Farmers' experiences of depop-repop of sow farms in the Netherlands.

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Abstract

This study is carried out at the request to a group of Dutch pig veterinarians united in the "Survival Group", who have indicated that the future Dutch pig industry has to produce in a veterinary and social responsible manner. Farming within a SPF system is seen as an important element. However the Survival group thinks there is a lack of information about the actual benefits of SPF pig farming in The Netherlands.

The aim of this study is to make an extensive inventory of the experiences of sow farmers as well as the changes in animal health of the farms that have made the transition to an SPF status by using the depop-repop method in the Netherlands. The survey consisted of four parts: the motivation of the transition, the current experiences, the changes in production and the economical results before and after the transition. The type of interview used in this study is called a semi structured interview, with in total 22 questions. A total of eleven suitable farms that carried out depop-repop were visited, for an interview with the farmer. During this interview the data were collected for this study.

The increased job satisfaction is the most important benefit for pig farmers that have conducted a depop-repop. The job satisfaction is improved due to the improvements in animal health. This improved animal health also results in a lower use of antibiotics and lower animal health costs. The weaned piglets in this study have 85%, and the sows have 55% lower use of antibiotics compared to a Dutch average sow farm in 2016(1). Because of the improved animal health the farmers responded that they are more assured of the marketing of their piglets. Next to the positive experiences, almost all farmers responded that it's very difficult to remain free of *Porcine Reproductive and Respiratory Syndrome virus* in a pig dense country as the Netherlands.

Introduction

Specific pathogen free (SPF) pig farms are considered free from certain specific pathogens, but from which pathogens farms should be free is not uniquely defined. There are no official organizations that determine from which pathogens SPF pig farms should be free . In the Netherlands, the SPF definition is often characterized by breeding organizations. For breeding organization Topigs Norsvin, a Dutch pig farm is considered SPF when it is free from *Porcine Respiratory Reproduction Syndrome virus, Mycoplasma hyopneumoniae and Actinobacillus pleuropneumomiae* (2). In literature, as well as in veterinary practice, often different definitions of SPF are used. For instance, often one also refer to micro-organisms as *sarcoptic mange, toxigenic Pasteurella multocida* and of course notifiable pathogens. For clarity in this report the following definition of SPF is used : A SPF farm is a farm which is free from *Porcine respiratory reproduction syndrome virus (PRRS), Mycoplasma hyopneumoniae(Mhyo) and Actinobacillus pleuropneumoniae (APP).*

Despite the potential benefits of SPF farming only a few Dutch pig farmers made the transition to SPF in the previous years. The most important reasons why only a few farmers took the decision for the transition to SPF is because it is thought to be very intensive, expensive, and risky to achieve the SPF status. It is difficult to eradicate endemic pathogens on an existing sow farm because on a sow pig farm there are always infected hosts (the sows) and susceptible hosts (piglets) present on the farm (3). It seems impossible to stop the transmission of endemic pathogens without any extra measurements. In the next part of this report some options to cease the transmission of endemic pathogens, eradicate these pathogens and finally reach the SPF status. Thereafter the potential the benefits of SPF pig farming will be discussed.

Transition to a higher health status

Eijk et al. (4) discussed some methods how to reach a higher health status, these methods will be summarized in the next part of this study. There are two ways possible ways for an existing sow farm to eradicate pathogens and finally reach the SPF status.

1. Eradication of certain pathogens by depopulation of the entire herd, and then repopulation called depop-repop.

2. Eradication of certain pathogen within the existing population.

Briefly these different methods will be introduced here.

1.Depopulation and repopulation

Depop-repop by buying SPF gilts

Briefly the procedure of depop and repop with SPF gilts is described. First, the farm is depopulated by removing the sows, that have weaned their piglets, from the farm. When the piglets of the last group of lactating sows are weaned and sold, the entire farm has been emptied. While the farm is empty, it should be thoroughly cleaned and disinfected, not only the barn itself but also the dung pit should be emptied and cleaned (5). The empty period should last at least 8 weeks (4). This empty period should preferably take place in the summer, because the warm and dry climate conditions during summer are ideal to reduce the amount of pathogens in the barn (5). During this empty period the barn can also be renovated so that the farm meet the strict biosecurity requirements (4). In an SPF farm the risk of introduction of pathogens into the should be minimized. Therefore SPF farms require implementation of a complete separation between a "dirt" and a "clean" road on a farm (6) . The "dirt" road is used for feed, animal, carcase and manure transport. The "clean" road is where the hygiene barrier is situated, this road is used for own staff and visitors who enter the farm. Around the barns, a complete fence should be present (5). All these measures should reduce the risk of the introduction of pathogens to the farm. But after all it is very important that all

visitors and most important own staff, are aware and be able to comply with the strict hygiene protocols before the SPF gilts are supplied (5).

