STRATEGIES FOR FEEDING WEANED PIGS

**Bob Goodband, Joel DeRouchey, Mike Tokach,
Steve Dritz, and Jim Nelssen
Department of Animal Sciences and Industry
Kansas State University
242 Weber Hall, Manhattan, Kansas 66502
E-mail: goodband@ksu.edu**

ABSTRACT

Feeding and nutritional strategies for weaned pigs, regardless of age, should be thoroughly reviewed on a regular basis to ensure success of your nursery nutrition program. Properly designed nutritional programs and feed budgets cannot, by themselves, ensure a successful nursery program. We are beginning to understand that it is not only an issue of *what* to feed the young pig, but equally important is *how* they are fed and managed. A successful nursery feeding program contains several components, but the most important are: A) Start with as heavy and as old a pig as feasible; B) Switch from complex to simple diets as quickly as possible; and C) Provide the proper management to start pigs promptly on feed and water and continually adjust feeders to optimize feed efficiency.

STRATEGIES FOR FEEDING WEANED PIGS

Start with as Heavy and as Old as Possible Pig

Recent Kansas State University research (Main et al., 2004; 2005) has shown that increasing weaning age through 21 days linearly increases growth rate and reduces mortality from weaning to market. In these studies, wean-to-finish growth performance and productivity (as measured by ADG, mortality, off-test weight per day of age, and weight sold per pig weaned) improved as weaning age increased from 12 to 21 days of age (Table 1). Linear improvements in growth and mortality rate largely occurred in the initial 42 d post-weaning period, with some ongoing growth improvements in finishing performance. Financial performance improved linearly as weaning age increased up to 21.5 days. Data were then modeled to determine the linear rates of improvement observed as weaning age increased from 15 to 21.5 days (Table 2). Each day increase in weaning age increased initial weight (taken prior to weaning) 256 ± 4 g and weight sold to slaughter 1.80 ± 0.15 kg per pig weaned. In the financial analysis, income over cost increased \$0.94 ± 0.07 per wean age day in the limited finishing space scenario and \$0.53 ± 0.06 per wean age day in the non-limited space scenario. These studies suggest increasing weaning age up to 21.5 days can be an effective production strategy to improve wean-to-finish growth performance in a multi-site production system.

Switch from Complex to Simple Diets as Quickly as Possible

The keys in diet formulation are remembering that: 1) feed intake drives growth performance; 2) complex diets with specialty ingredients increase feed intake during the first few weeks after weaning; 3) diet complexity must be reduced rapidly as the impact on feed intake declines. Common mistakes in nursery diet formulation include: 1) selecting ingredients that are highly digestible, but not highly palatable; 2) using whey or protein sources that are not high quality; 3) using high fiber ingredients in nursery diets in an attempt to help gut health; and 4) feeding complex, expensive diets too long.

Table 1. Influence of weaning age on wean-to-finish performance[a].

	Weaning age					Probability (P<)	
Item	12	15	18	21	SE	Linear	Quadratic
Allotment weight, kg[b]	3.42	4.26	4.89	5.75	0.05	0.001	0.68
Off-test weight, kg	103.9	109.1	112.1	117.3	0.81	0.001	0.94
ADG, g	580	616	637	687	8	0.001	0.36
Mortality, %	9.39	7.88	6.80	3.68	0.95	0.001	0.39
ADG per d post-weaning, g	643	671	686	714	5	0.001	0.96
Weight sold per pig weaned, kg	94.1	100.5	104.4	113.1	1.30	0.001	0.35

[a]Adapted from Main et al. (2004). A total of 2272 pigs with 34 or 36 pigs per pen (50% barrows, 50% gilts), and 16 replications (pens) per treatment, or a total of 64 pens on test in the nursery and 1,920 pigs with 20 pigs per pen and 24 replications (pens) per treatment, or a total of 96 pens on test in the finisher.
[b]Allotment weights were taken on all pigs 3 d prior to weaning.

Table 2. Modeling the linear rate of change observed as wean age increased from 12 to 21.5 days[a].

	Rate of linear change per day increase in wean age	
Item	Change per day	SE
Allotment weight, kg[b]	0.257	0.003
d 42 post-weaning, kg	0.93	0.017
Off-test weight, kg	1.35	0.08
Wean-to-finish ADG, g	9.9	0.74
Wean-to-finish mortality, %	-0.47	0.09
Weight sold per pig weaned, kg	1.80	0.12

[a]Adapted from Main et al. (2005). Modeling the linear rate of change (magnitude of change per d increase in weaning age) in wean-to-finish performance observed as weaning age increased from 12 to 21.5 days (trial 1 = 96 finishing pens with 20 pigs per pen, and trial 2 = 120 finishing pens with 25 pigs per pen).
[b]Allotment weights were taken on all pigs 3 d prior to weaning.

