CORE Organic

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Final Report of WP3

Development and evaluation of a HACCP based surveillance and management system



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For further information see: www.coreorganic.org

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A pdf can be downloaded free of charge from the project website at:
http://www.coreorganic.org/research/projects/corepig/index.html (to be launched 01.09.2011)

CONTENTS

“COREPIG - A tool to prevent diseases and parasites in organic pig herds”

Abstract

Organic farmer repeatedly face problems with suckling piglet mortality, weaning diarrhoea, endoparasites and farrowing/reproduction. These problems are multifactorial, they are caused by many factors whereby the key factors often differ from farm to farm. Thus, it was the aim of the 3rd work package of Corepig to develop a management tool based on the HACCP (hazard analysis critical control points) principle, which can be used by farmers, advisers and veterinarians to solve health problems on organic pig farms.

Several teams of experts for organic pig production including advisers and researchers created four risk assessment protocols, one each for suckling piglet mortality, weaning diarrhoea, endoparasites and farrowing/reproduction problems. As the lists of possible risk factors are long and complex, the assessment protocols were incorporated into semi-automated MS Excel® files. The tools were tested on 32 farms in Austria, Denmark, France and Germany, where risks for the four problem areas could but reduced on 72% of farms. Farmers as well as advisers acknowledged the HACCP based management tools as valuable helps for organic pig production.

The revised tools and their descriptions can be downloaded from the project homepage at http://www.coreorganic.org/research/projects/corepig/index.html (to be launched 01.09.2011).

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Introduction

Suckling piglet mortality, weaning diarrhoea, endoparasites and farrowing/reproduction problems are recurrent problems in (organic) pig production. They are multifactorial problems, meaning they depend on a complex net of causal factors, the combination of which differs from farm to farm. It is therefore often hard to find suitable solutions for these problems, and farm-individual approaches are needed. Thus, it was the aim of the 3rd work package of Corepig to develop management tools based on the HACCP (hazard analysis critical control points) principle, which can be used by farmers, advisers and veterinarians to solve health problems on organic pig farms.

Methods

Preparation

The first step in the development of HACCP based management tools was to collate knowledge on the causation of suckling piglet mortality, weaning diarrhoea, endoparasites and farrowing/ reproduction problems. This was done through a thorough review of the currently available literature and discussions with organic pig production experts (researchers, advisers, veterinarians and farmers).

Draft HACCP based management tools

Based on the collected knowledge four draft HACCP based management tools were developed in France. They consisted of checklists with risk factor evaluations and suggestions for solutions and were applied on 8 farms in France. Four weeks after assessment, farmers were sent a risk factor profile of their farm together with background information on the causal relationships and possible solutions, the implementation of which was then discussed via phone. Farms were re-assessed six to nine months later and feedback from the farmers on the tools collected. In addition, at the 2nd visit all information from both visits was entered in the new, semi-automated version of the tools (see below) and new measures of improvement discussed with the farmers.

Semi-automated HACCP based management tools

The four draft tools were integrated into four semi-automated HACCP based management tools to be applied on farms. The risk factor lists of the draft tools were revised and transferred into Microsoft Excel® files with macro programming in order to facilitate the selection of the most relevant influences on the farm. The relevance of single influences was determined based on the literature review and expert/adviser discussions and coded by weighting risk factors. The layout and programming was based on the "HAT- Tailbiting tool" (Taylor and colleagues, Bristol University, personal communication).

All tools were translated into German, French and Danish and applied in the respective national language. For testing the parasite tool in Austria and Germany outdoor farms were selected, because indoor farms had low parasite prevalences. All other farms were selected among those visited for WP2, from other national projects or were suggested by advisors, based on whether they had a problem with one of the topics addressed by the tools and whether they were willing to participate. The tool to be applied was chosen according to the main problem on the farm.

The tools were tested and implemented on 24 farms in three countries (see table) using the following procedure:

- 1st farm visit: farm assessment, printing of farm specific report, discussion of report with farmer and determination of what to improve and how. For endoparasites tool: collection of faecal samples.
- 2nd farm visit, approximately six months later: Repeat of 1st visit plus opinion questionnaires on the tool as well as on improvement measures suggested at 1st farm visit. In France, the semi-automated tools were applied at the 2nd farm visit. For endoparasites tool: collection of faecal samples.

Table 1: Overview of numbers of farms where tools were applied in the partner countries:

tool topic	AT	DE	DK	FR [a]	total
parasites	2	2	0	3	7
weaning diarrhoea	2	2	3	4	11
piglet mortality	2	2	2	5	11
reproduction and farrowing problems	2	2	3	4	11
N tools applied per farm	1	1	1	2	1 to 2
total N farms visited	8	8	8	8	32

[a] France applied a draft tool at first visits and the draft and project-level tools at second visits

Results

All results will be presented on international level, as the aim of Corepig was to find solutions on an EC-level rather than for single EC countries. In addition, the number of farms used for testing the HACCP based management tools was not large enough to allow representative conclusions by country. French results will be presented separately as the procedure applied in France was slightly different.

Tool effectiveness

Tools were evaluated by comparing the risk situation on the farms at the 1st and 2nd visit by summarising all risk factor weights in a risk score. The higher the risk score, the higher the risk for a problem, hence if the risk score was reduced from 1st to 2nd visit the risk for the problem addressed was reduced by the implementation of improvements suggested by the tool.

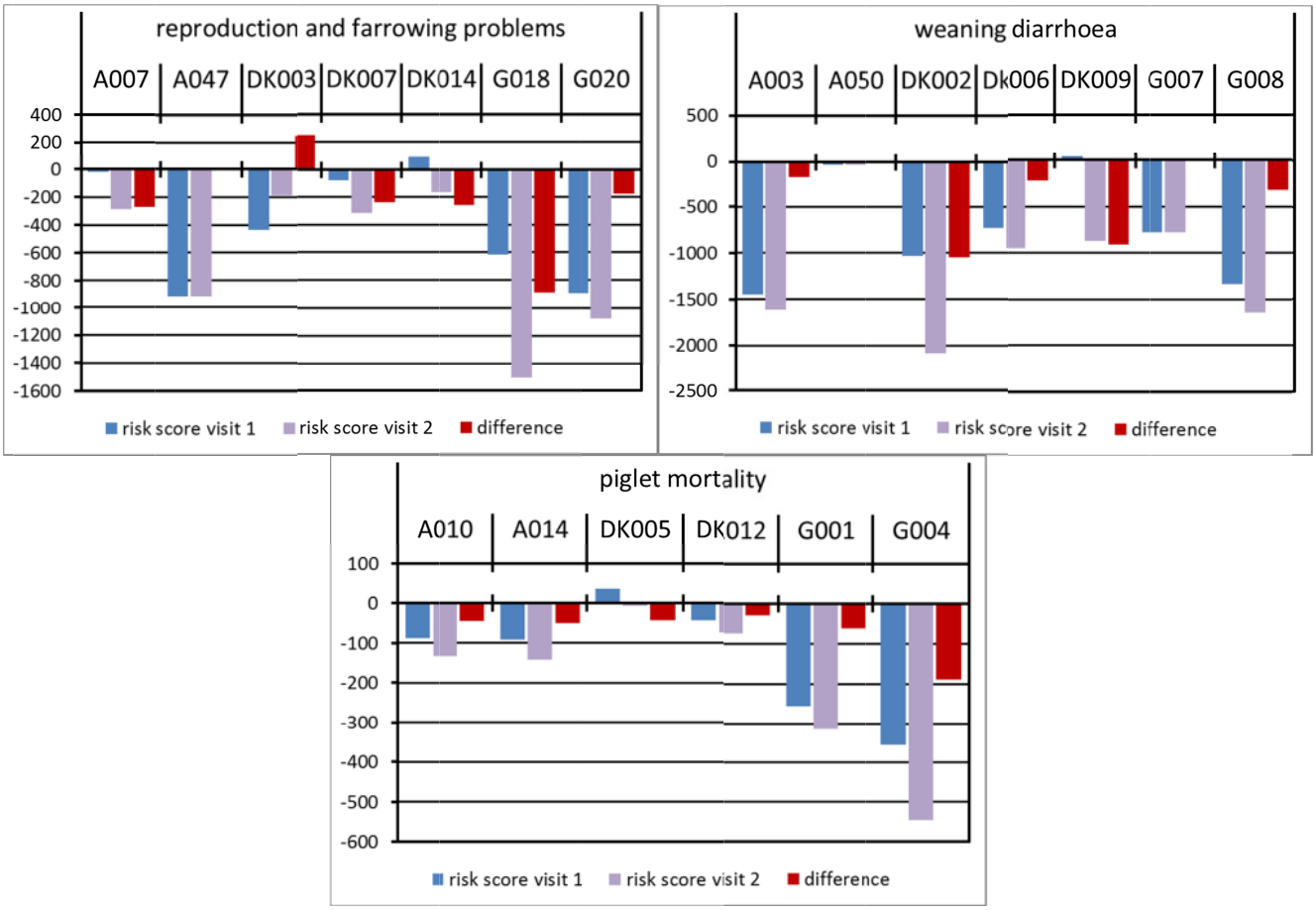


Fig. 1: Changes of farm risk scores for reproduction and farrowing problems, weaning diarrhoea and suckling piglet mortality on 20 **Austrian, Danish and German farms**. Red column show the difference between risk score at the 1st farm visit (blue) and the 2nd farm visit (violet). If the difference is negative, risk has been reduced on the farm. There were no parasite problems on farms visited.

