Appendix I: Animal welfare features per criterion of the animal welfare module of the simulation model and the feature scores of the default situation.

Criterion	Feature	Parameter	Score default
Absence of prolonged thirst	Water supply	Number of drinking nipples for sows	400
	Number of clean drinking spots	Number of clean drinking nipples for sows	350
	Number of sows per drinking spot	Number of sows per drinking spot	1
Comfort around resting	Bursitis	0 = no lump, 1 = lump in size of walnut, 2 = lump in size of tangerine	0: 60%, 1: 40%
	Absence manure on body sow	0 = <10% manure, 1 = 10-30%, 2 = >30%	0: 70%, 1: 20%, 2: 10%
	Absence manure on body piglet	0 = <10% manure, 1 = 10-30%, 2 = >30%	0: 70%, 1: 20%, 2: 10%
	Shoulder sores sow	0 = whole, 1 = old wound, 2 = fresh wound	0: 95%, 1: 4%, 2: 1%
Ease of movement	Surface per sow	Square meters per sow	2.4
	Group size	Number of pregnant sows per pen	20
Absence of injuries	Lameness sow	0 = not lame, 1 = moderately lame (1 leg relieved), 2 = seriously lame (1 leg not used)	0:90%, 1:10%
	Lameness piglet	0 = not lame, 1 = moderately lame (1 leg relieved), 2 = seriously lame (1 leg not used)	0:90%, 1:10%
	Body wounds sow	0 = no scratches, 1 = small scratches, 2 = serious scratches	0: 80%, 1: 15%, 2: 5%
	Body wounds piglet	0 = no biting wounds, 1 = superfisial biting wounds, 2 = serious biting wounds that need care	0: 98.8%, 1: 0.5%, 2: 0.7%
	Vulva lesions sow	0 = no wound or scar on vulva, 1 = crust or scar > 2 cm, 2 = fresh wound	0: 90%, 1: 8%, 2: 2%
Absence of disease	Mortality sow	Percentage sows that died in the stables	5%
	Mortality piglet	Percentage piglets that died	13%
Absence of pain induced by management procedures	Tail docking	0 = no tail docking, 1 = tail docking with sedation/analgesia, 2 = tail docking without sedation	2: 100%
Expression of social behaviors	Positive social behavior sow	Percentage snifs/liks without walking away of total behavior observations during five intervals	3.00%
	Positive social behavior piglet	Percentage snifs/liks without walking away of total behavior observations during five intervals	8.00%
	Negative social behavior sow	Percentage aggression with reaction of total behavior observations during five intervals of 2	5.00%
	Negative social behavior piglet	Percentage aggression with reaction of total behavior observations during five intervals of 2	12.00%
Expression of other behaviors	Stereotypies sow	0 = no stereotypies within 15 seconds, 1 = stereotypies within 15 seconds	0: 60%, 1: 40%
	Explorative behavior sow	Percentage exploration of total behavior observations during five intervals of 2 min	48%
	Explorative behavior piglet	Percentage exploration of total behavior observations during five intervals of 2 min	52%
Good human-animal relationship	Human-animal relation score sow	0 = touch head 10 sec, 1 = walks away when touching, 2 = walks away within 10 sec after	0: 18%, 1: 56%, 2: 26%
	Human-animal relation score piglet	0 = touch head 10 sec, 1 = walks away when touching, 2 = walks away within 10 sec after	0: 5%, 1: 34%, 2: 61%
Absence of general fear	Qualitative Behavioral Assessment (QBA) score sow	Sum of scores (0-125) for active, relaxed, fearful, agitated, quit, satisfied, tense, enjoying, social, bored, lively, indifferent, irritated, aimless, happy, sad.	-5
	Qualitative Behavioral Assessment (QBA) score piglet	Sum of scores (0-125) for active, relaxed, fearful, agitated, quit, satisfied, tense, enjoying, social, bored, lively, indifferent, irritated, aimless, happy, sad.	-5

