Table S5: Benchmark matrix combining grades of animal welfare and expert assessments

A key element in the benchmark value estimation is the matrix that combines grades of animal welfare in the 17 dimensions, expert assessment of each grade and assessment of the importance of each dimension of animal welfare. First step in the calculation is to estimate a benchmark value for each single label in each country. Such a benchmark value for each single initiative (legislation or label) in each country is calculated from following input:

1) Label characteristics (X) For each initiative, a grade is assigned for each welfare dimension. As the same grades are used to categorize all initiatives, some of the assigned grades are not precise but the closest possible.
2) Expert assessments of grades (V): The animal welfare score for each grade within a dimension
3) Expert assessments of importance of dimensions (I)
4) Coefficients (Z). Animal welfare characteristics relate to different parts of the production or herd. In the pig sector, for example, the piglet, finishers and sow population are included. Some countries have a relatively large piglet production, so in these countries the animal welfare characteristics found in piglet production should be given greater weight. These weight are denoted coefficient in the table.

The benchmark value of the individual initiative (regulation or label) in each country is obtained by multiplying the four mentioned factors for dimension and aggregating over all dimensions. A low value of a welfare dimension (close to zero) is obtained if the animal welfare characteristics found are low in the groupings and / or if the groupings concerned have a low weight.

Calculation of benchmark value are made in a matrix in spreadsheets. A generic example is shown in Table S5.

Table S5. Spreadsheet showing input for calculating benchmark value for individual labels

	Expert No.1	Expert No. 2	. . .	Expert No. n	Expert Average	Country A				Country B				. . . .	Country N			
						Label No. 1	Label No. 2	. .	Label No. N	Label No. 1	Label No. 2	. .	Label No. N		Label No. 1	Label No. 2	. .	Label No. N
						A1	**A2**		**An**	**B1**	**B2**		**Bn**		**N1**	**N2**		**Nn**
1. Dimension																		
No regulation					V1-1													
Minimun EU regulation					V1-2	X									X			
Low level					V1-3		X			X	X							
.																X		
.													X					X
Highest level					V1-n				X									
Importance					I-1													
2. Dimension																		
No regulation					V2-1													
Minimun EU regulation					V2-2	X	X			X								
Low level					V2-3										X			
.											X					X		
.									X				X					
Highest level					V2-n													X
Importance					I-2													
n. Dimension																		
No regulation					Vn-1													
Minimun EU regulation					Vn-2	X	X			X					X			
Low level					Vn-3													
.											X							
.									X							X		
Highest level					Vn-n								X					X
Importance					I-m													

X illustrate the position and level of animal welfare for each label. V and I weights according to expert assessments. A1 . . .An, B1 . . . Bn and N1 . . . Nn are benchmark values for individual labels in individual countries.

The benchmark value of the total production of a given product in a country is calculated by weighing the market shares of benchmark value of the individual labels. The market shares may be the production and consumption market shares. As estimation of benchmark value for one industry in one country includes more than 220 different numbers from different sources, the model is quite comprehensive. The files are linked and are connected automatically.

Please, find the entire matrix with grades, expert assessments, weights etc. on next page. Enlarge the text to at least 400 percent.

Matrix

Column group headers (top): DK (multiple), D (multiple), S (multiple), UK (multiple), NL (multiple), EU-requirement / Below EU-requirement

	Expert weighted	Expert no. 1 2 3 4	Coefficient Denmark 2,21	Danish Line Gården 1,48	DYRA F1 3,65	DYRA F2 5,51	DYRA F3 3,37	COOP C1 5,15	COOP C2 5,30	COOP C3 6,00	COOP C4 2,69	Friland 2,23	UK Pigs 4,66	Finland 5,06	Danish	Coefficient D 2,07	German law 2,37	Für mehr Tierschutz T1 T2 3,65	Tierwohlkennzeichen Initiative Tierwohl tt1 tt2 2,52 2,52	Haltungs form H1 H2 H3 H4 2,10 2,22 2,69 3,33	Neuland 3,85	EU Organic 5,31	Coefficient S 3,76	Swedish law 3,76	IP Sigill 3,09	John's selection 5,89	Swedish Organic	Coefficient UK 2,05	British common law 2,55	Red tractor 4,00	RSPCA1 5,12	RSPCA2 5,36	RSPCA3 5,36	RSPCA4 5,87	Organic	Coefficient NL 2,31	Dutch Law IKB Varken 2,75	Beter Leven 1 3,92	Beter Leven 2 4,65	Beter Leven 3 5,08	Organic	Coefficient Average 3,96	EU-requirement 1,05	Below EU requirement

