Feeder and Drinker Design and Management

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Outline

- Eating behaviour
- Feeder design
- Feeder carrying capacity
- Feed wastage
- Drinker management
- Feeding management

Eating:
defining a meal

- A meal is a period when the pig is focused on eating.
- The pig may enter and exit a feeder several times during a meal, but is never absent for long.
- In general, if a pig is out of the feeder for more than 10 minutes, or lies down between entrances, we consider the meal ended.

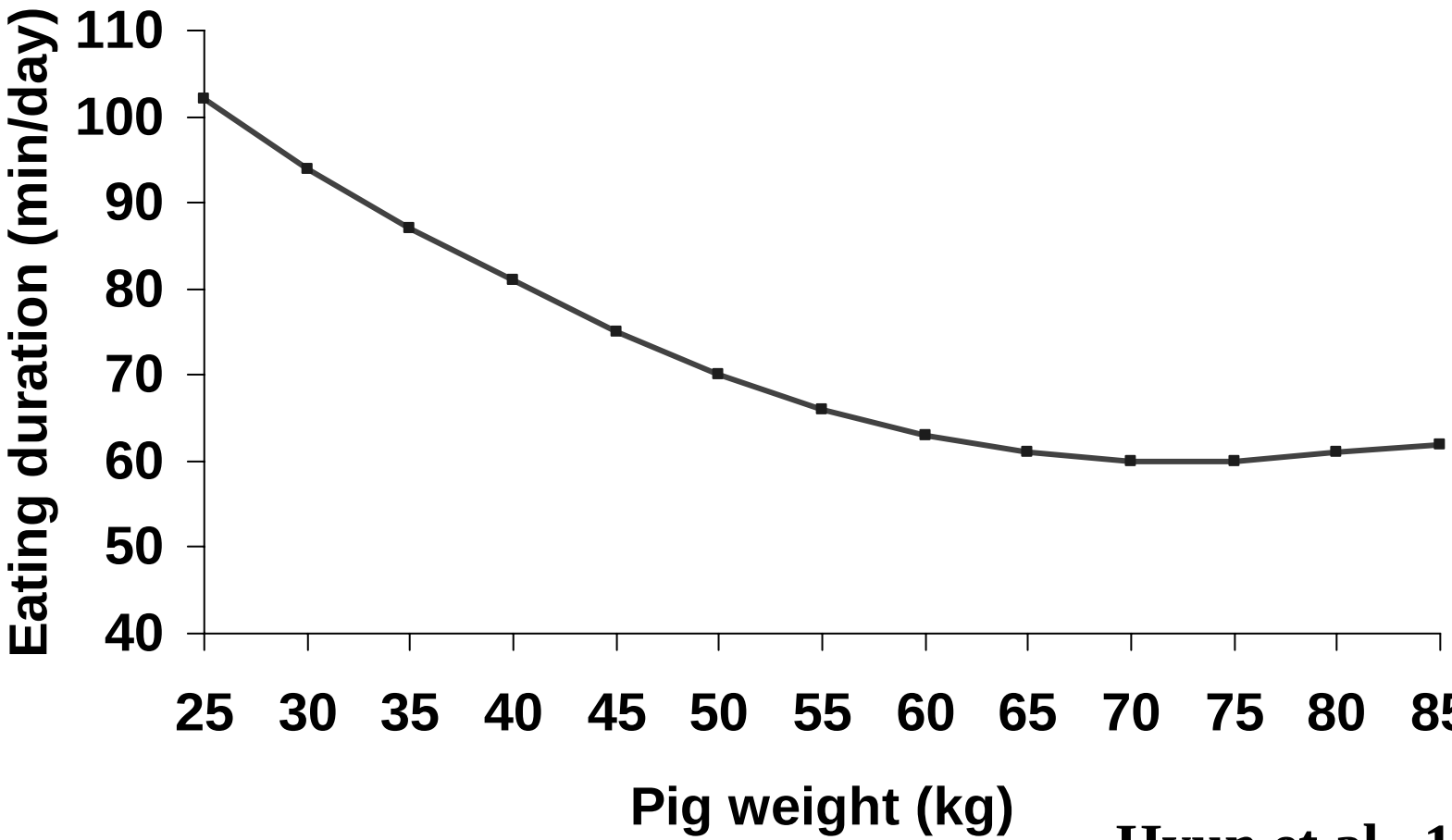
Eating:
meals per day

- Between 10 and 20 meals/day
- Decreases with age of pig
  - 15/day at weaning, 10/day at market
- Decreases with # of pigs/feeding space
  - 20/day for 1 pig, 10/day for groups of 20
- Increases with length of light period
  - 10/day with 8 hr of light, 16/day with continuous

Eating:
total duration

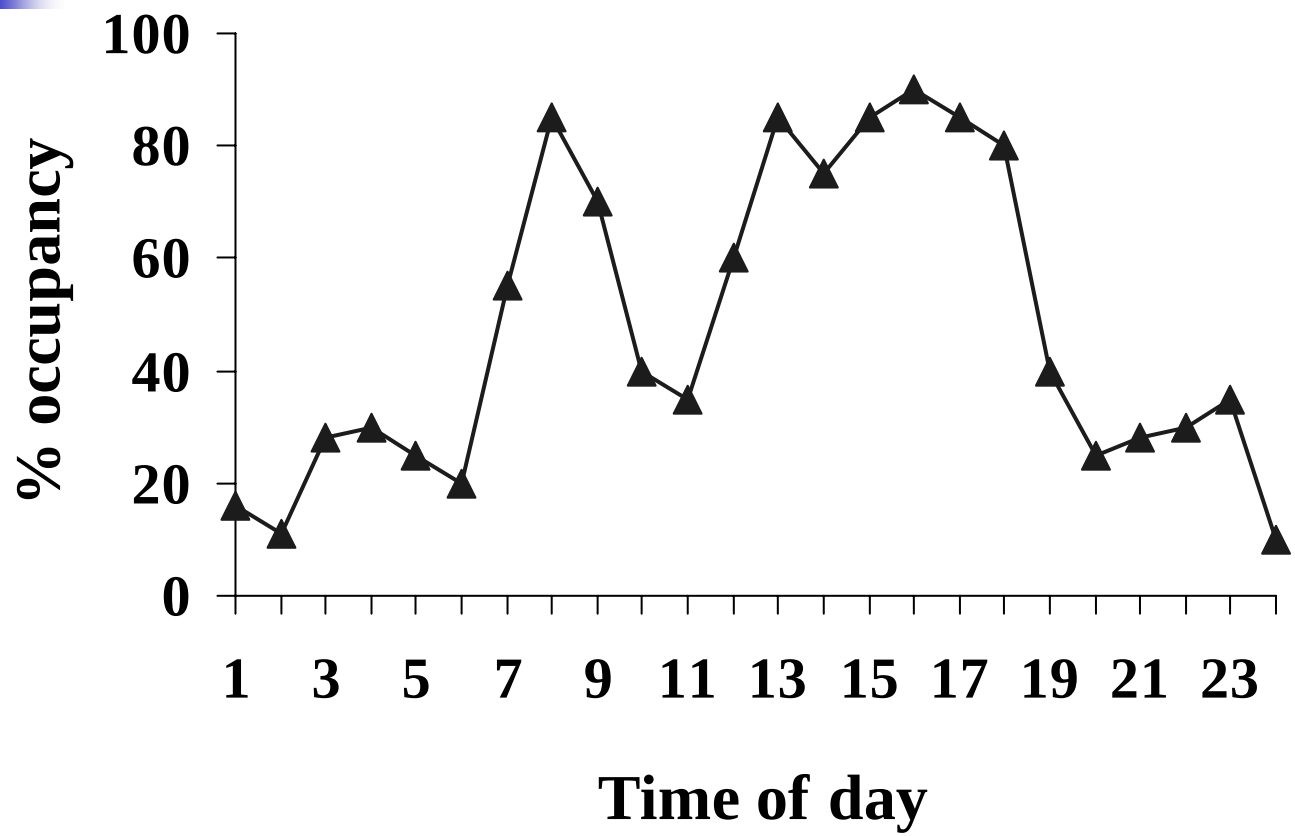
- Amount of time spent eating per day
- Min/pig/day or min/day
- ADFI = TD x Eating speed

Eating:
pig size and duration of eating



Hyun et al., 1997

Eating:
time of day



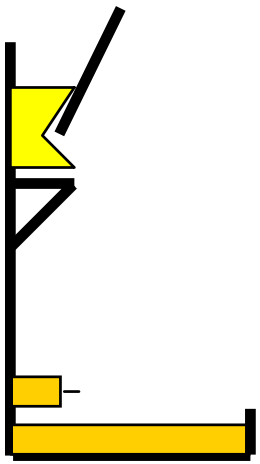
Walker, 1991

Feeder Design:
types

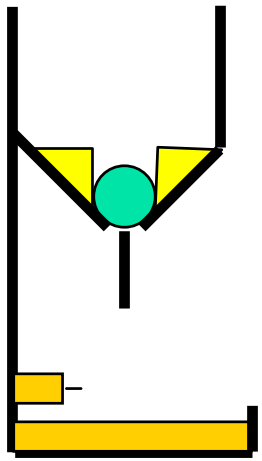
- Dry
- Wet/Dry
- Wet or liquid

Feeder Design:

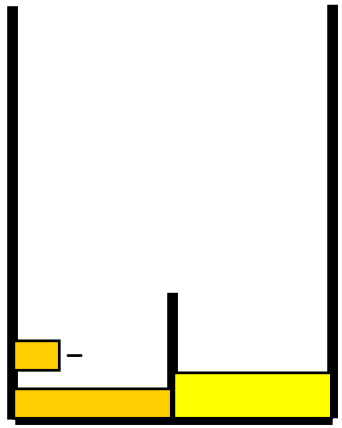
wet/dry, separating feed and water source



