HAU Pig Notes
Alan Stewart

These notes are designed to give basic factual information that will be referred to in lectures. Data tables and figures are provided to give evidence for the fundamental principles involved.

Directed Reading

AHDB Pork (Formerly BPEX) – Pig Year Book
AHDB Pork Web Site
DEFRA Web Site
Whittemore's Science and Practice of Pig Production. Ed Ilias Kyriazakis & Colin T. Whittemore 2006 3rd Edition (Blackwell Publishing).Chapter 2&16

BPEX APP Short video Clips
http://practicalpig.bpex.org.uk/outdoor-breeding/farrowing/piglet-management
http://practicalpig.bpex.org.uk/indoor-breeding/farrowing
http://practicalpig.bpex.org.uk/indoor-breeding/farrowing/piglet-management
http://practicalpig.bpex.org.uk/indoor-breeding/service/service-ai

Glossary of Terms – Pigs

Maiden Gilt - Young breeding female prior to first service.
Gilt - Young female up to the weaning of the first litter.
Farrowing - Parturition of Sows.
Parity - Number of litters a sow has had. (Parity 4 sows are on their fourth litter).

Boar - Entire male
Castrate - Castrated male

Weaner - Young weaned pig from 7kg to 30kg
Grower - Pig of 25kg – 70kg
Finisher - Pig of 65kg – 108kg
Pork / Cutters - Slaughter live weight 65kg-95kg
Bacon - Slaughter live weight 85 kg –115 kg
Heavy Bacon - Slaughter live weight 105kg-120kg

Cold Carcass Weight - Eviscerated carcass weight at 24 hours post slaughter (Usually adjusted from hot weight taken soon after slaughter)

Dressing Standards - Standards of trimming prior to establishing carcass weight. (eg. Tongue, kidney's and various body fat may or may not be removed.) MLC and EU Standards

Killing out % - Weight of carcass as a percentage of liveweight prior to slaughter.

P2 - Measurement of the depth of fat in mm half way down the loin 6.5 cm from mid line. (between the outside of the skin and eye muscle)

DLWG- Daily Live Weight Gain usually quoted in grams per day g/d

FCR - Food Conversion Ratio.
kg of food required to add one kg of live weight
e.g. 2.3:1. is 2.3kg of feed per kg of weight gain

DE - Digestible Energy in Diet Difference between the gross energy in the diet and the gross energy in the faeces. Megajoules/kg MJ/kg

Ad libitum Feeding - Diet available to the pig all the time.

Thermal Neutral Zone- TNZ. Environmental temperature zone in which the pig does not use metabolism regulation and thus feed resources, to control body temperature.

ACNV - Automatically Controlled Natural Ventilation

AI - Artificial Insemination

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THE UK PIG INDUSTRY

The pig industry produces meat and meat products e.g. pork, bacon, ham, sausages, pies

During 1990's 14million pigs were slaughtered each year, the weekly kill varied between 250,000 and 320,000. Currently the kill is down to 10 million/annum, however the live weight at slaughter has increased (85-107kg) . Pigs are processed through 128 abattoirs (13 specialist pig plants account for 89% of all slaughtering) eg Malton Bacon Factory has a throughput of up to 30,000/week. The trend will be to fewer larger units which will increasingly be part of a vertically integrated chain. For example The Malton group is now part of Vion Food group, which is a vertically integrated pig and poultry production and processing company. Vion slaughters the majority of Scottish pigs and has up to 25% of the UK kill. Vion is a Dutch company. Tulip/Dale Head/BQP is now the largest production/processing Company in the UK with (approx. 40k outdoor sows across southern England and East Anglia). 99% of pigs are sold dead weight under pre-determined grading contracts at prices calculated from the previous weeks trade both in UK and Europe. The DAPP/SAPP price is an average price pence/kg DW calculated and published by BPEX. Future contracts may move towards fixed prices based on the costs of production. Livestock auctions play a very small role in marketing pigs.

The industry has a **30% share of the total meat market** (14 billion/year), which is worth around ,4 billion/year retail. Total UK producer sales value lies between £0.9 -1.2 billion

Historically UK production supplied 75% of the market although this now stands at 56% - main imports are from Denmark, Holland and Ireland. Which enters either as packed branded product or more importantly as primal joints to be processed in the UK. Pig meat **exports account for 14%** of total production and are worth £180 million per year. This includes breeding stock sales.

UK pig numbers	-	1950's	-	large number of small herds
			-	Secondary enterprise on mixed farms
	-	1960's	-	start of intensification -75,000 holdings
	-	1970's	-	22,000 holdings
	-	1990's	-	14,000 holdings
	-	2003	-	93% Sows on 2,100 holdings
			-	96% Finishers on 3,600 holdings

Net Production of Pig Meat in the World

	Number of Sows (,000)				Pig Meat Production (,000 t)				Efficiency Kg meat per sow 2012
	2000	2007	2012	% Change	2000	2007	2012	% Change	
China	35500	47416	49250	38.7	41406	42878	53320	28.8	1083
USA	6267	6233	5770	-7.9	8597	9962	10554	22.8	1829
Vietnam	2954	4109	4000	35.4	990	1832	2000	102.0	500
Russia	2120	2124	2200	3.8	1341	1640	2075	54.7	943
Brazil	3020	2970	2915	-3.5	2556	2990	3330	30.3	1142
Spain	2441	2663	2250	-7.8	2912	3439	3515	20.7	1562
Germany	2526	2418	2118	-16.2	3982	4985	5459	37.1	2577*
Denmark	1344	1353	1229	-8.6	1624	1802	1603	-1.3	1304*
France	1377	1234	1076	-21.9	2318	2281	1957	-15.6	1819
Netherlands	1272	1060	1081	-15.0	1623	1290	1313	-19.1	1215*
UK	653	498	494	-24.3	923	739	824	-10.7	1668

*Artificially high/low due to weaner exports to Germany Pig International August 2013

Pig Meat & Production Trends UK

	84-86	91	98-99	00-04	08	09	10	11	12	14
Sows & Gilts (>000 head)	818	785	720	556	423	445	427	432	425	406
Clean Pigs Slaughtered (m head)	14.99	14.31	14.98	9.92	9.19	8.82	9.23	9.81	10.04	10.23
Dressed Carcass Weight (kg)	61.3	65.7	69.2	72.78	75.8	78.1	78.4	78.3	78.7	80.9
Total Pig Meat Production (>000 t)	964	996	1089	763	740	720	758	806	825	863
Average Realised Return (p/kg)	99	97	80	98	126	145	139	142	158	
Total Product Value (, million)	950	970	843	720.8	932	1044	1034	1144	1248	
Consumption ('000 tonnes)					1,516	1,516	1,535	1,570	1,575	1,543

Meat Production & Self Sufficiency (>000 tonnes dcw & % of consumption)

	84-86		98 – 01		2004			2010	2014
Beef & Veal	1,113	(100)	682	(78)	712	(71)		897 (83)	871 (82)
Sheep & Lamb	304	(76)	360	(96)	314	(84)		287 (92)	307 (102)
Poultry Meat	882	(96)	1506	(90)	1606	(90)		1570 (88)	1648 (91)
Pork	733	(102)	772	(95)	574	(62)	**Pig Meat**	712 (52)	820 (61)
Bacon & Ham	206	(44)	222	(47)	196	(40)			

Pig Industry Structure (UK)

Pig Breeding Herd Herd size	**1995 Holdings (>000)**	**Pigs (>000)**
1 to 49 breeding pigs	6.6	63
50 to 99	0.9	66
100+	2.1	613 (82.6%)
Total	9.7	742
Av. Herd Size 100+		292
Finishing Herd (Fattening pigs > 20kg)		
1 to 199 fattening pigs	6.1	247
200 to 999	2.9	1,437
1000+	1.3	2,942 (63.6%)
Total	10.3	4,626
Herd Size 1000+		2263

Pig Industry Structure (England)