Sources: Criteria, features and parameters based on Welfare Quality® (2009), feature scores based on Vermeer et al (2012

Appendix II: Sources per value for input economic module

Technical numbers	**Numbers**	**Source**
Week system	1 weeks all-in all-out	Expert
Feeding system	Gestation crates	Expert
Blood line	TOPIGS 20 (landrace x yorkshire)	Expert
Number of sows	400	
Number of sow places	440	
Number of sows per group	20	
Number of groups	20	
Replaced sows (%)	43	Agrovision, 2012
Number weaned piglets per sow per year	28,2	Agrovision, 2012
Number of raised piglets per sow per year	27,6	Agrovision, 2012
Number of litters per sow per year	2,36	Agrovision, 2012
Live born piglets per litter	13,8	Agrovision, 2012
Piglet mortality (%)	13	Agrovision, 2012
Weaning age (days)	26	Agrovision, 2012
Age piglets to fattening (weeks)	10	Expert
Number of farrowing pens	120	KWIN 2013/2014
Surface farrowing pen (m2)	5	
Surface gestation crate (m2)	1,2	
Surface sow stable (m2 per group)	42	
Time cleaning sow stable (min. per day)	20	Sow farmer
Number of times sows fed per day	2	Sow farmer
Time cleaning farrowing pen (min.) per day	0,125	Sow farmer
Time cleaning farrowing pen after weaning (min. per pen)	14	Sow farmer
Age tail docking (days)	2 - 5	Sow farmer
Time tail docking per litter (min.)	5	Sow farmer
Number of checks piglets until 48 hours (per day)	14	Sow farmer
Number of checks piglets after 48 hours (per day)	5	Sow farmer
Number of checks piglets after weaning (per day)	1	Sow farmer
Number of weaned piglets per group	40	
Surface weaned piglet pen (m2)	16	
Total number of weaned piglet pens	50	
Time cleaning weaned piglet pen (min.)	10	Sow farmer
Number of times weaned piglet pens cleaned (weeks)	6	
Temperature sow stable (degrees Celsius)	20	Sow farmer
Own labor (hours per week)	60	
Foreign labor (hours per week)	20	
Non productive days culled sow	29,7	Agrovision, 2012
Prices (€)		
Price piglet per month	37,9	Agrovision, 2012
Feed costs piglet per 100 kg	44,23	Agrovision, 2012
Feed costs sow per month (per 100 kg)	29,1	Agrovision, 2012
Income piglets (at 25 kg)	39,25	KWIN 2013/2014
Income piglets per kg (20-27 kg)	1,05	KWIN 2013/2014
Labor costs (average per hour)	22,85	Agrovision, 2012
Costs straw pakage	2,5	Seller of straw
Price breeding sow	250	KWIN 2013/2014
Health care costs per sow per year	68,81	Agrovision, 2012
Costs heating per sow per year	27,99	Agrovision, 2012

Income culled sow	-57,05	Agrovision, 2012
Buildings and investment (€)		
Investment barn	2600	Agrovision, 2012

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Appendix III: Inputs for the economic module of the simulation model

Economic input changes per measure for improvement of animal welfare:

PM1: Camera surveillance farrowing pen

- Piglet mortality is estimated to decrease with 1% with the extra supervision.
- Feed intake sow increases because of piglet mortality decrease. Food intake is 1165 kg/sow/year with piglet mortality of 13% (i.e. 28.33 weaned piglets per year). With 12% piglet mortality, food intake is 1178.57 kg/sow/year.
- The costs for cameras are calculated based on prices charged by a company (cameraindestal.nl, 2014) in the Netherlands. This company charges €500 for the first camera and €200 for each next camera, including installation. The depreciation time of the cameras was estimated at 15 years.
- Extra labor needed to look at the camera footage and to assist piglets in need is estimated at 0.06 hours/sow/year.