Feed budgeting: weaning to 7 kg. The goal of the nutritional program remains the same regardless of the number of diet phases used. That goal is to transition pigs to a low cost, grain-soybean meal-based diet as quickly as possible after weaning without sacrificing growth performance. In most cases, pigs achieve this goal without higher-cost products such as whey or fish meal after 11 to 12 kg body weight. A four-phase feeding approach replaced the traditional, three-phase system in the nursery phase when younger weaning ages were implemented in multi-site pig production. With later weaning, many considered reevaluating feed budgets and starter diet complexity. However recent research suggests that even with older, heavier pigs, the traditional 4-phase program offers the greatest margin over feed costs (Tables 3 and 4).

Table 3. Effect of pelleted vs. meal diets and modified feed budget on growth performance of weanling pigs in a commercial environment[a].

Diet Form:	Pellet 1	Pellet 2	Meal					
Plasma, %:	6.7/2.5%	6.7/2.5%	2.5%		4%			
SEW, kg/pig:	.45	.23	--	--	--	--		
Transition, kg/pig:	1.36	.45	.91	1.81	.91	1.81	SE	P <
Day of diet switch[b]								
Trans to Phase 2	11.2	6.2	7.0	11.2	8.0	11.0	0.1	0.01
Phase 2 to 3	22.3	20.0	20.5	22.7	21.2	22.5	0.3	0.01
d 0 to 28								
Final wt, kg	14.3	14.0	13.7	13.9	13.7	13.9	0.09	0.01
ADG, g	299	290	277	281	277	281	4.54	0.01
ADFI, g	404	404	399	399	395	4.4	4.54	0.65
F:G	1.34	1.39	1.45	1.41	1.43	1.43	0.01	0.01
Removals, %	3.0%	2.1%	4.8%	5.1%	3.9%	4.5%	1.1%	0.27
Feed, $/kg gain[b]	$0.34	$0.37	$0.35	$0.36	$0.35	$0.38	$0.004	0.01
Margin over feed[c]	$5.53	$5.06	$5.02	$4.99	$4.99	$4.87	$0.10	0.01

[a]Groesbeck et al. (2005). Each value is the mean of 6 feeders (2 pens/feeder and 28 pigs/pen). All pigs were fed the 5.4 kg/pig of the phase 2 after the indicated amount of SEW and Transition had been fed.

[b]Diet costs used were $596.50, $442.70, $360.61, $401.95, $241.12, and $161.64/ton for SEW, Pelleted Transition, 2.5% Plasma Transition, 4% Plasma Transition, Phase 2, and Phase 3, respectively.

[c]Margin over feed was calculated as d 0 to 21 gain × $.99/kg minus feed cost for d 0 to 21.

Table 4. Recommended feed budgets for older weaning ages and weights.

Diet,	Weaning Weight, kg/pig			
kg/pig	4.5	5.5	6.5	7.5
SEW	0.9	0.5	0.25	0.25
Transition	2.2	1.4	0.5	-
Phase 2	6 to 7	6 to 7	6 to 7	6 to 7

7 to 11 kg. This diet is typically a grain-soybean meal-based diet with 7 to 10% of a high-quality source of lactose and a small amount of a specialty protein source, such as spray-dried blood meal or high-quality fish meal. Other specialty protein sources may be used, depending on economic considerations or location. Many producers make this diet in meal form on their farm.

For producers in the U.S., growth-promoting antibiotics and zinc oxide are typically used in this diet. Research indicates that 2,000 ppm zinc is the optimal inclusion level (Smith et al., 1999). When zinc oxide is used for growth promotion, high levels of copper sulfate do not provide any additional growth response (Smith et al., 1997). Typically, 7 kg of feed is budgeted for pigs during this phase.

11 to 23 kg. This diet should resemble a grow-finish diet, which in most cases will be a simple grain-soybean meal diet without any specialty protein products or lactose sources. The digestive capacity of the pig by this weight is such that these ingredients are unwarranted; including them will increase feed cost/pig.

This diet is the lowest-cost diet in the nursery program. However, since consumption of this diet is the greatest during the nursery phase, it usually accounts for more than half of the total feed cost from weaning to 23 kg. Typically, 20 to 23 kg of feed is budgeted for pigs during this phase.

Because long-term feeding of high levels of zinc oxide has not been shown to be beneficial, growth-promotion levels of zinc should not be used in this ration. Copper sulfate at 125 or 250 ppm of complete diet and antibiotics can serve as effective growth promoters in this phase.