After the cleaning and renovation operation is completed the new SPF gilts are supplied, preferably within as few delivery moments as possible to reduce the risk of infection by transportation. These SPF-gilts can be inseminated as soon as they arrive, but the semen should be obtained from SPF artificial insemination stations only. To decrease the period of non-production it is also possible to buy gilts in different stages of gestation (5). To reduce the risk of disease outbreaks, the farm that carried out depop-repop should breed their own gilts so no new animals have to be introduced at the farm (5).

Depop-repop with maintaining own genetics

By following method the farm is also slowly depopulated but the repopulation takes place with piglets that are born via caesarian section performed on sows present at the farm. These piglets are raised motherless or by foster sows with a SPF status. There are a lot of extra costs with this method, thus this is mainly done by breeders with highly valuable animals (4).

Eradication of pathogens within an existing population.

Swiss depop

With this method all "susceptible hosts" animals aged 1-9 months are housed at an external location. The animals with the highest risk of infection the animals, the weaned piglets and the fattened pig are removed from the farm, which aims to break the cycle of transmission of endemic infections on that specific farm and thereby aims to eliminate those pathogens from the population (4). This is a less intense way to reach a higher health status. This method is an effective method to eradicate *PRRSv*, but is not able to eradicate pathogens that cause carrierships, for example *APP* and *Mhyo* (7).

Piglet snatching

With this method the piglets are removed from their mother immediately post parturition. The aim of this method is to keep the probability of transmission of pathogens from the sow to the piglets as low as possible. After removing the piglets from the sow, the piglets are raised motherless or with a high health foster sow. To prevent infection it is necessary to raise them in an isolated facility (4).

Isolated farrowing/multiple site

With this method the sows farrow at a separate location away from the pregnant sows. After weaning the piglets are moved to another separate location. Strict hygiene measures between locations is essential to ensure effectiveness of this method. By separating different rearing groups, the cycle of endemic transmission can be broken (4). This is an effective method to eradicate *PRRSv*, but again this method is not useful becoming free from *APP* and *Mhyo* (8).

Medicated early weaning and medicated weaning

The sooner the piglets are removed from the farm, the greater the chance that the piglets are free from specific pathogens that they usually acquire from their dam. By medicating the piglets and the sows during the suckling period, the risk of the transmission of infections is reduced. This method is only useful for bacterial pathogens (4). However, preventive use of antibiotics in this method is controversial in European countries and is deemed irresponsible. Moreover, one study indicates that it's hard to eradicate *APP* from the tonsils with the use of antibiotics (9).

And so, there are many different ways to reach a higher health status. Nevertheless, if a pig producer really wants to eradicate *APP* and *Mhyo.* Then a depop-repop is the most effective method to eradicate these pathogens on a commercial sow farm and thereafter reach the SPF status (7)(10).

To maintain the SPF status, pathogen monitoring is essential. It is recommended to combine structural serological monitoring with the pathological findings in slaughtered pigs (5). In addition, in case of clinical disease at the farm, additional research has to be done immediately to exclude the presence of the different SPF pathogens(5).

The benefits of SPF

SPF farming can result in multiple benefits for the farmer and the animals. Zonderland et al. (11) compared in 2003 two pig farms with 400 sows, one conventional farm and one with a SPF health status. It was shown that a lower mortality and higher growth of piglets at the SPF farm led to a cost reduction of € 3,19 per produced piglet which led to a € 21.000 extra profit per year for the SPF farm compared to the conventional pig farm (11). Schyns et al. (12) simulated in a deterministic economic model a pig farm with 2000 sows that performs a depop-repop. Schyns et al. (12) calculated with an empty period of five weeks, an additional SPF gilt price of €40.- and an additional SPF piglet price of €6,23 compared to conventional piglets . This study showed that the costs of the depop-repop were returned within 2.12 years (12). In addition, this study mentioned that the repayment time is very much dependent on the piglet prices during the transition period and the price surcharge paid for a SPF piglet (12).

Eijck et al. (13) compared in 2006 technical and financial results of 21 SPF farms with the results of the 20 % best producing pig farms in the Netherland. It was shown that SPF sow farms had similar production results compared to the 20% best producing conventional farms (13). The only difference in production results was the higher growth rate for the weaned piglets on the SPF sow farms, similar to the results from Zonderland et al. (11) . In addition, Eijk et al. (13) showed that SPF farms had €23.- lower health costs per sow/year and found an extra price surcharge for SPF piglets variating from €3.- to €6,- per piglet compared to the 20% best producing conventional farms.