In France, where two (draft) tools were applied per farm, risk scores for the outcome addressed could be reduced from 1st to 2nd visit in 10 out of 16 cases, were not changed in 4 cases and in 2 cases the risk scores increased. In Austria, Denmark and Germany one tool was applied per farm and risk scores could be reduced on 16 out of 20 farms by the application of the HACCP based management tools. Risk scores did not change on 3 farms and increased on 1 farm (**fig. 1**).
None of the 4 Austrian and German farms visited with the parasite tool had a problem with parasites and thus no measures from the tool were implemented. However, the HACCP based management tool was also applied on those farms twice in order to identify and monitor the situation.

Tool evaluation by farmers

The participating farmers completed an evaluation questionnaire which contained questions regarding the tool in general as well as questions about the implementation of improvements suggested by the tool (Appendix II).
In general, farmers (n = 24) regarded the tool as a useful help for farm management. They rated the layout and content of the farm report at 6.5 out of 10 points (**table 2**). Even though most of the factors listed were known to farmers they used information from both, the list with suggested improvements (negative list) as well as the list of measures which are already being implemented on the farm (positive list). Farmers could mostly see the tool to be applied a production adviser, with or without assistance by the farmer.

Table 2: Evaluation results for tool in general from **Austria, Denmark and Germany** (24 farms).

question	possible answers	N answers	% of answers median (min / max)
How valuable was the graphic summary as a whole?	1 (no value), …, 10 (very valuable)	15	7 (1 to 10)
How valuable was the negative list as a whole?	1 (no value), …, 10 (very valuable)	23	6 (1 to 10)
How valuable was the positive list as a whole?	1 (no value), …, 10 (very valuable)	23	7 (1 to 10)
Did the positive list provide any useful information concerning management of the problem?	1 (little), …, 10 (much)	23	6 (1 to 10)
Did you discuss the positive list with employees or advisers during the implementation process?	1. Employees 2. Adviser 3. None	22	1: 32 % 2: 14 % 3: 55 %
Did you include items from the positive list in implementing the action plans?	yes/no	21	yes: 48 % no: 52 %
Did the lists point to any risk factors that surprised you:	1. No 2. Yes -which risk factors?	23	yes: 17 % no: 83 %
Would you appreciate completing the questionnaire and check list regularly e.g. 1-2 times a year to monitor your risk profile and adjust your actions?	1. Yes if I can do it myself 2. Yes if the adviser has got the tool 3. No, only in case of problems 4. No it is not relevant in my herd	25	1: 36 % 2: 28 % 3: 16 % 4: 4 %
In the future how do you reckon the tool could be used?	1. Questionnaire and check list on Internet completed by farmer himself/herself and actions implemented without advisory assistance 2. Completed by farmer and actions discussed with adviser 3. Tool used by production adviser 4. Tool used by vet	32	1: 9 % 2: 31 % 3: 28 % 4: 3 %

The biggest obstacle for implementing suggested improvements were housing constraints (27 % of non-implemented solutions; **fig. 2**), meaning the improvement could only have been implemented by changing the housing environment on a larger scale. Other reasons for non-implementation

included having already tried the solutions but without success, or willing to implement it but not being able to do it at the time.

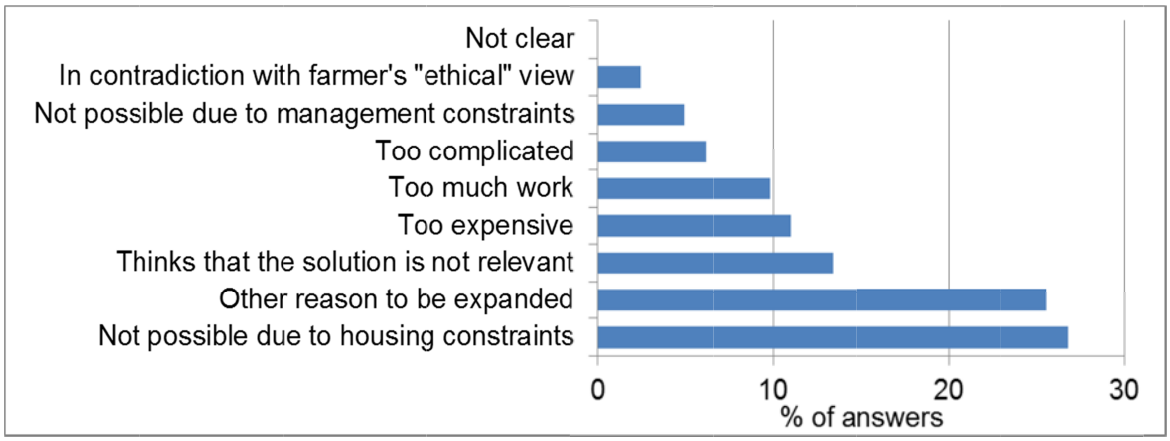


Fig. 2: Reasons given by farmers in **Austria, Denmark and Germany** why they did not implement a solution suggested by the tool (28 farms).

Farmers generally understood the content and reasoning of solutions (action plans) suggested by the tool, yet their motivation for implementation depended on single solutions (**table 3**, next page). The solutions which were implemented fitted fairly well into the work schedules, especially as most implemented solutions cost less than 1 extra hour of work per day. However, several solutions were not feasible, mostly due to housing constraints (see above). 52 % of solutions were not carried out through the trial period and farmers were medium satisfied with the effect of the solutions. Regarding the latter, the 6-month short trial period as well as compliance should be taken into account. 55 % of the implemented solutions will be carried on after the trial.
Evaluation results differed somewhat between tools, especially regarding the value of the farm report (positive list, negative list, graphical overview) for which the reproduction and farrowing tool was ranked highest (**fig. 3**, next page). Nevertheless, due to the relatively small sample size of 6 to 7 farms per tool (4 for parasites) single ratings can have strong influence. None of the farms assessed with the parasite tool had problems with endoparasites and thus no solutions were suggested or implemented.

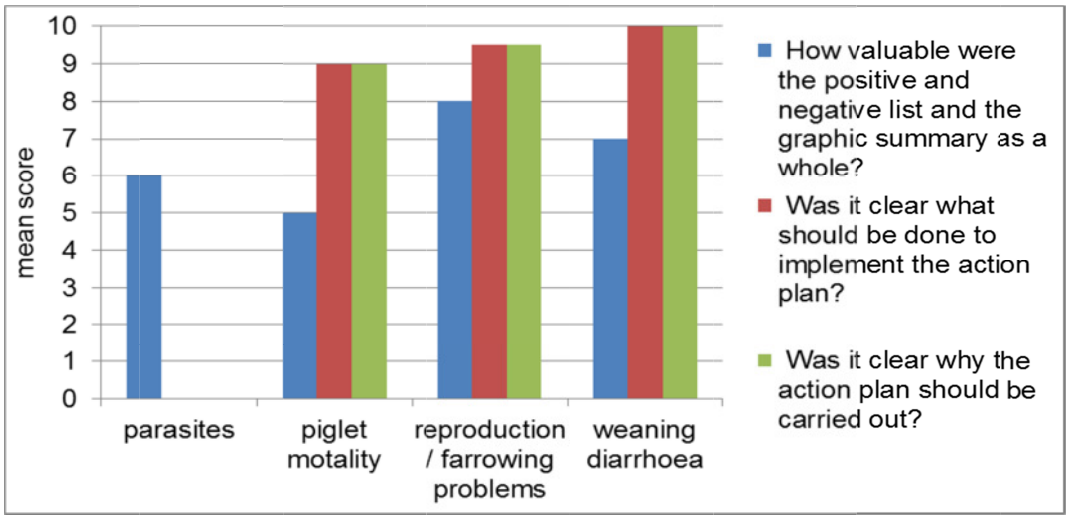


Fig. 3: Evaluation by tool: Answers were given on a scale from 1 (not valuable / not clear) to 10 (very valuable / very clear; mean scores) (data from **Austria, Denmark and Germany**, 24 farms). Parasite farms did not have a problem with parasites and therefore were not suggested improvements.

In France, where draft tools had been applied at the 1st and the semi-automated tools at the 2nd visit, farmers valued the farm reports higher (**fig. 4**), maybe because they had the 1st assessment to compare it against. In general, French farmers also regarded the tools as a useful help for farm management (**fig. 4**).

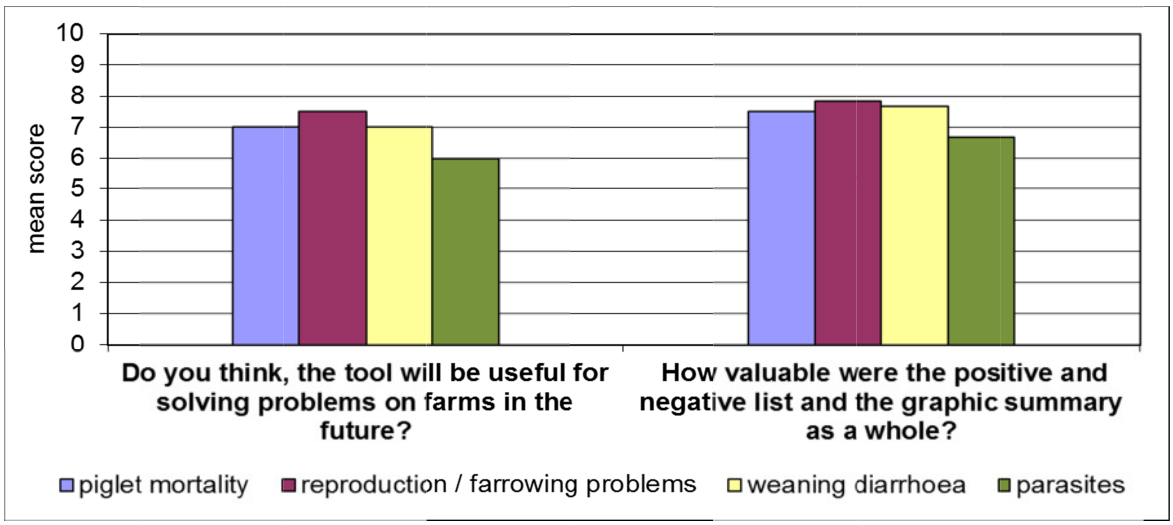


Fig. 4: Tool evaluation by **French farmers** (n = 8). In France, draft tools were applied at 1st visit and the semi-automated tools at 2nd visit. Answers were given on a scale from 1 (not valuable) to 10 (very valuable).