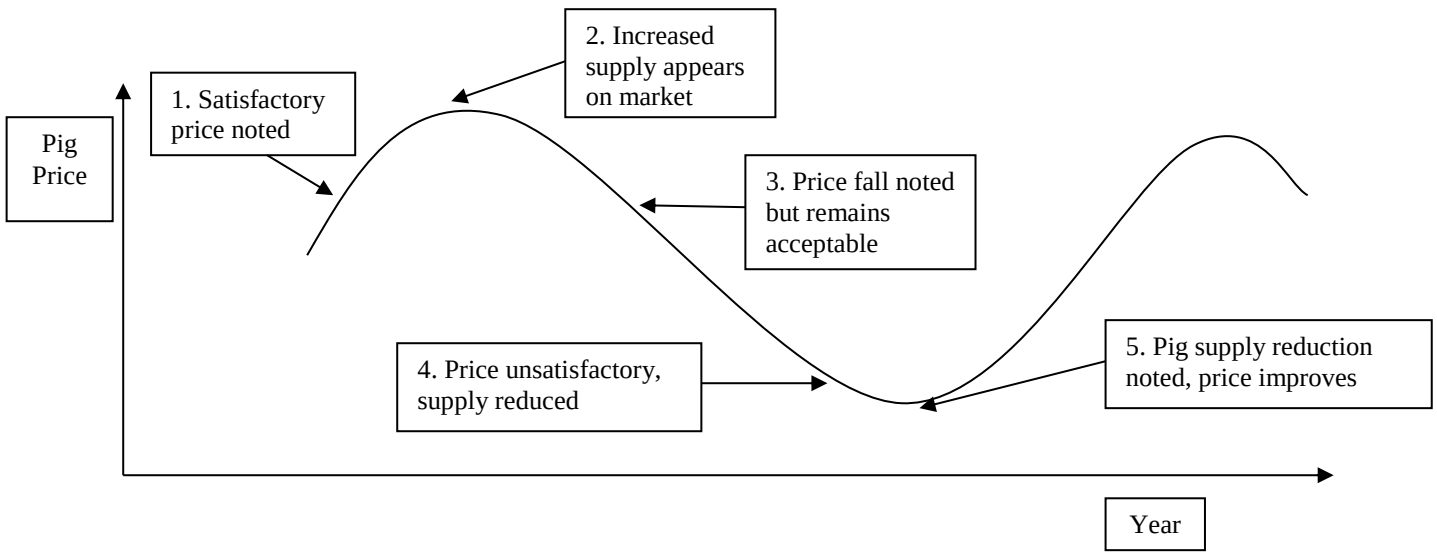
Herd size	**2005 Holdings (>000)**	**Pigs (>000)**	**2014 Holdings (>000)**	**Pigs (>000)**
1 to 24	3.2	19	3.4	16
25 to 99	0.7	37	0.4	21
100+	0.8	329 (93.7%)	0.6	292 (88.7%)
	4.7	351	4.4	329
		411		487
1 to 299	4.3	178	5.0	180
300 to 999	1.1	654	0.8	498
1000+	1.1	2,658 (76.1%)	1.1	2,865 (80.9%)
	6.9	3,490	7.0	3,542
		2416		2605

(Source: DEFRA Statistics Agriculture, June census www.defra.gov.uk)

Distribution of herd sizes in MLC/Agrosoft recorded herds illustrating the changing structure

	1994	2003		2008	2014
No. of Sows	% of herds	% of herds	No. Sows	% of herds	
Under 100	16	10	100-249	9	13
100-149	20	8	250-499	25	23
150-199	18	12	500-749	26	29
200-299	23	26	750-999	24	10
300-499	13	18	1000-1499	14	20
500-999	7	19	1500-2999	2	5
Over 999	3	7	Over 3000	0	0
	100	100		100	100

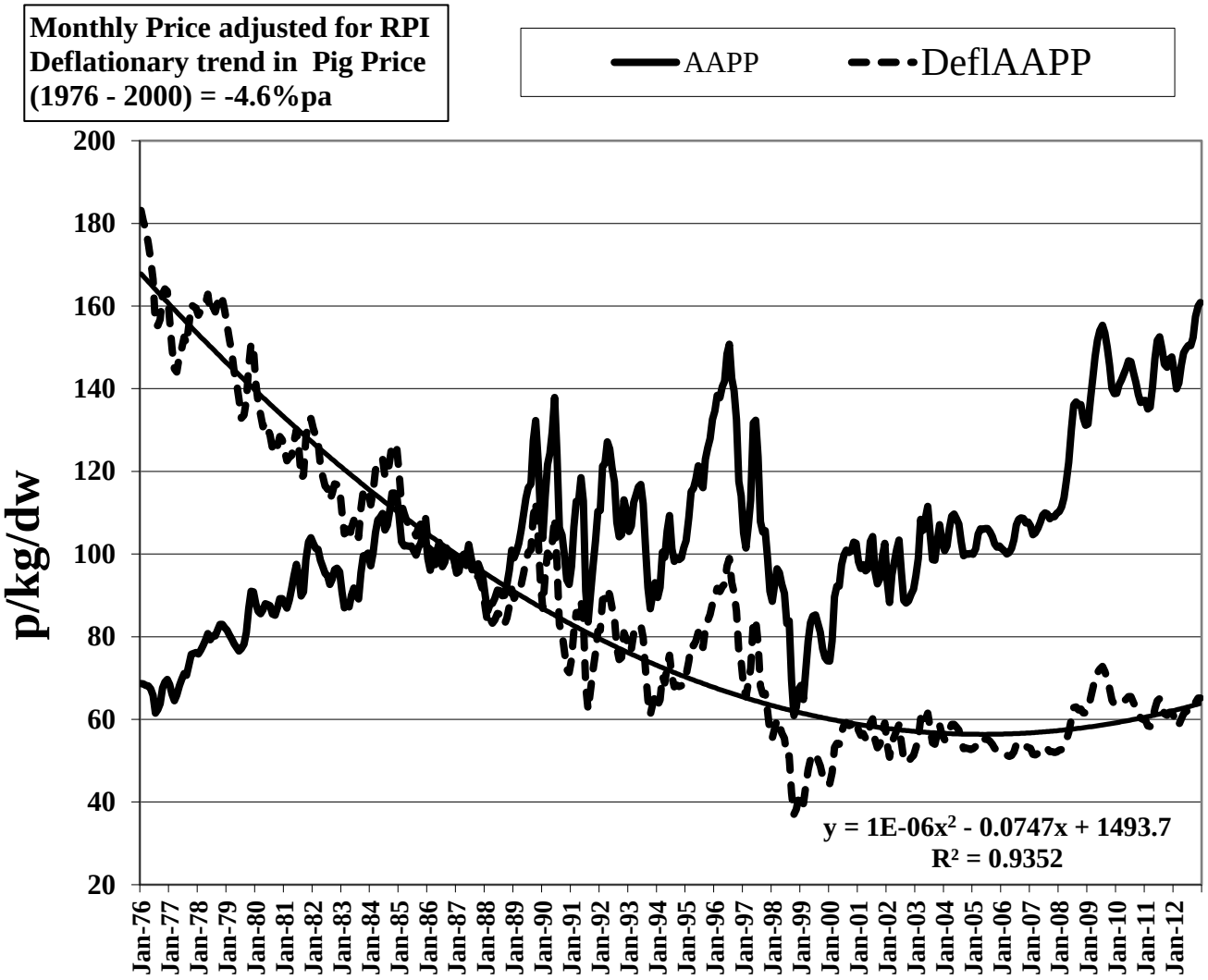
THE PIG CYCLE



Historical Pig Price Data

The Figure below demonstrates relatively stable price movements during the eighties moving towards a period of unsustainable price fluctuations as the pig meat market moved towards the global market and the dominance of the supermarkets and a small numbers of wholesalers and processors. Price fluctuations became increasingly out of control and dependant on external factors. The late 1990's resulted in a price collapse as the Russian and Japanese economies moved into recession and they stopped importing EU pig meat. This was compounded in the UK with the unilateral legislation on sow stalls in 1999. This required major reinvestment just at the time when serious losses were being incurred. After the collapse in the UK sow herd prices remained relatively stable and at a small premium to EU prices. Prices better reflected the cost of production allowing producers to rebuild confidence in the overall market. Recent price increases have been a better reflection of cost of production price increases allowing producers to maintain margins.

The deflationary line demonstrates the fact that producers for many years needed to improve performance and reduce cost just to compensate for price reductions in real terms. The recent upturn in this line demonstrates a genuine increase in the price of meat in relation to other household expenditure.



THE PIG CYCLE

In general the pig industry follows a cycle in terms of supply and demand. Traditionally this has a direct effect on prices with over supply within the UK putting downward pressure on the price, during the 1990's a UK kill of greater than 300,000 per week usually spelt danger however the recent drop in UK kill to <200,000 has not maintained high prices due to the importation of primal cuts from EU. The EU does not directly support the pig industry, however, there are import and export controls in place at the EU borders. Within the EU there are a number of national influences that distort the UK cycle. For example the swine fever out break in Holland 1997 and the consequent slaughter of 3m pigs kept UK prices high although this was tempered by the high pound value and a 9% increase in the UK herd size.

The 1998 collapse in the UK and EU prices was caused by a number of factors coming together 1) a 10% over supply in UK and 9% over production in EU. 2) The collapse of the Russian and Asian export markets from Holland and Denmark. 3) The recovery in health and performance of the Dutch herd. The UK problem was exacerbated by the fact that many producers had to invest large sums of capital in converting sow housing to comply with the UK regulations on confinement systems for sows. (Not applicable to the rest of the EU). There is no structure for exchange rate differences since the green pound adjustments ceased and the high relative price of the pound against the Euro has meant that EU imports are relatively cheap. The collapse in the UK sow herd size in the late 1990's has been tempered by an increase in slaughter pig weight which added a degree of efficiency to the UK pig meat production. Over the last decade UK prices have been relatively stable and in general there has been a price premium for UK pig meat. Profitability has fluctuated and over the last two years there has been some reinvestment in the pig industry although currently the high price of feed has pushed the real cost of production to 145-170 p/kg DW which is higher than the average DAPP price. Since mid-2000 two diseases, PDNS and PMWS, have also caused an increase in the average cost of production although these diseases are now under control. There has also been reductions in the continental herd over the recent years and new legislation on the welfare of sows is likely to put further pressure on the EU herd.

TYPES OF PRODUCTION UNITS

NUCLEUS HERD (Produce breeding stock)

▼

MULTIPLIER HERD (>Multiply= breeding stock)

▼ ▼

BREEDER/FINISHER (71.2%) **BREEDER/WEANER** (21.2%)

▼

FINISHER (7.6%)

The structure of the industry developed through the 1980's with the emergence of large breeding companies, which currently dominate the home market and are big players in the international market. During the early nineties and up to the present day there has been an expansion of large horizontally and vertically integrated production companies. Single businesses control tens of thousands of sows and finishers often with major feed processing facilities and slaughter and processing plants.(E.g. Vion, Dalehead and Bowyers) Dalehead a major vertically integrated company with 25% of the processing capacity was purchased by Tulip a Danish Crown subsidiary in 2004.