PM2: Jute sack provision sow

- Piglet mortality decreases with 0.8% when the sow is provided with two jute sacks (Hoofs, 2012).
- Feed intake sow increases because of piglet mortality decrease. Food intake is 1165 kg/sow/year with piglet mortality of 13% (i.e. 28.33 weaned piglets per year). With 12.2% piglet mortality, food intake is 1175.69 kg/sow/year.
- Cost for one jute sack is €0.90 (expert). One sow needs on average 4.72 (2*2.36) jute sacks per year. A sack holder costs €5 (expert) and is estimated to have a depreciation period of 15 years.
- Extra labor needed to install sack holders and to place jute sacks in the farrowing pens is estimated at 0.036 hours/sow/year.

PM3: Straw provision sow

- Piglet mortality is estimated to decrease with 0.6% with straw provision.
- Feed intake sow increases because of piglet mortality decrease. Feed intake is 1165 kg/sow/year with piglet mortality of 13% (i.e. 28.33 weaned piglets per year). With 12.4% piglet mortality, feed intake is 1173.22 kg/sow/year.
- The costs for the floor element that has to be replaced is estimated at €40 per element with a depreciation period of 15 years.
- Prices for straw were around €35 for 320 kg (marktplaats.nl, 2014).

- Extra labor needed for other tasks (providing straw) was estimated at 0.0066 hours/sow/year.

PM4: Sow habituation

- Piglet mortality is estimated to decrease with 0.6% with sow habituation.
- Feed intake sow increases because of piglet mortality decrease. Feed intake is 1165 kg/sow/year with piglet mortality of 13% (i.e. 28.33 weaned piglets per year). With 12.4% piglet mortality, feed intake is 1173.22 kg/sow/year.
- Extra labor needed to habituate sows is estimated at 0.10 hours/sow/year.

TB1: Tail docking with analgesia

- The costs for piglet analgesia were around €32 per 100 ml (veterinarian). The price of a needleless injection gun was around €200 (schippers.nl, 2014). The depreciation period of such an injection gun was estimated at 15 years.
- Extra labor needed to inject piglets with an analgesia is estimated at 0.09 hours/sow/year.

TB2: Biting material for weaned piglets

- The total costs for enrichment were calculated to be €0.85 sow/year.
- Extra costs for health care were estimated at €1.13 sow/year. These costs increase because tail biting will occur more often. We estimated that 4% of the piglets that are bitten need health care.
- Extra labor needed to install distance holders, renew and replace enrichment was estimated at 0.24 hours/sow/year.
- Extra labor needed to clean pens was estimated at 0.0014 hours/sow/year.

TB3: Straw playing area for weaned piglets

- Floor replacement was estimated to be €0.33 sow/year.
- Price for straw was around €35 for 320 kg (marktplaats.nl, 2014).
- Extra costs for health care were estimated at €0.85 sow/year. These costs increase because tail biting will occur more often. We estimated that 3% of the piglets that are bitten need health care.

- Extra labor needed to clean pens was estimated at 0.090 hours/sow/year.
- Extra labor needed for other tasks (providing straw) was estimated at 0.15 hours/sow/year.

TB4: Chopped straw provision for weaned piglets
- Prices for straw were around €6.00 for 20 kg (stronet.nl, 2014).
- Extra costs for health care were estimated at €0.71 sow/year. These costs increase because tail biting will occur more often. We estimated that 2.5% of the piglets that are bitten need health care.
- Extra labor needed for other tasks (providing straw) was estimated at 0.15 hours/sow/year.

IH1: Free range outside area
- The costs for pen changes was estimated at €7.31 sow/year.
- A decrease of €6.9 sow/year (10%) in health care was expected because of the positive effect of the measure on animal welfare.
- Extra labor needed to clean sow stables was estimated at 0.15 hours/sow/year.

IH2: Straw provision
- Prices for straw were around €35 for 320 kg (marktplaats.nl, 2014).
- A decrease of €4.83 sow/year (7%) in health care was expected because of the positive effect of the measure on animal welfare.
- Extra labor needed to clean sow stables was estimated at 0.075 hours/sow/year.
- Extra labor needed for other tasks (providing straw) was estimated at 0.15 hours/sow/year.