Table 3: Evaluation of suggested solutions (28 farms in **Austria, Denmark and Germany**; numbers of solutions rated given in in column N).

question	possible answers	N answers	% of answers median (min to max)
Was it clear what should be done to implement the action plan?	1 (not clear), …, 10 (very clear)	38	9.7 (4 to 10)
Was it clear why the action plan should be carried out?	1 (not clear), …, 10 (very clear)	38	9.6 (7 to 10)
Was the action plan carried out the whole trial period?	yes/no	36	yes: 48 % no: 52 %
Was the action plan easy feasible on your farm?	1 (not easy), …, 10 (very easy)	36	5.4 (1 to 10)
Was the action plan easy to respect?	1 (not easy), …, 10 (very easy)	38	5.6 (1 to 10)
How did the action plan fit in your daily/weekly/ monthly work schedules?	1 (bad), …, 10 (good)	37	7.1 (1 to 10)
How did you instruct your employees?	1. Discussed the action plan and put into work plan 2. Put into work plan 3. Put it into a notebook 4. Carried out the action plan myself 5. Something else	38	1: 13 % 2: 0 % 3: 0 % 4: 44 %
How motivated were you to implement this action plan?	1 (little), …, 10 (much)	38	7.6 (1 to 10)
How much extra work did the action plan cost?	1. < 1 hour a day 2. > 1 hour a day 3. < 1 hour a week 4. >1 hour a week	28	1: 43 % 2: 0 % 3: 31 % 4: 26 %
Are you satisfied with the effect of the action plan?	1 (not at all), …, 10 (very)	29	6.3 (1 to 10)
Will you still conduct the action plan when the trial period ends?	yes/no	33	yes: 55 % no: 45 %
Did you consult your advisers during the implementation process?	1. Did it myself without consulting an adviser 2. Did it after consulting an adviser 3. My adviser implemented it 4. Something else	38	1: 90 % 2: 0 % 3: 0 % 4: 10 %
Would an adviser visit improve the implementation process?	1 (little), …, 10 (much)	30	1 (1 to 6)

Many farmers in Austria, Denmark and Germany would be willing to apply the HACCP based management tools regularly if they were assisted by an adviser (**fig. 5**). This is also reflected in the answers given to who should apply the tools in the future (**fig. 6**).
French farmers were even more motivated than farmers in Austria, Denmark and Germany to apply the tool in the future or to apply it without external assistance (**fig. 7 a + b**).

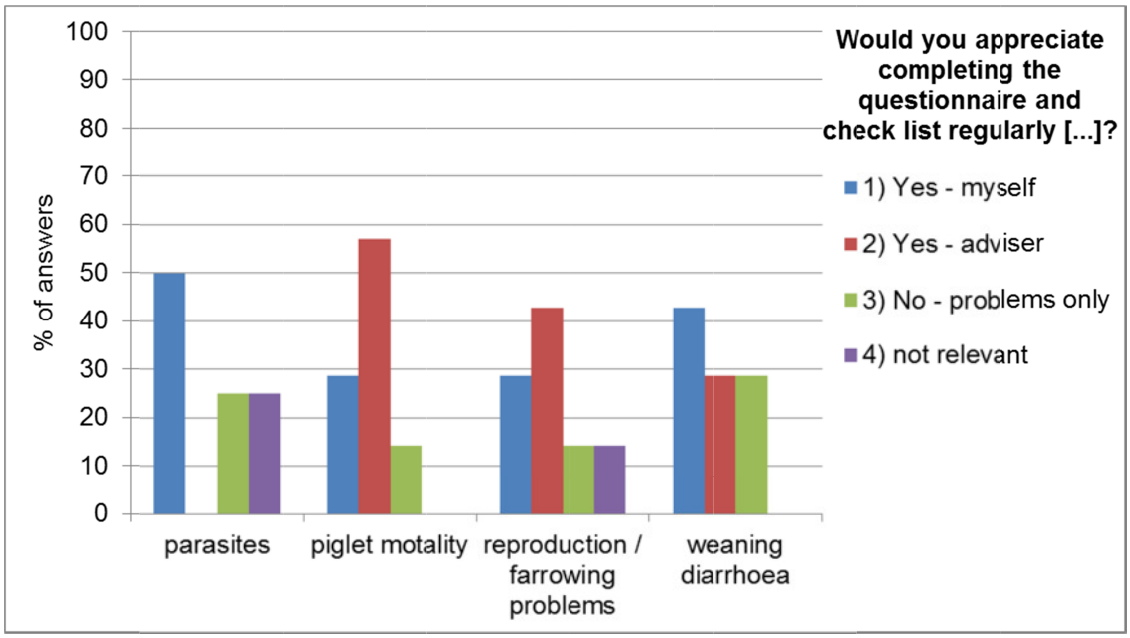


Fig. 5: Farmer opinion on "Would you appreciate completing the questionnaire and check list regularly e.g. 1-2 times a year to monitor your risk profile and adjust your actions?" (data from **Austria, Denmark and Germany**, 24 farms). Possible answers were: 1) Yes if I can do it myself, 2) Yes if the adviser has got the tool, 3) No, only in case of problems, 4) No, it is not relevant in my herd (multiple answers possible).

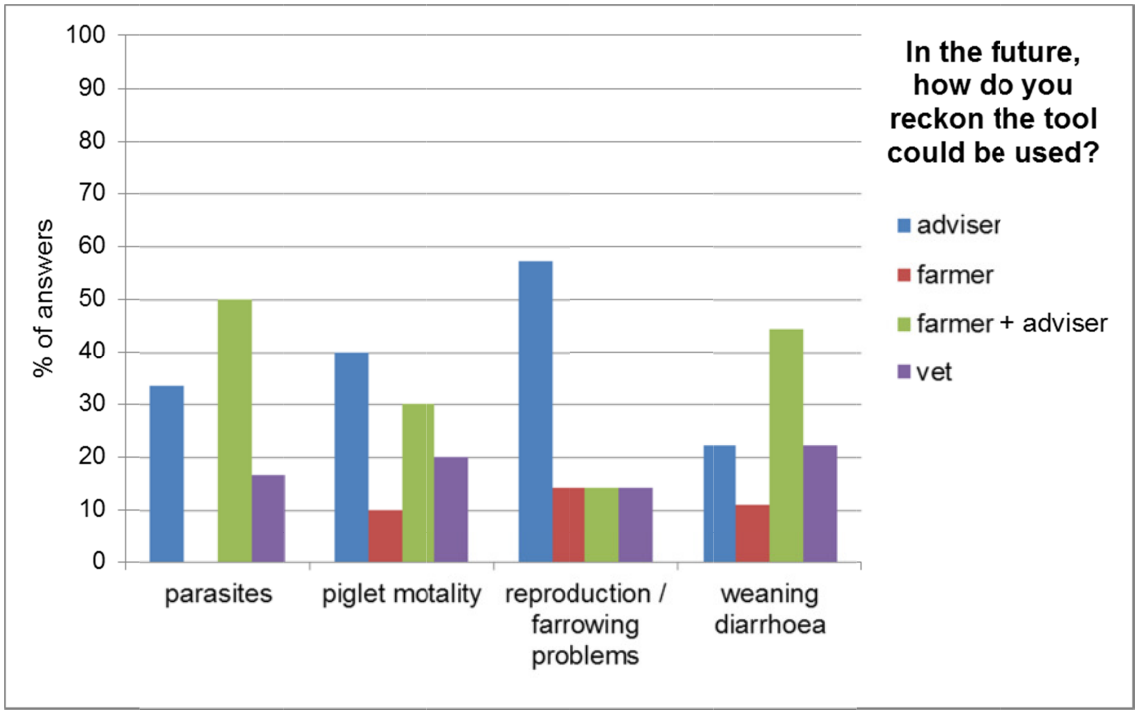
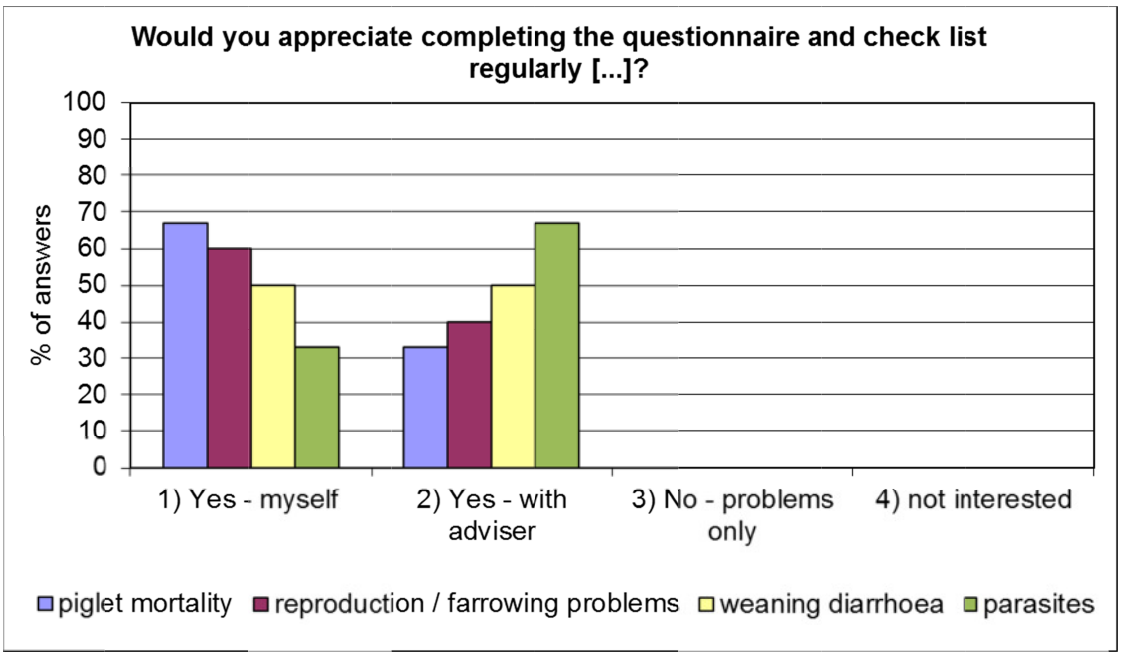