It is critical to practice strict discipline when using a feed budget to prevent overfeeding of the more expensive nursery diets past the desired weight range. Often, this is the major cause of high feed costs in the nursery. Listed in appendix 1 of this paper are some suggested specifications for SEW and Transition diets as well as options for phase 2 and 3 diets.

Ingredients and Ingredient Quality

The decision to add fat to the diet will depend on the ability of the producer or feed company to economically purchase it. Fat is routinely added to SEW and Transition diets because these diets are typically pelleted. Added fat will serve to lubricate the pellet die and help make a high quality pellet. By increasing added fat in diets for pigs greater than 7 kg, pigs will often respond with improvements in average daily gain and feed efficiency. From 3% to 5% added fat is a common recommendation. Weanling pigs appear to be most affected by poor quality fat sources. Therefore, choice white grease or plant sources such as soybean oil are recommended. Fat sources such as beef tallow, poultry fat and restaurant fats should be avoided in nursery pig diets.

The use of high-quality protein sources, such as spray-dried animal plasma and blood meal, fishmeal and lactose sources, purchased from a reputable source, can assure producers that ingredient quality is not a limiting nutritional factor in nursery pig diets. Producers who decide to manufacture on-farm nursery diets in meal form may choose to utilize granular

specialty protein and lactose sources that have better flow ability properties. Products with poor flow characteristics can lead to problems with bins and feeders bridging, thus limiting feed intake.

PROVIDE PROPER NURSERY PIG MANAGEMENT

The best nursery diets cannot overcome poor management. When pigs enter the nursery, they should have continual access to feed and water. Techniques, such as dripping water from cups or nipples, or gruel feeding, should be used during the first few days after weaning to encourage feed and water consumption. After pigs have started on feed, feeders need to be adjusted frequently to minimize wastage to achieve excellent feed efficiency. The most common feed management problems in nurseries are: 1) not making feed and water easy for the pigs to find after weaning; 2) treating starve-out pigs with antibiotic injections instead of helping them find feed and water; and 3) having too much feed in feed pans leading to spoiled and wasted feed.

Water Intake

Newly weaned pigs dehydrate rapidly and must have readily available drinking water. Whether you are providing water through nipple or bowl drinkers, proper positioning and sanitation of watering devices are essential elements of proper pig hydration. Either cup or nipple-type drinkers are suitable for weanling pigs. However it is important to set them to trickle water for the first 12 to 24 hours once pigs are placed in the nursery so the pigs can find them. Secondly, it is a common mistake to set the drinker too high for the pig to reach. Nipple drinkers should be adjusted so the nipple is shoulder height of the pig.

Also, to maximize feed intake, pigs must be provided unrestricted access to feed. Producers often limit-feed pigs to reduce postweaning diarrhea. However, recent research indicates that limit feeding current highly digestible nursery diets actually increases the risk for diarrhea (Madec et al., 2000). Limit feeding is a frequent cause of reduced nursery exit weights.

A number of management lapses may also result in limited feed intake. These include failure to investigate all potential contributing areas like improper air temperature or ventilation, poor sanitation or undetected disease challenges.

Social interaction between the piglets while eating is critical to develop feeding behavior. Feeders with solid partitions prevent this feeding interaction because piglets cannot see each other while eating. A properly designed feeder without solid partitions encourages proper social interaction and maximum feed intake, while preventing the small pigs from laying and defecating in the feeders.

Feeding mats are also useful to facilitate social interaction during feeding for the first few days after weaning. While useful to facilitate social interaction, mats can lead to higher levels of feed wastage and disease risk from improper sanitation if kept in the nursery pen too long.

Feeder Adjustment

Proper and frequent feeder adjustments are the keys to excellent feed efficiency and low feed cost in the nursery. Feeder adjustment must start with the first feed placed in the feeder. Regardless of whether the first diet comes in bags or bulk, the feed gate in all feeders should be closed before placement of the first pellets. The feed gate then should be opened so that a small amount of feed is visible in the feed pan. Placing pelleted feed into an empty feeder with the agitation gate open will result in large amounts of feed filling the trough, leading to feed wastage and difficulty in achieving the proper feeder adjustment.

Although adequate amounts of feed must be present in the feeder at all times after weaning, too much feed in the pan of the feeder can also decrease growth rate. In an attempt to stimulate feeding behavior, some producers place large amounts of the first diet in the feeding pan. Although the intention is positive, the outcome is negative. Energy deficiency can result from pigs "sorting" the diet and producing a buildup of fine feed particles ("fines") in the feeding pan that pigs can find less palatable. These fines then lodge in the feed agitator mechanism, making it difficult for new feed to flow from the feeder.