As the industry becomes more competitive in world markets it is anticipated that this trend will continue utilising the low capital, outdoor production system and integrated multi-site systems. This will change the overall structure of the industry in that more sites will become specifically breeding, rearing or finishing managed on all in all out systems. Out door production has overall health benefits however care must be taken with the biosecurity within company breeding and production pyramids as highlighted by the UK Swine Fever outbreak (July 2000). Currently the rise in feed prices is disproportionately affecting out door producers where feed efficiency is poorer.

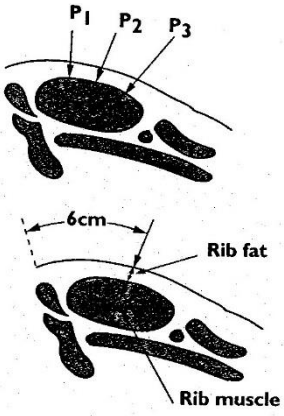
Live and deadweights of pigs for different markets

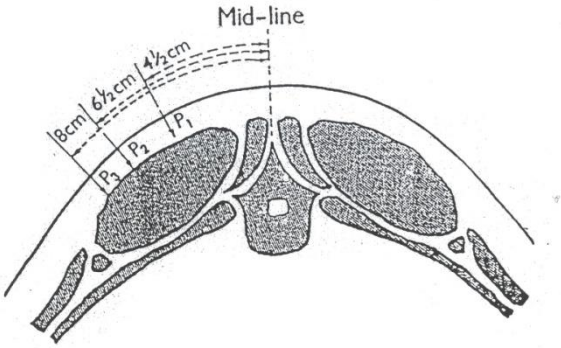
Liveweight Range (kg)	Deadweight Range* (kg)	Market
10-20	**(eaten whole)**	Suckling Pig Small Connoisseur market (Traditional Chinese Dish)
58-68	**40 – 50**	**Pork** Only ≈ 3% of Annual kill
69 – 85	**51 – 65**	**Cutters** ≈ 4% of Annual kill
85 – 108 (Traditional) Upto 120	**66 – 90**	**Bacon** ≈ 93% of Annual kill (relatively new contracts up to 90kgdw)
120 +		Cull Sow

*Weight of cold eviscerated carcass, includes head, feet, Skin and abdominal fat, usually 70-76% of liveweight after fasting over night.

Location of probing sites on a pig carcass

Most contracts work on the P2 Back Fat depth measurement 6.5 cm from the mid line over the last rib. Other measurements taken using the Hennessey Grading Probe and the Fat-O-Meater include the Eye Muscle depth at the rib fat probing point 6cm from the mid line between the third and fourth last rib. New automated body scanning machines are used on the continent. One major UK slaughter plant installed the **AutoFOM** system, however its use has been discontinued. This system provided ultrasonic data throughout the carcass and allowed better estimation of lean meat content and also distribution of high value lean meat.





Typical Contract Grid

Most abattoirs offer grading grids similar to that below. Many will have variations to encourage producers in slightly different directions (eg. More uniformity with tighter weight brackets or heavier weight brackets with different fat grades)

	Probe P2	Weight		Category		
		< 57.5	57.5 -59.5	60-82	82.5 - 85	>85
Q	90% <12mm			Base +7p		
Grade A	<14 mm	Base -30p	Base -3p	Base +2p	Base -3p	Base -30p
Grade B	15-17 mm		Base -10p	Base -5p	Base -10p	
Grade C	>17 mm		Base -25p	Base -20p	Base -25p	

Base price is usually negotiated by producers and marketing groups on a weekly basis. A guide to previous prices is reported as the GB All Pig Price (GB APP) and is published weekly by AHDB Pork.

BREEDS

REQUIREMENTS
- LARGE LITTER SIZE and EFFICIENT REPRODUCTIVE PERFORMANCE
- QUICK, EFFICIENT GROWTH
- LEAN CARCASE

MAIN COMMERCIAL BREEDS

LARGE WHITE	-	Basis of all commercial pigs
LANDRACE	-	(Male and female lines)
DUROC	-	Used mainly in Dam lines Hardiness and meat Quality
PIETRAIN	-	Terminal sire lines Third breed Increased Heterosis
HAMPSHIRE	-	Terminal sire lines Third breed Increased Heterosis

OTHER BREEDS Limited to various breeding programmes and niche markets such as organic production and direct sale marketing)

MEISHAN
BRITISH SADDLEBACK
BRITISH LOP
BERKSHIRE
LARGE BLACK
OXFORD SANDY AND BLACK
WELSH
MIDDLE WHITE
GLOUCESTERSHIRE OLD SPOT
TAMWORTH

BREED IMPROVEMENT

MAJOR UK BREEDING COMPANIES

-Pig Improvement Company PIC, ACMC, JSR Healthbred (inc. Cotswold & Newsham), Seghers, Rattlerow, Premier Genetics, DanBred

-Maintain a number of lines within each breed with two distinct selection objectives

MALE LINES - selection made on growth efficiency and leanness only

FEMALE LINES - selection made on growth performance without losing prolificacy and mothering ability

- Alternative traits and gene markers are increasingly being identified eg. in the areas of meat quality and health

PURE BRED 'GRANDPARENTS' OR F1 HYBRID		**PURE BRED OR 'HYBRID' BOAR**
Large White Sow x Landrace Boar (From multiplier herd)		LW or LR or Pietrain or Hampshire
x		(From nucleus herd)
Duroc Dam Line (From nucleus herd)		
↓		↓
(LW/LR) x D (hybrid sow)	X	**TERMINAL SIRE** (can be pure or hybrid)

↓

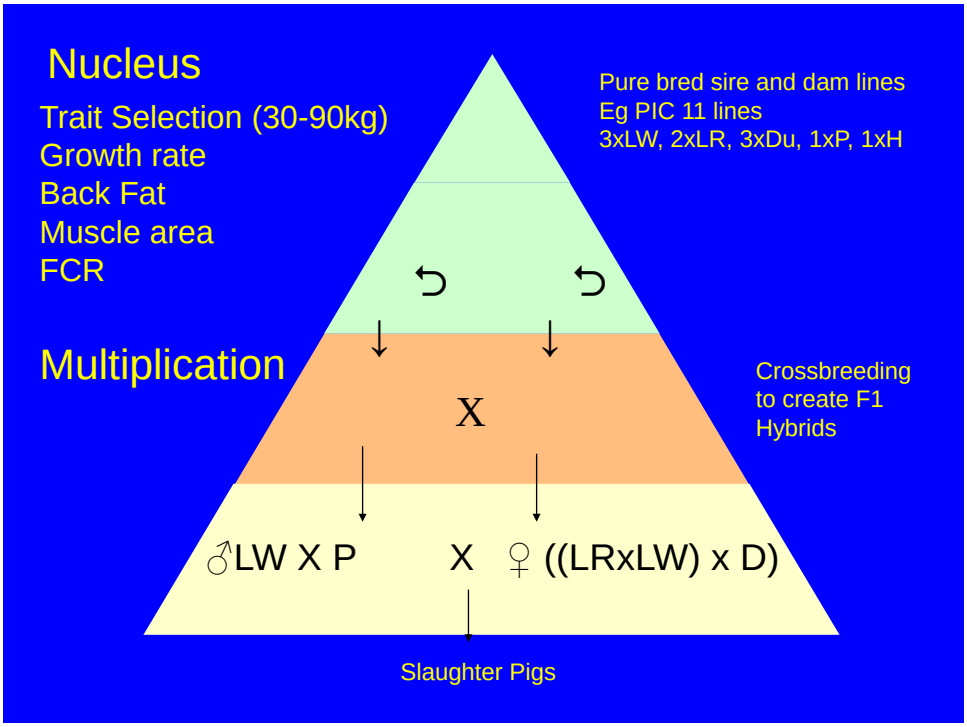
Slaughter Pig

(LW/LR)D x (Boar line)

Commercial producers use a first cross (F1) hybrid female because
- maximum litter production is achieved through **hybrid vigour**

Cross bred terminal sires are preferred because
- **superior reproductive performance** compared to pure breeds
- produce **more lean meat** in the carcasses of their progeny
- Potentially can impart disease resistance or improved health

The breeding pyramid



Activity summary

Nucleus Great –grandparent generation
Rigorous testing of purebred lines using performance test and DNA marker selection. Best 5% retained within nucleus. Next 20% females supplied to multipliers or Next 5% of Males supplied to AI studs.
Above average supplied direct to commercial producers.
Surplus and inferior stock slaughtered.

Nucleus units are wholly owned by breeding companies. These range in size from small pedigree breeders to independent Large Breeding Companies (eg JSR, Rattlerow) and corporate breeding companies (eg PIC Part of Genus)

Multiplier Grandparent generation
Purebred stock multiplied.
Crossbred females produced for sale to commercial producers.
Selection of stock on basis of performance and visual characteristics.
Surplus and inferior stock slaughtered.

Multipliers can be part of the breeding company or independent. Many commercial producers now multiply within the herd to increase biosecurity and provide greater flexibility.