Fig. 6: Farmer opinion on which persons should apply the HACCP tool in the future by tool (data from **Austria, Denmark and Germany**, 24 farms; multiple answers possible).

a)



b)

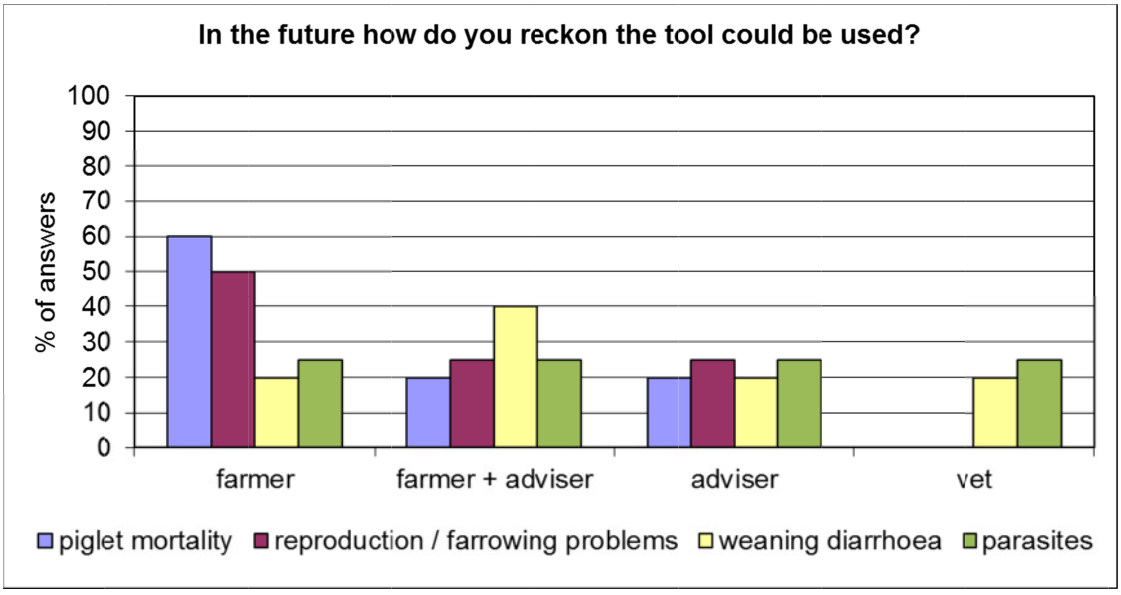


Fig. 7 a + b: Future use of the HACCP based management tools as assessed by 8 **French farmers** (multiple answers possible).

Tool evaluation by advisers

The project-level tools were demonstrated to local organic pig advisers in Austria, Denmark, Germany and France in seminars. In addition, selected advisers in all four countries were introduced to the Piglet Mortality tool in workshops. Advisers were asked to list the in their opinion most important risk factors for piglet mortality and rank a selection of risk factors for piglet mortality used in the tool. Additionally they were encouraged to use the tool themselves and thereafter complete an opinion questionnaire on the tools in general (appendix III).

Like the farmers, advisors generally acknowledged the HACCP based management tools as useful tools for organic pig production. The positive and negative list included in the HACCP based tools was regarded as a good starting point for discussion with the farmer. The advisors suggested that the tool should be further developed to include only country specific aspects and that solution proposals could benefit from cost-benefit-analyses.

Publishable HACCP based management tools

All suggestions by farmers, advisers and researchers who applied the tools were collected and used to revise the tools. The revised for improving problems with piglet mortality, reproduction / farrowing problems, weaning diarrhoea or endoparasites can be downloaded

- in English: http://dl.dropbox.com/u/9437274/HACCP-tools_EN.zip
- in German: http://dl.dropbox.com/u/9437274/HACCP-tools_DE.zip
- in French: http://dl.dropbox.com/u/9437274/HACCP-tools_FR.zip.

The tools for weaning diarrhoea and reproductive problems were additionally revised by the French partners INRA and IBB (funded nationally) and are available in French at http://www.interbiobretagne.asso.fr/elevage-2-45.html#corepig (http://www.interbiobretagne.asso.fr/upload/File/Recherche/Elevage/Corepig/Corepig_Outil_Diarrhees_PS_1_0.xls, http://www.interbiobretagne.asso.fr/upload/File/Recherche/Elevage/Corepig/Corepig_Outil_Fertilite_1_0.xls).

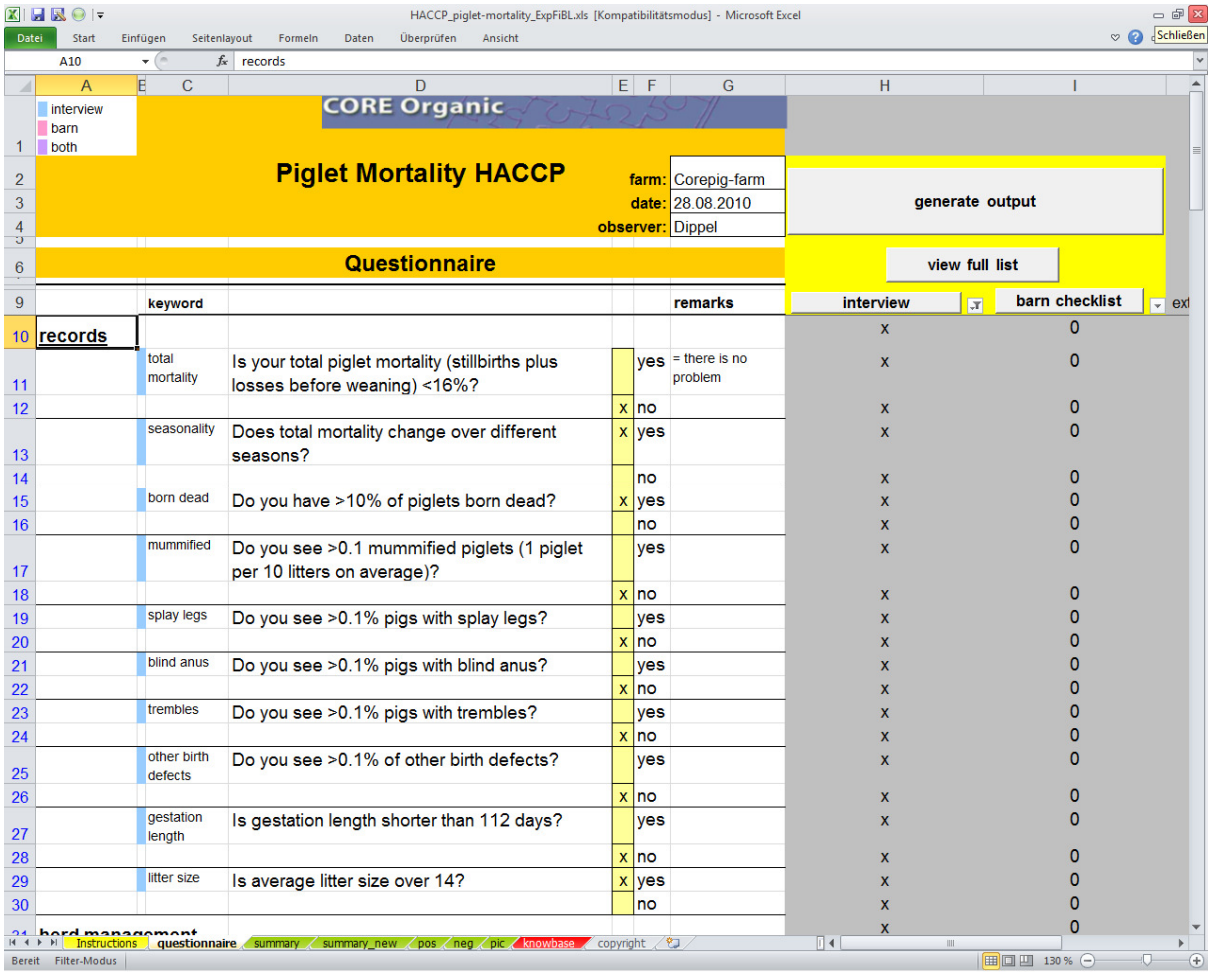
Each tool consists of three parts: 1) a questionnaire for the farmer, 2) a check list to be used in the barn and 3) the farm specific report. An information sheet is available for each of the four tools at http://www.coreorganic.org/research/projects/corepig/index.html (to be launched 01.09.2011).

