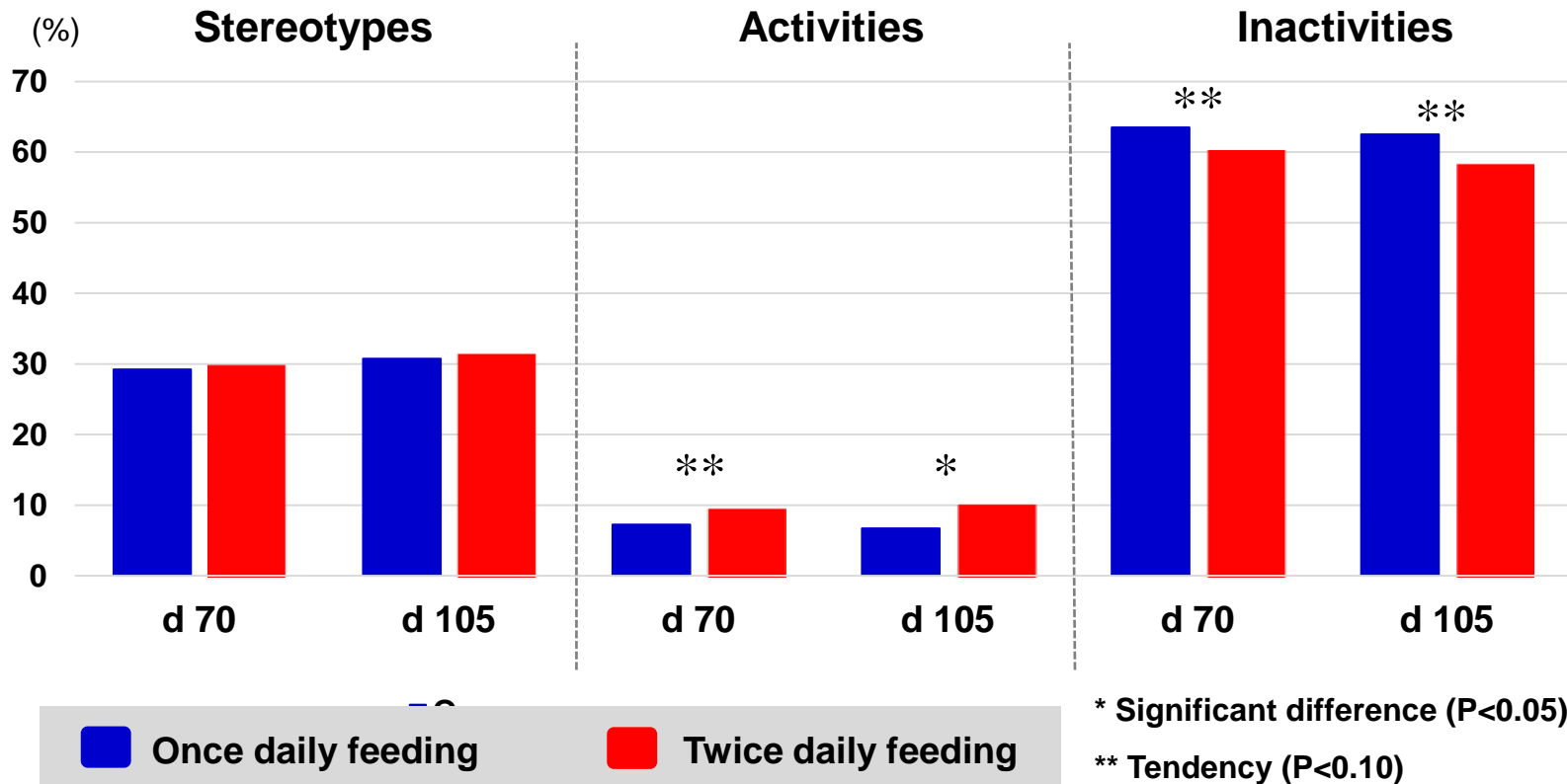
Criteria	Frequency		SEM
	1×	2×	
No. of sows	10	10	-
Body weight, kg			
d 35	202.0	201.7	2.96
d 90	228.4	222.2	2.93
d 110	243.1	237.3	3.19
Body weight gains, kg			
d 35-90	26.4^a	20.6^b	1.23
d 90-110	14.6	15.1	0.74
d 35-110	41.1^A	35.7^B	1.45
Back-fat thickness, mm			
d 35	19.0	19.0	0.99
d 90	20.2	20.7	0.92
d 110	21.1	22.0	0.91
Back-fat changes, mm			
d 35-90	1.2	1.7	0.48
d 90-110	0.9	1.3	0.43
d 35-110	2.1	3.0	0.60

