

**Table S1 Summary of the main animal welfare factors identified in the literature and their expected effect on the slaughterhouses' economic outcome.**

<b>Factors influencing animal welfare at slaughter</b>	<b>The expected effect on the economic outcome</b>	<b>References</b>
Health and welfare-related conditions (animal behaviour, stress, injuries etc) that necessitate trimming of the carcass	Economic loss Influences marketability	Grandin 1995; Alleweldt <i>et al</i> 2007, Harley <i>et al</i> 2012; Gibson & Jackson 2017; Wigham <i>et al</i> 2018
Well-designed animal facilities (eg lairage) and equipment, elimination of distractions and modifications of drive-races, which improves transition of animals within the slaughter house	Increased economic outcome and production efficiency	Grandin 1995, 2013
Maintenance of equipment, eg captive bolt for stunning, non-slip flooring to ensure proper functioning	Increase in production efficiency	Atkinson <i>et al</i> 2013; Grandin 2013
Stock-handling skills in the slaughterhouse (human-animal interaction). Stressful pre-slaughter treatment and handling of cattle and pigs at the slaughterhouse, obstructing transition of animals within the slaughterhouse	Major implications on meat quality, thus reduced economic outcome	Grandin 1997; Chulayo & Muchenje 2015; Gibson & Jackson 2017; Losada-Espinosa <i>et al</i> 2018
Positive attitudes by management to animal welfare, which facilitates animal welfare-friendly operations	Increase in production efficiency, and thus increased economic outcome	Grandin 1995
Training, behaviour and attitude of employees handling the animals pre-slaughter. Employee training in principles of animal behaviour and methods of humane handling, which improves transition of animals within the slaughterhouse	Increase in production efficiency, and thus increased economic outcome	Grandin, 1995; Hemsworth <i>et al</i> 2011
Acknowledging consumer demands by conducting welfare audits of transport and slaughter systems	Increase in consumer awareness	Grandin 1995; Algers & Berg 2017; Gibson & Jackson 2017; Wigham <i>et al</i> 2018

**Table S2 Summary of focus group results on the main investments by Swedish slaughterhouses in animal welfare improvements for pigs and cattle, and the expected effects on economic outcome and animal welfare.**

	<b>Animal welfare improvements</b>	<b>The expected effect on economic outcome</b>	<b>The expected effect on animal welfare</b>
<b>Pigs</b>	- Larger CO <sub>2</sub> Dip-Lift (BUTINA Aps, Copenhagen, Denmark) for stunning pigs - Automated driving system to the Dip-Lift, where the pigs enter at the long side instead of the short side	- High investment cost ( <i>FC</i> ) - Increased production efficiency due to improved slaughter process flow - Reduced labour costs ( <i>L</i> ) due to improved work environment	- Decreased levels of stress for pigs, and for slaughterhouse personnel, during handling
	- Establishment of new lairage - Remodelling of old lairage	- High investment cost ( <i>FC</i> ) - Increased production efficiency, with two slaughter lines instead of one - Reduced labour costs ( <i>L</i> ) due to improved work environment, eg enhanced lairage environment	- Improved environment for the pigs, eg better lighting, lower sound and improved ventilation
	- A new drive-race to the Dip-Lift	- Increased production efficiency due to improved slaughter process flow - Reduced labour costs ( <i>L</i> ) due to improved work environment and increased animal flow	- Decreased levels of stress for pigs, and for slaughterhouse personnel, during handling
	- New design of the unloading area and improved design of the drive-race (straighter, no sharp turns)	- Reduced labour costs ( <i>L</i> ) due to improved work environment and increased animal flow	- Decreased levels of stress for pigs, and for slaughterhouse personnel, during handling
	- New design of the sticking section	- Increased revenues from by-products ( <i>q<sub>2</sub></i> ) due to higher yield of heads and ears	- Inappropriately stunned animals could experience some levels of distress if their head hits the interior
	- Planned investment in a new stunning method, CO <sub>2</sub> , for sows	- Reduced labour costs ( <i>L</i> ) due to improved work environment, ie easier handling than when stunning with electricity	- Decreased levels of stress when handling the sows during the stunning procedure

<b>Cattle</b>	<ul style="list-style-type: none"> <li>- New design of the unloading area and improved design of the drive-race to the stunning box (straighter, with no sharp turns)</li> </ul>	<ul style="list-style-type: none"> <li>- Increased production efficiency due to improved slaughter process flow</li> <li>- Reduced labour costs (<math>L</math>) due to improved work environment, ie easier handling procedures that require less slaughterhouse personnel in the lairage</li> <li>- Increased revenue from the carcasses (<math>q_1</math>)</li> </ul>	<ul style="list-style-type: none"> <li>- Decreased levels of stress for cattle, and for slaughterhouse personnel, during handling and in lairage</li> <li>- Improved meat quality due to lower pH of the carcasses, ie longer lasting meat</li> </ul>
	<ul style="list-style-type: none"> <li>- Rebuilt stunning box</li> <li>- Planned reconstruction of the height of the vertical hydraulic tailgate</li> </ul>	<ul style="list-style-type: none"> <li>- Reduced labour costs (<math>L</math>) due to improved work environment, ie easier handling procedures</li> <li>- Increased production efficiency due to improved slaughter process flow</li> <li>- Improved carcass quality (<math>q_1</math> and <math>q_2</math>) due to less bruising on the back of cattle, and thus increased revenue, <math>R(q_1)</math></li> </ul>	<ul style="list-style-type: none"> <li>- Decreased levels of stress for cattle, and for slaughterhouse personnel, during driving to the stunning box</li> </ul>
	<ul style="list-style-type: none"> <li>- Planned investments in the sticking section and stunning box</li> </ul>	<ul style="list-style-type: none"> <li>- Increased production efficiency due to improved slaughter process flow</li> <li>- Improved work environment, ie lower sound level and higher safety for the employees (<math>L</math>)</li> </ul>	<ul style="list-style-type: none"> <li>- Decreased levels of stress, which could have an impact on carcass quality</li> </ul>