Appendix I: Case farm

This section demonstrates the HACCP based management tool for piglet mortality by going through the application process on a fictional farm. We recommend that the tools be applied by the farmer together with an adviser or veterinarian in order to include the “fresh eye” of an outsider. The tool comes as a Microsoft Excel® file, which starts with a page with instructions. The procedure starts with an interview, continues with a housing inspection and finishes with the generation and discussion of the farm specific report. The structure is identical for all tools (piglet mortality, reproduction / farrowing problems, weaning diarrhoea and endoparasites) and will be demonstrated here for piglet mortality.

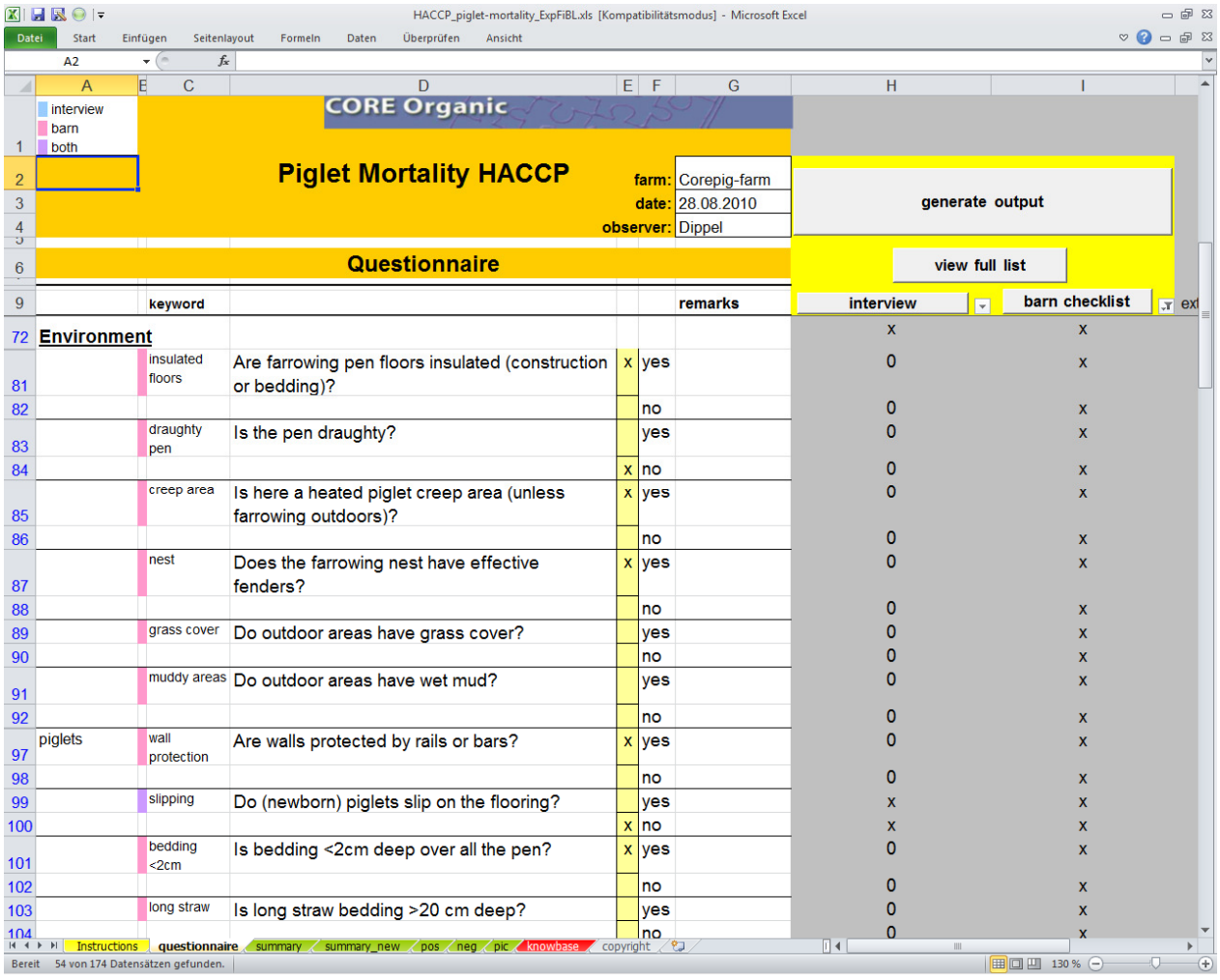
Farmer interview

The farmer (or manager of the relevant section) is interviewed in order to collect background and management information. The questions for the farmer are selected by pressing the macro button “interview”. Questions can be printed out or be answered directly on the computer.



Housing checklist

The next step is an inspection of the animal's environment with a prepared list of questions. The list is generated by pressing the button "barn checklist".



HACCP_piglet-mortality_ExpFiBL.xls [Kompatibilitätsmodus] - Microsoft Excel

interview
barn
both

CORE Organic

Piglet Mortality HACCP

farm: Corepig-farm
date: 28.08.2010
observer: Dippel

generate output

view full list

Questionnaire

		keyword				remarks	interview	barn checklist
72	**Environment**						x	x
81		insulated floors	Are farrowing pen floors insulated (construction or bedding)?	x	yes		0	x
82					no		0	x
83		draughty pen	Is the pen draughty?		yes		0	x
84				x	no		0	x
85		creep area	Is here a heated piglet creep area (unless farrowing outdoors)?	x	yes		0	x
86					no		0	x
87		nest	Does the farrowing nest have effective fenders?	x	yes		0	x
88					no		0	x
89		grass cover	Do outdoor areas have grass cover?		yes		0	x
90					no		0	x
91		muddy areas	Do outdoor areas have wet mud?		yes		0	x
92					no		0	x
97	piglets	wall protection	Are walls protected by rails or bars?	x	yes		0	x
98					no		0	x
99		slipping	Do (newborn) piglets slip on the flooring?		yes		x	x
100				x	no		x	x
101		bedding <2cm	Is bedding <2cm deep over all the pen?	x	yes		0	x
102					no		0	x
103		long straw	Is long straw bedding >20 cm deep?		yes		0	x
104					no		0	x

Instructions | questionnaire | summary | summary_new | pos | neg | pic | knowbase | copyright

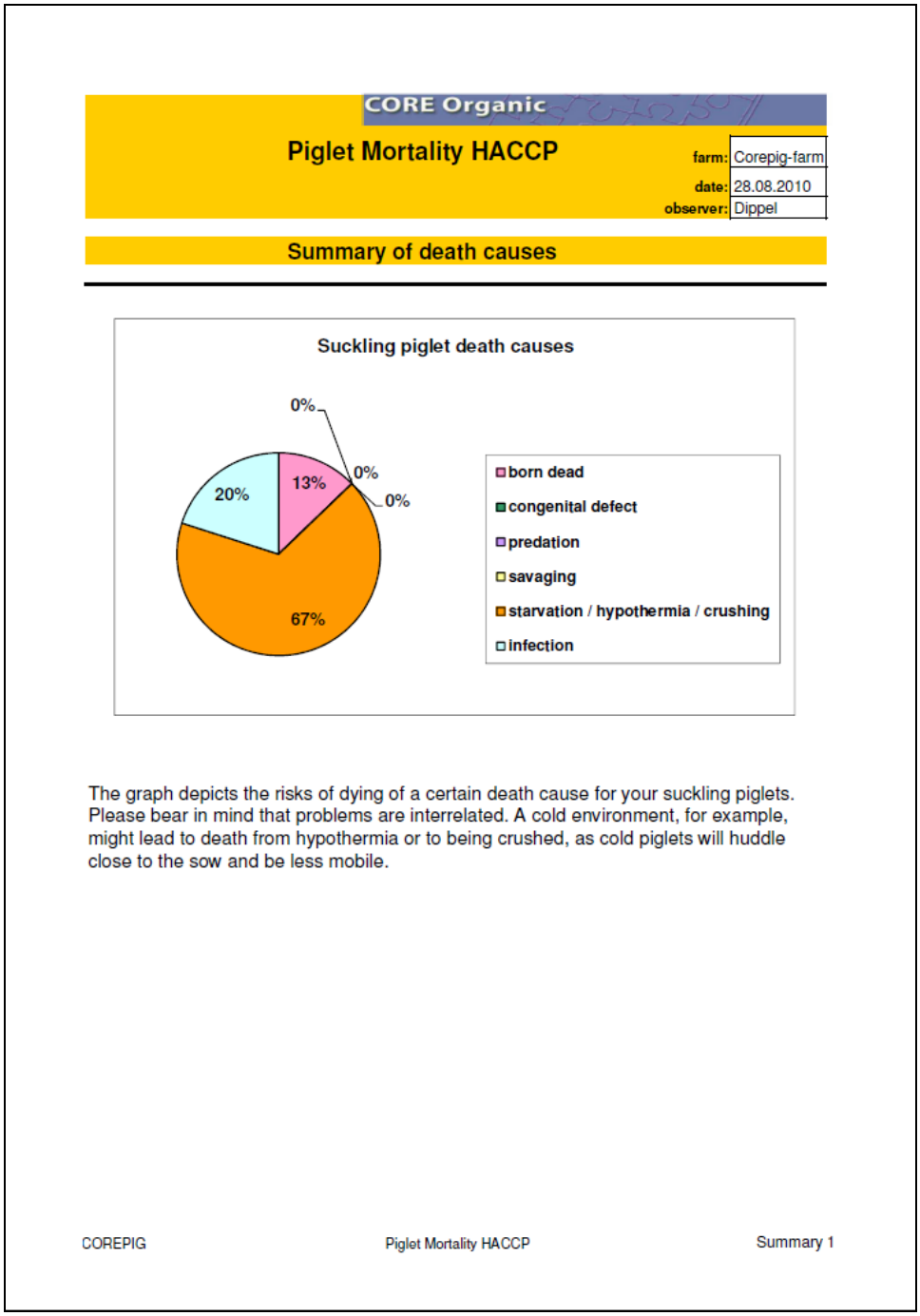
Bereit 54 von 174 Datensätzen gefunden. 130 %

Farm report

All information from interview and housing checklist is integrated into a farm specific report, which is generated by pressing the macro button “generate output”. The report consists of four parts: a) a summary of potential death causes, b) a list of preventive actions already being taken on the farm, c) a graphical overview of the risk situation for piglet mortality on this farm, and d) a list of high impact risks which are prevalent on the farm and should be changed.