^{ab} Means with different superscripts in the same row significantly differ (P<0.05)

^{AB} Means with different superscripts in the same row numerically differ (P<0.10)

Once daily feeding → Gestation body weight gain ↑

Sow behaviors during daytime (12-h observation)



Feeding frequency ↓



{
 Stereotypes : Not affected
 Activities ↓ / Inactivities ↑

Water consumption in gestation

Criteria	Frequency		SEM
	1×	2×	
Average daily water consumption, L/day			
d 35-70 postcoitium	9.46^b	12.44^a	0.745
d 70-105 postcoitium	11.88^B	14.81^A	0.790
d 35-105 postcoitium	10.67^b	13.62^a	0.625

^{ab} Means with different superscripts in the same row significantly differ (P<0.05)

^{AB} Means with different superscripts in the same row numerically differ (P<0.10)

Feeding frequency ↓

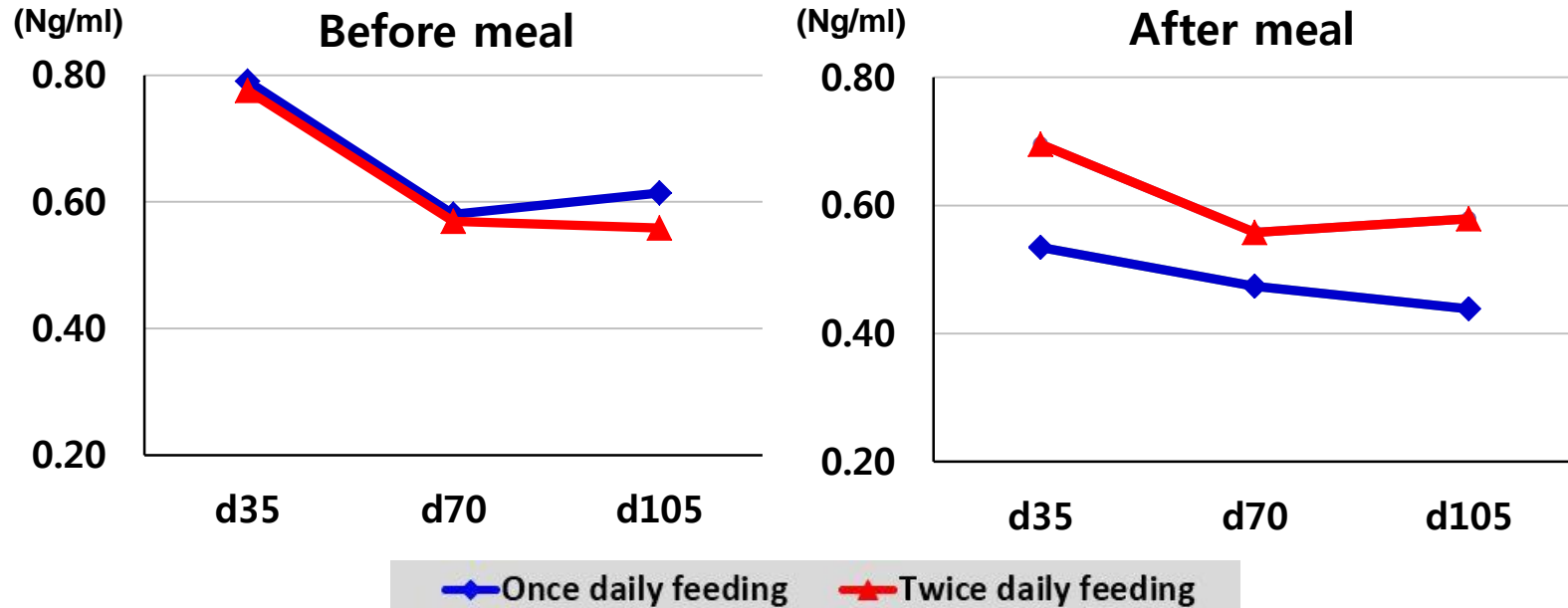
→ Water consumption ↓ = Excreta ↓

Ex) 100 sows, 25 dollar/ton for the disposal cost

→ 300L/d × 365 days = 109,500 L

→ Can **save** about **2,500 dollars** a year

Salivary cortisol level



Not affected by feeding frequency

✱ Took saliva sample using cotton roll (Salivette®)

Reproductive performance

Criteria	Frequency		SEM
	1×	2×	
No. of sows	10	10	-
Litter size, no. of piglets			
Total born	12.7	11.9	0.76
Stillborn	1.3	1.2	0.40
Mummy	0.0	0.0	0.00
Born alive	11.4	10.6	0.53
After-cross-fostering	10.8	10.8	0.14
Death	0.3	0.4	0.13
Weaning pigs	10.5	10.4	0.53

No significant difference in reproductive performance

Litter & Piglet performance

Criteria	Frequency		SEM
	1×	2×	
No. of sows	10	10	-
Litter weight, kg			
At birth	19.82^a	17.34^b	1.054
After-cross-fostering	17.34	17.29	0.653
d 21	71.08	70.08	1.653
Litter weight gain (d 0-21)	53.74	52.79	1.442
Piglet weight, kg			
At birth	1.58	1.53	0.071
After-cross-fostering	1.60	1.61	0.063
d 21	6.77	6.75	0.130