At Harper Adams of the 240 sows in the herd 12 are Grand parent stock mated to Pure Duroc or Large White Dam line semen. The female off-spring are notched or tattooed and selected as the replacement gilts at 80 kg. This procedure reduces the need to bring new animals into the herd from the breeding company farms from 10 per month to 12 once every two years, greatly improving Biosecurity and reducing risk.

Commercial Parent generation
Purebred or more usually crossbred females crossed with either one of parent breeds or a third breed to produce slaughter pigs.

STOCKMANSHIP

Management and its interaction with the animal and system of production is the main difference between top performing herds and average performing herds. It is essential to have quality staff that are self motivated. This is particularly important in less extensive systems where there is less control over the pig environment such as outdoor production. Many of the larger pig production businesses are developing internal training programmes and implementing strict standard operating procedures. English et al (1988) described the qualities exhibited by good stock people.

- Sound basic knowledge of the animals and their requirements
- Basic attachment for and patience with the stock
- Ability and willingness to communicate and develop a good relationship with the stock (empathy)
- Ability to recognise all individual animals and to remember their particular eccentricities
- Keen sensitivity for recognising the slightest departure from normal behaviour of individual animals (perceptual skills)
- An ability to organise the working time well
- Having a keen appreciation of priorities with a ready willingness to be side tracked from routine duties as pressing needs arise to attend to individual animals in most need of attention.

Good stockmanship not only improves the overall welfare of the animal but productivity gains can be made. The research summary below shows the effect of human interaction on pig behaviour, physiology and performance over a number of controlled experiments.

General unit Management

Pig units are generally managed as a continuous cycle with batches of sows farrowing at weekly, fortnightly or three week intervals. This results in a continuous flow of pigs through the system with the same number of services, farrowings, weaned piglets and sales each batch throughout the year. Each week or batch will have a set routine that allows the most efficient use of building space and labour. For example in addition to the daily routines of feeding, health checks, heat detection and farrowing house management. The following weekly routine may be used.

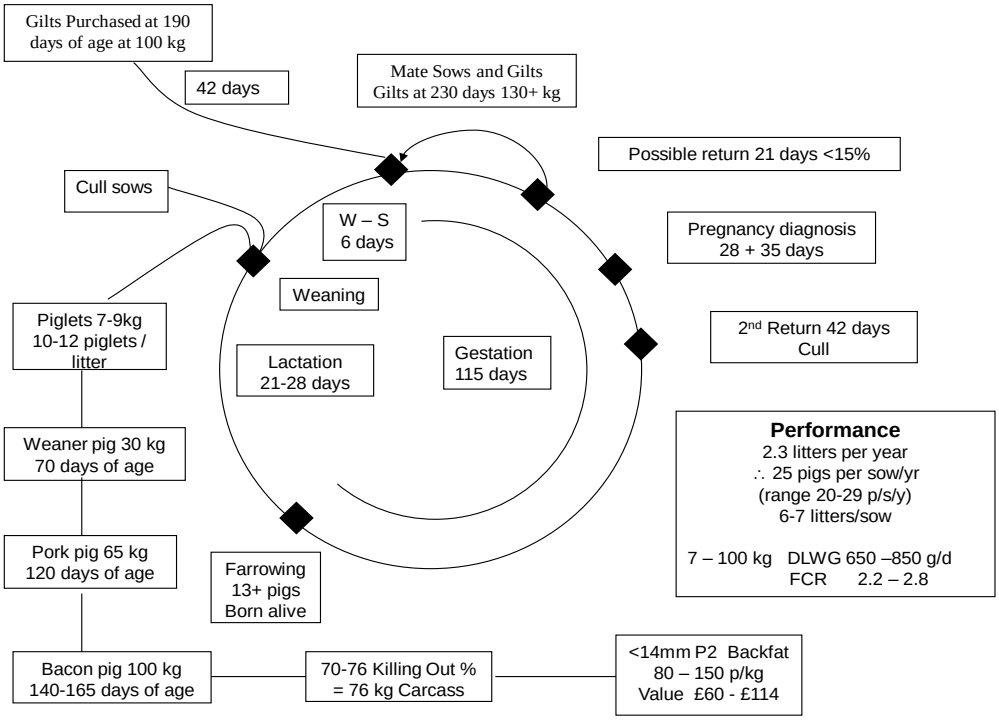
Monday	Sell finisher pigs, make space and move pigs up the finishing housing system, mate sows, scrape muck and straw down.
Tuesday	Empty weaner accommodation and pressure-wash, move sows into farrowing accommodation, mate sows.
Wednesday	Pregnancy diagnose, vaccination and parasite program, scrape muck and straw down, mate sows, sell cull sows, weigh and slap mark finishers for sale.
Thursday	Wean sows and move piglets into weaner accommodation, pressure wash farrowing pens, make weekly records, farrow sows, induce sows.
Friday	Farrow sows, scrape muck and straw down, prepare feed and catch up with jobs prior to weekend, general maintenance.

Some of the largest units (1000 + sows) will wean twice a week and have a continuous program of mating and farrowing seven days a week. These units will often employ night staff to attend to farrowing sows.

Throughput

Once the herd size and structure has been decided (eg. weekly or 3 week batch management), target performance must be determined before throughput and accommodation requirements can be calculated.
e.g. How many sows a week will farrow per hundred sows given a litters/sow/year of 2.3.
100 sows x 2.3 litters/sow/year = 230 litters/year
230 litters/year / 52 weeks = 4.42 litters/week/100sows
If 10 pigs are weaned/litter with a 5% post weaning mortality then:
$\approx$ 44 pigs will be weaned/week and $\approx$ 42 pigs sold/week

The Pig Production Cycle



THE BREEDING CYCLE

FEEDING	**EVENT**	**MANAGEMENT**
2.3 kg/day (2.0 Kg/day gilts) (overfeeding may increase embryo mortality) **Condition Score (CS)** **Target 2½ - 3**	**SERVICE** ↓	Serve 2-3 times over 2 days minimise stress at time of implantation (12-20 days)
2.3 - 2.5 kg/day Gestation Diet (14% Crude Protein) (feed according to body condition) **CS Target 3½**	**21 days** ↓ 35 days ↓ 42 days ↓	check for returns to service pregnancy test check for returns to service
3.0 - 3.5 Kg/day Gestation (to improve piglet birth weight IF it is a problem)	85 days ↓	
2.0 Kg/day Gestation diet (to prevent mastitis)	108 days ↓	Move into farrowing house
CS Target 3½ - 4 Build up by **0.5 kg/day** to maximum intake of **9-11kg/day** (See Stotfold scale) Lactation diet (18% Crude Protein)	**FARROWING** **115 DAYS** ↓	Piglets born - teeth and tail - iron injections - ear notch
CS Target 2 ½ (2-3) No less than 2 remember condition score 1 is a welfare issue. **4 kg/day or to appetite** Lactation diet if possible - body weight - weaning to service interval **CS Target 3**	**WEAN** **21-28 DAYS** ↓ 4 - 7 days ↓ **SERVICE**	House sows within sound, sight, smell & touch of boar Check daily for sign of heat - red, swollen vulva - riding other sows - back pressure test

GILT MANAGEMENT

Objectives: To attain a stable and efficient herd structure
Maximise efficiency with minimal lost days
Maximise gilt litter output whilst maintaining lifetime performance and welfare

TARGETS AT FIRST SERVICE

Age:	230 to 240 days
Number of Oestrous Cycles From Puberty:	2 or 3
Body Weight:	130 -140 kg
Condition:	20 mm backfat (condition score 3)

All these factors are important when considering the LIFETIME performance of the breeding female.

Breeding too early results in:- low numbers born over several parities (not just first)
- problems in maintaining body condition of the sow
- bone and leg weaknesses which may lead to premature culling

To aid management and provide a controlled efficient system which allows gilts to cycle at least twice prior to service, without adding too many empty days, it is desirable to stimulate puberty as early as possible:

WHEN - gilts are responsive to stimulation from **160 days** of age
HOW -**most effective way is by using <u>boar contact</u>**
daily contact with a mature boar for at least 10 mins
- less effective ways include
- **moving** e.g. transport to new farm
- **mixing** e.g. strange gilts mixed together
- **Exogenous hormone** e.g. PG600(Intervet) FSH+LH analogue

<u>Percentage of Gilts in Heat Showing the Standing Reflex in Response to Various Boar Stimuli</u>

Boar Stimuli	% Showing Standing reflex
None	48
Smell and Sound	90
Smell Sound and sight	97
Smell Sound Sight and contact	100

<u>REASONS FOR SOW DISPOSALS</u> (Easicare 93)
To maximise performance it is desirable to have a planned culling program based on performance. Unfortunately, however, only 80% of gilts introduced to a herd have two or more litter (Easicare 93). The breakdown of reasons for culling is given below with only 35% being on performance, the main category being age.

Reproductive		**Physical**		**Performance**	
Barren	14%	Death	12%	Maximum Litters	15%
Repeats	12%	Legs	9%	Poor Litters	12%
Abortion	2%	Hysterectomy	1%	Sold for breeding	8%
Discharge	2%	Farrowing difficulty	1%	Miscellaneous	11%
		Prolapse	1%		

Synchronising gilts to come on heat in batches is often achieved very successfully using a progesterone analogue (Regumate®) which is added to the feed for 18 days and withdrawn. Five days later the gilts will show signs of heat.