IH3: Straw provision and daylight
- The costs for pen changes was estimated at €2.50 sow/year.
- Prices for straw were around €35 for 320 kg (marktplaats.nl, 2014).
- Because of the window less artificial light is necessary. We estimated a decrease in lighting costs of €0.95 sow/year.

- Because of the windows, heating will change. It is assumed that heating costs on average will be the same because when the sun is shining less heating is necessary and when it is cold and cloudy more heating is necessary.
- A decrease of €4.14 sow/year (6%) in health care was expected because of the positive effect of the measure on animal welfare.
- Extra labor needed to clean sow stables was estimated at 0.075 hours/sow/year.
- Extra labor needed for other tasks (providing straw) was estimated at 0.15 hours/sow/year.

IH4: Straw provision, daylight and increased group size
- The costs for pen changes was estimated at €12.74 sow/year.
- Prices for straw were around €35 for 320 kg (marktplaats.nl, 2014).
- Because of the windows, less artificial light is necessary. We estimated a decrease in lighting costs of €0.95 sow/year.
- Because of the windows, heating will change. It is assumed that heating costs on average will be the same because when the sun is shining less heating is necessary and when it is cold and cloudy more heating is necessary.
- A decrease of €6.21 sow/year (9%) in health care was expected because of the positive effect of the measure on animal welfare.
- It is assumed that less time is needed to clean sow stables because of bigger pens without free access stables. The less labor needed was estimated at 0.23 hours/sow/year.
- Labor needed for other tasks was kept the same as for the reference farm because providing straw takes extra time but the change of system will save time.

Appendix IV: Animal welfare inputs for the simulation model; the animal welfare scores (AWS) per feature for the default situation and the increase or decrease in AWS compared to the default situation and the variation (Var; ±) per measure for sow husbandry.

	AWS[a]	Increase or decrease in AWS per measure and their variation																							
Feature	**Default**	**μ PM1[b]**	**Var PM1**	**μ PM2**	**Var PM2**	**μ PM3**	**Var PM3**	**μ PM4**	**Var PM4**	**μ TB1**	**Var TB1**	**μ TB2**	**Var TB2**	**μ TB3**	**Var TB3**	**μ TB4**	**Var TB4**	**μ HS1**	**Var HS1**	**μ HS2**	**Var HS2**	**μ HS3**	**Var HS3**	**μ HS4**	**Var HS4**
Water supply	87.5	[c]																						7.5	0.0
Number sows per drinking spot	100																							-23.0	0.0
Bursitis	60																	20.0	10.0	15.0	10.0	15.0	10.0	15.0	10.0
Absence manure body sow	69.5																	10.2	5.2	7.2	5.0	7.2	5.0	7.2	5.0
Absence manure body piglet	69.5													10.3	5.1	10.3	5.1								
Shoulder sores sow	95.0					3.5	1.5																		
Surface per sow	12.5																	40.8	0.0						
Group size	20																							80.0	0.0
Lameness sow	90																	5.0	3.0	5.0	3.0	5.0	3.0	5.0	3.0
Lameness piglet	90											5.0	2.0	1.0	1.0	5.0	2.0								
Body wounds sow	79.8																	10.2	5.2	5.1	3.0	5.1	3.0	10.2	5.2
Body wounds piglet	98.8											-18.7	5.3	-12.6	5.4	-10.6	5.4								
Vulva lesions sow	89.9																	8.1	1.0	8.1	1.0	8.1	1.0	6.0	2.0
Mortality sow	95																	2.0	0.0						
Mortality piglet	87	1.0	0.2	0.8	0.1	0.6	0.1	0.6	0.2																
Tail docking	0									25.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0								
Positive social behavior sow	3							1.0	1.0									3.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0
Positive social behavior piglet	8													4.0	2.0	1.0	0.5								
Negative social behavior sow	95							1.0	1.0									3.0	1.0	1.0	1.0	1.0	1.0	2.0	1.0
Negative social behavior piglet	88											2.0	2.0	4.0	2.0	2.0	2.0								
Stereotypies sow	60																	5.0	5.0	30.0	15.0	30.0	15.0	32.0	15.0
Explorative behavior sow	48			12.0	5.0	12.0	5.0											32.0	10.0	22.0	10.0	22.0	10.0	32.0	10.0
Explorative behavior piglet	52											18.0	5.0	28.0	10.0	13.0	10.0								
Human-animal relation score sow	16.7							58.1	5.2									32.4	10.2	22.1	6.1	19.1	3.1	35.5	7.3
Human-animal relation score piglet	1.95											5.6	4.3	11.8	4.2	16.1	4.5								
Qualitative Behavioral Assessment (QBA) score sow	18.8			12.5	6.3	12.5	6.3	12.5	6.3									43.8	6.3	37.5	6.3	37.5	6.3	43.8	6.3
Qualitative Behavioral Assessment (QBA) score piglet	18.8											25.0	6.3	37.5	6.3	25.0	6.3								