Piglet weight gain (d 0-21)	5.17	5.14	0.100

^{ab} Means with different superscripts in the same row significantly differ (P<0.05)

One feeding showed higher litter weight at birth

Sow performance in lactation

Criteria	Frequency		SEM
	1×	2×	
No. of sows	10	10	-
Body weight, kg			
12 h postpartum	220.2	215.3	2.66
d 21 of lactation	219.5	217.9	3.00
BW gains (d 0-21)	-0.7	1.7	1.24
Back-fat thickness, mm			
12 h postpartum	20.2	20.3	1.07
d 21 of lactation	17.5	18.8	0.92
BF changes (d 0-21)	-2.7	-1.5	0.65
Average daily feed intake, kg/d			
d 0-21	6.58	6.48	0.098
Weaning to estrus interval, day			
	4.5	4.5	0.28

Not affected by **feeding frequency** during gestation

Colostrum and milk composition

Criteria	Frequency		SEM
	1×	2×	
Fat, %			
Colostrum	6.78	6.77	0.567
Milk (d 21)	7.17	6.76	0.289
Lactose, %			
Colostrum	4.02	4.42	0.168
Milk (d 21)	5.82	5.95	0.074
Protein, %			
Colostrum	8.96	6.94	0.936
Milk (d 21)	4.80	4.59	0.107
Solid-not-fat, %			
Colostrum	13.43	11.84	0.785
Milk (d 21)	10.83	10.76	0.084
Total solid, %			
Colostrum	21.71	20.22	0.915
Milk (d 21)	19.26	18.65	0.362

No significant difference between treatments

● Immune parameters

Criteria	Frequency		SEM
	1×	2×	
IgG of colostrum, mg/ml			
12 hr. postpartum	0.35	0.26	0.032
Serum IgG of piglet, mg/ml			
12 hr. postpartum	0.93	1.00	0.151
d 21 of lactation	0.63	0.57	0.030

Feeding frequency didn't affect immune of piglet

- ▶ **Sow reproduction** was **not affected** by feeding frequency
- ▶ **Once daily feeding** **reduced** the **activities**
 - **BW gain increased**, **water consumption reduced**
 - Needs more study for nutrient digestion and utilization
- ▶ **Practical application**
 - Once daily feeding {
 - Positively affects **sow welfare**
 - Can save the **labor cost**
 - Reduce the amount of **excreta**

Thank you for your attention!