SERVICE MANAGEMENT

Weaning to service

Key points

1. House sows within **SIGHT, SMELL, SOUND & TOUCH** of the boar
   - stimulates the sow to come to OESTRUS
   - makes OESTRUS DETECTION easier

2. Check sows **twice a day** for signs of oestrus
   - swelling of vulva
   - reddening of vulva
   - riding other sows
   - increased activity and vocalisation
   - reduced feed intake
   - use of '**back pressure test**' Sow will stand rigid with ears pricked in the presence of a boar when the stockman applies pressure on the back.

OBJECTIVES AT SERVICE

- to get sow pregnant!!
- to maximise number of piglets conceived

KEY POINTS

1. OESTRUS lasts 2-3 days
2. OVULATION occurs – 36 hours after the onset of oestrus (3/4 way through oestrus)
   - BUT range can be 24-60 hours in individual sows
3. SPERM need to be in the tract 6-8 hours before fertilisation to allow for capacitation
4. OVA remain viable until – 12 hours after ovulation

THEREFORE TIMING IS CRUCIAL!!

BUT, we do not know the exact time that the sow will ovulate

THEREFORE we need to maximise the chance of conception within the standing oestrus using multiple matings.

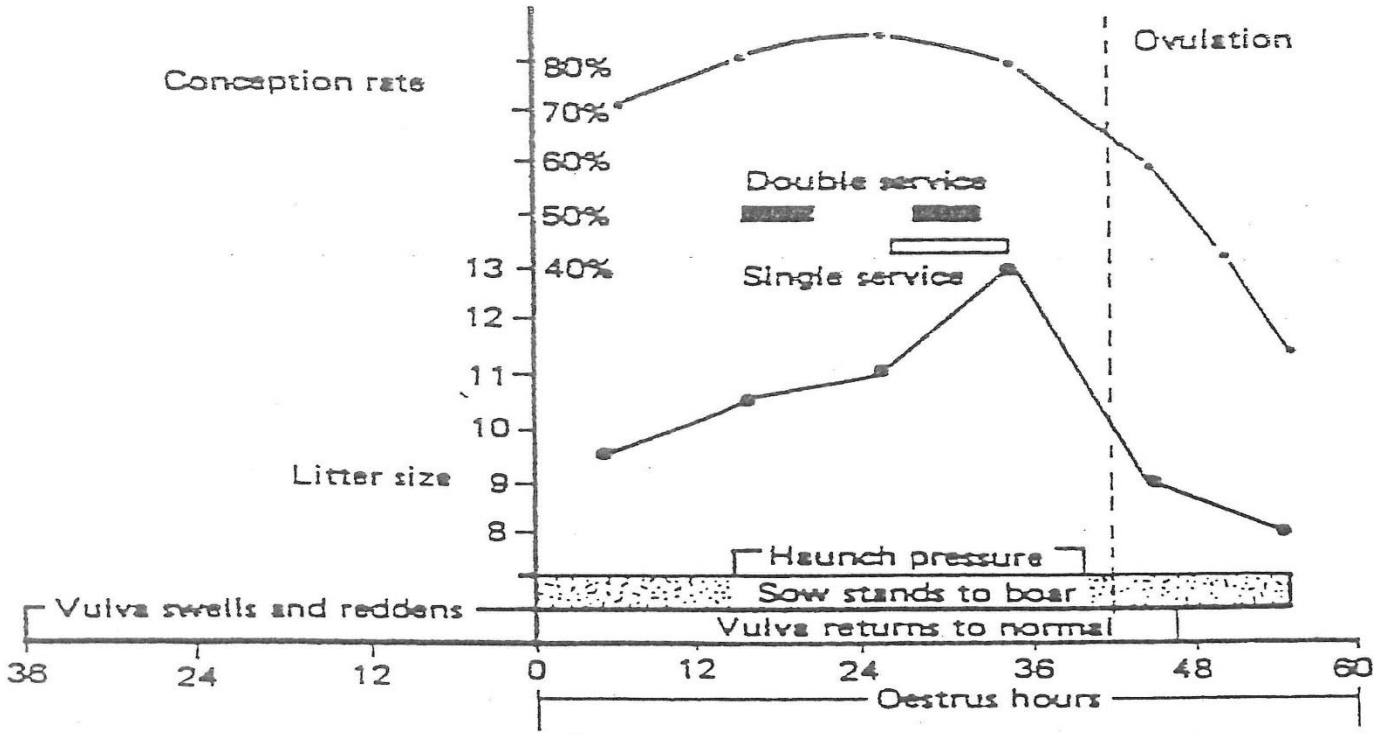
- In general oestrus detection is done once a day and sows are mated once a day at no more than a 24 hour interval This will maximise fertility as shown in the following figure.
- Sows will normally be mated twice, however, if they continue to show standing heat then a third mating may be used.
- Gilts are likely to only stand for 24 hours so some producers may mate gilts twice in the same day. Records should show if gilts are not standing to the boar.

OESTRUS DETECTION ONCE A DAY

Sows	Gilts
- Detect AM	- Detect AM
- Serve AM, AM , (+ Poss. AM)	- Serve AM, PM, AM

- If there is time in the routine to detect twice a day then mating routines can be better tailored to the best insemination timing. Eg Sows are not necessarily served on the first detection.
- AI is by far the preferred method for mating sows 80% + of UK matings. Indoor and Outdoor
- Should be targeting a conception to first service of at least 85%.
- Wean to service intervals do vary between farms depending on daily routine. At HA weaning takes place on Wednesday ≈ 9.00 am. and sows are first mated on Monday ≈ 10.00 am

The "ideal" service routine depends on time and boar power available but if conception rate is a problem multiple matings will improve it. Producers will now generally have a mating area which maximises boar contact, minimises potential injury, is well lit to improve conception and has good stall facilities for artificial insemination.



PREGNANCY DIAGNOSIS

After sows have been served, they should be checked for signs of oestrus 'returns' nineteen to twenty three days later. Following this pregnancy can be confirmed at 28-35 days post mating using ultrasound equipment on farm. Those diagnosed in the doubtful category should be checked one week later. All animals should be checked mid-pregnancy (i.e. from 6 weeks), as some sows may abort or reabsorb their conceptus after a positive pregnancy diagnosis. Although a skilled stockman should be able to visually diagnose pregnancy from day 60.

Ultrasonics

Using external probe from 25 days after service.

An ultrasound beam is directed (Figure 2) and changes frequency on reflection from a moving surface e.g. foetal heartbeat or uterine artery. The frequency change is converted into an audible signal, which can be heard in the head set. The sound heard is a regular 'whooshing' noise. Avoid the period immediately post-feeding as digestive background noises may confuse the reading.

Ultrasonic Pregnancy diagnosis

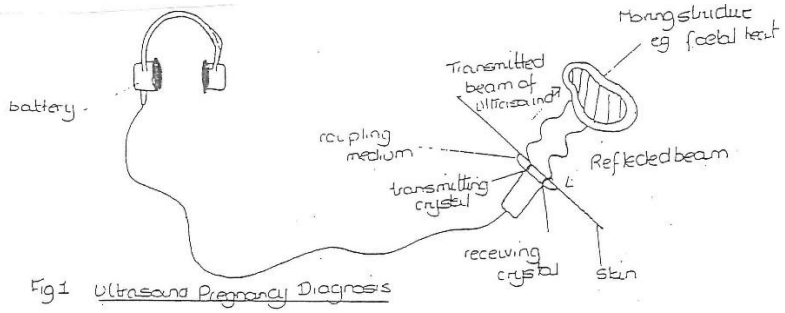


Fig 1 Ultrasound Pregnancy Diagnosis

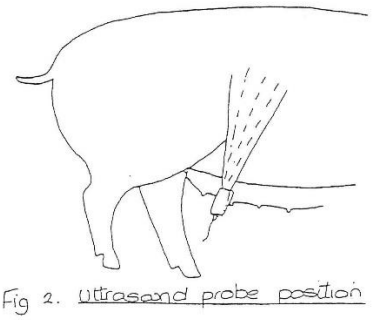


Fig 2. Ultrasound probe position

Natural Mating and Stud Boar Management

The Young Boar

1. Boars should be a minimum of 230 days (7.5 months) at first mating.

2. Sperm number and volume of ejaculate increases from puberty to around 18 months and will remain at this level until the boar is about 5 years old.
   - but boar may need to be culled out before this time due to its size and to be replaced by boars of a higher genetic merit.

3. Use a small sow (NOT a gilt) who is well on heat for the boar's first mating.
   - it is advisable to mate her again with a mature boar to ensure conception.

4. Supervise the service and help if necessary
   - do not allow the boar to be bullied or to damage himself as this may put him off in the future.

5. Make sure the floor of the pen is not slippery and that there are no projections (e.g. nipple drinkers that may hurt either sow or boar)

6. Always treat the boar with respect - use pig boards, quick release gates or escape gaps.

BOAR WORK RATES

Both over-use and under-use of boars can cause infertility

- over-use high % of immature sperm
- under-use high % of old and defective sperm

Age of boar	**Max. number of ejaculations per week**
Under 7.5 months	Do not use
7.5 to 10 months	2
10 to 12 months	4
Over 12 months	4 -6*

* provided that several rest days are given after periods of heavy work

NUMBER OF BOARS REQUIRED

Indoor herds: 1 boar for 20 sows
Outdoor herds: 1 boar for 12 sows (see outdoor production notes)

NB If a boar works three times weekly and sows need to be mated 2-3 times at each oestrus, the number of boars needed will be **equal to the average numbers of sows on heat each week.** This creates a problem with 3 week batch farrowing with large numbers of boars required once every 3 weeks.