Vertical



Mechanical



Horizontal

Feeder Design:
dry vs wet/dry, mash feed

Item	Dry Feeders	Wet/Dry Feeders
Total duration of eating (min/day)	104	86
Frequency of entrances (#/day)	60	37
ADFI (kg)	2.66	2.82
ADG (gm)	873	917

Gonyou and Lou, 2000

Feeder Design:
wet/dry feeders with mash diets

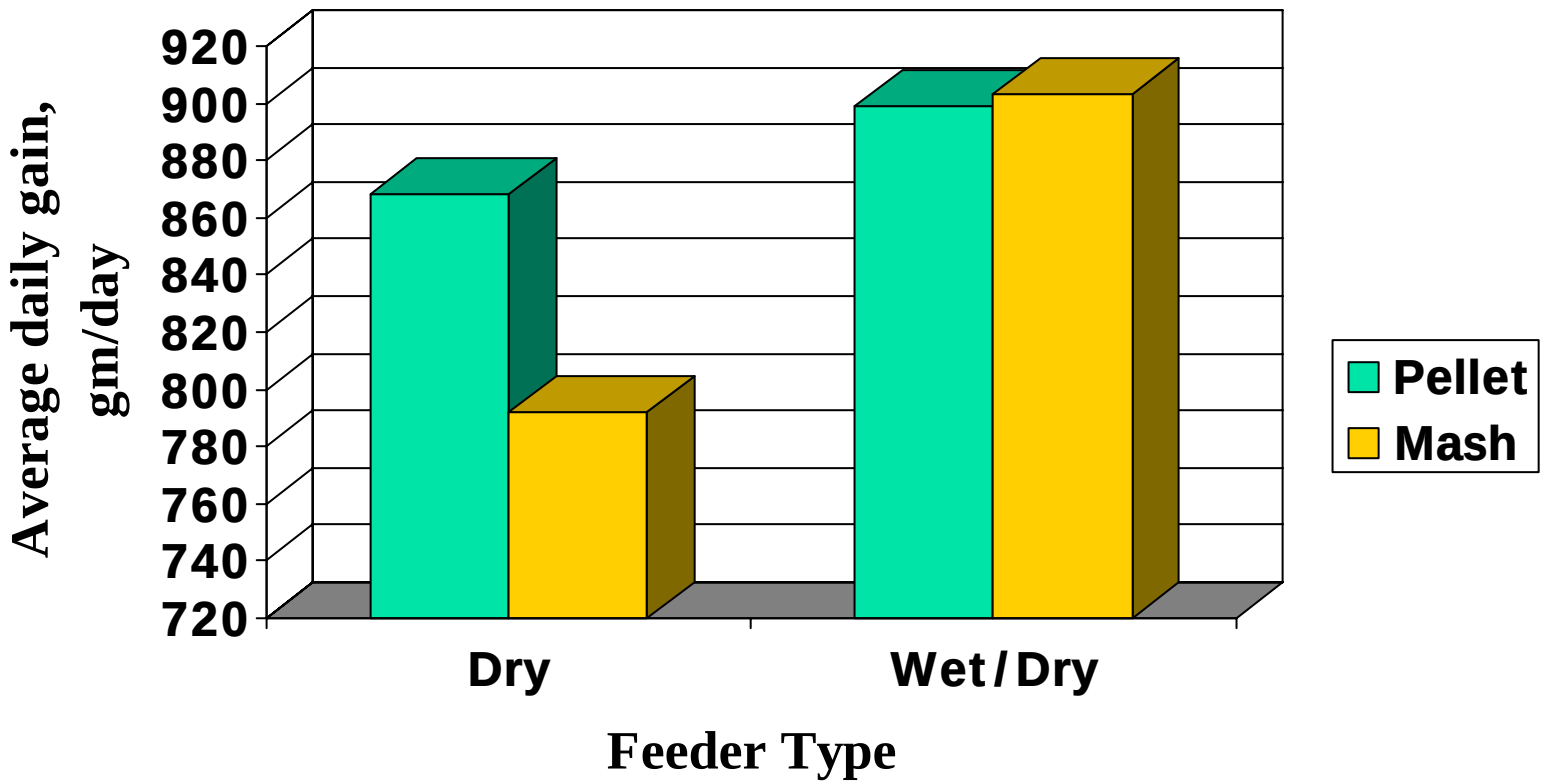
Advantages

- Increased intake (5%)
- Increased gain (5%)
- Reduced water use (40%)
- More pigs per feeder (20%)

Disadvantages

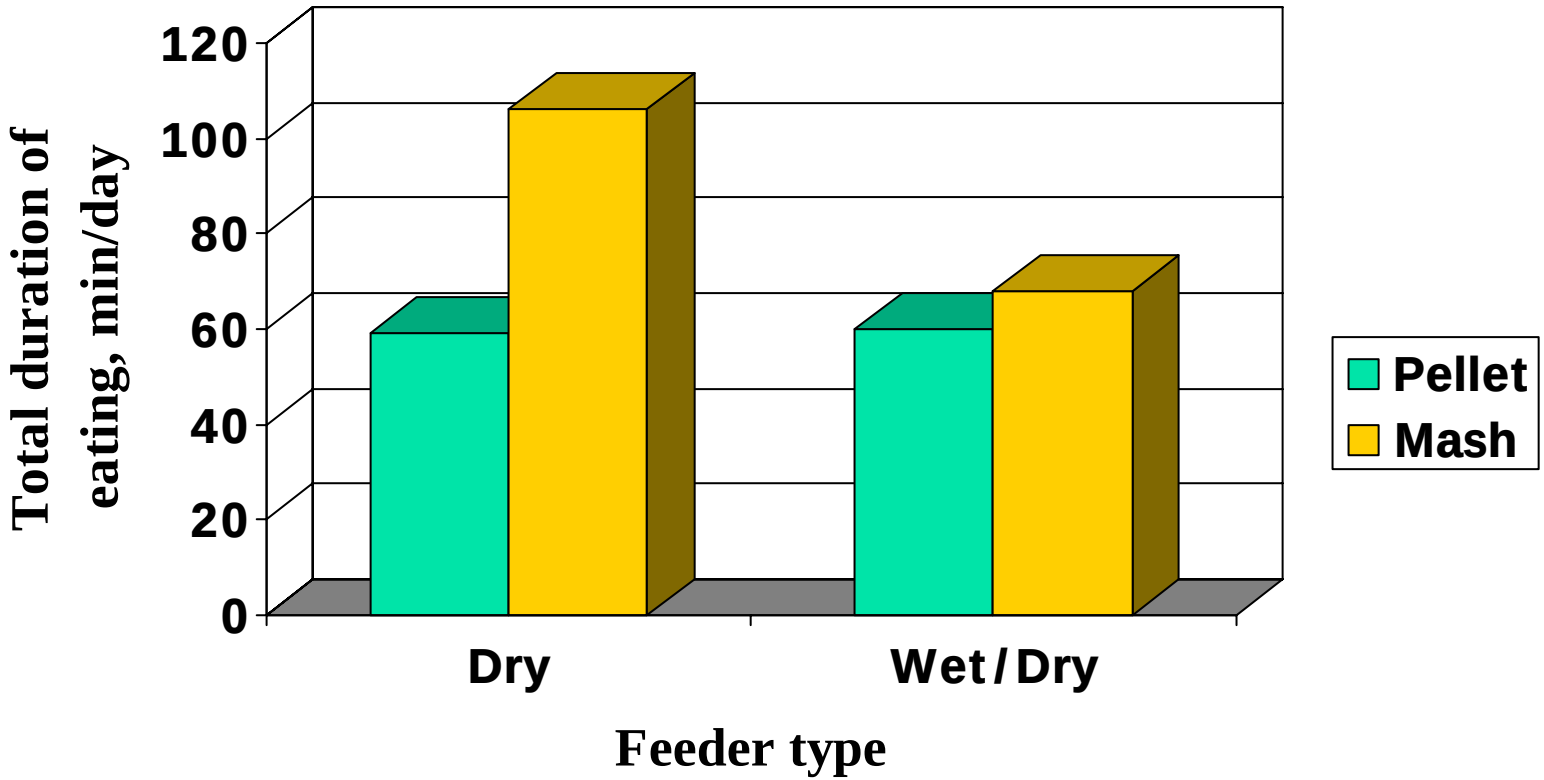
- Carcass
- Cleanliness
- Plugged feeders
- Overflow

Feeder Design:
feed, feeder type and ADG



MacDonald, unpublished

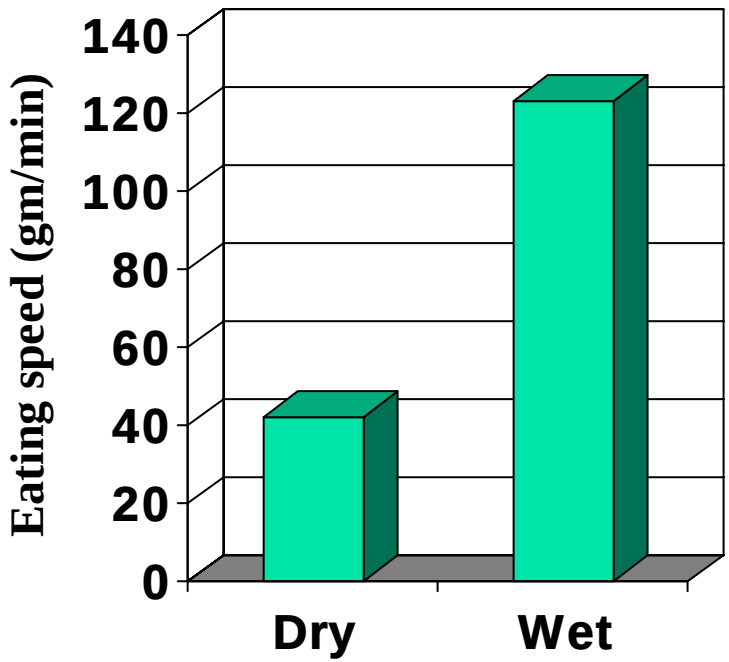
Feeder Design:
feed, feeder type and duration



