

Motivation for additional water use of growing-finishing pigs

Herman M. Vermeer*, Nienke Kuijken, Hans A.M. Spoolder

Animal Sciences Group of Wageningen UR, Lelystad, The Netherlands

ARTICLE INFO

Article history:

Received 5 November 2007

Received in revised form 23 December 2008

Accepted 14 January 2009

Keywords:

Pigs
Water
Drinking
Motivation
Behaviour

ABSTRACT

Liquid fed growing-finishing pigs receive an amount of water in their ration that is more than their physiological requirement. For welfare reasons it can be argued that in addition to this diet, pigs may be motivated to obtain additional fresh water. The aim of the present experiment was to test the hypotheses that liquid fed pigs will work harder to obtain extra fresh water, compared to dry fed pigs which receive water in a conventional way. A consumer-demand technique was used, in which flow rate from an extra (test) drinker determined the ease with which pigs could obtain the water. The more persistent pigs were to obtain water from the test drinker (with declining flow rates), the harder they were assumed to work for it. Four treatments were divided over 48 pens of 12 finishing pigs in 2 batches (566 pigs). There was one Dry Feed treatment (D, with standard drinking nipple in a single space trough) and three liquid feeding systems: Long trough (LT); Sensor Feeding (S) and Variomix (V). Each pen had an additional drinker with a weekly randomly changing flow rate of 134, 356, 733 or 1041 ml/min. From the extra drinker pigs used on average 3.39^a (D), 0.76^b (LT), 0.58^{bc} (S) and 0.44^c (V) litre per day (different superscripts indicate differences $P < 0.05$). The persistence to obtain water differed between the four treatments. This was indicated by the rate of decline (ρ_i) of the asymptotic curve depicting water disappearance at decreasing flow rates: $\rho_i = 0.00378^a$, 0.00274^{ab}, 0.00122^b and 0.00275^{ab} for D, LT, S and V, respectively. This suggests that liquid fed pigs work equally hard (LT and V) or less hard (S) to obtain water from an extra drinking nipple, compared to dry fed pigs (D).

© 2009 Elsevier B.V. All rights reserved.

1. Introduction

Water is an essential part of the nutritive and welfare requirements of pigs. Mroz et al. (1995) stated in a review that water intake mainly depends on body weight, feed intake and temperature. Heavier pigs need more water to maintain their body. The daily water intake of *ad libitum* fed finishing pigs increases on average from 2 l at 25 kg to 6 l at about 110 kg live weight (Nagai et al., 1994). Mroz et al. (1995) also found in their review that the water to feed ratio decreases with increasing age or weight and increases with the ambient temperature. When ambient temperature increases from 10 to 25 °C, the need for water for evaporative cooling, mainly via respiration,

increases from 2.2 to 4.2 l/d for finishing pigs (Vandenheede and Nicks, 1991).

Water can be offered to the pig as part of a liquid diet, or as plain, fresh water from a drinker. The welfare of pigs is compromised if water is unavailable (Kyriazakis and Savory, 1997). The EU minimum standards for the protection of pigs (N.N., 2001) state: "All pigs over two weeks of age must have permanent access to a sufficient quantity of fresh water." Although intuitively logical, this requirement warrants further investigation following the development of new feeding systems as well as the current pressures on environmental aspects of pig husbandry. An increase in water consumption inevitably leads to an increase in urine production. It can be questioned if the need for fresh water does indeed exist, providing the physiological and behavioural needs for water uptake have been met by the ration. Part of the growing-finishing pigs is fed liquid feed, instead of dry feed with additional fresh water. Fresh water differs considerably from

* Corresponding author. Animal Sciences Group of Wageningen UR, P.O. Box 65, 8200 AB Lelystad, The Netherlands. Tel.: +320 293 378.

E-mail address: herman.vermeer@wur.nl (H.M. Vermeer).

liquid feed. Liquid feed has a high energy content and can incidentally have high concentrations of salt and acid. However, the water to feed ratio in these systems is much higher than in dry feeding systems: around 3.0: 1 for wet feed with 25% dm, compared to 2.0:1–2.5:1 for dry feed (Brooks et al., 1989; Van der Peet-Schwering and Plagge, 1995; Smolders and Hoofs, 2000). Even water to feed ratios of 1.5: 1 are reported without negative effects (Brumm et al., 2000). This suggests that the physiological requirement for water is met, but does not necessarily mean that no additional fresh water is needed to satisfy other (behavioural) requirements or covers individual variation in requirements (Brooks et al., 1989).

Information about additional fresh water intake of liquid fed growing-finishing pigs is scarce. Smolders and Hoofs (2000) found an additional fresh water use of 0.86 l per pig per day, by pigs from 25 to 109 kg with the water to feed ratio decreasing from 3.1: 1 in the beginning and 2.9: 1 at the end of the growing-finishing period. Geary et al. (1996) compared different liquid feeds ranging from 15 to 25% dm for weaned piglets and measured the additional water use. At lower dry matter levels pigs ate more feed to keep their feed intake at the same level. Below 22.4% dm the additional fresh water use was stable at 0.22 l/pig/day. They conclude that even at low dry matter levels pigs keep drinking fresh water.