Artificial Insemination

- Boar semen is used fresh (not frozen), has a shelf life of 4-6 days and should be stored at 17°C
- Many units now collect from stud boars on the farm this provides an economic option and fresh semen when it is required otherwise it is delivered from breeding company studs within 24 hours of collection. Each dose of semen cost between £5-£9 plus postage plus £1 consumables ie. disposable catheters. Specialist lines will be more expensive.
- Performance is as good as natural mating and can improve efficiency (eg reducing over use)
- Enhances genetic improvement resulting in better performance in the finishing herd
- Commercial boar semen is "Pooled" from more than one boar, from the same genetic lines.
- Currently ≈80% of all matings are done by AI including Outdoor units
- A well lit mating area with nose to nose access to a mature boar should maximize the heat stimulation and ovulation rate in the gilt and sow.
- Post insemination the sow should be allowed to rest before reintroducing to the group pen.

FARROWING HOUSE MANAGEMENT

The sow should be moved into a CLEAN AND DISINFECTED Farrowing House 5-7 days before her due date (i.e. day 108-110 of pregnancy)

- allows for sows that farrow early (range is 111-119 days)
- allows her to settle into new environment

<u>Signs that sow is about to farrow</u>

i) Increased restlessness (12-24 hours before)
   - bar chewing
   - pawing the ground
   - arranging straw (if available)
   - Wild sows seek isolation and build a nest

ii) **Milk present** in udder (– 8 hours before)

iii) Expulsion of **blood stained fluids** from vulva (– 2 hours before)

iv) Sow **lying down** (– 2 hours before)
   - tail twitching
   - vulva soft and flabby

BIRTH OF PIGLETS

<u>Farrowing process takes – 2-6 hours</u> (But can be up to 18hours)

- interval between piglets – 15 minutes gilt, 20- 40 minutes sow
- prolonged farrowing may lead to an increase in stillbirths especially in older sows (6th litter plus)
- assistance should be given if interval is greater than 30 - 40 minutes and signs are that the sow is pushing to no effect. Some sows may have a period of rest half way through thus intervention is very much down to individual sows and the experience of the stockman.
- If the channel is clear then sows can be injected with Oxytocin to speed the process
- Up to 10% of gilts may savage piglets during farrowing. Facilities must be available to temporarily remove piglets. (Once the farrowing process is over the piglets can be returned to the gilt without major issues)

<u>Piglets should go straight to udder to suckle</u>

Very important for piglet to get **COLOSTRUM** within 6 hours of birth even after this short time the piglets gut starts to close up and becomes less able to absorb the immunoglobulins

- provides **antibodies & white blood cells** to protect against infection
- provides energy and protein
- contains laxative type chemicals which kick starts the digestive function and helps remove the Muconium (protective membrane in gut)
- Is available constantly in the first 24 hours. Each piglet should receive 200ml of its mothers own colostrum if at all possible, colostrum from another dam is not as efficient in boosting the immunity.

<u>Teat Order is established in 24 hours</u>

- every pig must have access to a functional teat. An assessment needs to be made early of the rearing capacity of the sow. All gilts should have at least 14 teats, however, over time some may become damaged or disfunctional
- allows maximum intake of milk over the short 'let down' period of 20 seconds every 40 to 50 minutes. Milk is **NOT** available between suckles
- each piglet has its own individual teat if this is not achieved the piglet will never get access to milk and will starve. (Alternative feeding methods can be used eg HAUC Milk line or rescue decks)

<u>Importance of birth weight</u>

- piglets should weigh **1.5kg** at birth
- any pig below 1.0kg has a very poor chance of survival

MANAGEMENT OF PIGLETS

Within first 24 hours

I) Dip or spray navels with iodine
- prevents bacteria entering the blood stream via the umbilical cord which may cause diseases such as joint ill and meningitis.

ii) Clip teeth (?)
- Welfare code - only clip teeth if proved necessary
- can prevent damage to udder reduces sow discomfort
- can prevent damage to piglets while establishing teat order

iii) Dock tails(?)
- Welfare code - only dock tails if proved necessary
- May reduce tail biting when pigs get older
- BUT preferable to improve environment

iv) Help weak piglets
- use of artificial colostrum
- use of artificial rearing systems e.g. Nürtringer unit, rescue decks or milk line.

v) Cross foster

- Even up litter numbers so that all piglets have a functional teat (Preferably with 36 hours of birth)
- It is preferable that piglets receive the colostrum from the birth dam. (Foster after 12 hours of birth)
- Do not over foster as it is another stressor. An established piglet, even if it is small, will compete.

Up to -7 days Usually done within first 3 days

vi) Iron injections
- prevents anaemia not necessary in outdoor systems
- promotes healthy immune system
- can be given orally as a paste

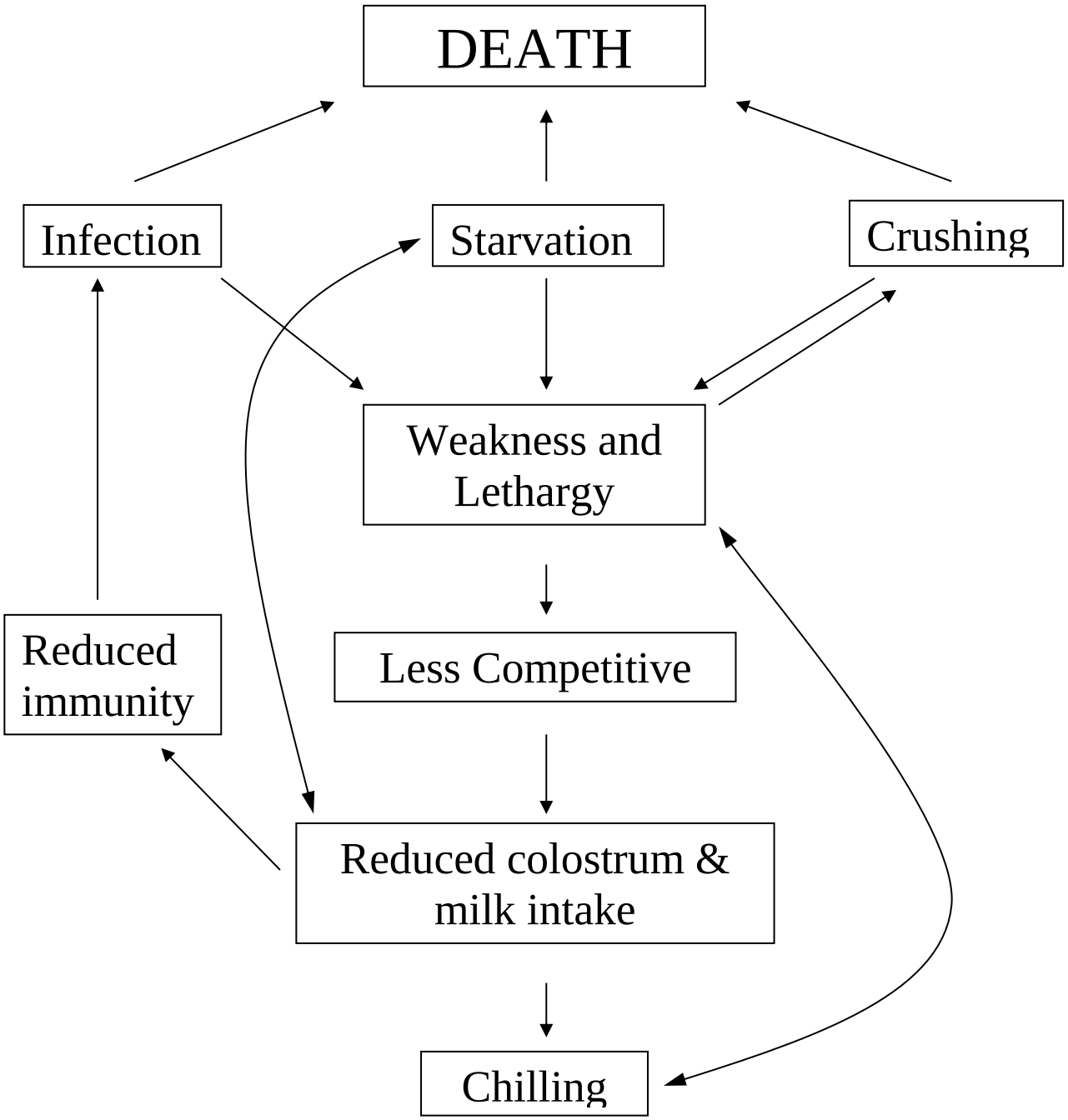
vii) Ear notch or tattoo
- identifies the pig for breeding purposes or growth rate calculation

NB It is not illegal to castrate pigs in the UK however it is deemed as poor practice in the welfare code and is not allowed in any quality assurance schemes. Most contracts have a 108kg top weight, which removes the possibility of over mature boars at slaughter and the risk of boar taint. There is currently a UK shift towards heavier weights however Boar taint may become a problem at above 115 kg. Continental pigs are grown to higher weights 120kg+ and therefore castrated. This is a restriction on the UK pig industry when it comes to competing in the global market eg. Germany will not import UK boar meat. It provides a good argument for sexed semen.