MacDonald, unpublished

Feeder Design:
water and eating speed

- In a specific test situation, adding water to the feed increased eating speed by a factor of 3
- Pigs on wet/dry feeders ate 20% faster than those on dry with meal feed



Gonyou and Lou, 1998

Carrying Capacity

- Number of pigs per feeder
  - Maintain maximum productivity
  - Does not increase behaviour problems
- Based on
  - Number of feeding spaces
  - Total duration of eating

Carrying Capacity: width of an eating space

Rationale

- Shoulder width based on body weight
- Additional 10% to accommodate wide pigs
- 6.7(cm) x BW $^{.333}$(kg)
- Must accommodate largest pig to use feeder

Recommendations

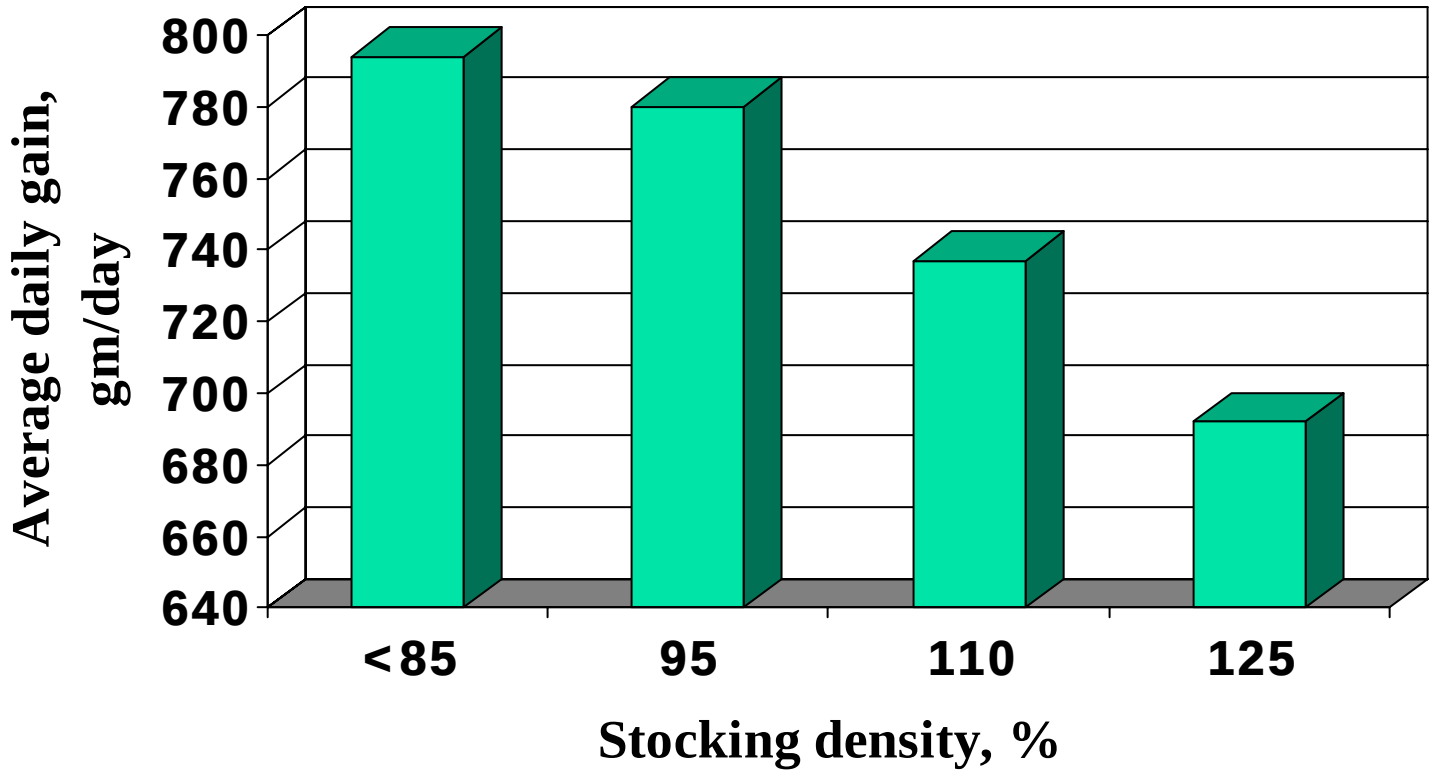
Weight	Width	
kg	**cm**	**in**
55	25.5	10.2
70	27.7	11.1
100	31.1	12.4
110	32.2	12.9
120	33.1	13.2

Carrying Capacity:
how many pigs per feeding space?

Feeder	Eating time (min/day)	Estimated stocking rate
Dry - mash	106	13
Dry - pellet	59	24
Wet/Dry - mash	68	21
Wet/Dry - pellet	60	24

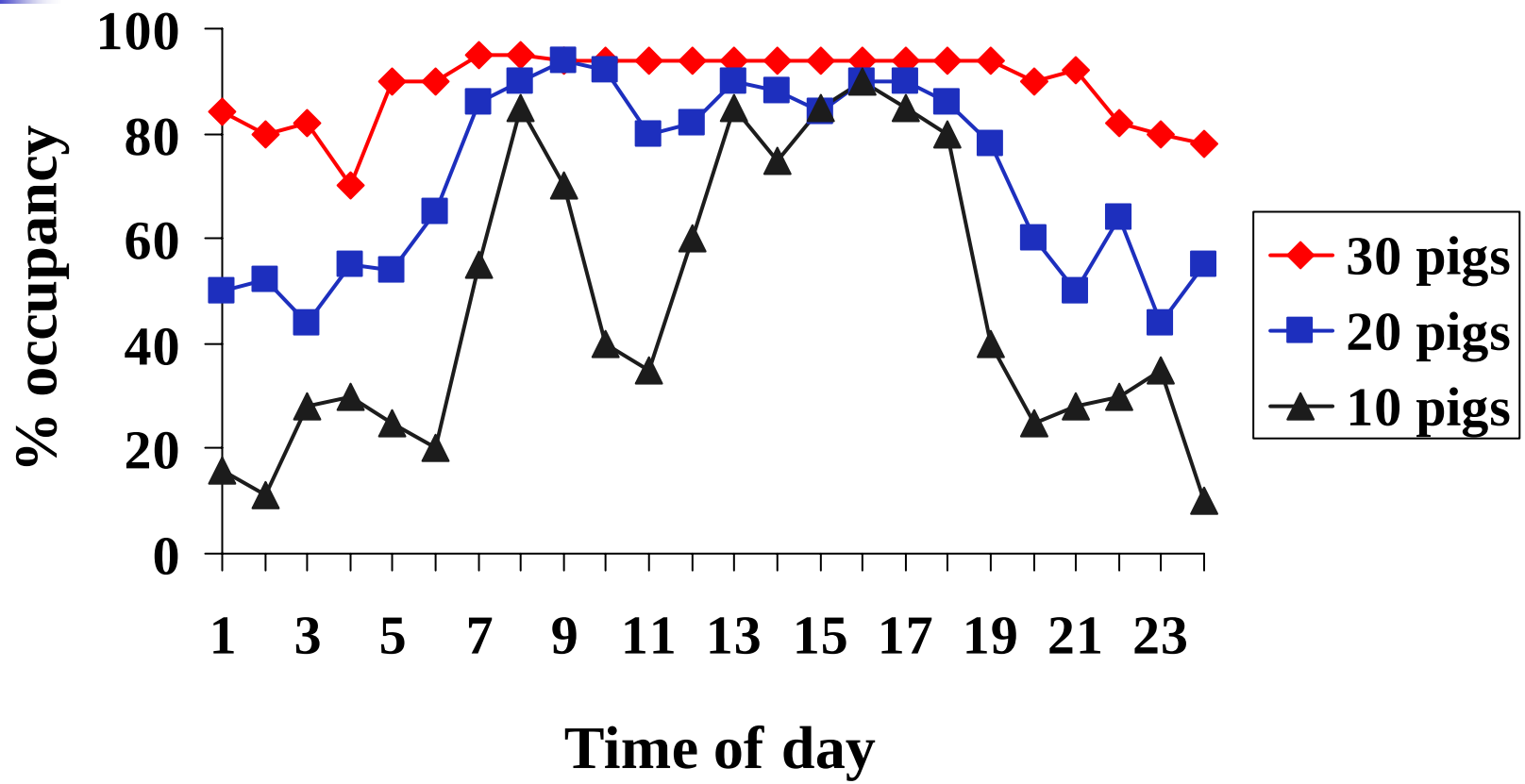
MacDonald, unpublished

Carrying Capacity:
feeder stocking density and performance



MacDonald, unpublished

Carrying Capacity:
diurnal pattern of eating



Walker, 1991

Carrying Capacity

- Determine the number of feeding spaces
- Determine total duration of eating with standard stocking (eg. 12 pigs/space)
- Estimate the number of pigs that would keep feeder busy the entire day
- Reduce by 1-2 pigs for safety factor
- Stocking capacity for grower and finisher phases will differ
- Check your pigs at midnight