[a] Animal welfare scores were given on a scale of 1 (worst for animal welfare) to 100 (best for animal welfare).

[b] Measure abbreviations: PM: piglet mortality, TB: tail biting, IH: indoor housing gestating sows, PM1: camera surveillance farrowing pen, PM2: jute sack provision sow, PM3: straw provision sow, PM4: sow habituation, TB1: tail docking with analgesia, TB2: biting material for weaned piglets, TB3: straw playing area for weaned piglets, TB4: chopped straw provision for weaned piglets, IH1: free range outside area, IH2: straw provision, IH3: straw provision and window, IH4: straw provision, window and increased group size.

[c] When no value is given it was assumed to be the same value as in the default situation.

Appendix V: Inputs for the attitude module; the mean negative attitude (NA) levels per aspect for the default situation and the increase or decrease in NA levels compared to the default situation and the variation (Var; ±) per measure for sow husbandry.

	NA[a]	Increase or decrease in NA per measure and their variation																							
Aspect	**Default**	**μ PM1[b]**	**Var PM1**	**μ PM2**	**Var PM2**	**μ PM3**	**Var PM3**	**μ PM4**	**Var PM4**	**μ TB1**	**Var TB1**	**μ TB2**	**Var TB2**	**μ TB3**	**Var TB3**	**μ TB4**	**Var TB4**	**μ HS1**	**Var HS1**	**μ HS2**	**Var HS2**	**μ HS3**	**Var HS3**	**μ HS4**	**Var HS4**
Animals																									
Disease/infection/injuries	3.8	-0.8	0.3	-0.3	0.2	-0.6	0.3	-0.2	0.1	-0.8	0.3	-0.5	0.3	-0.8	0.5	-0.8	0.5	-1.2	0.5	-0.4	0.2	-0.5	0.3	-0.8	0.5
Mortality	3.6	-0.8	0.3	-0.3	0.2	-0.6	0.3	-0.5	0.3	-0.5	0.3	-0.2	0.1	-0.5	0.3	-0.5	0.3	-1.2	0.5	-0.4	0.2	-0.5	0.3	-0.8	0.5
Fear/anxiety	3.8	-0.8	0.3	-0.8	0.3	-0.6	0.3	-0.2	0.1	-1.3	0.4	-0.8	0.3	-1	0.4	-0.8	0.3	-1.5	0.5	-0.4	0.2	-0.5	0.3	-1	0.5
Pain	3.9	-0.8	0.3			-0.6	0.3	-0.2	0.1	-0.8	0.4	-0.8	0.3	-1	0.5	-0.8	0.3	-1.2	0.5	0	0	0	0	-0.8	0.5
Number of kept animals	3.9	-0.25	0.25									-0.6	0.3	-0.5	0.2	-0.4	0.2	-1.2	0.8	0	0	0	0	-1	0.5
Environmental enrichment	3.6	[c]		-0.4	0.15	-0.7	0.5					-0.7	0.3	-1.2	0.5	-0.8	0.4	-1.8	0.5	-0.6	0.4	-0.8	0.5	-1.2	0.5
Number of animals per m2	3.9											-0.6	0.3			-0.6	0.3	-1.5	0.5	-0.4	0.3	-0.5	0.3	-1	0.5