REDUCING PIGLET MORTALITY

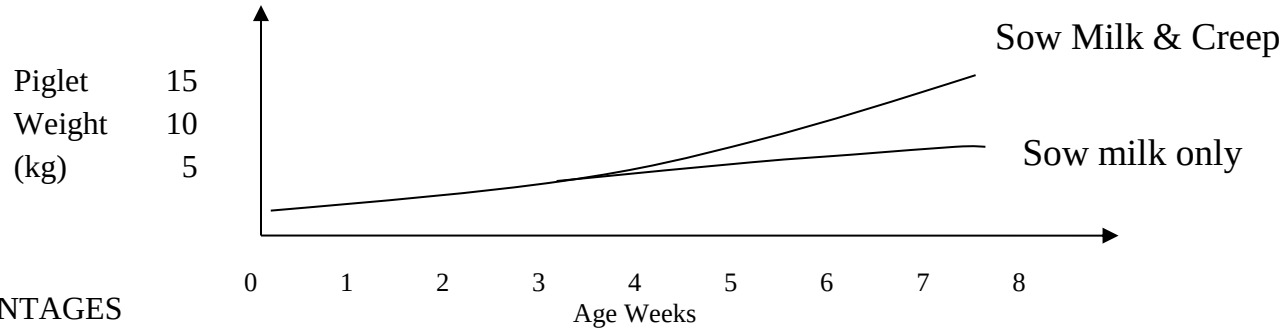
1 Good health and hygiene
2 Efficient breeding stock (free from genetic defects)
3 Gilts with good underlines (at least 14 teats)
4 Good management in pregnancy reduces Stillborn and Mumified pigs
5 Crossbred sows and gilts
6 Good farrowing pen and crate design - adequate micro-environment for piglet (esp. temp)
7 Batch farrowing Encourages better stockmanship and enables fostering
8 Good stockmanship (esp. with gilts – remove temporarily pigs in danger of being savaged)
9 Feed suckling sows for milk production
10 Regular checks on sow health (appetite, temp., piglet appearance)
11 Fostering piglets where necessary (even up litters, lack of milk)
12 Prevent anaemia
13 Cull poor performing and older sows vigorously

Sequence of events leading to piglet death



CREEP FEEDING

1. The benefits of creep feeding in the farrowing house depend on the age at which the piglets are weaned.



ADVANTAGES

i) may increase weaning weights
ii) may reduce post-weaning stress because piglets are bigger and used to solid food
iii) may prepare lining of the gut for solid feed at weaning

DISADVANTAGES

i) if not done correctly and poor intakes are achieved (less than 650g/pig) it can lead to post-weaning diarrhoea
ii) piglet creep is very expensive so should be cost effective
ii) extra time is needed in the daily routine to do it effectively

SUMMARY OF REQUIREMENTS OF THE PIGLET

1) <u>Minimum challenge from infection</u>

- vaccinate sows against E.coli and clostridia infections.
- clean farrowing pens between batches
- dip navels in iodine
- ensure adequate intake of colostrum
- Treat sows for Parasites (Worms and Mange)
- minimise cuts and abrasions - clip teeth with CLEAN teeth clippers
  - no rough floors

2) <u>Safety from overlying</u>

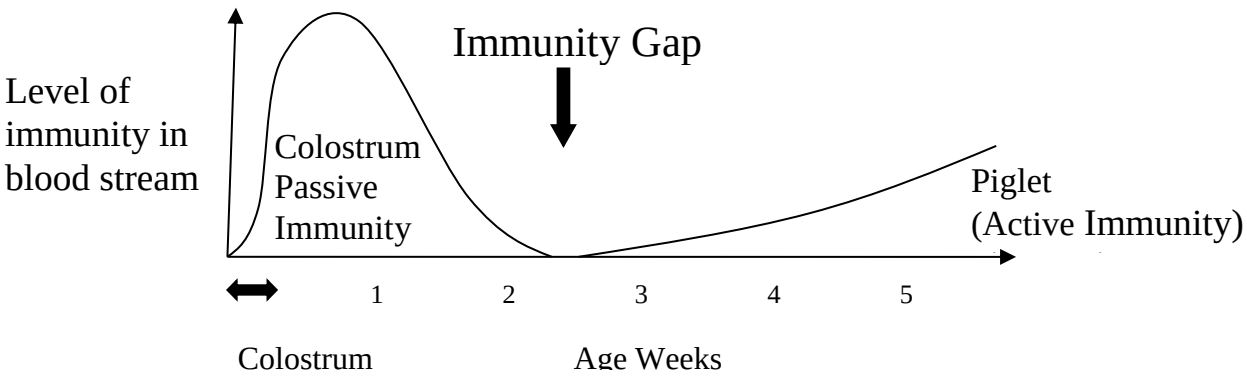
- house sow in farrowing crate / outdoor arc of an appropriate size
- ensure correct environmental conditions for sow and piglet

3) <u>Adequate piglet environment</u>

- provide a warm (28-30°C), dry creep area
- ensure freedom from draughts

4) <u>Adequate and regular nutrition</u>

- maximise milk production in sow by correct scaled feeding regime
- even up litter sizes to number of functional teats available.
- use creep if necessary. Essential for those weaning at more than 4 weeks



MANAGING THE WEANER PIG

Weaning is the most stressful time in a pigs life
- leaving its mother
- moving to a new environment
- eating a new feed
- mixing with other piglets

Undue stressors at weaning can increase susceptibility to disease

OBJECTIVES AT WEANING

- **Maximise weaning weight** - Target; 7kg @ 3 weeks, 9kg @ 4 weeks
- **Minimise mortality** - Target: <1% Weaning to 30kg
- **Reduce weaning stress**
- **Maximise sow productivity** - Litters per year and subsequent litter size
- **Maximise post weaning performance**
  - Encourage feed intake
  - Maintain optimum environment
  - Prevent disease

Properly managed weaning should not result in a post weaning growth check. Natural weaning occurs at 10-16 weeks. Pigs that are weaned off the sow at 6 to 8 weeks compared to 3 week weaned pigs may be up to 3kg heavier at 12 weeks of age. Similarly out door pigs that have had a gradual development of stressors such as the sow going away for relatively long periods will not show a check at weaning (they're street wise!)

Early weaning offers distinct benefits
- Reduced Suckler Mortality
- Increased sow productivity
- Reduced sow housing cost

Alternative Weaning Methods

ISO Wean
- 10-21 days (Welfare?)
- Split site production disease control
- USA Major expansion in this system

Outdoor
-Gradual piglet learning curve
-Social, Environment & Nutrition

Multisuckle
Farrowing crate for 14 days then sows and litters mixed
- Low cost housing
- Less weaning stress
- Potential high mortality
- Requires better management

Split weaning
-Remove large pigs a few days early
-Improves the poorer piglets chances but difficult to manage

Reducing weaning stress
- Litter penning reduces mixing
- Leave piglets in farrowing crate for a few days although can have negative response as pigs remain in unclean environment.
- Keep back nurse sow care need to be taken in hygiene and disease control
- Creep feeding
- Mixing piglets prior to weaning whilst maintaining sows in crates - mid lactation is best

MANAGEMENT OF THE GROWER/FINISHER PIG

AIM - Fast, lean growth to give maximum GROWTH RATE
- Minimise FEED CONVERSATION RATIO (FCR)
- Minimise feed costs which can account for **80%** of total input costs

FCR = amount of feed needed to produce 1 kg growth
e.g. 2.3 kg feed for 1 kg growth FCR = 2.3:1 or more commonly 2.3

FACTORS AFFECTING GROWTH PERFORMANCE

I)	**Nutrition –**	**-** Balanced rations that meet the pigs requirement at all stages
ii)	**Environment**	**-** Outside the thermal neutral zone pigs use food energy to regulate body temperature
iii)	**Genetic potential**	- Selected lines have different growth characteristics
iv)	**Sex of pig**	- Boars > Gilts > Castrates (120,110, 100)
v)	**Health status**	- This is a major factor in growth performance. The presence of chronic sub clinical disease can affect growth rates by 25%
vi)	**Stockmanship**	- Positive human/animal interaction can show a 10% improvement in growth compared to neutral or negative interactions.