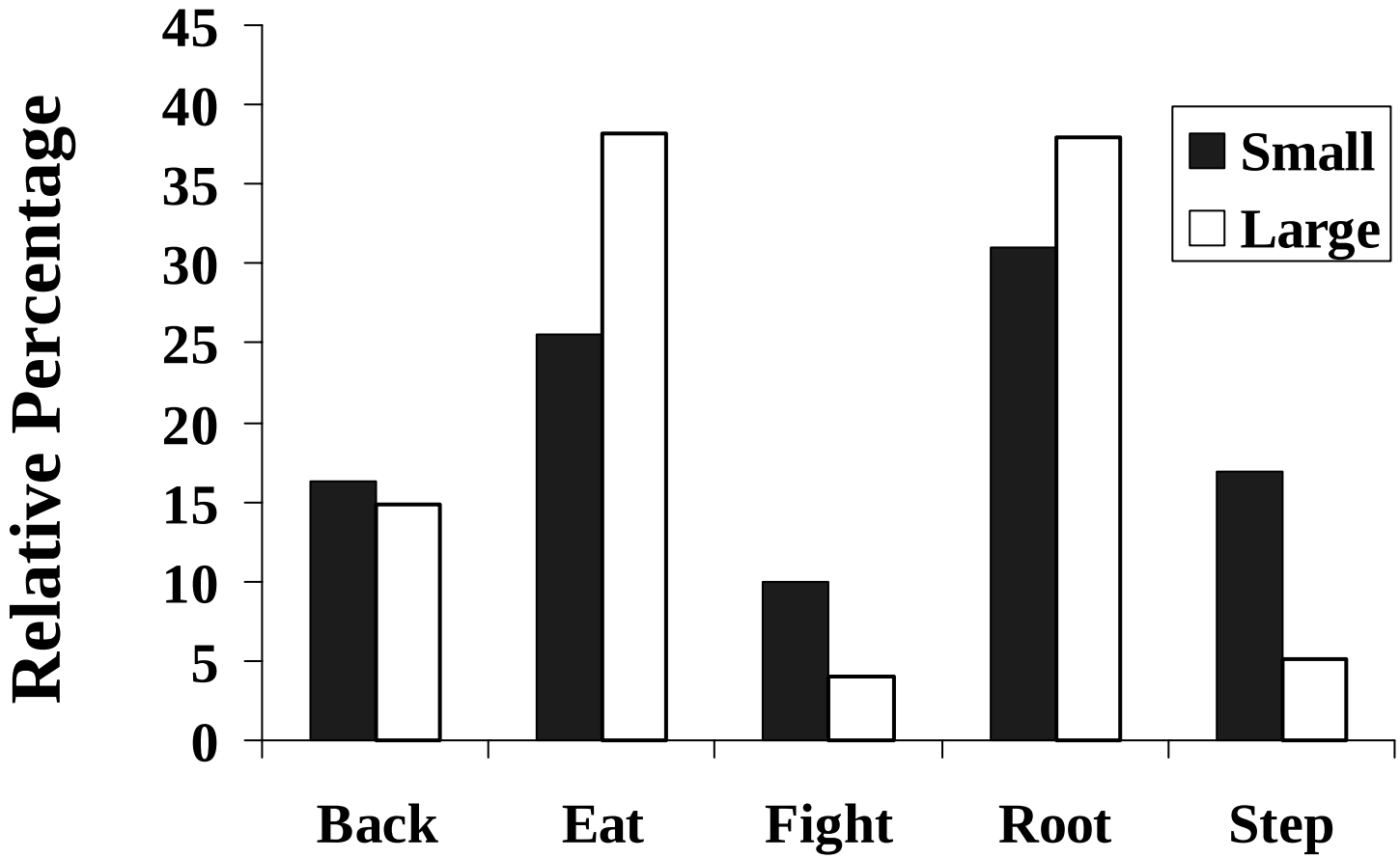
Feed Wastage

- Earlier designs minimized wastage by restricting access to feed
  - Close the gap
  - Slow eating speed, reduce carrying capacity
- Current approach is to minimize wastage by improving trough design
  - Facilitate eating

Feed Wastage:
results from commercial feeders

- Spillage ranged from 2.0 to 5.8%
- 40-kg pigs averaged 4.4%
- 80-kg pigs averaged 2.4%

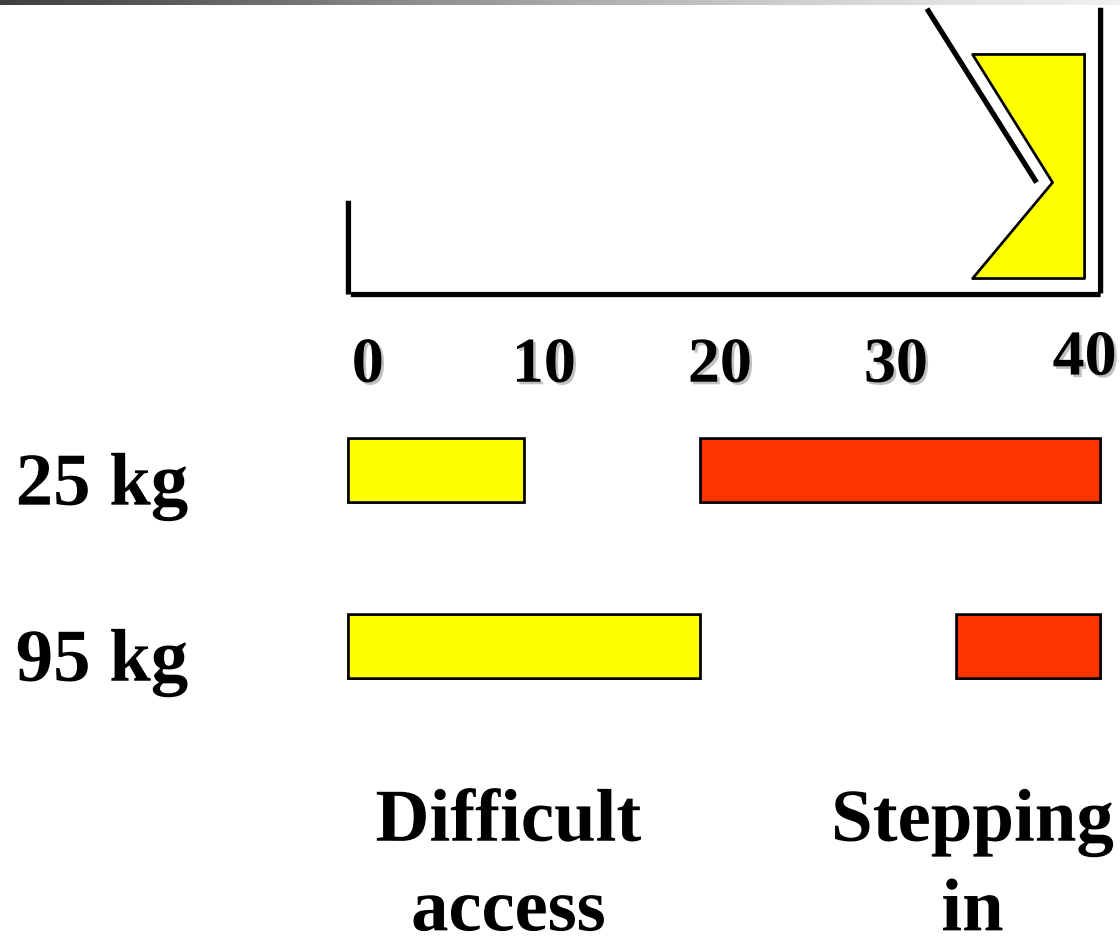
Feed Wastage:
behaviors associated with wastage



Feed Wastage:
feeding space width and fighting

Market weight	Feeding space width	Maximum weight of two pigs eating
105	31.6 cm (rec.)	17 kg
	39.5 cm (+25%)	34 kg
120	33.0 cm (rec.)	20 kg
	41.3 cm (+25%)	39 kg

Feed Wastage:
feeder depth and pig size



Feed Wastage:
recommended dimensions for feeders

	Depth	Width
Finisher only (60-110 kg)	30-35 cm	35-40 cm
Grow/Finish (25-110 kg)	25-30 cm	32 cm
Wean to finish (8-110 kg)	25-30 cm	32 cm