Based on the results of the studies mentioned before it can be concluded that farms with a SPF status are capable of producing piglets with improved efficiency and improved financial outcome . In addition, the SPF animals have a better welfare because their welfare is less harmed by disease (14). Healthy animals also mean that less antibiotics need to be used, which means that there is a reduced risk of selection for antibiotic resistant (14).

Although, these benefits of producing under SPF conditions have been known for a long time, only a limited number farms switched to SPF in the Netherlands in the last 10 years. A number of Dutch pig vets, united in the Survival Group, have indicated in 2011 that the future Dutch pig industry has to produce in a veterinary and social responsible manner (14). The transition to higher animal health status is seen as an important element. However the Survival group thinks there is a lack of documentation and information about the actual benefits of SPF farming (14).

Aim of the study

The aim of this study is to make an extensive inventory of the experiences of pig farmers, as well as the changes in production and animal health of the farms that have switched to a SPF status by using the depop-repop method in The Netherlands. The veterinarians may use this report in their advice to farmers that wish to make the transition to SPF. Pig farmers could also use this report to inform their financer to enable the extra investments to ensure a transition to SPF is possible and brings specific benefits.

Materials and Methods

Inclusion criteria for farms

For this study the selected sow farms had to meet a number of criteria. To be able to make a report about the experiences of depop-repop, only farms that carried out depop-repop were selected. The farms had to have made the transition of depop-repop in the last fifteen years. This period was chosen because it is very difficult to make a fair comparison of financial and production results between the current situation and with situation of more than fifteen years ago, due to the genetic and management progress in the recent years. In addition, only farms were included when depop-repop took place within the existing sow stable or when the sow farm was expanded in size on the same location. Initially only the farms that housed the weaned piglets on the same location as the sows were included in this study. As a first recruiting stage resulted in too low number of participants, the criteria were broadened and SPF farms without weaned piglets were also included for this study.

Recruiting of farms

First of all, the members of "Survival group" were requested if they had farms meeting the inclusion criteria for this study. Only two veterinary practices responded. They came up with ten farms but only four farms met the criteria. In addition, eight big pig veterinary practices in The Netherlands, were approached by telephone. This, in combination with the change in criteria, resulted in ten extra farms.

After a first contact with the farmer, three of fourteen farms were not motivated to participate in this study. The other eleven farms were all visited individually. During these visits the farmers or herd managers were interviewed for approximately one hour.

The questionnaire

The questionnaire for the farmer was composed in cooperation with two pig veterinarians from the veterinary practice the "De Varkenspraktijk" and with a supervisor of the faculty of veterinary medicine in Utrecht. These two veterinarians are seen as depop-repop experts because they have supervised several farmers that have carried out depop-repop on their farm.

The questionnaire consisted of four parts, in addition to a general part about farm characteristics (size, year of depop-repop, farm type and genetics):

1. The first part was about the motivation of the transition,

2. The second part was about the current experiences of SPF after depop-repop.

3.The third part was about the changes in production after depop-repop

4. And the fourth part was about the economic outcome, after depop-repop.

The questionnaire consisted of 22 question including five multiple choice and seventeen open question. The type of interview used in this study is called a semi-structured interview, the large number open questions allows new ideas to be brought up during the interview (15). The different possible answers of the five multiple choice questions were based on literature and the expert opinion of the veterinarians of "De Varkenspraktijk". All participating farmers were made aware of the fact that the results of the survey were completely anonymised. The reader is referred to the attachment 1 for the questionnaire.

Study results

The characteristics of the participating farms are presented first and thereafter the results of the interviews are given, grouped on subject with regard to motivation of farmer, role of the veterinarian, health aspects and economic aspects of depop-repop.

Characteristics of the participating farms

Veterinary practices.

In total five veterinary practices showed commitment to this study. Five farms(5/11) are a client of one particular veterinary practice "Q", three (3/11) of practice "R", one (1/11) of practice "S", one (1/11) of practice "T" and one (1/11) of practice "U" as shown in table 1.

Year of transition of depop-repop

The participating farms carried out depop-repop between 2005 and 2016. Two sow farms(2/11) switched between 2005 and 2009, four between 2010 and 2015 and five farms(5/11) made the switch in 2016 as shown in table 1.

Farm size

The participating farms have a current size of 420 to 4000 sows, with a median of 850 sows. During the depop-repop process seven farms(7/11) increased in size, as shown in table 1.

Farm type

Six farms(6/11) are regular sow farms where the weaned piglets are housed at the same location as the sows. Four farms(4/11) do not house weaned piglets at the same location. One participating farm(1/11) is a nucleus farm.