1. What score would you give for sow welfare in a production system where the sow is confined for certain periods?

- The sow is confined at all times (does not meet EU requirements) — 0,6
- The sow is loose in the gestation unit (i.e. loose 60% of the time) but confined in the mating and farrowing units (meets EU requirements) — 2,4
- The sow is loose in the mating and gestation units (i.e. loose 80% of the time) but confined in the farrowing unit — 3,4
- The sow is loose at all times except 4-5 days around farrowing — 4,8
- The sow is loose at all times except 2-3 day around farrowing — 5,2
- The sow is loose at all times — 7,6
- The sow is loose at all times and she farrows in huts with outdoor access — 9,6
1. How important is loose-housing for sow welfare? — 4,8

2. What score would you give for sow welfare in a production system with the following space requirements for sows with piglets?
- 3 m² per sow (below the EU norm) — 1
- 3 m² per sow (EU norm) — 2,4
- 6 m² per sow — 4,6
- 7,5 m² per sow — 6
- 10 m² per sow — 7
- 10 m² per sow, with outdoor access — 8,8
2. How important is space in the farrowing unit for sow welfare? — 4,4

3. What score would you give for sow welfare in a production system with the following space requirements for sows in group housing?
- 1.5 m² per sow (does not meet EU requirements) — 0,8
- 2.25 m² per sow (meets EU requirements for groups under 40 sows; the EU standard for groups of over 40 sows is 2.025 m2) — 2,4
- 2.5 m² per sow — 3
- 2.8 m² per sow — 4,2
- 3 m² per sow — 5,2
- 3 m² per sow, with outdoor access — 8
3. How important is space for sow welfare when she is loose in group housing (in mating and gestation units)? — 4,2

4. What score would you give for sow welfare in a production system with the following access to nest-building material?
- Sows are not given any nest-building material (does not meet EU requirements) — 0,4
- The week before farrowing, sows are provided with appropriate nest-building material unless it is technically not possible due ... — 1,8
- The week before farrowing, sows are provided with appropriate nest-building material (no dispensations) — 6,2
- The week before farrowing, sows are provided with plenty of nest-building material (no dispensations) — 8,4
4. How important is nest-building for sow welfare? — 4,4

5. What score would you give for sow welfare in a production system with the following practice for weaning?
- Piglets are weaned after 14 days (does not meet EU requirements) — 4,2
- Piglets are weaned after 21 days (EU requirement is 28 days but special dispensation to 21 days can be given) — 4,8
- Piglets are weaned after 28 days — 5,8
- Piglets are weaned after 30 days — 6,5
- Piglets are weaned after 40 days — 6,25
- Pattegrise fravænnes efter minimum 49 dage — 6
- Piglets are weaned after 70 days — 5,75
5. How important is the weaning age for sow welfare? — 2,2

PIGLETS

6. What score would you give for piglet welfare in a production system where the sow is confined for certain periods with different space requirements?
Piglet welfare when the sow is confined in the farrowing pen:
- With pens of 4 m2 (as per EU norm) — 2
- With pens of 6 m2 — 4,8
- With pens of 7.5 m2 — 6,4
- With pens of 10 m2 — 7,4
How important — 1

7. Piglet welfare when the sow is loose in the farrowing pen, except for 4-5 days after farrowing:
- With pens of 4 m2 (as per EU norm) — 2
- With pens of 6 m2 — 4,8
- With pens of 7.5 m2 — 6,4
- With pens of 10 m2 — 7,4
How important is it for piglet welfare that the sow is loose in the farrowing unit? — 2,6

8. Piglet welfare when the sow is loose in the farrowing pen, except for 2-3 days after farrowing:
- With pens of 4 m2 (as per EU norm) — 1,8
- With pens of 6 m2 — 4,4
- With pens of 7.5 m2 — 6
- With pens of 10 m2 — 7
How important? — 2,6

9. Piglet welfare when the sow is loose in the all times:
- With pens of 4 m2 (as per EU norm) — 0,8
- With pens of 6 m2 — 3,6
- With pens of 7.5 m2 — 5,4
- With pens of 10 m2 — 6,4
- With the sow loose in farrow hut with outdoor access — 9
How important is it for piglet welfare that the sow is loose in the farrowing unit? — 2,6

10. What score would you give for piglet welfare in a production system with the following practice for weaning?
- Piglets are weaned after 14 days (does not meet EU requirements) — 0,6
- Piglets are weaned after 21 days (EU requirement is 28 days but special dispensation to 21 days can be given) (EU requirement... — 3,6
- Piglets are weaned after 30 daysPiglets are weaned after 30 days — 4,4
- Piglets are weaned after 40 days — 6
- Piglets are weaned after 49 days — 7,4
- Piglets are weaned after 70 days — 9
How important is weaning age for piglet welfare? — 4,2