To correct this problem, manage the amount of feed flow in the pan to stimulate the development of feeding behavior. Approximately 50% of the feeding pan should be visible in the first few days after weaning. As the pigs become more accustomed to the location of the feed and adjust their feeding behavior, the amount of the feed in the feeding pan should be decreased rapidly to less than 25% coverage. Also, feed agitators need to be tested and adjusted frequently to ensure that the buildup of fines does not prevent them from working freely.

Identifying Starve-outs

In our experience, weaning an older pig will reduce but not eliminate starve-out pigs. It's essential to have a dedicated workforce that can identify the signs of a starve-out pig, and then gently teach the pig where and how to eat with either mat or individual feeding system.

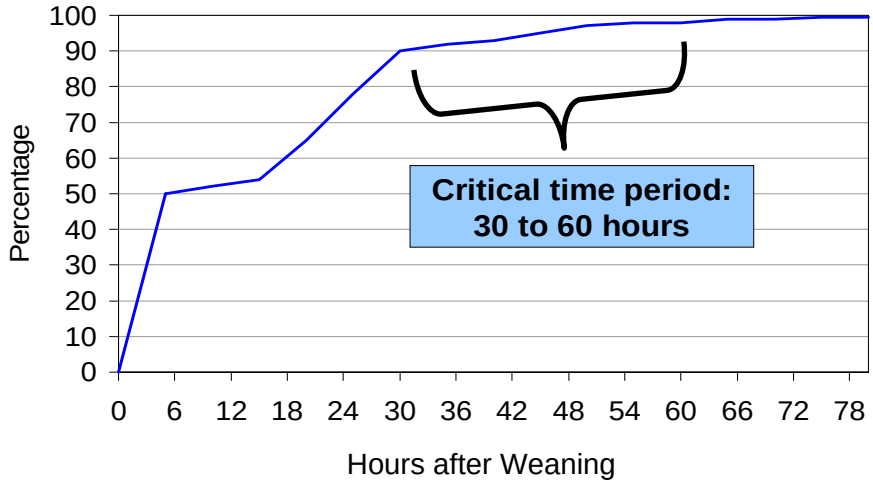
Some pigs simply do not start eating readily after weaning – regardless of age. Producers who have the ability to teach these starve-out pigs to eat, rather than treating them with an antibiotic, will save more pigs.

The main signs to help identify starve-out pigs include:

- Mental status – depressed;
- Body condition – thin;
- Abdominal shape – gaunt;
- Skin – fuzzy;
- Appetite – huddled with no activity at the feeder, and
- Signs of dehydration – sunken eyes.

It would appear that the most critical time to identify and assist pigs who do not begin to eat is approximately 30 hours after weaning (Figure 1).

Figure 1. Percentage of pigs that have eaten by hours after weaning (adapted from Bruininx et al., 2001).



Pen Space

One of the largest advantages with later weaning is the improvement in pig growth rate, both in the nursery and finishing stages. For every day of increased weaning age up to 21 days of age, producers should expect that pigs will be over 1.4 kg heavier from weaning until marketing on a fixed day system, or marketed 1.7 days faster. However, nursery pen space must be managed carefully. With a higher initial weight and the expected increase in growth rate, space allotments/pig need to be adjusted accordingly. Pig space will need to be increased if pigs remain in nursery pens for the same number of days before being moved to finishing barns. In wean-to-finish facilities, this is not a concern unless producers are double stocking during the nursery phase of growth.

Sorting Pigs by Weight

The sorting and grouping of pigs by body weight is a common management technique believed to minimize variation. Thus, pigs commonly are grouped at weaning in light, medium, and heavy weight pens. However a recent study (Tokach et al., 2003) where pigs were sorted into groups of light, medium and heavy weight groups, or left unsorted, showed that sorting pigs by weight had no advantage on final weight or the percentage of cull and removed pigs (Figures 2 and 3). In fact, it could be argued that sorting pigs by weight in the nursery could even have some negative implications on growth rate. It has also been demonstrated that in finishing pigs, sorting weight has no advantage on either growth rate or market weight variation.

Figure 2. Effects of sorting pigs into the nursery on final weight (adapted from Tokach et al., 2003).