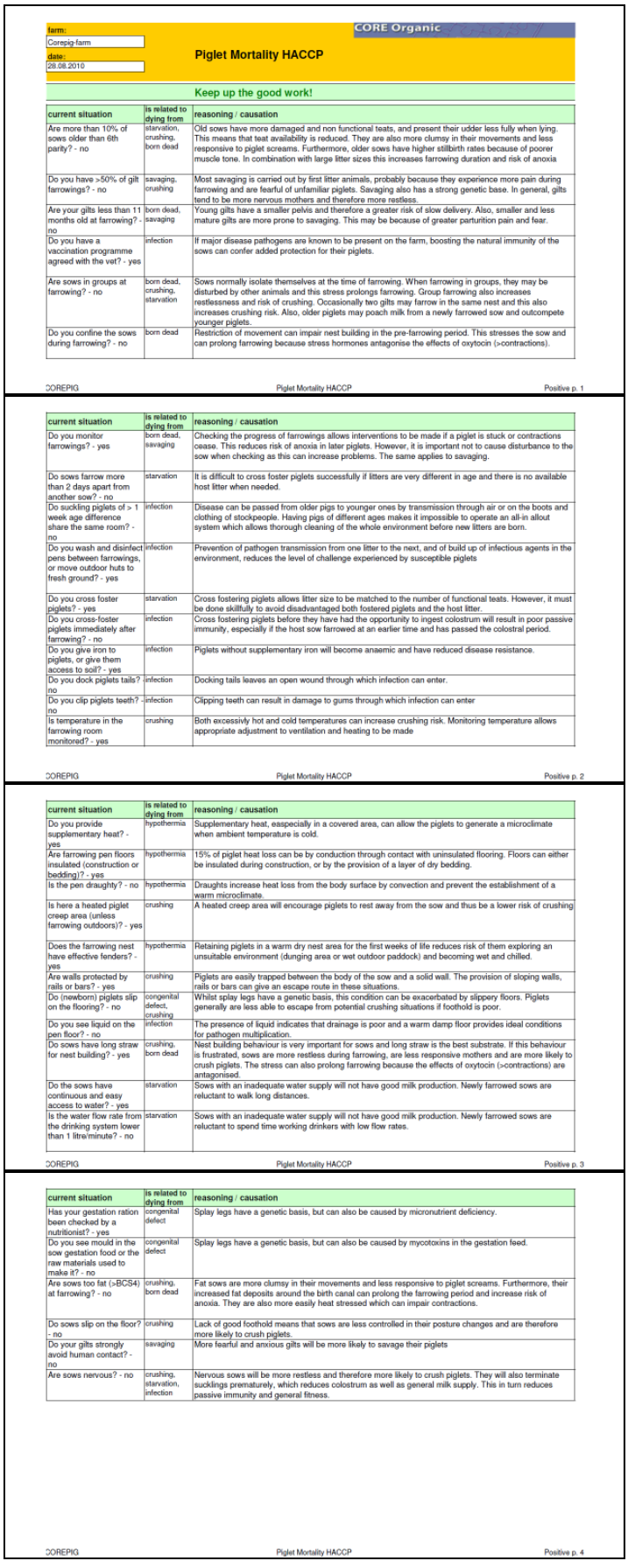
a) Summary of potential death causes

The graph depicts the potential causes for suckling piglet death based on the risk assessment. It serves as an orientation for finding the main problem area.
On this farm most suckling piglets will probably die of starvation/hypothermia/crushing, three causes which are linked with each other (e.g. if there is lack of milk piglets will become weak and thus be crushed more easily and also lack energy to produce warmth).



b) List of preventive actions already being taken on the farm

Next follows a list of measures already being applied on the farm which contribute to preventing suckling piglet mortality by alleviating or eliminating risk factors. The list contains the measures together with an explanation of the causal relationships with piglet mortality.



CORE Organic

farm: Corepig-farm

date: 28.08.2010

Piglet Mortality HACCP

Keep up the good work!

current situation	is related to dying from	reasoning / causation
Are more than 10% of sows older than 6th parity? - no	starvation, crushing, born dead	Old sows have more damaged and non functional teats, and present their udder less fully when lying. This means that teat availability is reduced. They are also more clumsy in their movements and less responsive to piglet screams. Furthermore, older sows have higher stillbirth rates because of poorer muscle tone. In combination with large litter sizes this increases farrowing duration and risk of anoxia
Do you have >50% of gilt farrowings? - no	savaging, crushing	Most savaging is carried out by first litter animals, probably because they experience more pain during farrowing and are fearful of unfamiliar piglets. Savaging also has a strong genetic base. In general, gilts tend to be more nervous mothers and therefore more restless.
Are your gilts less than 11 months old at farrowing? - no	born dead, savaging	Young gilts have a smaller pelvis and therefore a greater risk of slow delivery. Also, smaller and less mature gilts are more prone to savaging. This may be because of greater parturition pain and fear.
Do you have a vaccination programme agreed with the vet? - yes	infection	If major disease pathogens are known to be present on the farm, boosting the natural immunity of the sows can confer added protection for their piglets.
Are sows in groups at farrowing? - no	born dead, crushing, starvation	Sows normally isolate themselves at the time of farrowing. When farrowing in groups, they may be disturbed by other animals and this stress prolongs farrowing. Group farrowing also increases restlessness and risk of crushing. Occasionally two gilts may farrow in the same nest and this also increases crushing risk. Also, older piglets may poach milk from a newly farrowed sow and outcompete younger piglets.
Do you confine the sows during farrowing? - no	born dead	Restriction of movement can impair nest building in the pre-farrowing period. This stresses the sow and can prolong farrowing because stress hormones antagonise the effects of oxytocin (>contractions).

COREPIG Piglet Mortality HACCP Positive p. 1

current situation	is related to dying from	reasoning / causation
Do you monitor farrowings? - yes	born dead, savaging	Checking the progress of farrowings allows interventions to be made if a piglet is stuck or contractions cease. This reduces risk of anoxia in later piglets. However, it is important not to cause disturbance to the sow when checking as this can increase problems. The same applies to savaging.
Do sows farrow more than 2 days apart from another sow? - no	starvation	It is difficult to cross foster piglets successfully if litters are very different in age and there is no available host litter when needed.
Do suckling piglets of > 1 week age difference share the same room? - no	infection	Disease can be passed from older pigs to younger ones by transmission through air or on the boots and clothing of stockpeople. Having pigs of different ages makes it impossible to operate an all-in allout system which allows thorough cleaning of the whole environment before new litters are born.
Do you wash and disinfect pens between farrowings, or move outdoor huts to fresh ground? - yes	infection	Prevention of pathogen transmission from one litter to the next, and of build up of infectious agents in the environment, reduces the level of challenge experienced by susceptible piglets
Do you cross foster piglets? - yes	starvation	Cross fostering piglets allows litter size to be matched to the number of functional teats. However, it must be done skillfully to avoid disadvantaged both fostered piglets and the host litter.
Do you cross-foster piglets immediately after farrowing? - no	infection	Cross fostering piglets before they have had the opportunity to ingest colostrum will result in poor passive immunity, especially if the host sow farrowed at an earlier time and has passed the colostral period.
Do you give iron to piglets, or give them access to soil? - yes	infection	Piglets without supplementary iron will become anaemic and have reduced disease resistance.
Do you dock piglets tails? - no	infection	Docking tails leaves an open wound through which infection can enter.
Do you clip piglets teeth? - no	infection	Clipping teeth can result in damage to gums through which infection can enter
Is temperature in the farrowing room monitored? - yes	crushing	Both excessivly hot and cold temperatures can increase crushing risk. Monitoring temperature allows appropriate adjustment to ventilation and heating to be made