Table 1, overview of the characteristics of the participating farms

Farmcode	Year of transition	Current number of Sows	Number of sows before transition	Type of SPF farm	Veterinary practices code	Genetics organisation code
E	2005	660	400	Sows, weaned piglets	S	W
D	2008	1400	400	Sows, weaned piglets	T	W
B	2011	720	600	Sows, weaned piglets	R	X
C	2011	850	600	Nucleus	U	X
I	2013	3000	1260	Sows	R	W
J	2015	4000	1800	Sows weaned piglets	Q	Y
L	2016	420	420	Sows weaned piglets	Q	Z
K	2016	550	500	Sows	Q	W
F	2016	580	580	Sows, weaned piglets	Q	W
G	2016	1600	1200	Sows	Q	X
H	2016	2000	2000	Sows	R	Y

Genetics

Five farms (5/11) use the sow genetics of breeding organisation W. Three farms (3/11) use sow genetics of organisation X, two farms (2/11) of organisation Y and one farm uses the sow genetics of organisation Z. Nine farms (9/11) use the sire boar line of organisation W.

Motivation for depop-repop and transition proces

Motivation

The majority of the farms (8/11) chose to change the production system into a SPF farming by depop-repop because difficulties arose in controlling pathogens within their existing herd. According to the respondents, the second major reason (3/11) to change to SPF farming is to decrease uncertainty of piglet marketing.

Role of the veterinarian during depop-repop

On five (5/11) farms the veterinarian had a major role in making the decision to depop-repop, by telling the farmers that the only achievable way to eradicate *APP* and *MHyo* on their farm is by a depop-repop. At three farms (3/11) the veterinarian clearly emphasized the risks of SPF farming to the farmers.

The majority of the farmers (7/11), indicated that their veterinarian was the most important source of advice during the transition period. Their veterinarian supervised the whole process, composed action plans and made protocols for the depop-repop process. One farmer (1/11) indicated that their veterinarian had only played a role in the monitoring of pathogens. Two farmers (2/11) indicated that they didn't need any advice during the transition period, so their veterinarian did not play any role during the depop-repop. Two farmers indicated that in addition to their veterinarian, an advisor of the breeding organisation played an important role in supervising the transition process. One farmer (1/11) indicated that his feed adviser played the most important role in supervising the transition process.

At six farms (6/11) the role of the veterinarian didn't change at all after depop-repop. Two farmers (2/11) indicated that the role of their veterinarian changed completely because the monitoring of pathogens became much more complex. At three farms (3/11) the veterinarians' jobs changed because the veterinarians are paying more attention to the biosecurity on the farms.

Almost all pig farms (10/11) have the same veterinarian as before the depop-repop. Only one farmer (1/11) switched to another veterinary practice that was able to supervise the whole process of depop-repop.

Empty period

The empty period is the period between depop and repop when there are no pigs on the farm. Four farms(4/11) did not install any empty period of the entire farms during the transition. On those farms, SPF gilts were brought in while conventional pigs were still kept on the premises. On these farms the conventional and SPF pigs were kept completely separate by strict hygiene rules and in separate barns during the transition period. Three farms(3/11) had an empty period for 4 to 6 weeks. Four farms (4/11) had an empty period of 8 to 20 weeks. These four farms(4/11) often used this longer empty period to expand their barns.

Farm improvements / adjustments during transition

Five farms(5/11) did not renovate their stables to improve the biosecurity. These farmers were convinced that their stables were still up to date in terms of infrastructure and biosecurity. Three farms(3/11) improved their hygiene barrier. Two farms(2/11) build a covered central corridor. On four farms(4/11), a complete fence was built around the stables.

Information needs

Most of the farmers (9/11) responded that they did not miss out on any information during the transition. Two farmers(2/11) indicated that they missed the experiences of other farmers who have already performed a depop-repop.

Farmers were asked whether there were issues they oversee now, but did not oversee during the depop-repop process. On this matter different answers were provided;

- Three farmers (3/11) would have paid more attention to optimize their biosecurity on their farm.
- Two of the six participating sow farmers (2/6) from Noord- Brabant indicated that it is impossible to remain free of *PRRSv* in the pig dense province of Noord-Brabant
- One farmer (1/11) indicated that the impact of an outbreak of *PRRSv* on his farm was much greater than they expected in advance.
- Another farmer (1/11) indicated that he should have considered an empty period on his farm.
- One farmer (1/11) indicated that adaptation of his SPF gilts was a fiasco and that he should have done this completely different.
- Two farmers (2/11) indicated that no information has been added after they had conducted depop-repop.

Experiences of SPF.