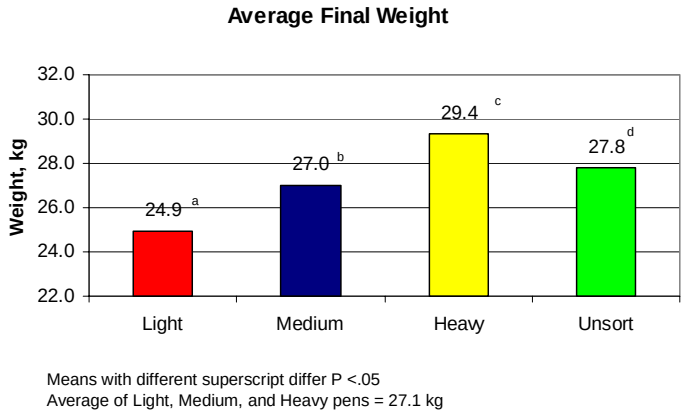
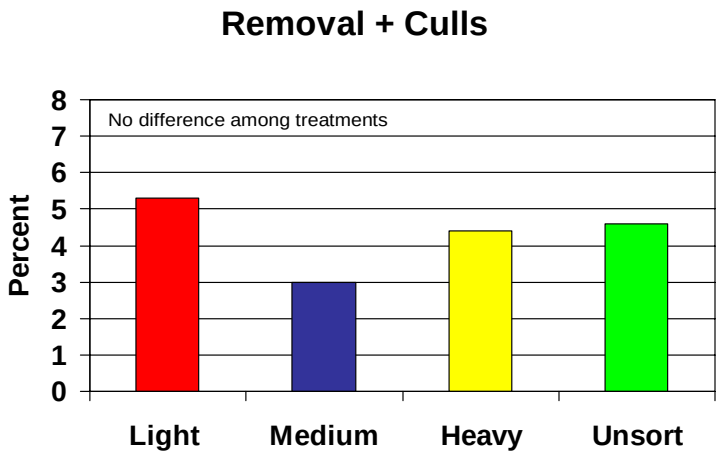


Figure 3. Effects of sorting pigs into the nursery on percentage of cull and removed pigs (adapted from Tokach et al., 2003).



RECOMMENDATIONS AND PROCEDURES FOR FILLING ROOMS (OR BARNS)

When moving weanling pigs into a nursery room:

1. Sort out the 10 to 15% of the very lightest pigs. These pigs will include any lame pigs, runt pigs, ruptures or any other pigs that will require specialized attention and care. These pigs are typically put into “hospital” or “disadvantaged pig” pens. They will be allowed a more generous (increased amounts) of the initial starter diets.
2. The remaining 85 to 90% of the pigs get randomly placed in pens without any special attention to initial weight. These pigs will be fed the standard amounts of feed according to the feed budget.

If you will be:

1. Feeding the entire room or each individual pen a different feed budget;
2. Managing individual pens of pigs differently, i.e., vaccinations, environmental modifications or any other management procedure that will be weight specific, then it is probably worth the added labor to sort pigs by weight.

Creep Feeding

The effectiveness of creep feeding is an area open to considerable debate now that weaning age has increased. During the past decade, providing creep feed to early-weaned pigs typically has not been advocated when weaning age is less than 21 days. However, with older-weaned pigs and longer lactation lengths, if properly managed, this practice may help alleviate pressure on the sow while helping pigs get off to a more rapid start in the nursery. This is an area that needs more research before a definitive recommendation can be made.

If producers do decide to offer creep feed to pigs supplying a high-quality starter diet equivalent to a SEW diet for earlier-weaned pigs is recommended. Creep feed must be kept fresh and in feeders or troughs that prevent excess wastage. Even though only small amounts are actually fed, the cost of creep feeding, if not managed properly, will increase the cost/weaned pig beyond the returned benefit.

CONCLUSIONS

The basic concepts and management practices for feeding older-weaned pigs are not different than those for younger weaning ages. Intense management of newly weaned pigs to get them started on feed as soon as possible is critical to the success of the nutritional program.

Ultimately, producers who have high nursery feed intake, follow strict nursery feed budgets, use high-quality ingredients and maximize sow lactation feed intake will also maximize profitability.

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APPENDIX 1

Complete Starter Diet Specification (SEW) – Page 1 of 2

Name:
Address:

Phone:_____ Fax:
Date:

DATE NEEDED:

Product name: SEW Diet

Quantity,kg Package size, kg
Use: To be fed to pigs weighing less than 5.4 kg as a complete diet.
Price: FOB or $/ton Delivered