However, it is unclear whether this water intake is associated with a nutritional or behavioural need, or whether it is redirected exploratory or 'playing' behaviour. Pigs in otherwise barren environments will tend to investigate and play with any objects enriching their environment. Stalled sows will develop behavioural routines or stereotypies directed at the nipple drinker, leading to excessive use of water (Rushen, 1984; Terlouw et al., 1991) which indicates that measuring water disappearance (as opposed to water intake) may be introducing important errors in the assessment of water requirements. Kyriazakis and Savory (1997) conclude that more meaningful methods to assess the motivation to obtain water are operant methods or aversion methods.

Matthews and Ladewig (1994) used an operant technique to determine how hard pigs are willing to work for food in comparison to social contact. They produced so called demand curves by measuring the effort (i.e. 1 to 30 pushes on a button) required to get access to the "reward". Similar to

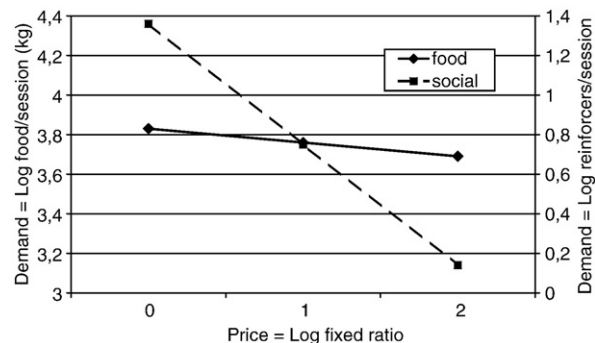


Fig. 1. An increase in effort required to obtain a resource (via increased fixed ratio) will lead to a greater decrease in obtaining social contact (elastic demand) compared to food (inelastic demand). (From: Matthews and Ladewig, 1994).

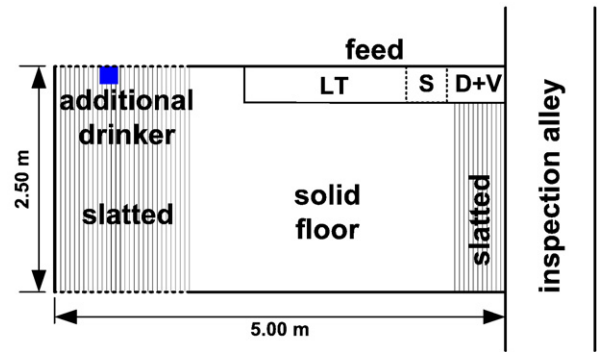


Fig. 2. Layout of a pen, indicating the location of the four feeding systems (D = Dry feed; LT = Long trough; S = Sensor; V = Variomix).

demand curves in macro economics, these curves can be elastic or inelastic. Elasticity is defined by Lea (1978) as

$$\text{Elasticity} = ((\Delta y) / y) / ((\Delta x) / x)$$

In which y = reward obtained and x = fixed ratio of effort to be made. In economic terms, the expenditure of a product is unaffected by price if elasticity is 1. This means that with increasing effort to be made, the amount of reward obtained will reduce linearly. Coefficients below or above 1 indicate less or more elasticity in demand, respectively (Lea, 1978; Jensen and Pedersen, 2008). Thus an elastic curve shows a rapid decline in level of access to the reward, when increasing effort is needed to obtain it. Inelastic curves are closer to a horizontal line: even when the effort required increases a lot, the animal will still try to get a similar level of access to the reward (and thus work increasingly hard). In Fig. 1, based on data from Matthews and Ladewig (1994), the amount of food received (solid line) and social contact received (dashed line) is projected against increasing effort (increasing 'fixed ratio') to obtain the rewards. The rate of decline of the demand curve for food is much closer to 0 (therefore 'inelastic') compared to the demand curve for social contact, which is more than 1 and can be called 'elastic'.

The present experiment aimed to test the hypothesis that the demand for additional fresh water will be less elastic in finishing pigs on wet feeding systems, compared to dry feeding. The assessment was made using a consumer – demand technique, but instead of pushing a button more or less often, the flow rate of the drinker was reduced, so the pigs had to work harder (drink longer) for the same amount of water.

2. Material and methods

The effort finishing pigs will make to obtain additional fresh drinking water was assessed in a trial comparing three wet feeding systems and one dry feeding system.

2.1. Animals

Two batches of 288 pigs each were used between May and August 2006 (batch 1) and November 2006 to February 2007 (batch 2). All animals had a Great Yorkshire × Dutch Landrace mother and a Tempo terminal boar father (synthetic line, Topigs

Download English Version:

<https://daneshyari.com/en/article/2448049>

Download Persian Version:

<https://daneshyari.com/article/2448049>

[Daneshyari.com](https://daneshyari.com)