Six (6/11) farmers considered the higher job satisfaction by having less diseased animals to be the biggest advantage of working within the SPF system. Three farmers (3/11) considered the improved economic result to be the most important advantage. Two farmers (2/11) considered the improved so-called piglet quality to be the most important advantage, because of the better piglet quality they are more assured of the marketing of their piglets.

In addition to the benefits, the disadvantages of working within the SPF system after depop-repop were also evaluated. Four farmers (4/11) found the risk of introducing pathogens the biggest disadvantage. Three farmers (3/11) replied that the high cost of transition was the major disadvantage, whereas three other farmers(3/11) found the extra work related to biosecurity as the major disadvantage. One farmer (1/11) thinks there is no disadvantage to the SPF system at all.

Health aspects

Health status before depop-repop

Ten farmers(10/11) indicated they had a farm with conventional health status before the depop-repop these farms were not free from *APP, MHyo and PRRSv*. One farmer (1/11) indicated that the farm was already free from *APP* and *Mhyo* before the depop-repop.

Re-infections and monitoring

Nine farms (9/11) were repopulated with gilts which were officially free from *APP + MHyo and PRRSv*. After repopulation, eight of these nine farms were re-infected with *PRRSv* (Table 2). The consequences of these infections were very diverse. Five farms (5/8) experienced no clinical effects of the infection, *PRRSv* was only detected serologically. At three farms (3/8) reinfection with *PRRSv* had major clinical consequences. The major clinical signs during the *PRRSv* outbreak on these three re-infected farms(3/8) were: premature farrowing, a lot of stillborn piglets and weak piglets were born during the outbreak and a lot of these weak piglets died within first week after birth.

Four *PRRSv* re-infected farms (4/8) eradicated *PRRSv* again successfully. Two farms (2/8) were also re-infected wi*th Mhyo*, without any clinical effects. An overview of the reinfection of the farms is shown in table 2.

Table 2 overview reinfections after depop-repop

Reinfection after depop-repop	Number of farms
No idea, no monitoring	2
No SPF pathogen has (re-)infected the farm since the transition	1
Only *PRRSv* reinfection	6
PRRSv & Mhyo	2

Two farms (2/11) were repopulated with gilts that were only free from *APP and Mhyo*. They both indicated that they are still free from both pathogens. Two farms have no information about re-infection because there is no form of monitoring taking place at these farms.

The monitoring of pathogens is diverse at each farm. On some farms blood samples for serological monitoring are taken every month whereas other farms sample every three months or even only twice a year. Four farms, do not have any form of monitoring, they only perform additional research in case of clinical disease.

Current SPF status

Four farmers (4/11) indicated they are free from *APP, Mhyo and PRRSv*. Two farmers (2/11) indicated they are free from *APP* and *Mhyo*,one farm (1/11) is free from *APP and PRRSv* and three farms are only free from *APP*. Two farmers(2/11) have no idea of the actual health status of their farm, an overview is shown in table 3.

Table 3 Current health status

Free from	Number of farms
APP + Mhyo + PRRSv	4
APP + Mhyo	1
APP + PRRSv	1
APP	3
No idea	2

Piglet vaccinations

An overview of the current piglet vaccinations and the vaccinations that were administered before the transition are shown in the table 4. Before the transition an average of 3.3 vaccination were administered per weaned piglet, currently 2.3 vaccinations are administered per piglet (Table 4). So, on average, one vaccination less is administered per piglet.

Table 4, Number of farms per type of piglet vaccinations administered before depop-repop and current, PCV=Porcine Circo Virus

Type of piglet vaccination	Before depop-repop	Current
No data	2	0
PCV	1	2
PCV, Mhyo	2	4
PCV, Mhyo, APP	2	0
PCV, Mhyo, PRRSv	1	5
PCV, Mhyo, APP, PRRSv	4	0

In most of the cases (9/11) the current piglet vaccinations are demanded by the piglet trader.

Antimicrobial drug use

In the Netherlands, all antimicrobial drug deliveries to each farm are compiled, and for every farm a defined daily dosage (DDD) is calculated. For this study DDD's of the participating were collected and presented(table 5).

Table 5 Overview Defined daily dosage(DDD).