Floor cover	3.8					-0.7	0.5							-1.2	0.5	-1	0.4	-1.5	0.5	-0.8	0.6	-1	0.5	-1	0.5
Possibility of going outside	4.0																	-3	0.8					-1.5	0.5
Tail docking	3.7									-1	0.5	-2.1	0.5	-2.1	0.5	-2.1	0.5								
Number of litters per sow	3.6	-0.25	0.25									-0.2	0.1	-0.3	0.1	-0.2	0.1								
Litter size	3.6	-0.25	0.25					-0.2	0.1			-0.2	0.1	-0.3	0.1	-0.2	0.1								
Care for individual animal	3.8	-0.8	0.3	-0.2	0.1	-0.5	0.3			-0.6	0.3	-1.2	0.5	-1.3	0.5	-1	0.5	-1.5	0.5	-0.6	0.4	-0.8	0.5	-1.2	0.5
Humans																									
Enough income	3.6									0.15	0.15			0.2	0.15	0.1	0.1	0.5	0.3	0.15	0.15	0.15	0.15	0.1	0.1
Working conditions	3.5													0.15	0.15	0.1	0.1	0.4	0.3	0.15	0.15	0.15	0.15	0.2	0.1
Health risks	3.8																								
Physical burdon	3.5																			0.15	0.15	0.15	0.15	0	0.3
Product price	3.3	0.15	0.15							0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.8	0.5	0.3	0.1	0.3	0.1	0.2	0.1
Freedom of choice	3.4																	-0.5	0.3	0.3	0.1	0.3	0.1	-0.3	0.1
Food safety risks	4.0									0.1	0.1														
Public health risks	4.0																	0.6	0.4						
Environment																									
Environmental waste	4.0																	0.4	0.2						
Smell	3.6																	0.7	0.5						
Change in infrastructure	3.7																	-0.3	0.6						
Image landscape	3.6																	-0.3	0.6						

[a] Negative attitude levels are on a scale of 1 (no negative attitude) to 5 (maximum negative attitude).

[b] Measure abbreviations: PM: piglet mortality, TB: tail biting, IH: indoor housing gestating sows, PM1: camera surveillance farrowing pen, PM2: jute sack provision sow, PM3: straw provision sow, PM4: sow habituation, TB1: tail docking with analgesia, TB2: biting material for weaned piglets, TB3: straw playing area for weaned piglets, TB4: chopped straw provision for weaned piglets, IH1: free range outside area, IH2: straw provision, IH3: straw provision and window, IH4: straw provision, window and increased group size.

[c] When no value is given it was assumed to be the same value as in the default situation.

1 Inputs for the default situation and the increase or decrease in inputs compared to the default situation and the variation (Var; ±) per
2 measure for sow husbandry.

