



Reducing Water Wastage by Growing and Finishing Pigs at Nipple Drinkers

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Background

- Water disappearance
 - 1.9 ~ 6.8 L/pig/d
 - = intake + wastage
 - Up to 60% of water wasted at nipple drinkers (Brooks, 1994)
- Water wastage related to large amounts of slurry produced on pig units



Background

- Causes of water wastage
 - Drinker type (nipple vs. bowl)
 - Drinker height
 - High flow rate (low drinking speed)
 - Group size
 - Pig size
 - Others (temperature, tail bites...)



Objectives

- To reduce water wastage while maintaining adequate water intake of pigs at nipple drinkers
 - Water intake, wastage and maximum intake rate (study 1)
 - Effects of nipple height and flow rate on water wastage (study 2)
 - To reduce water wastage by drinker management (study 3)



Experiment 1

- Animals
 - Six pens of 8 female pigs
 - Body weight, kg
 - Period 1 = 53 ± 4.9
 - Period 2 = 72 ± 5.5
 - One-space dry feeder (pelleted feed *ad libitum*)
 - One nipple drinker
- Housing
 - Partially slatted floor
 - Space allowance = $1.4 \text{ m}^2 / \text{pig}$
 - Room temperature = $20 \sim 23 \text{ }^\circ\text{C}$



Facilities

- Test pens
 - 2 raised pens ($1.4 \text{ m}^2 / \text{pig}$)
 - 60 cm above the floor
 - A nipple drinker connected with a water meter
 - Collecting basket below the drinker under the pen floor
- Thermal Environment
 - Temperature = $22 \pm 1.2 \text{ }^\circ\text{C}$
 - RH = $63 \pm 7.7\%$



Drinker height and flow rate

- Height
 - 50 mm above the shoulder height of the smallest pig (Bill and Barber, 1990)
 - Shoulder height (Patheric, 1983)
 - $SH \text{ (mm)} = 150 * BW \text{ (kg)}^{0.33}$
- Flow rate (Carr, 1994)
 - $650 \pm 14 \text{ mL / min}$ (Period 1)
 - $1000 \pm 65 \text{ mL / min}$ (Period 2)



Data collection

- Water disappearance
 - On daily pen basis for 4 days
- Water wastage
 - On daily pen basis for 4 days
- Water intake
 - = (Disappearance – Wastage)
- Feed intake
 - Weighed in and weighed back on a pen basis



Data collection

- Maximum water intake rate
 - Determined after 4 h water deprivation
 - Accessed at two flow rates
 - 650 vs. 1300 mL/ min (period 1)
 - 1000 vs. 2000 mL / min (period 2)
 - Allowed to access water by 20 sec individually
- Water intake rate (mL/min)
 - = (disappearance – spillage) / drink time

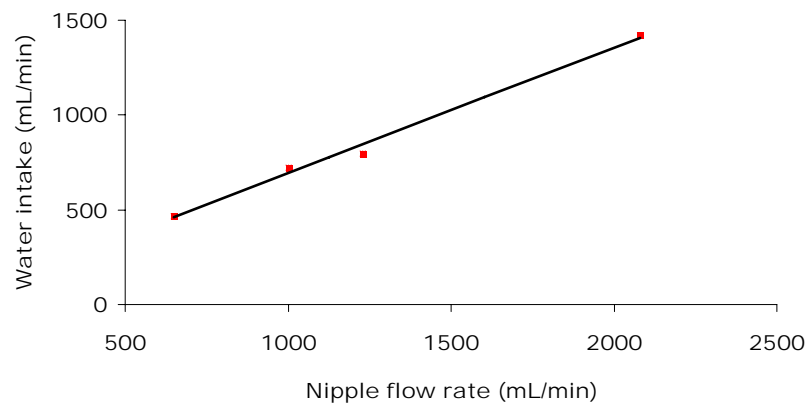


Results

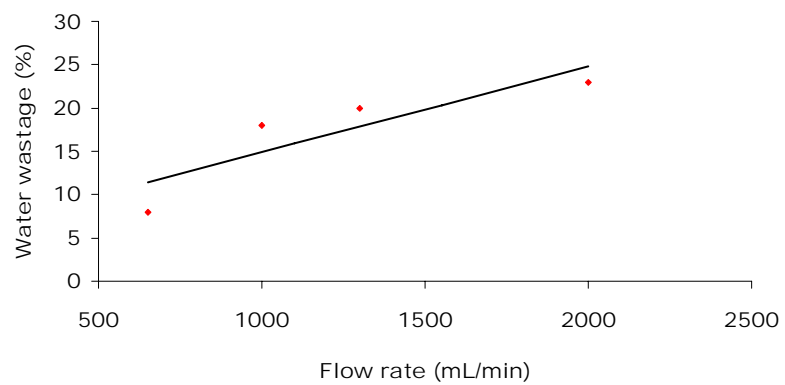
Water disappearance, intake and wastage by grow/finish pigs