Ingredients	Units	Guaranteed Potency In Complete Diet	Sources
Spray-dried whey	%	25.0	Edible grade from Land O'Lakes or equivalent
Lactose	%	5.0	Edible grade
Spray-dried animal plasma	%	6.7	American Proteins, DuCoa, Merricks, or North Central Processors
Spray-dried blood meal or cells	%	1.65	American proteins, California Spray Dry, or Merricks
Menhaden fish meal	%	6.0	Special Select Menhaden from Omega Proteins
Corn Minimum	%	33.0	
Maximum	%	36.0	
Soybean meal, 46.5% protein	%	12.5	
Fat	%	6.0	Soybean oil or choice white grease
Monocalcium phosphate (21% P)	%	0.50	
Limestone (38% Calcium)	%	0.40	
L-lysine HCl	%	0.15	
DL-methionine	%	0.15	
Salt	%	0.25	
Zinc oxide	%	0.375	
Acidifier	%	0.20	Kemgest, Syneracid, Digest acid or ADM Select Acid
Vitamins	**Units**	**Guaranteed Potency Added per Ton of Complete Feed**	**Sources**
Vitamin A	IU	10,000,000	Vitamin A acetate (retinyl acetate)
Vitamin D	IU	1,500,000	Vitamin D_3 (cholecalciferol)
Vitamin E	IU	40,000	d or dl- -tocophorol acetate
Vitamin K (menadione)	mg	4,000	MPB (Menadione dimethylpyrimidinol bisulfite) or MNB
Vitamin B_{12}	mg	35	Cyanocobalamin
Niacin	mg	45,000	Niacinamide, Nicotinic acid
Pantothenic acid	mg	25,000	d-calcium pantothenate
Riboflavin	mg	7,500	Crystalline riboflavin
Choline	mg	150,000	Choline chloride
Pyridoxine	mg	2,000	Pyridoxine hydrochloride

Complete Starter Diet Specification (SEW) – Page 2 of 2

Minerals	Units	Guaranteed Potency Added per Ton of Complete Feed	Sources
Copper	g	15	Copper sulfate
Iodine	mg	270	Ca iodate, Ethylenediamine dihydriodide (EDDI)
Iron	g	150	Ferrous sulfate, Ferrous carbonate
Manganese	g	36	Manganese sulfate, manganese oxide
Selenium	mg	270	Sodium selenite
Zinc	g	2,700	Zinc oxide (MUST BE ZINC OXIDE)
MEDICATION (AS DECIDED BY THE PRODUCER)	**Units**	**Guaranteed Potency Added per Ton of Complete Feed**	**Sources (Decided by the producer)**

The following points must be followed unless approval for changes have been made:

a) Must be pelleted in 1/8 or 3/32" pellets.

b) Guaranteed to stay free-flowing, lump free, and non-dusty.

c) When bagged, all bags must be labeled with tags. Tags should include date of manufacture, lot number, guaranteed analysis, inclusion rate, and proposed use of the product.

d) Formulate using the guaranteed analysis from the supplier for the nutrient. We can request label copies of your ingredients and copies of your mixing records to show quantities of ingredients per batch.

e) Permission must be obtained before using an alternative source for any ingredient.

Complete Starter Diet Specification (Transition) – Page 1 of 2

Name:

Address:

Phone:_____ Fax:

Date:

DATE NEEDED:

Product name: Transition Diet

Quantity, kg Package size, kg

Use: To be fed to pigs weighing between 4.5 and 6.8 kg as a complete diet.

Price: FOB or Delivered

Ingredients	Units	Guaranteed Potency In Complete Diet	Sources
Spray-dried whey	%	25.0	Edible grade from Land O'Lakes or equivalent
Spray-dried animal plasma	%	2.5	American Proteins, DuCoa, Merricks, North Central Processors
Spray-dried blood meal or cells	%	2.5	American proteins, California Spray Dry or Merricks
Menhaden fish meal	%	2.5	Special Select Menhaden from Omega Proteins
Corn Minimum	%	36.0	
Maximum	%	39.0	
Soybean meal, 46.5% protein	%	20.0	
Fat	%	5.0	Soybean oil or choice white grease
Monocalcium phosphate (21% P)	%	1.10	
Limestone (38% Calcium)	%	0.60	
L-lysine HCl	%	0.15	
DL-methionine	%	0.15	
Salt	%	0.30	
Zinc oxide	%	0.375	
Acidifier	%	0.20	Kemgest, Syneracid, Digest acid, or ADM Select Acid
Vitamins	**Units**	**Guaranteed Potency Added per Ton of Complete Feed**	**Sources**
Vitamin A	IU	10,000,000	Vitamin A acetate (retinyl acetate)
Vitamin D	IU	1,500,000	Vitamin D_3 (cholecalciferol)
Vitamin E	IU	40,000	d or dl- -tocophorol acetate
Vitamin K (menadione)	mg	4,000	MPB (Menadione dimethylpyrimidinol bisulfite) or MNB
Vitamin B_{12}	mg	35	Cyanocobalamin
Niacin	mg	45,000	Niacinamide, Nicotinic acid
Pantothenic acid	mg	25,000	d-calcium pantothenate
Riboflavin	mg	7,500	Crystalline riboflavin
Choline	mg	150,000	Choline chloride
Pyridoxine	mg	2,000	Pyridoxine hydrochloride