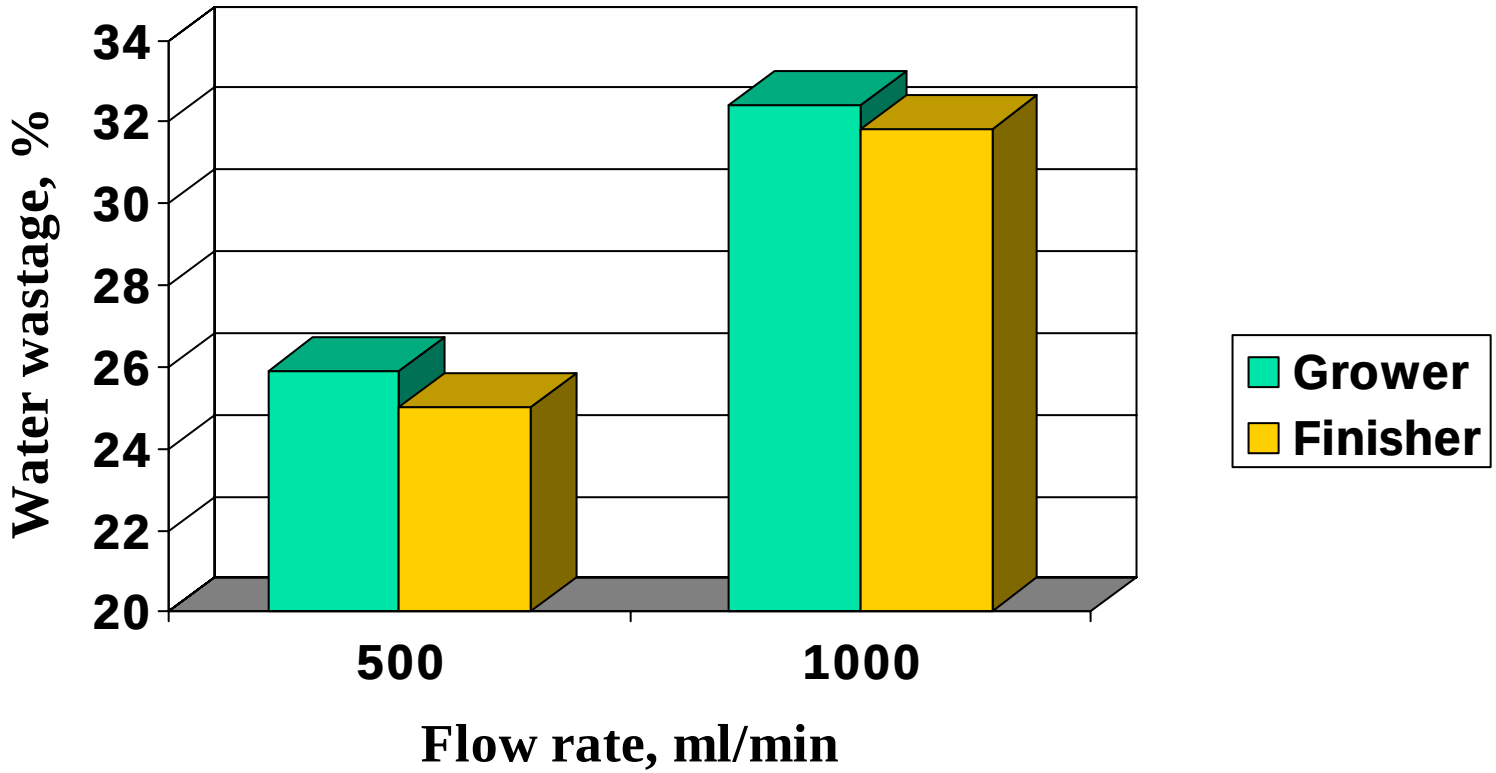
Drinking: behavior

- Approximately 80% of drinking events are associated with a meal
- Wastage from nipple drinkers occurs when mouth does not ‘cover’ the nipple
- Miscellaneous wastage also occurs when pigs brush the nipple while walking by

Drinking:
drinker types

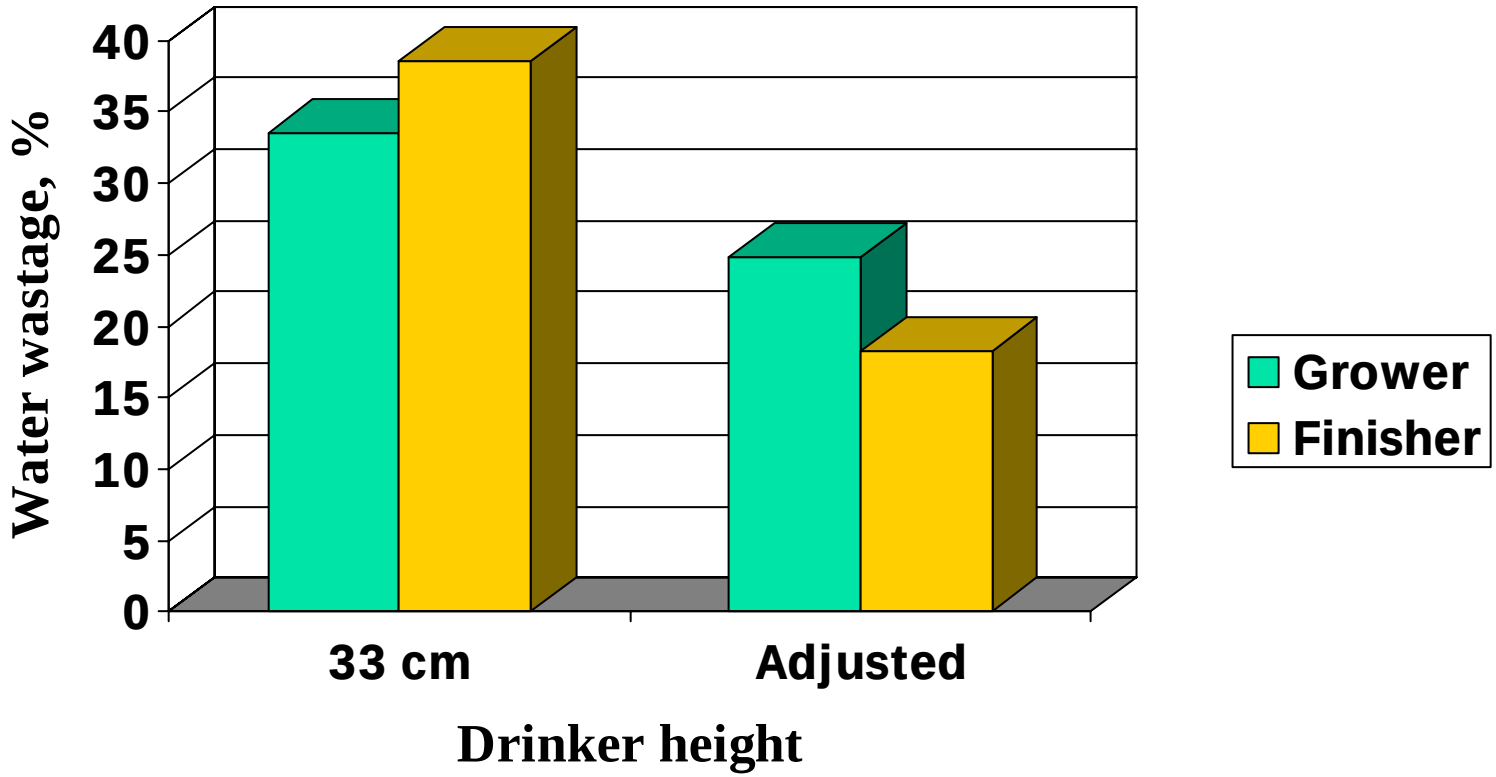
	Wastage
Nipple	25-40%
‘Swing’ nipples	20%
Bowl	
‘Recessed’ bowl	minimal
Wet/Dry feeders	minimal
Trough	
‘Straw’ drinkers	minimal