Item	Growth period		SE	<i>P</i>
	Period 1	Period 2		
BW, kg	53 ± 4.9	72 ± 5.5	-	-
Disappearance, L	5.3	7.3	0.25	0.01
Wastage, L	1.3	1.9	0.11	0.01
Intake, L	4.0	5.4	0.19	0.01
Water : feed	2.4	2.1	0.12	0.18
Intake/BW, mL/kg	78	75	3.8	0.59
Wastage, %	25	26	1.9	0.66

Relation between water intake rate and drinker flow rate



Relation between water wastage and drinker flow rate





Experiment 2

- Animals
 - Four pens of 8 female pigs
 - Body weight
 - Grower period = 23 ± 2.7 kg
 - Finisher period = 68 ± 5.3 kg
- Housing as in Experiment 1
- Facilities as in Experiment 1



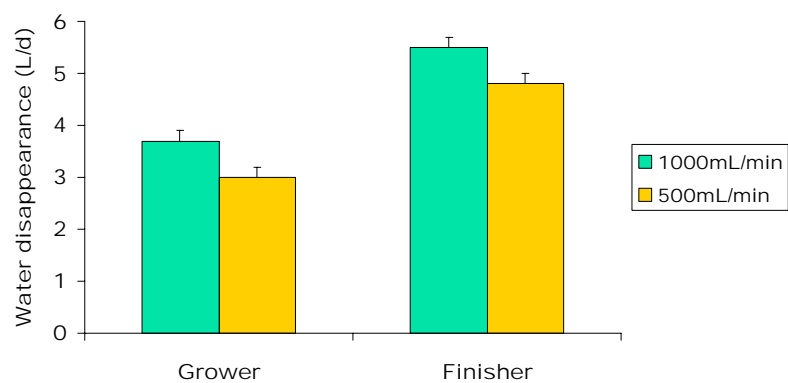
Drinker height and flow rate

- Height
 - Constant: 330 mm
 - Recommended (50 mm above shoulder height)
- Flow rate
 - 500 mL/min
 - 1000 mL/min