Farm code	DDD before transition combination Sows weaned piglets.	DDD before transition, Sows	DDD before transition, weaned piglets	Current DDD Sows	Current DDD weaned piglets
B	4	X	X	0.6	0.8
C	X	X	X	3	0.5
D	X	X	X	2	3
E	X	X	X	0.5	0.5
F	X	38.6	15	0.6	0
G	30	X	X	0.7	NP
H	X	9.4	X	2.5	NP
I	X	X	X	3.2	NP
J	X	14.2	3	3	18.3
k	X	X	X	0.5	NP
l	X	3	3	1	1
Average DDD				1.6	3.44

Table 5 X=no data, NP= Not present at the farm, As shown in this table, there are a lot of missing data, for a number of reasons; First before 2010 the DDD calculation method did not exist. Secondly, before 2015 the DDD's were not calculated separately for the sows and the weaned piglets. Thirdly, four farms (4/11) (G, H, I and K) do not house weaned piglets. Fourthly, two farmers (2/11) did not have any data from the period before the depop-repop.

Despite there are a lot of missing data it was possible to calculate the average current DDD for the sows and weaned piglets. The current DDD of the sows varies from 0.5 to 3.2, the median is 2.5. The current DDD for the weaned piglets varies between 0.0 to 18.3, the median is 1.

Due to the fact that there is a lot of missing data about the situation before the transition, it is hard to draw conclusions. However, based on the collected data, it seems that less antibiotics are used after depop-repop, but the data does not allow to statistically test this.

Financial aspects

Six farmers (6/11) indicated that they paid the costs of depop-repop themselves. So there was no need to convince their bank for an additional loan. Three farmers (3/11) convinced their bank to provide the loan for the costs of depop-repop by a well-developed financing plan. Only one farmer (1/11) had great difficulty to provide the loan for the costs of depop-repop, the veterinarian, the breeding advisor and farmer together had to convince the bank for the investment of depop-repop. One farmer (1/11) indicated that the pig feed company financed the entire investment for depop-repop.

The majority of the farmers (7/11) paid during repopulation no extra money for a SPF gilt relative to conventional gilts. The four other farmers (4/11) paid an additional 25 to 100 euro for SPF gilts relative to conventional gilts.

Health costs per sow

The health costs per sow per year is calculated by adding all animal health cost in one year on a farm and divided that amount by the number of sows present on that farm. About half of the farmers (5/11) did not know the health cost of the situation before the transition. The other six farmers (6/11) had health costs per sow per year that varied between 70 and 190 euro with an average of 136 euro. In addition, nine farmers (9/11) responded on the question about the current health costs. The current health costs per sow per year varied between 56 and 110 euros with an average of 79 euros. Table 6 showed an overview of the animal health costs per sow per year before and after depop-repop.

Table 6 Number of farms with categorized health costs per sow per year, before and after depop-repop

Health costs (euro per sow per year)	Before the transition	Current
No idea	5	2
50-90	1	7
91-130	1	2
131-170	3	0
171-200	1	0

SPF piglet bonus

One question regarded the additional revenues of the SPF piglets compared to the conventional piglets was asked. The majority of the farmers (7/11) had no idea of the added value of their 'SPF' piglets. Three farmers (3/11) indicated that that their piglets yield an average of 3 euros more compared to conventional piglets. For one farm(1/11) the added value of their piglets is 10 euros compared to conventional piglets.

Final question

Finally, farmers were asked whether they would make the transition once again, with all current knowledge. Without exception, each farmer (11/11) answered YES with full conviction.

Discussion

The aim of this study was to make an extensive inventory of the experiences of pig farmers as well as the changes in production and animal health of sow farms that had made the transition to a SPF status by applying the depop-repop strategy. The main result in relation to aim of this study is that the most important benefit for the sow farmers that had carried out a depop-repop is the increased job satisfaction due to less diseased animals. According to the farmers, less diseased animals resulted in lower animal health costs compared to the situation before the depop-repop, and a lower use of antibiotics compared to a Dutch average sow farm in 2016(1). Next to these positive experiences almost all farms were re-infected with *PRRSv* after the depop-repop. Nevertheless, with the acquired knowledge, all participating farmers indicated that they would make the transition once again. Another interesting result is that fact that participating farmers consider the veterinarian the most important adviser during the depop-repop process.

In this chapter study results are compared to literature, next the validity of the study are discussed and finally the conclusion of this study will be given.

Reinfections

Groenland et al. (16) concluded in 2011 that almost all SPF-farms in the Netherlands have been re-infected with *PRRSv.* Consistent with Groenland et al. (16) eight out of nine of the interviewed farmers whose farms were repopulated with *PRRSv* free gilts acknowledged that their farm was re-infected with *PRRSv*. Some studies indicate that farms may have been infected with *PRRSv* by an aerosol infection originating from a neighbouring farm(16)(17)(18). An air filtration of incoming air is able to filtrate these *PRRSv* infected aerosols (16). Alonso et al. (17) compared the incidence of new *PRRSv* introductions in twenty filtered and seventeen nonfiltered control sow herds in a swine dense region of the USA. Presence of air filtration systems was associated with an approximately 80% reduction in risk of introduction of *PRRSv* in a sow herd (17). In addition to Alonso et al. (17) the only sow farm that remained free from *PRRSv* in our study is a farm that installed an air filtration system during the transition. Although, almost all studies considering air filtering studies are performed with regard to the *PRRSv* virus. However the principal of filtering can be broadened for other pathogens that can spread by aerosols, for example for example for *Mhyo* (19).