Drinking:
flow rate and wastage from nipples



Li, unpublished

Drinking:
drinker height and wastage from nipples

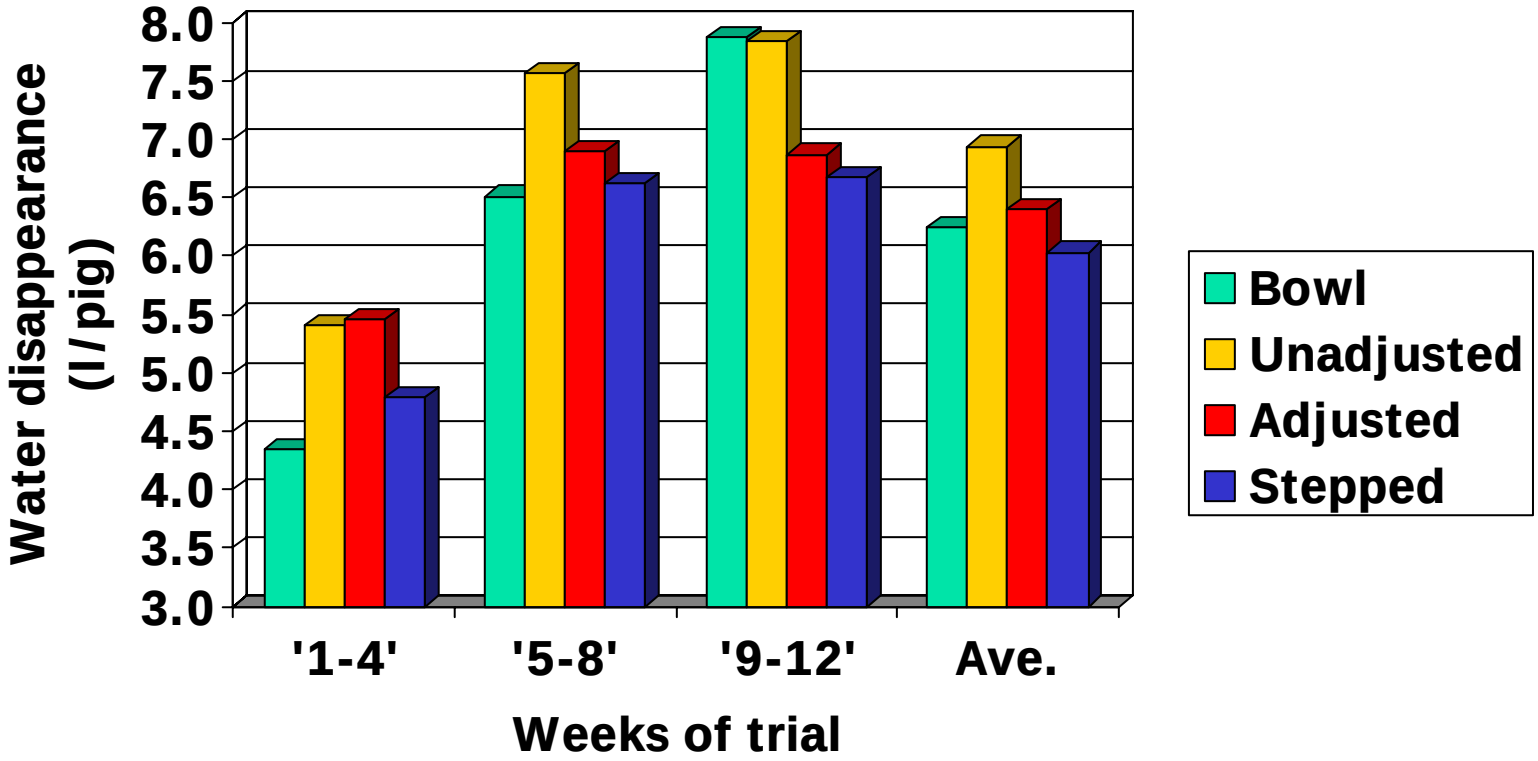


Li, unpublished

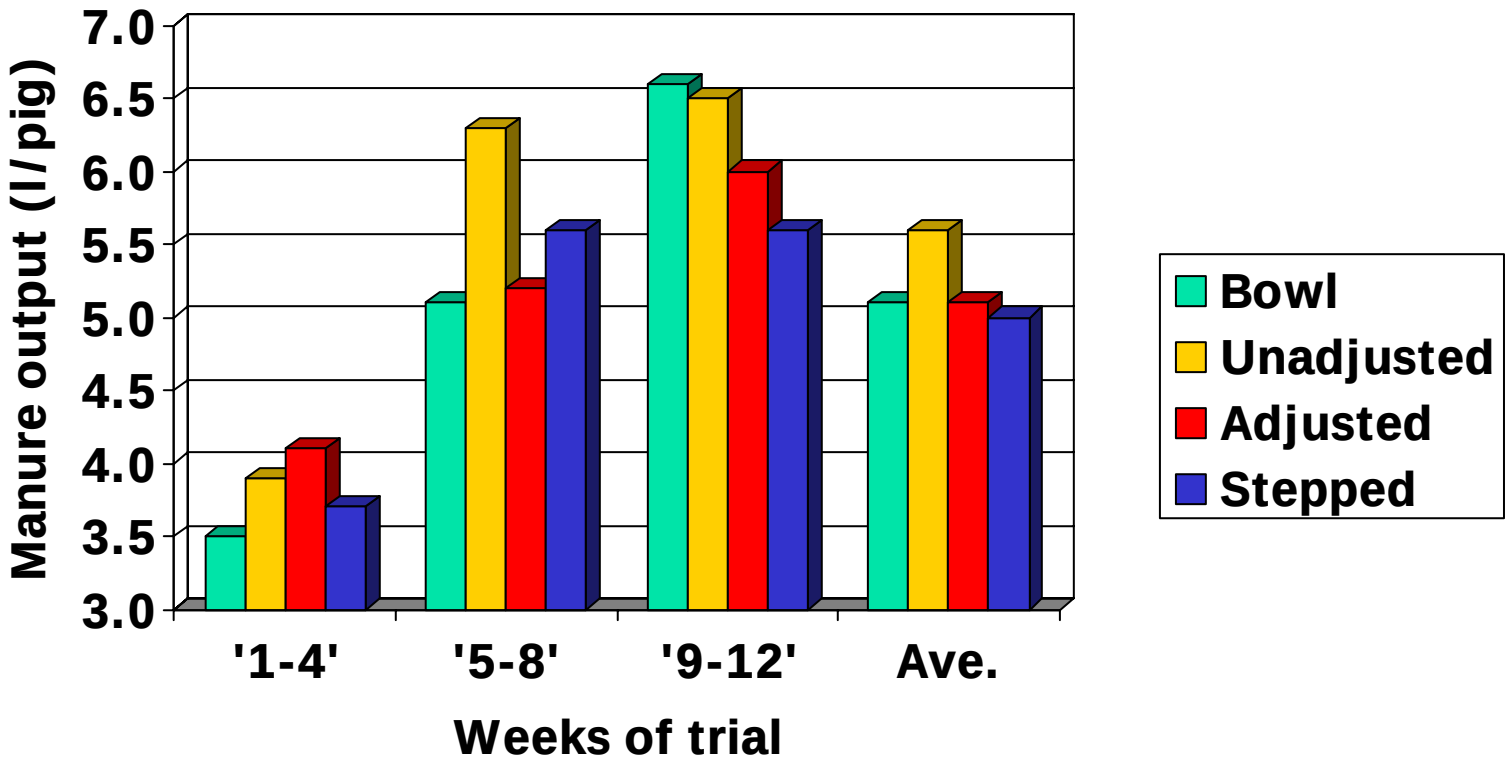
Drinking:
drinker comparison study

- Bowl
  - Drik-o-mat
- Unadjusted
  - Set at entry, 25 kg pigs, 48 cm
- Adjusted
  - Adjusted bi-weekly to 5 cm above shoulder
- Stepped
  - Set at 73 cm, with 25 cm step

Drinking:
water disappearance at 3 stages



Drinking:
manure output at 3 stages



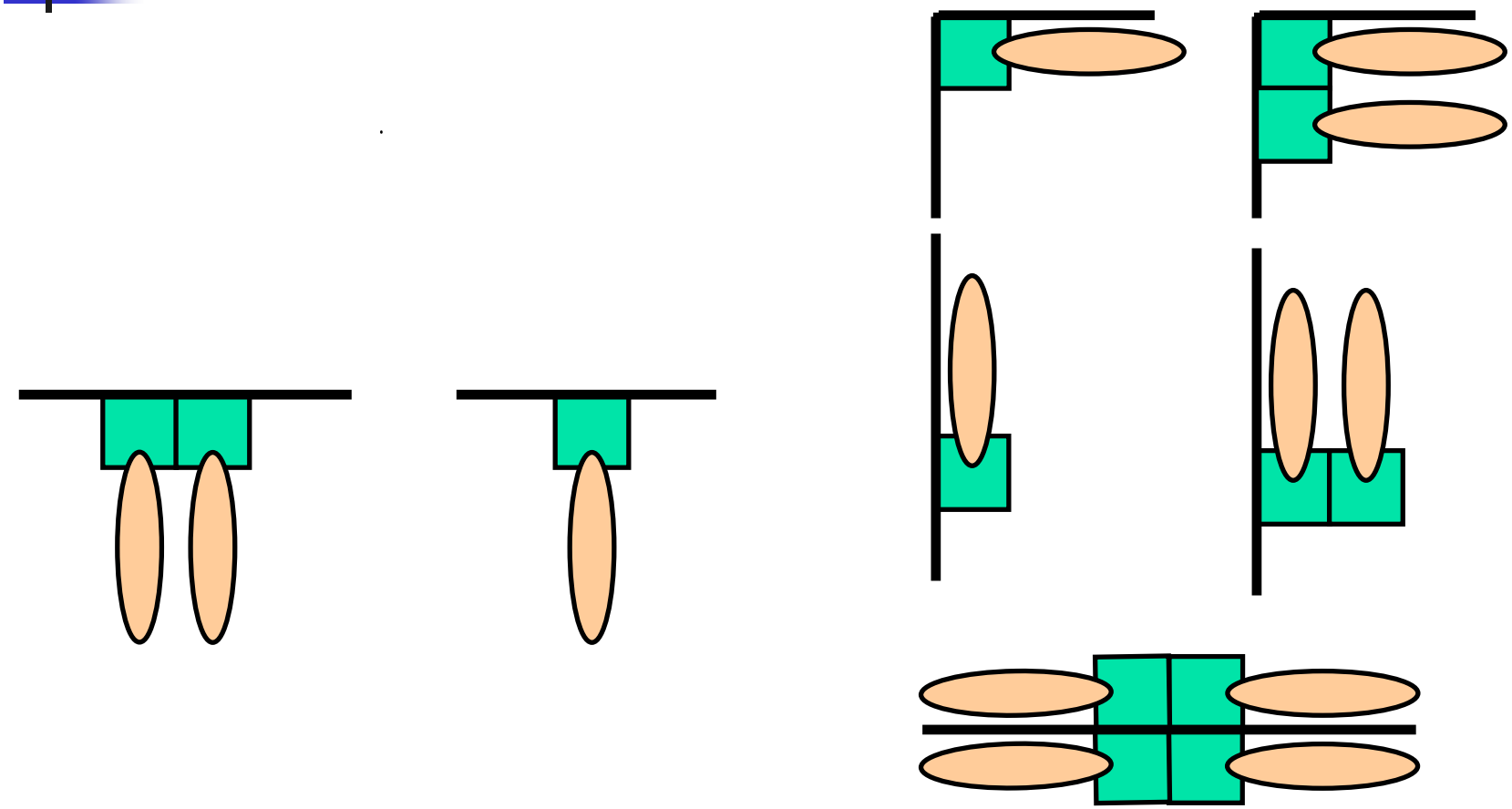
Drinking:
reducing wastage

- Water supply may limit size of operation
- Wasted water must be stored and disposed of as slurry
- Water conserving bowls are available
- Improved management of nipples is necessary to reduce waste (flow rate, height, protection)