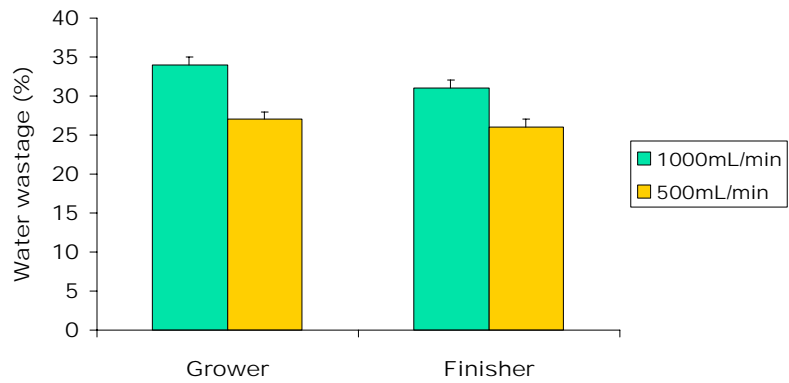
Data collection

- Water disappearance
- Water wastage
- Water intake
- Feed intake

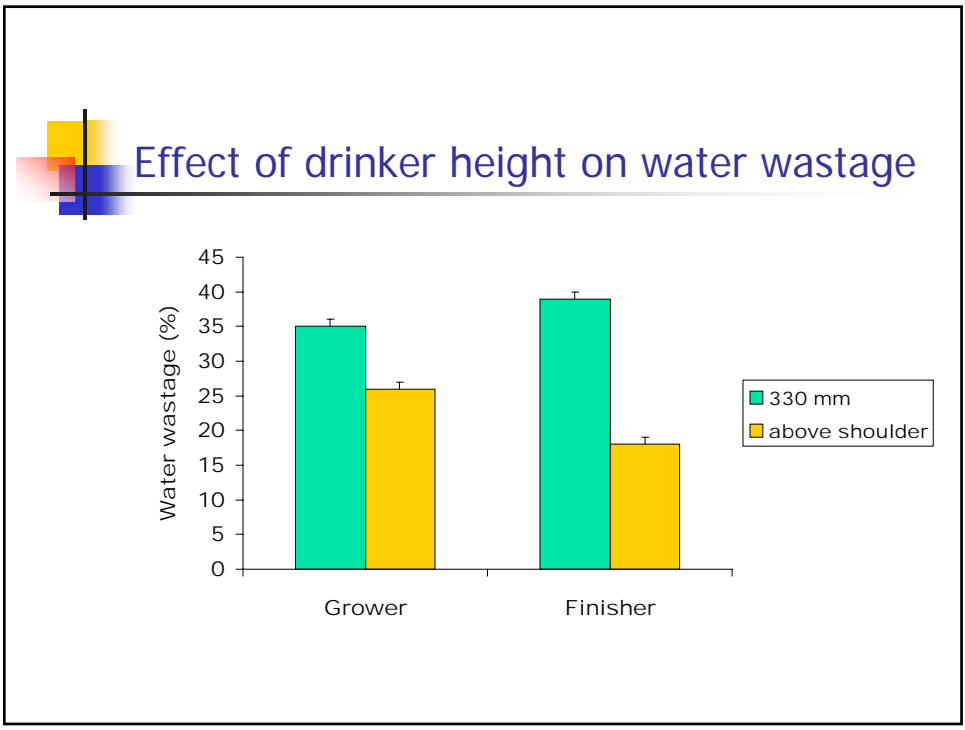
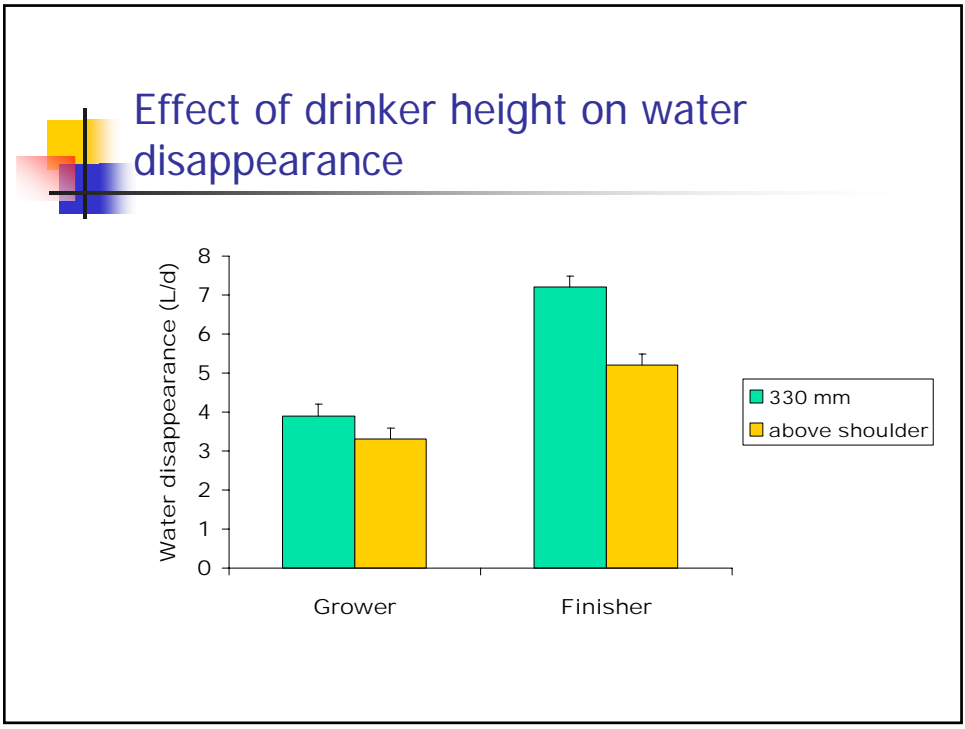
Effect of drinker flow rate on water disappearance



Effect of drinker flow rate on water wastage



- The flow rates did not affect either water or feed intake





- The drinker heights did not affect either water or feed intake



Experiment 3

- Animals
 - Sixteen pens of 18 pigs
 - 9 females and 9 males per pen
 - Body weight at start: 32 ± 4.5 kg
 - Dry mash diet *ad libitum*
- Housing
 - Fully slatted floor
 - Space allowance: 0.78 m^2 / pig
 - Room temperature: $18 \sim 25$ °C