Complete Starter Diet Specification (Transition) – Page 2 of 2

Minerals	**Units**	**Guaranteed Potency Added per Ton of Complete Feed**	**Sources**
Copper	g	15	Copper sulfate
Iodine	mg	270	Ca iodate, Ethylenediamine dihydriodide (EDDI)
Iron	g	150	Ferrous sulfate, Ferrous carbonate
Manganese	g	36	Manganese sulfate, manganese oxide
Selenium	mg	270	Sodium selenite
Zinc	g	2,700	Zinc oxide (MUST BE ZINC OXIDE)
Medication (As decided by the producer)	**Units**	**Guaranteed Potency Added per Ton of Complete Feed**	**Sources (Decided by the producer)**

a) The following points must be followed unless approval for changes have been made:
b) Must be pelleted in 1/8, 3/32, or 5/32" pellets.
c) Guaranteed to stay free-flowing, lump free, and non-dusty.
d) When bagged, all bags must be labeled with tags. Tags should include date of manufacture, lot number, guaranteed analysis, inclusion rate, and proposed use of the product.
e) Formulate using the guaranteed analysis from the supplier for the nutrient. We can request label copies of your ingredients and copies of your mixing records to show quantities of ingredients per batch.
f) Permission must be obtained before using an alternative source for any ingredient.

	Phase 2 options (15 to 25 lb)			
Ingredient, %	Blood meal	Fish meal	Deproteinized whey	**Phase 3 25 to 50 lb**
Corn	51.70	52.30	52.10	58.30
Soybean meal, 46.5% CP	28.35	26.65	26.45	34.80
Select menhaden fish meal		4.50	6.00	
Spray-dried blood cells	2.50			
Spray dried whey	10.00	10.00		
Deproteinized whey			9.00	
Choice white grease	3.00	3.00	3.00	3.00
Monocalcium P, 21% P	1.10	0.55	0.45	1.15
Limestone	0.85	0.50	0.45	0.95
Salt	0.30	0.30	0.30	0.35
Zinc oxide	0.25	0.25	0.25	0.00
Vitamin premix with phytase	0.25	0.25	0.25	0.25
Trace mineral premix	0.15	0.15	0.15	0.15
Lysine HCl	0.25	0.30	0.30	0.30
DL-Methionine	0.18	0.15	0.15	0.13
L-Threonine	0.13	0.13	0.14	0.13
Antibiotic 1	1.00	1.00	1.00	0.50
TOTAL	100.00	100.00	100.00	100.00
TID Lysine, %	1.35	1.35	1.35	1.30
Total lysine, %	1.49	1.48	1.48	1.44
TID Lysine:ME ratio, g/Mcal	3.99	3.94	3.92	3.79
TID Isoleucine:lysine ratio, %	54%	59%	59%	62%
TID Leucine:lysine ratio, %	132%	121%	119%	128%
TID Methionine:lysine ratio, %	34%	36%	36%	33%
TID Met+Cys:lysine ratio, %	56%	58%	58%	57%
TID Threonine:lysine ratio, %	62%	62%	62%	63%
TID Tryptophan:lysine ratio, %	18%	17%	17%	18%
TID Valine:lysine ratio, %	73%	65%	65%	69%
ME, kcal/kg	3,382	3,423	3,439	3,432
Protein, %	21.5	21.3	21.4	21.6
Calcium, %	0.71	0.71	0.72	0.71
Phosphorus, %	0.65	0.65	0.66	0.64
Available phosphorus, %	0.37	0.38	0.38	0.32
Available phosphorus equiv, %	0.47	0.48	0.48	0.42
Avail P:calorie ratio g/mcal	1.40	1.39	1.41	1.22

Vitamin Premix Specification Form with Phytase

Name:_____

Address:_____

_____

Phone:_____

Fax:_____

Date:_____

Date Needed:_____

Product name: Vitamin Premix with Phytase

Quantity, lb Package size, lb

Use level, lb/ton Sow diets: 2.27 kg
Nursery diets: 2.27 kg
Grower diets: 1.36 kg
Finisher diets: 0.68 to 1.13 kg