Management

- Feeder location
- Large groups
- Auto sorting

Management:
feeder location in small pens



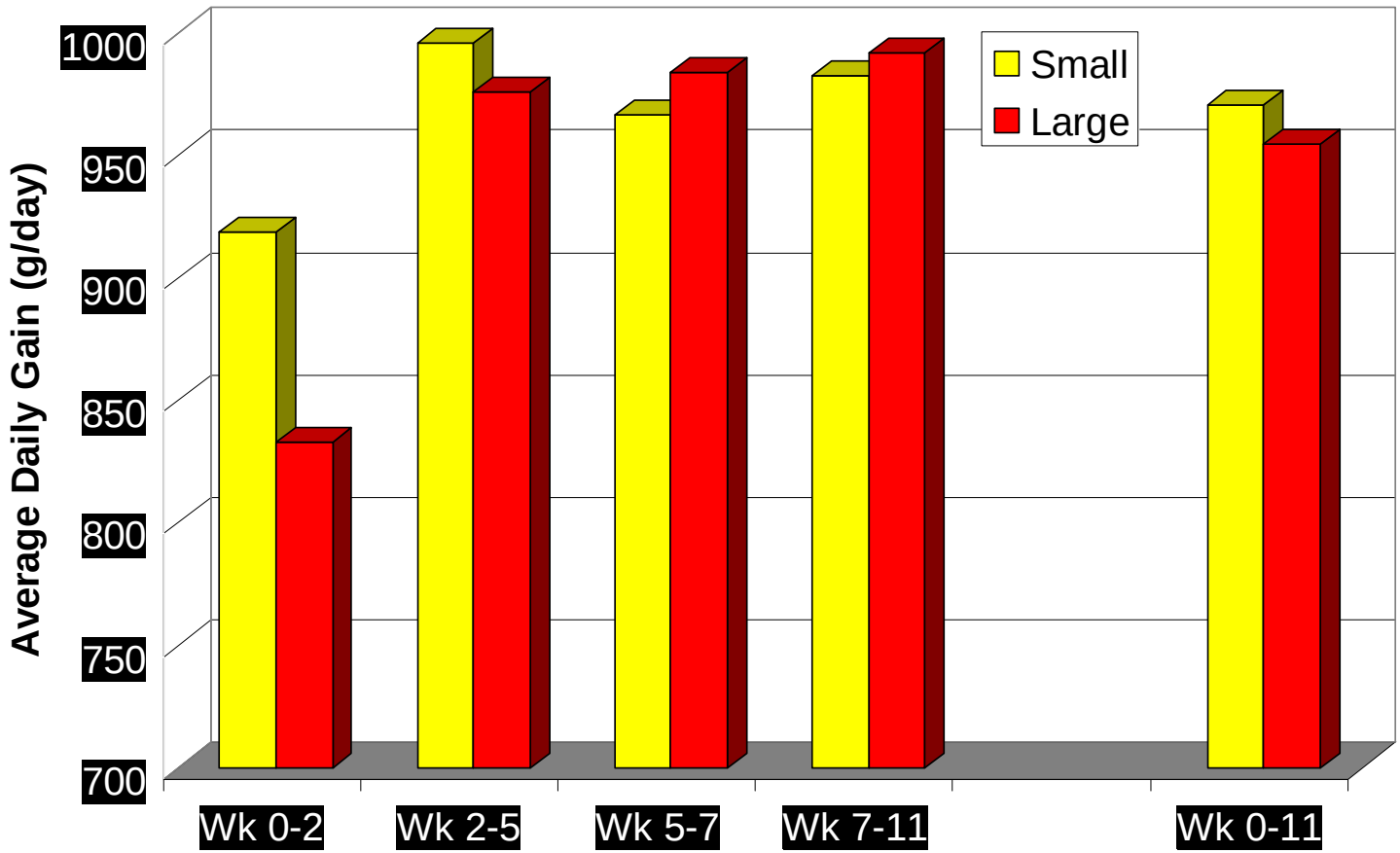
Management:
large groups for grow/finish

- Larger sow herds produce 1,000's of pigs per week
- Sorting by weight within similar aged animals is not advantageous
- Reduced housing costs
- Potential for new technology

Management:
conventional wisdom on large groups

- Keeping large groups of grow/finish pigs may result in:
  - Poor performance
  - Increased weight variation
  - Higher incidence of behavioral vices
    - English et al., 1988

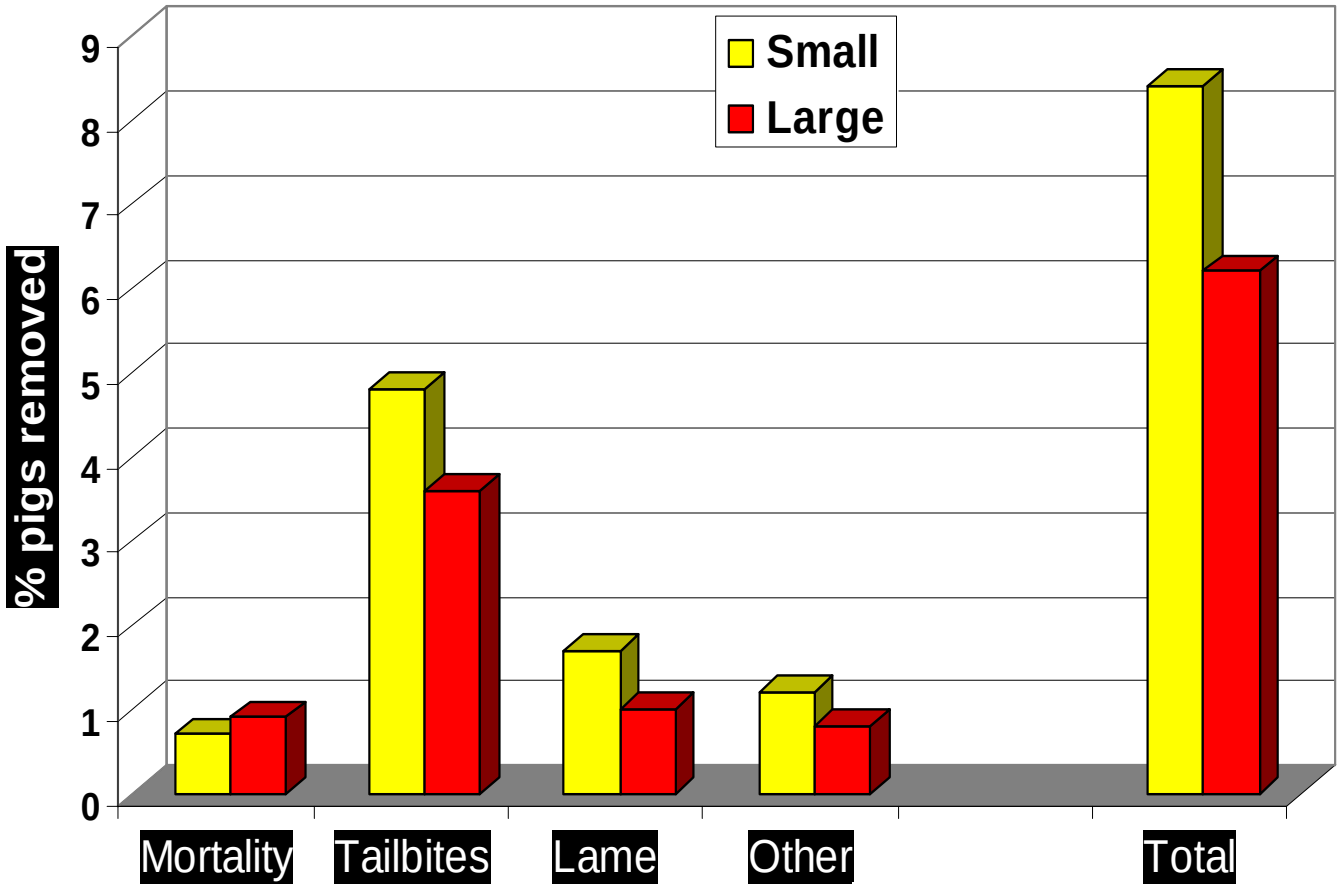
Management:
ADG in large and small groups



Management:
variability in large groups

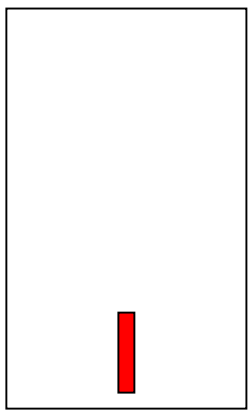
	Group size	
Item	**18 pigs/pen**	**108 pigs/pen**
Number of pens	**16**	**16**
Initial wt (kg)	**31.9**	**31.6**
CV initial wt (%)	***14.8***	***15.7***
Final wt	**106.6^{x}**	**104.9^{y}**
CV final wt (%)	***9.6***	***10.3***

Management:
mortality and morbidity in large groups

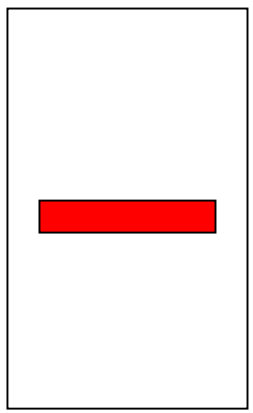


Management:
pen design for large groups

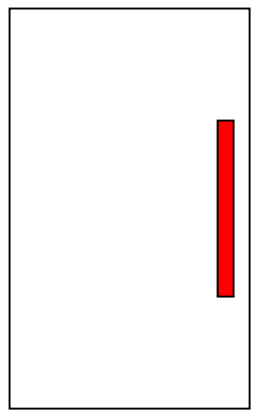
- Australian ‘ecoshelters’
  - Straw or rice hull based
  - Minimize distance to feeder in large groups