Drinker management


- Nipple drinkers
 - Constant low height (L-N)
 - 480 mm
 - 50 mm above the shoulder (S-N)
 - adjusted every 2 wk
 - Constant high height (Step)
 - 730 mm = 480 + 250 (Step)
- Bowl drinkers at 480 mm (B)

Flow rate = 1000 ± 42 mL /min



Data collection

- Performance
 - ADG (every 2 wk)
 - CV of weight
- Water disappearance
 - Daily pen basis
 - One water meter per pen
- Manure output
 - Weekly pen basis
 - Manure level in each individual pit



Effect of drinker management on body weight

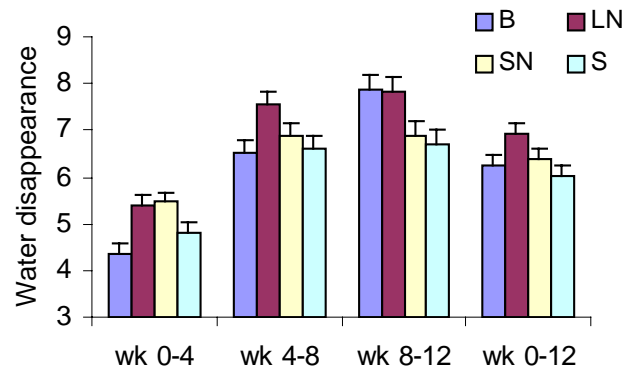
Item	Bowl	L-N	S-N	Step	SE	<i>P</i>
No. Pen	4	4	4	4	-	-
<u>Initial</u>						
BW, kg	31.5	31.8	31.7	32.1	0.67	0.92
CV, %	13.3	16.3	14.5	12.8	1.21	0.23
<u>Final</u>						
BW, kg	104.2	106.0	102.9	104.0	1.98	0.74
CV, %	10.8	10.6	10.5	10.8	1.18	0.99



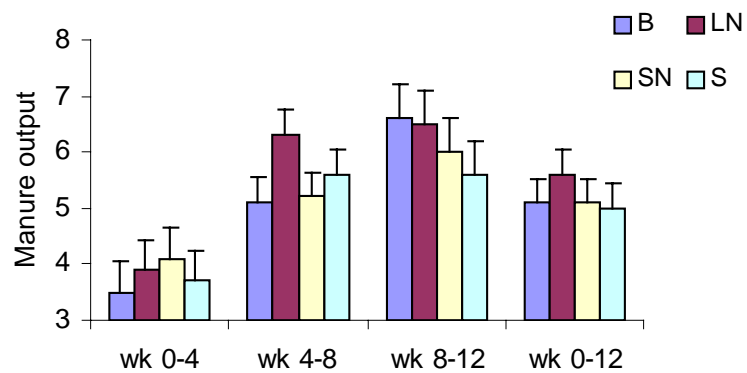
Effect of drinker management on ADG (g/d)

Item	Bowl	L-N	S-N	Step	SE	<i>P</i>
wk 0-4	732	693	721	735	32.0	0.78
wk 4-8	990	1010	974	902	60.1	0.61
wk 8-12	876	950	849	930	54.7	0.55
wk 0-12	866	885	848	855	19.5	0.59

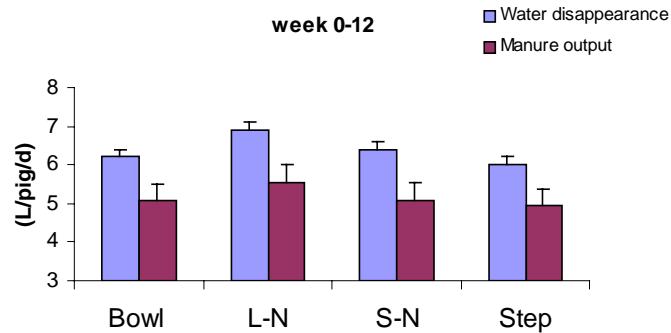
Effect of drinker management on water disappearance (L/pig/d)



Effect of drinker management on manure output (L/pig/d)



Water disappearance and manure output (L/pig/d)



Conclusions

- Grower/finisher pigs wasted 25% of water from well managed nipple drinker.
- High flow rate and low nipple height increased water wastage.
- Water disappearance (13%) and manure output (11%) were reduced by using the stepped nipple drinker



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