Based on our result that the majority of the farms were re-infected with *PRRSv*, the main objective for farmers who are considering applying depop-repop should not be to remain free from *PRRSv* in the long run. For the bacteria, e.g. *Mhyo* and *APP,* it seems more likely to remain free after depop-repop.

Animal health costs

Our study shows an average reduction of €57 in animal health costs per sow per year compared to the situation before the depop-repop. This €57 reduction could mainly be explained by reduction of the number of piglet vaccinations in combination with the reduction of the antimicrobial use. The current average health cost of the eleven participating farms is €79, which is €7 lower than the Dutch average of 2016. The average health costs per sow per year at a Dutch sow farm in 2016 was €86(20). The difference in animal health costs between the participating farms and the Dutch average could partly be explained by the fact that none of the participating farmers used an APP piglet vaccine anymore. Before the depop-repop the average piglet vaccination rate was 3.3 and currently 2.3 vaccinations per piglet. All participating farmers vaccinate their piglets against *PCV* and five out of eleven and nine out of eleven still vaccinate against *PRRSv* and *Mhyo* respectively. Most of the farmers indicated that these currently administered piglet vaccinations were demanded by the pig dealers. It could be concluded that Dutch pig dealers want vaccinated piglets they make no distinction between conventional of SPF piglets.

Eijck et al.(13) showed in 2006 that their nineteen participating SPF farmers earn a "SPF bonus" of €3 to €6 per piglet. The majority of the farmers in our study had no idea of the height of their SPF bonus per piglet. This may be due to the fact that four farmers produced within a fixed piglet supply chain and another three farms were so called closed farms (breeding and finishing farms), which do not sell piglets at all.

Antimicrobial drug use

The use of antimicrobials was analysed in our study with the Dutch defined daily dosage (DDD). The antimicrobial drug use for sows of the participating farms had an average of 1.6 DDD, (median 2.5), 55 % less compared to the Dutch average DDD of 2016 (1). The DDD for the weaned piglets was 3.2 DDD, (median of 1.0 DDD), 86% lower than an average Dutch sow farm in 2016 (1). Hybschmann et al. (21) compared the antimicrobial use for gastro intestinal diseases between conventional and SPF farms and showed no differences in use. Hybschmann et al. (21) only compared the antimicrobial use for gastro intestinal diseases while the pathogens used for classification of SPF are consider to be causing respiratory disease. This could probably cause the different results between Hybschmann et al. (21) and our study. Hybschmann et al. (21) concluded that herds within the SPF system had a larger decrease in antibiotic use with increasing herd size compared to conventional herds. In our study this relationship could not be investigated due to the limited data available.

Potential role of the veterinarian

Our study suggest that veterinarians are capable to convince and supervise farmers that consider depop-repop. So after all the Dutch pig veterinarians play a potential important role in improving the animal health status in the Dutch pig industry to SPF pig farming. This could result in a future Dutch pig industry who is able to produce in a veterinary an social responsible manner just as the "Survival group" has suggested in 2011 (14) .

Validity

Thanks to a firm recruitment a large part of farmers who conducted depop-repop participated in this study, our impression is that approximately 80% of the farmers who conducted a depop-repop in the Netherlands within the last 15 years were probably included in our study.

A possible disadvantage of an interview, is that the results depend on the honesty and the memory of the participants. The answers provided by the farmers are very subjective. This kind of bias is called recall bias which arises due to differences in the accuracy or completeness of participant recollections of past events. For example, the health status of the participating farms was only given by the farmers, it is not checked by additional laboratory analyses. In addition, the monitoring of the SPF pathogens differed between each farm, two farms didn't have any form of monitoring at all, while others performed monthly serological monitoring. Therefore, a discrepancy between actual the health status and health status according to the farmers' insights cannot be excluded. This lack of standardized monitoring could cause bias in our study.

Another point of attention is the potential selection bias. Our results rely on farms that were not randomly selected. Veterinarians provided the contact details of potential candidate farmers of our study. This could cause bias because the veterinarians may only have selected their favourite farmers or the farmers with positive thoughts about depop-repop and their veterinarian.