	Input	Adjusted inputs per measure and their variation																									
Input name	**Default**	μ PM1[a]	Var PM1	μ PM2	Var PM2	μ PM3	Var PM3	μ PM4	Var PM4	μ TB1	Var TB1	μ TB2	Var TB2	μ TB3	Var TB3	μ TB4	Var TB4	μ HS1	Var HS1	μ HS2	Var HS2	μ HS3	Var HS3	μ HS4	Var HS4
Technical numbers																											
Labor (hours/year)	3120	[b]																									
Company size (sow places)	440																										
Occupation (% sows/sow places)	91																										
Number of litters (sow/year)	2.36																										
Litter size (live piglets/litter)	13.8																										
Piglet mortality (%)	13	-1.00	0.50	-0.80	0.50	-0.60	0.50	-0.60	0.50																		
Replacement breeding sows (%)	43																										
Selection sow before first insemination (%)	5																										
Sow feed intake (kg/sow/year)	1165	13.60	6.66	10.70	6.88	8.20	6.70	8.20	6.70																		
Piglet feed intake (kg/piglet)	28.2																										
Buildings and inventory																											
Investment building and inventory (€/sow place)	2500																										
Depreciation period investment (year)	20																										
Residual value (€/sow place)	0																										
Market interest (%)	6																										
Maintenance (% of investment)	1.5																										
Prices																											
Sow price (€/sow)	163																										
Breeding sow price (€/sow)	250																										
Selected breeding sow price (€/sow)	121.2																										
Sow feed (€/100 kg)	23.5																										

Piglet price (€/piglet)	43																							
Piglet feed (€/100 kg)	35																							
Labor (€/hour)	22.85																							
Other costs																								
Health care (€/sow/year)	69											1.13	0.05	0.85	0.04	0.80	0.13	-6.90	0.39	-4.80	0.27	-4.10	0.15	-6.20	0.32
Transport costs piglets (€/piglet)	27																							
Heating (€/sow/year)	29																							
Lighting (€/sow/year)	2.7																					1.76	0.77	1.76	0.05
Pen adjustments (€/sow/year)	0					0.67	0.01							0.33	0.01			7.31	0.37			2.50	0.12	12.74	0.64
Cameras (€/sow/year)	0	1.77	0.09																					
Jute bag (€/sow/year)	0			4.33	0.22																			
Straw (€/sow/year)	0					0.08	0.01							2.58	0.13	0.27	0.01			3.99	0.20	3.99	0.20	3.99	0.20
Environmental enrichment (€/sow/year)	0											0.85	0.04												
Pain relief tail docking (€/sow/year)	0									1.45	0.07														
Other costs (e.g. water) (€/sow/year)	60																								
Time management																									
Time cleaning sow pen (hours/sow/year)	0.30																	0.15	0.00	0.08	0.00	0.08	0.00	-0.22	0.01
Time cleaning farrowing pen (hours/sow/year)	0.23																								
Time cleaning farrowing pen after weaning (hours/sow/year)	3.22																								
Time cleaning weaned piglet pen (hours/sow/year)	0.18																								
Time tail docking (hours/sow/year)	0.92																								
Time checks piglets first 2 days (hours/sow/year)	0.30	0.06	0.00																						
Time other tasks (hours/sow/year)	5.22			0.03	0.00			0.10	0.00	0.09	0.00	0.24	0.03	0.15	0.01	0.15	0.01			0.15	0.01	0.15			

[a] Measure abbreviations: PM: piglet mortality, TB: tail biting, IH: indoor housing gestating sows, PM1: camera surveillance farrowing pen, PM2: jute sack provision sow, PM3: straw provision sow, PM4: sow habituation, TB1: tail docking with analgesia, TB2: biting material for weaned piglets, TB3: straw playing area for weaned piglets, TB4: chopped straw provision for weaned piglets, IH1: free range outside area, IH2: straw provision, IH3: straw provision and window, IH4: straw provision, window and increased group size.

[b] When no value is given it was assumed to be the same value as in the default situation.

Table 2: Farm income, animal welfare and attitude outputs of the simulation model; the mean (μ) and variation (Var; ±) for farm income (FI), total costs (TCO), total revenues (TRE), total animal welfare score (TWS) and total attitude score (TAS) for the default situation and the different measures.