COREPIG Piglet Mortality HACCP Positive p. 2

current situation	is related to dying from	reasoning / causation
Do you provide supplementary heat? - yes	hypothermia	Supplementary heat, easpecially in a covered area, can allow the piglets to generate a microclimate when ambient temperature is cold.
Are farrowing pen floors insulated (construction or bedding)? - yes	hypothermia	15% of piglet heat loss can be by conduction through contact with uninsulated flooring. Floors can either be insulated during construction, or by the provision of a layer of dry bedding.
Is the pen draughty? - no	hypothermia	Draughts increase heat loss from the body surface by convection and prevent the establishment of a warm microclimate.
Is here a heated piglet creep area (unless farrowing outdoors)? - yes	crushing	A heated creep area will encourage piglets to rest away from the sow and thus be a lower risk of crushing
Does the farrowing nest have effective fenders? - yes	hypothermia	Retaining piglets in a warm dry nest area for the first weeks of life reduces risk of them exploring an unsuitable environment (dunging area or wet outdoor paddock) and becoming wet and chilled.
Are walls protected by rails or bars? - yes	crushing	Piglets are easily trapped between the body of the sow and a solid wall. The provision of sloping walls, rails or bars can give an escape route in these situations.
Do (newborn) piglets slip on the flooring? - no	congenital defect, crushing	Whilst splay legs have a genetic basis, this condition can be exacerbated by slippery floors. Piglets generally are less able to escape from potential crushing situations if foothold is poor.
Do you see liquid on the pen floor? - no	infection	The presence of liquid indicates that drainage is poor and a warm damp floor provides ideal conditions for pathogen multiplication.
Do sows have long straw for nest building? - yes	crushing, born dead	Nest building behaviour is very important for sows and long straw is the best substrate. If this behaviour is frustrated, sows are more restless during farrowing, are less responsive mothers and are more likely to crush piglets. The stress can also prolong farrowing because the effects of oxytocin (>contractions) are antagonised.
Do the sows have continuous and easy access to water? - yes	starvation	Sows with an inadequate water supply will not have good milk production. Newly farrowed sows are reluctant to walk long distances.
Is the water flow rate from the drinking system lower than 1 litre/minute? - no	starvation	Sows with an inadequate water supply will not have good milk production. Newly farrowed sows are reluctant to spend time working drinkers with low flow rates.

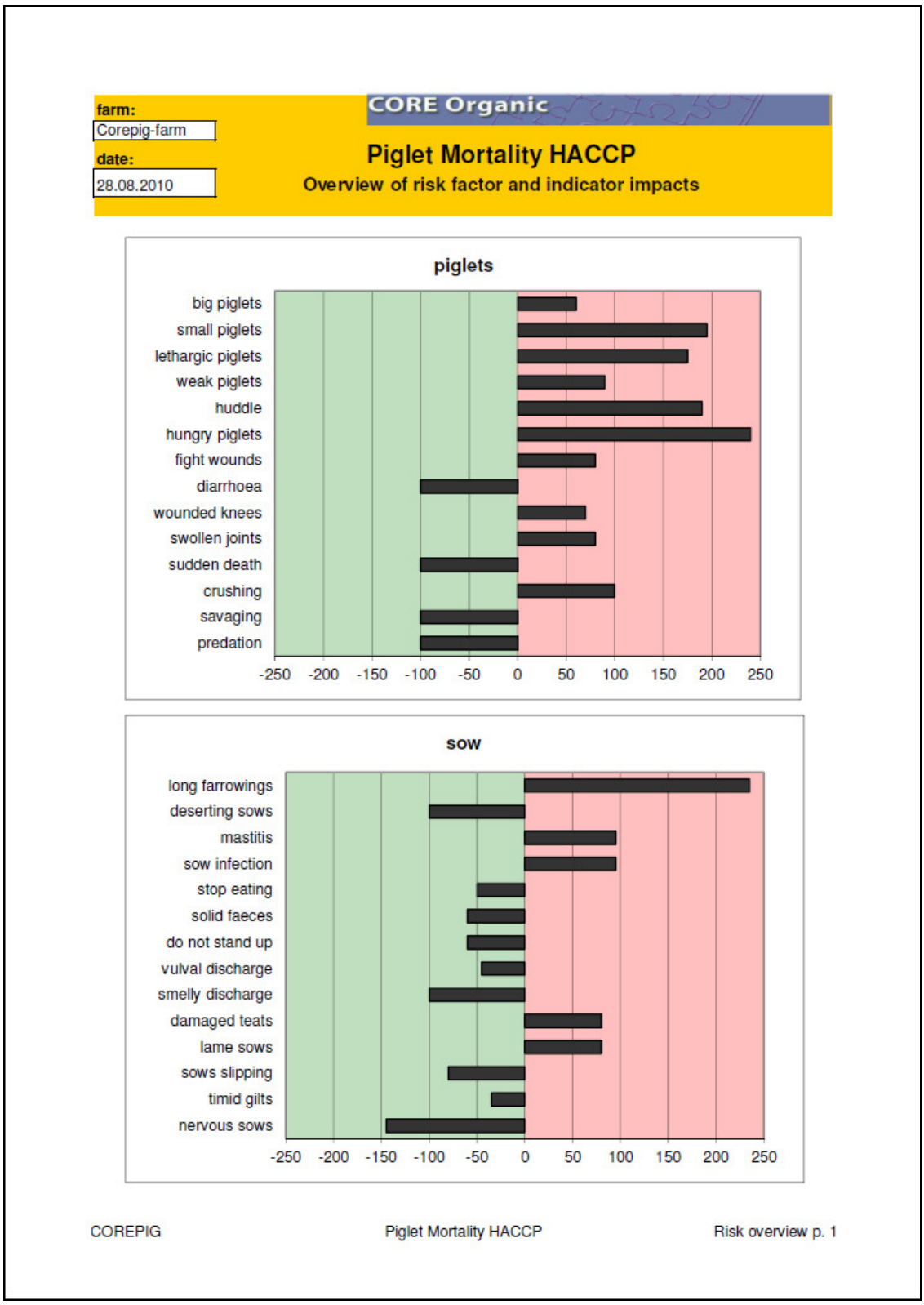
COREPIG Piglet Mortality HACCP Positive p. 3

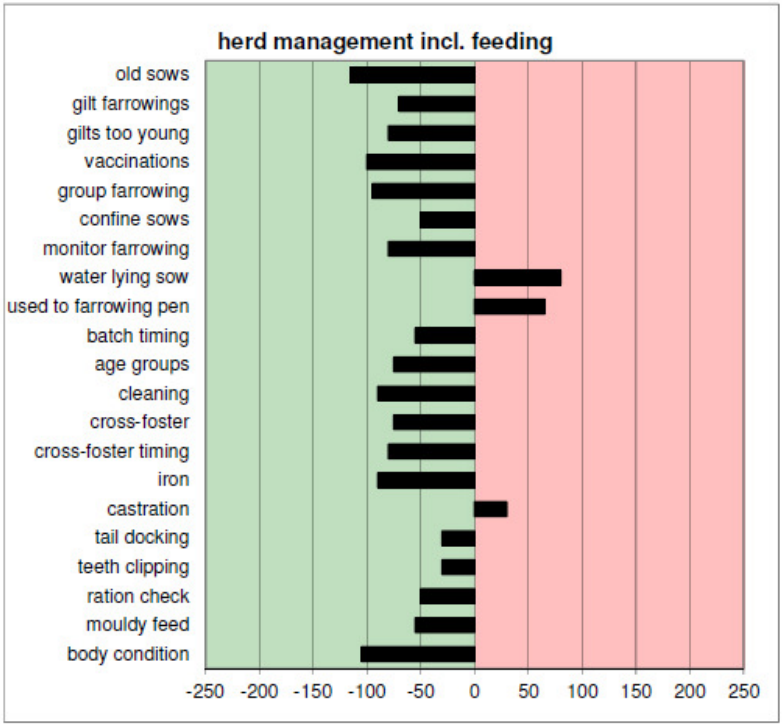
current situation	is related to dying from	reasoning / causation
Has your gestation ration been checked by a nutritionist? - yes	congenital defect	Splay legs have a genetic basis, but can also be caused by micronutrient deficiency.
Do you see mould in the sow gestation food or the raw materials used to make it? - no	congenital defect	Splay legs have a genetic basis, but can also be caused by mycotoxins in the gestation feed.
Are sows too fat (>BCS4) at farrowing? - no	crushing, born dead	Fat sows are more clumsy in their movements and less responsive to piglet screams. Furthermore, their increased fat deposits around the birth canal can prolong the farrowing period and increase risk of anoxia. They are also more easily heat stressed which can impair contractions.
Do sows slip on the floor? - no	crushing	Lack of good foothold means that sows are less controlled in their posture changes and are therefore more likely to crush piglets.
Do your gilts strongly avoid human contact? - no	savaging	More fearful and anxious gilts will be more likely to savage their piglets
Are sows nervous? - no	crushing, starvation, infection	Nervous sows will be more restless and therefore more likely to crush piglets. They will also terminate sucklings prematurely, which reduces colostrum as well as general milk supply. This in turn reduces passive immunity and general fitness.