Price desired (circle one) $/lb FOB

$/lb Delivered

Nutrient	Units	Guaranteed Potency per lb of premix	Sources
Vitamin A	IU	2,000,000	Vitamin A acetate (retinyl acetate)
Vitamin D	IU	300,000	Vitamin D_3 (cholecalciferol)
Vitamin E	IU	8,000	dl-α-tocophorol acetate or d-α-tocophorol acetate
Vitamin K (menadione)	mg	800	MPB (Menadione dimethylpyrimidinol bisulfite) or MNB
Vitamin B_{12}	mg	7	Cyanocobalamin
Niacin	mg	9,000	Niacinamide, Nicotinic acid
Pantothenic acid	mg	5,000	d-calcium pantothenate
Riboflavin	mg	1,500	Crystalline riboflavin
Phytase	FTU	90,700	Natuphos
Carrier			50:50 mixture of rice hulls and limestone
Oil	%		Mineral or vegetable

The following points must be followed unless approval for changes have been made:

a) Guaranteed to stay free-flowing, lump free, non-dusty and packaged in multi-wall, poly-lined paper bags or totes as specified above.

b) The final moisture level will be less than 10% and 99.5% product will flow through a #14 U.S./Canadian screen.

c) Bulk density will be 32 ± 5 lb per cubic foot. Please notify me if oil level or carrier cause a flow problem.

d) All bags or totes must be labeled with tags. Tags should include date of manufacture, lot number, guaranteed analysis, inclusion rate, and proposed use of the product.

e) Formulate using the guaranteed analysis from the supplier for the nutrient. We can request label copies of your ingredients and copies of your mixing records to show quantities of ingredients per batch.

Trace Mineral Premix Specification Form

Name:_____

Address:_____

_____

Phone:_____

Fax:_____

Date:_____

Date Needed:_____

Product name: Trace Mineral Premix

_____ _____
Quantity, lb Package size, lb

Use level, lb/ton Sow diets: 1.36 kg
Nursery diets: 1.36 kg
Grower diets: 1.36 kg
Finisher diets: 0.68 to 1.13 kg

Price desired (circle one) $/lb FOB

$/lb Delivered

Nutrient	**Units**	**Guaranteed Potency per lb of premix**	**Sources**
Copper	G	5	Copper sulfate, Copper chloride
Iodine	mg	90	Ca iodate, Ethylenediamine dihydriodide (EDDI)
Iron	g	50	Ferrous sulfate
Manganese	g	12	Manganese sulfate, Manganese oxide
Selenium	mg	90	Sodium selenite
Zinc	g	50	Zinc sulfate
Carrier	%		Calcium carbonate
Oil	%		Mineral or vegetable

The following points must be followed unless approval for changes have been made:

a) Guaranteed to stay free-flowing, lump free with little dust, and packaged in multi-wall, poly-lined paper bags or totes as specified above.

b) All bags or totes must be labeled with tags. Tags should include date of manufacture, lot number, guaranteed analysis, inclusion rate, and proposed use of the product.

c) Formulate using the guaranteed analysis from the supplier for the nutrient. We can request label copies of your ingredients and copies of your mixing records to show quantities of ingredients per batch.

d) Trace mineral sources must comply with the AFIA Mineral Handbook as to maximum levels of arsenic, mercury, cadmium, and lead.

Vitamin Premix Specification Form – Sow Add Pack

Name:_____

Address:_____ Product name: Sow Add Pack

_____ _____ _____

Quantity, lb Package size, lb

Phone:_____

Use level, kg/ton Sow diets: 2.25 kg

Fax:_____

Date:_____ Price desired (circle one) $/lb FOB

Date Needed:_____ $/lb Delivered

Nutrient	**Units**	**Guaranteed Potency per lb of premix**	**Sources**
Biotin	mg	40	Biotin
Folic Acid	mg	300	Folic acid
Pyridoxine	mg	900	Pyridoxine HCl
Choline	mg	100,000	Choline Cl
Carnitine	mg	9,000	L-carnitine
Chromium	mg	36	Chromium picolinate
Carrier			50:50 mixture of rice hulls and limestone
Oil	%		Mineral or vegetable

The following points must be followed unless approval for changes have been made:

a) Guaranteed to stay free-flowing, lump free, non-dusty and packaged in multi-wall, poly-lined paper bags or totes as specified above.

b) The final moisture level will be less than 10% and 99.5% product will flow through #14 U.S./Canadian screen.

c) Bulk density will be 32 ± 5 lb per cubic foot. Please notify me if oil level or carrier cause a flow problem.

d) All bags or totes must be labeled with tags. Tags should include date of manufacture, lot number, guaranteed analysis, inclusion rate, and proposed use of the product.

e) Formulate using the guaranteed analysis from the supplier for the nutrient. We can request label copies of your ingredients and copies of your mixing records to show quantities of ingredients per batch.