One important goal of our study was to make a comparison of the production results from before and after the depop-repop. For a number of reasons it appeared impossible to make a fair comparison. The first main argument is that almost all sow farms changed the sow genetics during the transition. Secondly a number of

farms did not have their results prior to the transition anymore. Thirdly some farmers, despite their consent to the study, eventually didn't want to share their productions results for privacy reasons. The fourth reason why it was appeared impossible to make an fair comparison was that production results from ten year years ago were very difficult to compare to the results nowadays due to the genetic and management progress in the recent years. Due to these arguments it was eventually decided not to carry out the comparison of the production results.

Despite the fact that it was not possible to make reliable analyses of the production results from before and after the depop-repop, it was possible to make an unique report about the farmers' experiences of depop-repop of sow farms in the Netherlands.

Conclusions

The increased job satisfaction is, in contrast to the expected rise in economic gain, the most important benefit for pigfarmers who carried out depop-repop. The job satisfaction increased because of the improved animal health status. In addition, due to the fact that the pigs are less frequently diseased the farmers responded that they perceived the SPF status beneficial as they are more assured of the marketing of their piglets. The improved animal health status also results in lower animal health costs, and a lower use of antibiotics compared to the Dutch average in 2016. Next to all the positive experiences, almost all farmers responded that it is very difficult to remain free of *PRRSv* in a pig dense country as the Netherlands.

Recommendations

- When convincing a farmer to carry out depop-repop, the potential increased job satisfaction should be an important argument.

-Due to the fact that most participating farms were reinfected with *PRRSv* after a depop-repop, more effort should be made if the farms want to remain free from *PRRSv*.

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Attachment 1 questionnaire:

Vragenlijst SPF Veehouder

Algemene informatie bedrijf
Type, Grootte, genetica, wekensysteem.

Ervaringen rondom overstap

-Waarom is men overgestapt?

Kosten aspect, arbeidsvreugde, maatschappelijke reden of ziekte problematiek, Anders namelijk:

-Wanneer is het bedrijf overgestapt?

- Hoelang heeft de locatie leeg gestaan?

-Wat is er verbouwd met betrekking tot het verbeteren van de biosecurity ter behoud van de SPF status?

- Wie is/zijn er qua advisering essentieel geweest in de overstap?

Voervoorlichter, dierenarts, gezondheidsdienst voor dieren, bank, handelaar/afnemer of fokkerij organisatie

- Welke rol heeft de begeleidend Dierenarts gespeeld in de overstap?

-Heeft u intussen een overstap gemaakt van dierenarts al dan niet geïnitieerd door de overschakeling?

-Heeft uw DA een andere rol/manier van dienstverlening na de SPF overstap? Zo ja welke dan?

-Welke informatie heeft u gemist bij het nemen van de beslissing om naar SPF over te stappen?

-Of er is nadien ook info bijgekomen waar je op het moment van overschakeling niet op de hoogte was?

Huidige ervaringen SPF

-Wat vind u de belangrijkste voordelen van het werken in het SPF systeem?

Technische resultaten, economische resultaten, arbeidsvreugde of anders:

-Wat vindt u de belangrijkste nadelen?

Hoge overstapkosten, extra werkzaamheden rondom biosecurity

Risico op insleep

anders

-Welke ziekte status had het bedrijf voor de overstap?

-Wat is momenteel de ziekte status van het bedrijf?

-Welke ziekte is er na de overstap binnen gekomen en met welke gevolgen?

PRRSV, APP, Mhyo of anders:

-Hoe regelt u de monitoring rondom uw SPF status en door welke organisatie wordt dit gecontroleerd?

Technische resultaten heden en verleden

Zeugen

	Voor overstap	Momenteel
Aantal zeugen		
Worp index		
Levend geboren biggen/worp		
Doodgeboren/ worp		
Uitval tot spenen		
Gespeend per zeug/ jaar		
Genetica		
Dierdagdosering		

Gespeende Biggen

	Voor overstap	Momenteel
Uitval		
Groei/per dag		
Aflever gewicht		
Aflever leeftijd		
Voerwinst per afgeleverde big		
Dierdagdosering		

Kosten overstap:

-Hoe stond de kredietverstrekker over tegen de extra kosten die er gemaakt moesten worden voor de overstap naar SPF?

-Wat waren de extra kosten van SPF gelten van ten opzichte van een reguliere gelt?

-Wat waren de gezondheidskosten per zeug/jaar voor de overstap en wat zijn ze nu?

-Welke biggenvaccinaties past u nu toe en welke in het verleden voor de overstap?

-Wie eist deze vaccinaties

-Wat is de meerwaarde van uw big tov de conventionele biggen in euro's?

-Stel u zou de tijd terug kunnen draaien zou u dan met de kennis van nu de overstap overdoen?

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