250 pigs

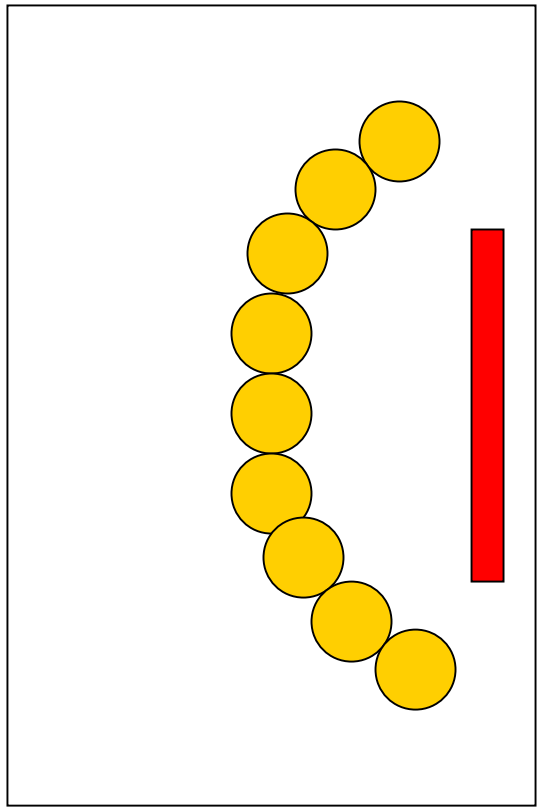


500 pigs



500 pigs

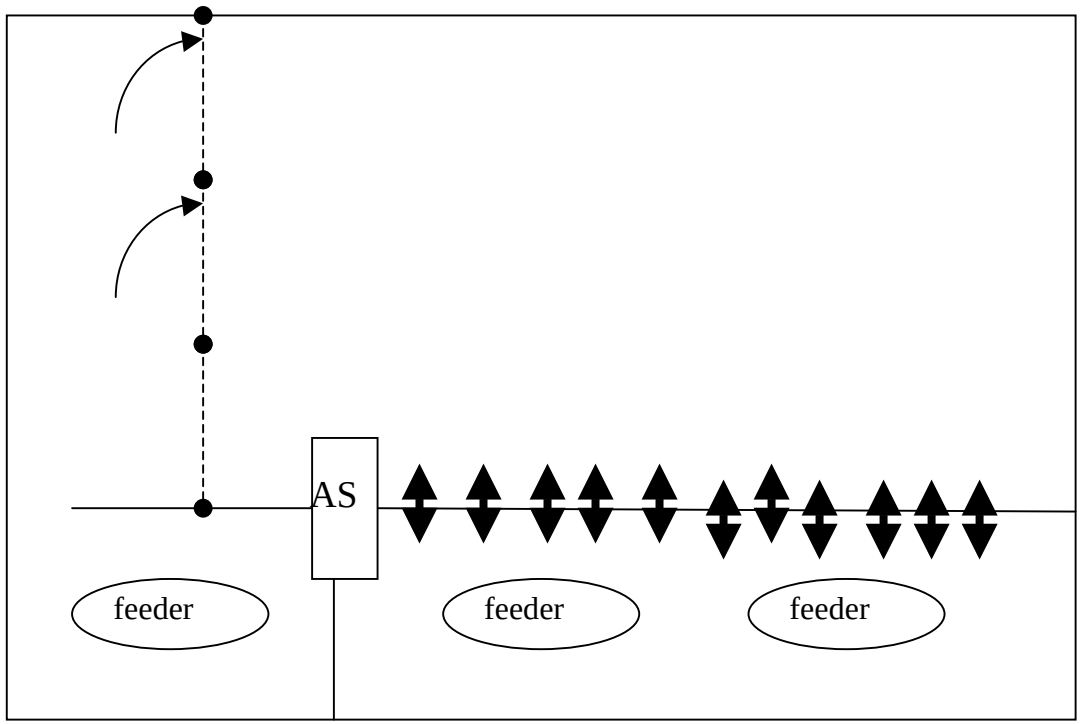
Management:
example of wean to finish large group



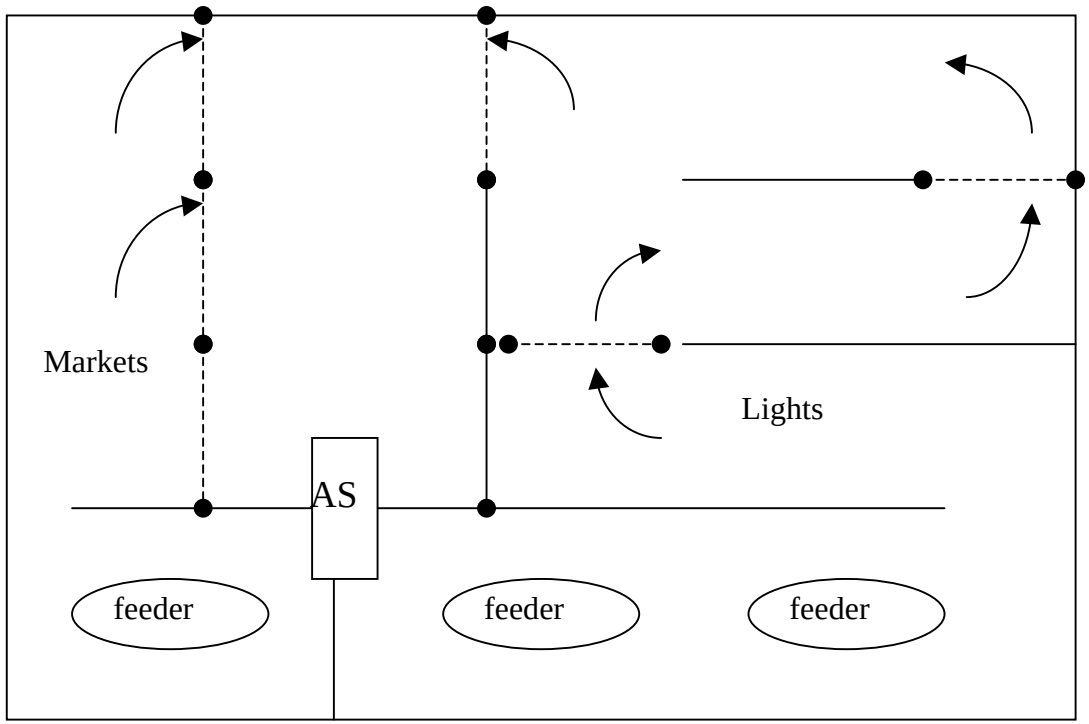
Management:
sorting in large groups

- Groups of 500 pigs/sorter work well
  - Some producers have gone higher, but this is pushing the limit
- Training
  - Self trained
  - Forced trained

Management:
self training for sorters



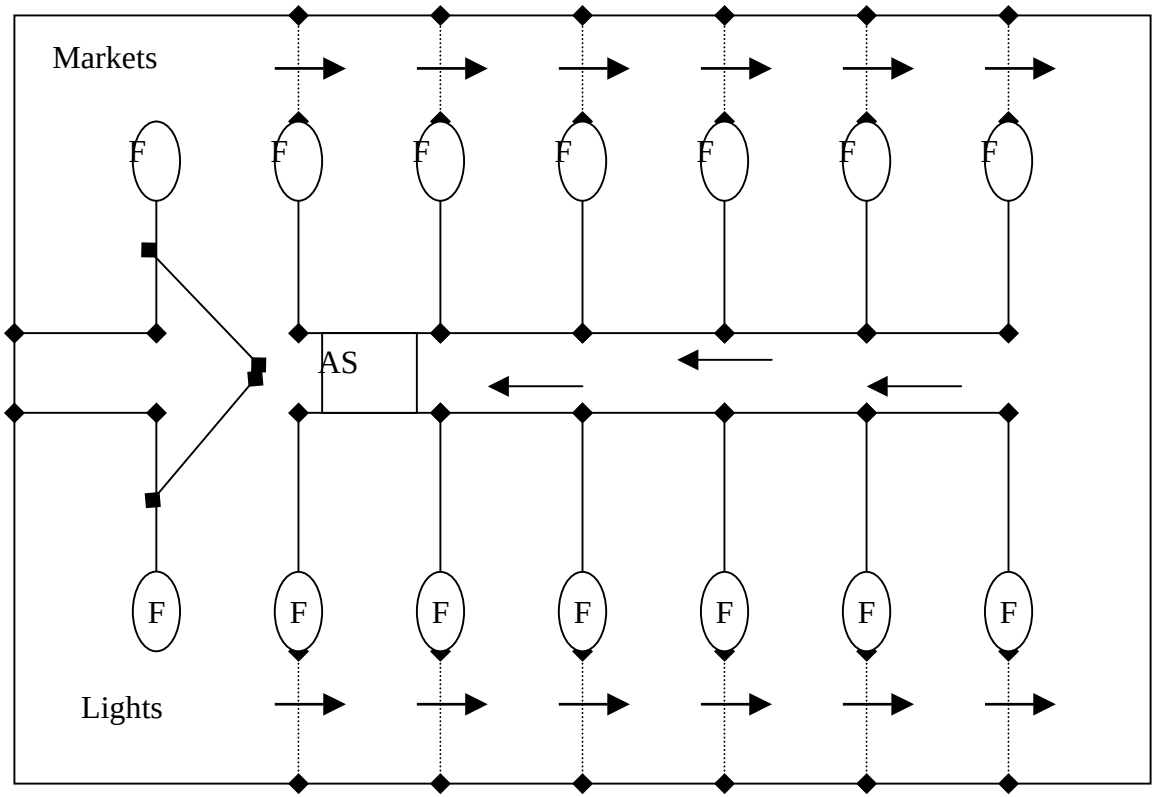
Management:
forced training or forced sorting



Management:
reasons to force train

- To use sorting capability throughout finishing
  - To feed rations by weight
  - To incorporate special feeds
    - Paylean is available in the U.S.A. and is fed for 2-4 weeks prior to shipping

Management:
auto-sort in conventional layout



Adapted from Farmweld

Feeder and Drinker Design and Management

Feed	Feeders and Drinkers
Represents major proportion of production costs	Significant capital cost, but minor operating
Large body of research	Little research
Large commercial industry	Industry varies in quality and support
Mistakes can be corrected after each bin	Mistakes last forever