11.What score would you give for piglet welfare in a production system with the following practice for tail docking?
- Piglets are tail docked without pain relief or anaesthesia (does not meet EU requirements) — 1,6
- Until after 4, piglets are tail docked without pain relief. After day 4, piglets that are tail docked receive general pain relief and ... — 2,2
- Piglets are only tail docked with general pain relief and full anaesthesia — 3
- Piglets are not tail docked and there are no requirements to reduce tail biting — 2,2
- Piglets are not tail docked and tail biting is only tolerated to a limited degree — 8
How important are initiatives regarding tail docking for piglet welfare when there is a risk of tail biting if tails are not docked? — 4,6

12. What score would you give for piglet welfare in a production system with the following practice for surgical castration?
- Piglets are surgically castrated without any anesthesia, analgesia or general pain relief (does not meet EU requirements) — 0,2
- Until day 7, piglets are surgically castrated without any anesthesia, analgesia or general pain relief. After day 7, piglets are ca... — 1
- Until day 7, piglets are surgically castrated without any anesthesia, analgesia or general pain relief. After day 7, piglets are ca... — 1,8
- Until day 7, piglets are surgically castrated without anaesthesia but with general pain relief. After day 7, piglets are castrated ... — 2,8
- Piglets are only surgically castrated with local analgesia via an injection and with general pain relief — 4
- Piglets are only castrated with full anaesthesia through inhalation and with general pain relief — 4,8
- Piglets are not castrated — 7,8
How important are initiatives regarding castration for piglet welfare? Note: Include piglet welfare relating to both the castratio... — 3,8

14. What score would you give for pig welfare in a production system with the following space requirements for finisher pigs of 100-110 kg?
- 0.5 m2 per pig (does not meet EU requirements) — 0,6
- 0.65 m2 per pig (meets EU requirements) — 3,4
- 0.85 m2 per pig — 3,4
- 1-m2 per pig — 4,6
- 1.3 m2 per pig — 5,6
- 2 m2 per pig — 6,6
- 2 m2 per pig, with outdoor access — 8,8
How important? — 4,4

15. What score would you give for pig welfare (100-110 kg) in a production system with the following restrictions for slatted floors?
- Fully slatted floors (meets EU requirements) — 2,4
- Slatted floors, max. two thirds of total floor area — 4,2
- Slatted floors, max. half of total floor area — 5,4
- Slatted floors, max. one third of total floor area — 6,4
- No slatted floors — 7,2
15. How important are initiatives to limit slatted flooring for finisher welfare? — 3,4

GENERAL ISSUES

16. What score would you give for pig welfare in a production system with the following practice for bedding?
- No bedding (does not meet EU requirements) — 0,4
- Bedding to be picked from a rack (meets EU requirements) — 2,6
- Bedding on the floor — 5,2
- Plenty of permanent bedding on the floor — 7,8
- Plenty of permanent bedding on the floor and in the lying area — 8,8
16. How important is bedding for pig welfare? — 4,2

17. What score would you give for pig welfare in a production system with the following practice for investigation and manipulation material?
- No material on the floor (does not meet EU requirements) — 0,2
- Manipulation material includes a chain or car tyres (meets EU requirements) — 1,4
- Manipulation material includes a piece of wood — 2,2
- Manipulation material includes a piece of wood or saw dust — 4
- Manipulation material includes straw or sphagnum — 8,2
17. How important is access to investigation and manipulation material for pig welfare? — 4,8

18. What score would you give for pig welfare in a production system with the following practice for keeping animals in pen groups?
- Pigs are mixed in new groups several times during their life (meets EU requirements) — 4
- Pigs are kept in pen groups for the entire production — 8,8
18. How important are pen groups for pig welfare? — 4

19. What score would you give for pig welfare in a production system with the following practice for transport to slaughter?
- The pigs are transported for 24 hours without a break. After 24 hours, the pigs have a break of 24 hours with food and water... — 0,4
- The pigs are transported for 24 hours without a break — 1,8
- The pigs are transported for 8 hours including time in the waiting area — 3,6
- The pigs are transported for 8 hours plus time in the waiting area — 4
- The pigs are transported for 4 hours including time in the waiting area — 4,8
- The pigs are transported for 4 hours including time in the waiting area — 5
- The pigs are not transported (mobile slaughtering units are used) — 9,2
19. How important is transportation time for pig welfare? — 3,6