Measure[a]	μ FI	Var FI	μ TCO	Var TCO	μ TRE	Var TRE	μ TWS[b]	Var TWS	μ TAS[c]	Var TAS
Default	-38177	0	5514	0	5132.2	0	1555	0	32.7	0
PM1	-36475	1545	5497	15.4	5188.2	280.7	1556	0.2	33.6	0.5
PM2	-37850	1562	5511	15.6	5177.0	305.7	1580	11.4	33.1	0.2
PM3	-36762	1498	5500	15.0	5165.8	306.0	1583	12.9	33.6	0.5
PM4	-37322	1493	5505	14.9	5165.8	311.6	1628	13.7	33.0	0.1
TB1	-39607	74	5528	0.7	5132.2	0.0	1580	0.0	35.9	1.8
TB2	-41218	151	5544	1.5	5132.2	0.0	1692	24.9	38.3	2.3
TB3	-41895	185	5551	1.9	5132.2	0.0	1739	36.0	39.6	3.2
TB4	-39959	88	5532	0.9	5132.2	0.0	1716	35.8	39.0	3.0
IH1	-39712	353	5529	3.5	5132.2	0.0	1770	57.9	41.8	6.4
IH2	-39916	279	5531	2.8	5132.2	0.0	1709	61.4	34.4	2.0
IH3	-40814	334	5540	3.3	5132.2	0.0	1706	58.4	35.1	2.3
IH4	-39950	578	5532	5.8	5132.2	0.0	1809	65.8	39.6	3.9

[a] Measure abbreviations: PM: piglet mortality, TB: tail biting, IH: indoor housing gestating sows, PM1: camera surveillance farrowing pen, PM2: jute sack provision sow, PM3: straw provision sow, PM4: sow habituation, TB1: tail docking with analgesia, TB2: biting material for weaned piglets, TB3: straw playing area for weaned piglets, TB4: chopped straw provision for weaned piglets, IH1: free range outside area, IH2: straw provision, IH3: straw provision and window, IH4: straw provision, window and increased group size.

[b] AWS: animal welfare score with a maximal possible score of 2700 (27 animal welfare features times a maximum score of 100).

[c] TAS: attitude score with a maximal possible score of 125 (25 attitude features times a maximum score of 5).

Table 3: Mean (μ) technical efficiencies (TE) and 95% confidence intervals (CI) resulting from 1,000 data envelopment analysis runs under variable returns to scale with impacts on farm income (FI), animal welfare (AW) and/or attitudes toward sow husbandry (AT) for the default situation and measures for sow husbandry.

		For impact on..	Default	PM1*	PM2	PM3	PM4	TB1	TB2	TB3	TB4	IH1	IH2	IH3	IH4
TE	μ	FI, AW and AT	.966	.993	.979	.990	.992	.975	.987	.994	.992	.999	.986	.986	1.000
	μ	AW and AT	.908	.987	.957	.985	.987	.884	.944	.973	.965	.996	.946	.940	1.000
	μ	AT	.824	.981	.903	.969	.940	.820	.868	.909	.897	.983	.756	.770	.993
CI	Lower bound	FI, AW and AT	.966	.992	.978	.989	.991	.975	.987	.993	.991	.999	.986	.985	1.000
	Upper bound		.967	.994	.980	.991	.993	.976	.988	.994	.992	.999	.986	.986	1.000
	Lower bound	AW and AT	.907	.986	.954	.983	.989	.882	.942	.972	.963	.995	.945	.939	1.000
	Upper bound		.909	.989	.957	.986	.990	.886	.945	.974	.966	.997	.947	.941	1.000
	Lower bound	AT	.820	.978	.897	.966	.945	.815	.863	.904	.892	.980	.751	.765	.991
	Upper bound		.828	.983	.903	.972	.948	.825	.873	.913	.902	.985	.762	.776	.995

* Measure abbreviations: PM: piglet mortality, TB: tail biting, IH: indoor housing gestating sows, PM1: camera surveillance farrowing pen, PM2: jute sack provision sow, PM3: straw provision sow, PM4: sow habituation, TB1: tail docking with analgesia, TB2: biting material for weaned piglets, TB3: straw playing area for weaned piglets, TB4: chopped straw provision for weaned piglets, IH1: free range outside area, IH2: straw provision, IH3: straw provision and window, IH4: straw provision, window and increased group size.