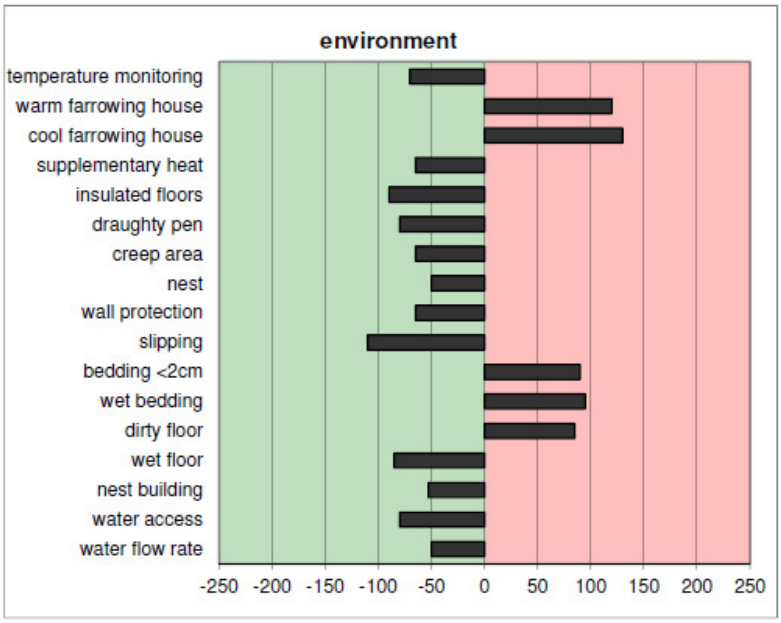
COREPIG Piglet Mortality HACCP Positive p. 4

c) Graphical overview of the risk situation

All potential risk factors which were assessed on the farm are grouped by area of influence and presented in bar charts. Bars pointing to the left (green background) refer to potential risks for suckling piglet mortality which are handled well, i.e. in a preventive manner on the farm (they are also listed in the positive list above). Bars pointing the right (red background) are factors increasing the risk for piglet mortality on the farm. The longer a bar, the stronger the impact on mortality. Risks can be looked up using the keywords on the vertical axis, which can be found on the questionnaire and on the positive and negative list.







COREPIG Piglet Mortality HACCP Risk overview p. 2

Our example farm is doing well in the areas herd management and environment (meaning potential risks in these areas have been eliminated), but should pay more attention to mortality risk factors related to the piglets themselves as well as to the duration of farrowings.

d) List of high impact risks prevalent on the farm

The factors which increase risk for suckling piglet mortality on the farm are ranked by their impact and those of highest impact are presented together with an explanation of the causal relationships and suggestions for removing the detrimental influence. Addressing the high impact factors first bears higher chances of changing the outcome, and the standard list is restricted to five items in order to focus on the most important issues. The list can be extended to show more or all detrimental influences. The suggestions for improvement are discussed with the farmer, and in the end the farmer should decide, what he/she is going to improve and how.

farm: Corepig-farm

date: 28.08.2010

CORE Organic

Piglet Mortality HACCP

Things which might be improved

current situation	keyword	contributes to dying from	reasoning / causation		solutions
Is average litter size over 14? - yes	litter size	starvation, born dead, infection	Larger litters mean that farrowing is prolonged and later piglets are at higher risk of anoxia. Furthermore, most sows have a maximum of 14 functional teats and often fewer. If the number of piglets exceeds the number of functional teats weaker piglets often fail to suckle colostrum, will feed less in general, and hence have higher mortality.	→	Monitor the course of farrowings and be prepared to attempt resuscitation of later born piglets. Practice split suckling by shutting the stronger, early born piglets which have already suckled in a warm creep area for an hour to allow the weaker piglets to suckle without competition. Adjust the litter size to match the number of functional teats on the sow. Provide supplementary milk (hygienically) for large litters.
Do farrowings last >5h? - yes	long farrowings	born dead, hypothermia, crushing	Long farrowings increase the risk of later born piglets losing placental blood supply and becoming anoxic and lethargic.	→	This might be due to a number of reasons (e.g. stress before farrowing, sow body condition) which are explored singly in the remainder of this tool.

current situation	keyword	contributes to dying from	reasoning / causation		solutions
Are piglets small at birth (many <1kg)? - yes	small piglets	crushing, hypothermia	Piglets of low birthweight lose heat rapidly because of their high surface area to volume ratio. They also suckle less well because of competition with bigger littermates. This makes them lethargic and prone to remain in high risk areas close to the sow. Small piglet size is caused by large litter size or because sows have too little body condition.	→	Ensure that sows have adequate body condition at farrowing (BCS3: bones can only be felt by pressing hard with the flat of the hand). Consult a nutritionist to check that the gestation diet is correctly formulated. If possible provide supplementary heat at the site of birth until piglets are dry.
Do piglets huddle and shiver? - yes	huddle	hypothermia, crushing	Piglets which are cold will huddle close to the sow for warmth and therefore be in a high risk zone for crushing. They will also be more lethargic and slower to escape.	→	Try to provide a warm and dry environment for piglets. Check the questions relating to temperature/chilling in this tool.
Do piglets look thin (hollow) or vocalise a lot? - yes	hungry piglets	starvation, crushing, infection, hypothermia	Hollowness and vocalisations are signs of hunger. Piglets which are hungry remain near to the udder and therefore in a high risk zone for crushing. If colostrum yield is poor, piglets will have less passive immunity, i.e. are more prone to infections. Poor milk yield in general will decrease piglet ability to generate body heat.	→	Check sow health after farrowing and treat animals with mastitis. See the HACCP for MMA for more detailed investigation. Also see questions related to hunger in this tool (eg fight wounds).

Appendix II: Farmer opinion questionnaire

Farmer evaluation of HACCP-plans

In the questionnaire below the farmers will evaluate the whole project.

Table 1 General evaluation of positive list and solutions

General evaluation		
Questions	**Answers**	**Comments**
Did the positive list provide any useful information concerning management of the problem?	Little 1 2 3 4 5 6 7 8 9 10 Much	
Did you include items from the positive list in implementing the solutions?	Yes No	
Did you discuss the positive list with employees or advisers during the implementation process?	1. Employees 2. Adviser 3. None	
How valuable was the positive list as a whole?	No value 1 2 3 4 5 6 7 8 9 10 very valuable	
How valuable was the negative list as a whole?	No value 1 2 3 4 5 6 7 8 9 10 very valuable	
How valuable was the graphic summary as a whole?	No value 1 2 3 4 5 6 7 8 9 10 very valuable	
Did the lists point to any risk factors that surprised you:	1. No 2. Yes -which risk factors?	
In the future how do you reckon the tool could be used?	1. Questionnaire and check list on Internet completed by farmer himself/herself and actions implemented without advisory assistance 2. Completed by farmer and actions discussed with adviser 3. Tool used by production adviser 4. Tool used by vet	
Would you appreciate completing the questionnaire and check list regularly e.g. 1-2 times a year to monitor your risk profile and adjust your actions?	1. Yes if I can do it myself 2. Yes if the adviser has got the tool 3. No, only in case of problems 4. No it is not relevant in my herd	

In the questionnaire below all the implemented solutions (negative list) will be graded by the farmer. Each solution has 14 questions that will be answered.

Table 2 Evaluation of each implemented solutions.

Negative list: Solution evaluation			
Reasoning/Causation		**Solution**	**Comments**
Sows with an inadequate water supply will not have good milk production. Newly farrowed sows are reluctant to walk long distances.		Add water to the feed at each mealtime. Make sure that fresh water is always available and not at too great a distance from the farrowing hut in outdoor paddocks	[example]
Grade questions below from 1 to 10 for each solution or tick off answers you agree with (put a circle around the respective number).			
Questionnaire			
How motivated were you to implement this solution?	Little 1 2 3 4 5 6 7 8 9 10 Much		
Was it clear why the solution should be carried out?	Not clear 1 2 3 4 5 6 7 8 9 10 Very clear		
Was the solution easy feasible on your farm?	Not easy 1 2 3 4 5 6 7 8 9 10 Very easy		
Was the solution easy to respect?	Not easy 1 2 3 4 5 6 7 8 9 10 Very easy		
Did you consult your advisers during the implementation process?	1. Did it myself without consulting an adviser 2. Did it after consulting an adviser 3. My adviser implemented it 4. Something else		
Was it clear what should be done to implement the solution?	Not clear 1 2 3 4 5 6 7 8 9 10 Very clear		
How did you instruct your employees?	1. Discussed the solution and put into work plan 2. Put into work plan 3. Put it into a notebook 4. Carried out the solution myself 5. Something else		
How did the solution fit in your daily/weekly/monthly work schedules?	Bad 1 2 3 4 5 6 7 8 9 10 Good		
How much extra work did the solution cost?	1. < 1 hour a day 2. > 1 hour a day 3. < 1 hour a week 4. >1 hour a week		
Would an adviser visit improve the implementation process?	Little 1 2 3 4 5 6 7 8 9 10 Much		
Are you satisfied with the effect of the solution?	Not at all 1 2 3 4 5 6 7 8 9 10 Very		
Was the solution carried out the whole trial period?	Yes No		
Will you still conduct the solution when the trial period ends?	Yes No		
What aspects of the solution were good?	Answer:		
What aspects of the solution were not good?	Answer:		

Appendix III: Adviser evaluation questionnaire

General evaluation		
Questions	**Answers**	**Comments**
General opinion to HACCP tool	No value 1 2 3 4 5 6 7 8 9 10 very valuable	
General opinion to questions?	No value 1 2 3 4 5 6 7 8 9 10 very valuable	
General opinion to solutions?	No value 1 2 3 4 5 6 7 8 9 10 very valuable	
Did the positive list provide any useful information concerning management of the problem?	Little 1 2 3 4 5 6 7 8 9 10 Much	
How valuable was the positive list as a whole?	No value 1 2 3 4 5 6 7 8 9 10 very valuable	
How valuable was the negative list as a whole?	No value 1 2 3 4 5 6 7 8 9 10 very valuable	
How valuable was the graphic summary as a whole?	No value 1 2 3 4 5 6 7 8 9 10 very valuable	
Did the lists point to any risk factors that surprised you:	3. No 4. Yes -which risk factors?	
In the future how do you reckon the tool could be used?	5. Questionnaire and check list on Internet completed by farmer himself/herself and actions implemented without advisory assistance 6. Completed by farmer and actions discussed with adviser 7. Tool used by advisor 8. Tool used by vet 9. other:……..	
Which role could advisors play to support implementation of actions?		