TYPICAL PERFORMANCE FIGURES (Weaning 9kg to Slaughter 100kg)

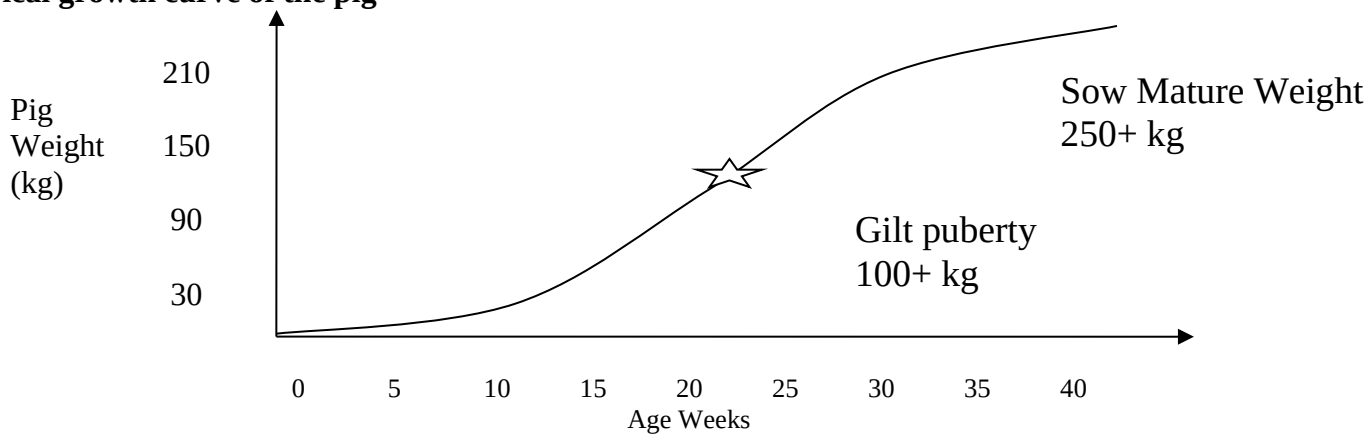
BPEX 2011	Average	Top	
Daily gain from	700g/d	850g/d	(genetic potential 950g/d)
Average FCR	2.3	2.15	(genetic potential <2.0)

TARGET GROWTH RATES AND FCR THROUGH THE FINISHING PERIOD

Age of pig (weeks)	Weight (Kg)	Suggested growth rate (g/day)	FCR
3-6	6-12	250 – 400	1.1:1
6-10	10-35	450 – 650	1.6:1
10-14	30-55	650 – 900	2.0:1
14-18	55-85	750 – 1000	2.5:1
18-22	80-110	900 – 1000+	3.0:1

Modern Genotypes can be adlib fed without going too fat tend to start laying down fat at 100kg
Older Genotypes /Rare breeds tend to lay down more fat from 70kg thus need to restrict feed to 85% of natural appetite.

Typical growth curve of the pig



NUTRITION AND FEEDING MANAGEMENT

Pigs are: MONOGASTRIC - have one stomach

OMNIVOROUS - able to eat plant and animal material
- able to utilise a wide range of foods

Pig diets contain:

- high energy cereals - e.g. barley, wheat, maize

- vegetable proteins - e.g. -soybean meal – hipro and full fat
  - rape seed meal, canola, legumes (peas, beans)

- animal protein - fishmeal (possible restrictions in the future)
  - NB meat and bone meal and swill feed is now BANNED
  - Whey and Skim milk (wet or dried)

- fats - soya oil, fat blends, fish oils

- vitamins and minerals - especially Ca, P

FEEDING THE WEANED PIG

The young pig at weaning has an 'immature' digestive system with limited the ability to absorb nutrients

Weaner feeds must be:

- H**ighly digestible** - use cooked cereals, milk products
  - poorly or undigested feed leads to diarrhoea (scours)
- **High nutrient Density** - due to low intakes
- **Very palatable** - use of sweeteners and flavourings to improve intakes

Post Weaning Dietary Regimes

Most producers will use one or two specialist creep diets, a link diet, a grower diet and a finishing diet. These diets are formulated to progressively provide a diet which matches the appetite and the nutrient requirements of the pig bearing in mind the production system and how pigs progress from one building to the next. The following table gives example specifications of a range of diets and their applications

Example Diet Specifications

Diet	Creep	Link	Grower 1	Grower 2	Finisher
Pig Performance					
Weight Range (kg)	<10	10-20	15 - 40	25 - 60	60 - 100
Daily food intake (g)	330	690	1400	1710	2860
Growth rate g/day	300	460	800	900	1100
FCR	1.1	1.5	1.75	1.9	2.6
Nutrient Specification					
DE (MJ/kg)	15	14.75	14.5	14.0	13.0
Lysine (g/kg)		13.5	14.0	12.75	10.0
Crude Protein (%)		21*	22	20	18
Fat (%)					
Sodium (g/kg)		0.18	0.175	0.175	0.175
Calcium (g/kg)		0.9	0.75	0.75	0.75
Available Phosphorus (g/kg)		0.48	0.42	0.42	0.32

FEEDING THE GILT

Gilts require nutrients for: GROWTH
REPRODUCTION

TARGET

- Usually selected at 90 kg at 140 days from finishing herd
- Achieve weight of 130 kg at 220 days
- Feed 2.5 - 3.0 kg of dry sow ration (13 mj DE/kg, 14% protein, 0.6% Lysine)
- Growth rate of 500-600 g/day
- Condition Score 3 P2 fat depth >18mm

KEY POINTS IN FEEDING THE DRY SOW

STAGE	AMOUNT	OBJECTIVE
weaning to remating (W-R)	4 kg/day	- reduce W-R interval - increase no. of pigs born - obtain a long, strong heat period
service to 21 days	2.3 kg/day (2.0 kg for gilts)	- minimise embryo losses
21 - 85 days	2.3 to 2.5 kg/day	- maintain condition - do NOT get fat
85 - 112 days	2.3 to 2.5 kg/day or 3.0 - 3.5 kg/day	- if litter weights OK - if litter weights poor
112 - 115 days	2.0 kg/day	- minimise risk of mastitis

Diet specification: 13.0% protein, 13.5 MJDE, 0.55% Lysine

FEEDING THE LACTATING SOW

AIM To match milk production to the piglets requirements.

The **Stotfold feeding scale** involves feeding a high protein food (18%) gradually increasing over first 14 days (from 2.5kg to 9kg) and then feeding to appetite to the end of lactation.

Encourage feed intake by:
- frequent feeding (2 or 3 times a day)
- keeping food fresh (remove all stale feed at feeding time)
- ensuring plentiful water supply (1.5 - 2 litres per min nipple drinker)
- keeping temperature down (16-18EC) - feed at cooler times in the day?

METHODS OF FEEDING

The majority of finishing pigs are fed *ad-libitum* right through to bacon weight. If however a producer has grading problems then an immediate solution is to feed on a restriction regime (This does require an alternative feeding method as all pigs need to eat at the same time). Feeding sows *ad-libitum* is usually not economical or productive. However high fibre diets utilising sugarbeet pulp have been developed experimentally and successfully used, although the diets do cost more than standard cereal based diets.

	Ad Libitum	Restrict Feeding
Advantages	Simple management Low capital cost Reduced trough space Fast growth	Control of fatness Better FCR Floor feeding possible
Disadvantages	Carcass grading Wet feeding complex Hygiene	Slower growth Feed space / pig Variation in gain

PELLETS

i) **more expensive** than meal
ii) **less dust** in the environment therefore improved health
iii) **less feed is wasted** therefore FCR is better
iv) suitable for floor feeding
v) **flows well in hoppers**, feed bins and automatic metering systems
vi) heat treatment may **improve digestibility**
vii) may cause problems with colitis

MEAL

i) **cheaper**, especially for the home mixer
- pelleting can be expensive, especially creep pellets
ii) tends to create a **dusty environment** which may lead to respiratory problems
iii) **Higher wastage** compared to pellets (6% cf 2%)
iv) Unsuitable for floor feeding
v) May "**bridge" in hoppers** and feed bins

BENEFITS OF LIQUID FEEDING

Liquid feeding is an effective way of utilising by-products of the food industry

e.g. **Dairy Products** - whey, skimmed milk, yoghurt washings
Other products - biscuit waste, crisp and potato waste, apple pulp

1) **Reduction of food loss** as dust in handling and feeding
2) **Improvement of the pigs environment and health** due to reduction of dust in the atmosphere
3) **Improved pig performance** and feed conversion efficiency (FCR)
4) **Flexibility in raw material use;** liquid feeding creates an opportunity to use a much wider rate of food sources and so reduce the cost per kg gain
5) **Improved materials handling;** the equipment can act both as a feed mixing and distribution system and can be highly automated.
6) **Increased accuracy and frequency of feeding:** computer control enables a degree of management that is difficult to achieve with dry feeding systems.
7) **Improved dry matter intake of problem classes of pig** - for example weaners and lactating sows.

Additional water supply should be available <u>at all times.</u>

PRESENTATION OF FEED

FLOOR

ADVANTAGES

I) cheap!! - no need to buy hoppers or troughs
ii) economical utilisation of floor space – don't need to allow space for feeders therefore can get more pigs in a pen
iii) encourages "natural" feeding behaviour i.e. foraging on the ground

DISADVANTAGES

I) wasteful - feed should be cleared up within 20 minutes of delivery
ii) therefore need frequent feeding to maximise intake
iii) gives variable pig size - timid pigs tend to be pushed out

HOPPERS
TROUGHS

Class of pig	Trough width (mm)	Trough Depth (mm)	Length/pig (mm)
Adult	300	150	400
Lactating sow	450	200	450
Pigs up to 10 kg	100	100	75
10-25 kg	150	125	50
25-50 kg	225	150	200
50-75 kg	225	150	250
Over 75 kg	300	150	300

WATER

- the forgotten nutrient!
- involved in virtually all metabolic functions
- comprises 70% of adult body mass

Required for

i) tissue maintenance and growth
ii) reproduction and lactation
iii) adjustment of body temperature
iv) maintenance of mineral homeostasis
v) excretion of the end products of digestion (esp. urea)
vi) achievement of satiety (gut fill)
vii) satisfaction of behavioural drives

Pigs= weight range	**daily requirement (litres/pig)**	**type of drinker**	**flow rate (l/min)**
up to 15 kg	1.2	nipple or bowl	0.7
15 - 30 kg	2.25	bite	1.0
30 - 65 kg	5.0	bite	1.5
over 65 kg	6.0	bite	1.8