# Values of some Reproduction Indices in Sows Depending on Artificial Insemination Time

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**Abstract**
In order to improve some reproduction indices, we need to implement a farm management that uses at optimum levels the artificial insemination time depending on oestrus period in sows because in the classical oestrus identification programme there are significant differences between fecundity and prolificacy in oestrus females identified as such and artificially inseminated in the morning. In our management programme, females identified in oestrus twice a day and artificially inseminated at shorter time intervals produced higher fecundity indices (88.90±2.51 compared to 87.40±1.25) with similar prolificacy.

**Keywords**: artificial insemination, optimum time, oestrus, sows

## 1. Introduction

In the intensive production system, swine farms whose goal is to produce weaned piglets are organised per sectors: the **reproduction and gestation sector**, which includes sows being prepared for artificial insemination, gestating sows, boars, and young replacement reproduction swine, and the **maternity sector**, where farrowing and rearing of suckling piglets until the weaning age (28 days) take place [1,2].
At the level of the reproduction farm, there are selection works of the young female populations based on the results obtained during the first reproduction cycles [3-5].
Optimising reproduction in swine is necessary to obtain higher reproduction indices. To increase the number of weaned piglets per year, we need to produce the largest number of piglets per litter per sow possible [6-8]. The most important factor affecting the number of piglets per sow per year is the number of litters per sow per year. In this respect, we believe that the best way to improve reproduction is to reduce the number of non-productive days, which can be done by reducing the weaning to artificial insemination interval. To reduce the number of non-productive days, we need to pay major attention to the sow feeding programme, to the body condition, to the artificial insemination techniques, to the detection of oestrus, gestation and distribution of farrowing, as well as to the weaning age and to sow mortality rate.
Sows are poly-oestrus animals that, during lactation, do not show signs of oestrus because of the ocytokine secretion that blocks the maturation of ovary follicles and oestrus. Four to five days after sows are separated from their piglets, the first signs of oestrus appear. The mean duration of an oestrus cycle is 21 days, with variations between 16 and 25 days; however, the optimum time to inseminate artificially lasts 2-3 days, when the females shows immobility. In this period, there is hyperaemia of the female genital tract mucous and sometimes filleting mucous leakage [9-11]
To improve reproduction indices, we need to take into account the fact that the maximum duration of

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the fecundating ability of the sperm is 24 hours, and that an ovule needs to be fecundated within 6 to 8 hours. We need to implement a farm management that is specific to the reproduction sector [12].

## 2. Materials and methods

To inseminate the sows artificially at optimum time, we developed a farm management programme with artificial insemination that meets both the normal work schedule and improved results in fecundity and prolificacy in sows reared in an intensive industrial system. The study was carried out on a reproduction farm with two experimental work programmes whose experimental results were processed statistically.

## 3. Results and discussion

To improve reproduction indices, we need to identify females in **oestrus** twice a day, between 7:00 am and 3:00 pm, with the first artificial insemination 1-2 hours after the females have been identified as being in oestrus, and the second artificial insemination 6 to 15 hours later, when there are the best fecundity and prolificacy indices. For short work programme days (from 7:00 am to 12:00 am), we recommend that lactating sows be separated from their piglets twice a week, on Mondays and on Thursdays. Based on the management programme, we gave up the classical programme of identifying sows in oestrus and on inseminating artificially at intervals longer than 15-20 hours because numerous females have shorter oestrus and do not accept a second artificial insemination, which results in lower reproduction indices.

Experiments were carried out in two work programme variants:

- The classical programme from 7:00 am to 4:00 pm (from Monday to Friday) and from 7:00 am to 12:00 am (on Saturdays and Sundays) includes two identifications of sows in oestrus (between 7:00 am and 9:00 and 1:00 pm and 3:00 pm) and artificial insemination between 10:00 am and 12:00, and between 3:00 pm and 4:00 pm; artificial inseminations are repeated, in both categories, the next day, between 7:00 am and 9:00 am;
- The programme we suggest includes the following:

• From Monday to Friday, two identifications of sows in oestrus between 7:00 am and 9:00, and between 1:00 pm and 3:00; artificial insemination in sows in oestrus in the morning is done between 10:00 am and 12:00 am and, in sows in oestrus in the afternoon, between 3:00 pm and 4:00 pm, and the next day, in the morning, between 7:00 am and 9:00 am;

• On Saturdays and Sundays, sows in oestrus are inseminated artificially between 10:00 am and 12:00 am, and the next day between 7:00 am and 9:00 am.

In the classical management programme, many females in oestrus and inseminated artificially in the morning do not show immobility signs the next day and are included in the gestating group with a single artificial insemination. Females identified in oestrus and inseminated artificially in the afternoon accepted the second artificial insemination the next day. We can see that, with shorter intervals between artificial inseminations, it is possible not to overcome the oestrus period when females show no boar immobility reflex, which influences the reproduction indices; it is also possible that females are in oestrus again, though we consider them gestating after artificial insemination.

The values of the reproduction indices in the classical swine farm management programme are shown in Table 1 below.

**Table 1.** Reproduction indices in the classical swine farm management programme

| Females in oestrus (N) | Identification period (h) | 1st artificial insemination (h) | 2nd artificial insemination (h) | Fecundity (%) | Prolificacy (N) |
|---|---|---|---|---|---|
| 22 | 7:00-9:00 am | 10:00-12:00 am | 7:00-9:00 am | $87.40\pm1.25^{c}$ | $10.70\pm2.07^{c}$ |
| 15 | 1:00-3:00 pm | 3:00-4:00 pm | 7:00-9:00 am | $89.60\pm0.93^{A}$ | $11.32\pm1.82^{A}$ |

Test $\chi^2$ A-a $p<0.001$; A-b $p<0.01$; A-c $p<0.05$; a-a $p>0.05$

As shown in Table 1, there are significant statistic differences between females identified in oestrus in the morning from both the point of view of fecundity and of the number of live piglets per litter (test $\chi^2$ $p<0.05$).

For the swine farm management programme we suggest, we obtained the reproduction indices values shown in Table 2.

**Table 2.** Reproduction indices in our swine farm management programme

| Females in oestrus (N) | Identification period (h) | 1st artificial insemination (h) | 2nd artificial insemination (h) | Fecundity (%) | Prolificacy (N) |
|---|---|---|---|---|---|
| 28 | 7:00-9:00 am | 10:00-12:00 am | 3:00-4:00 pm | $88.90\pm2.51^{a}$ | $10.65\pm1.83^{c}$ |
| 18 | 1:00-3:00 pm | 3:00-4:00 pm | 7:00-9:00 am | $89.40\pm1.83^{a}$ | $11.44\pm2.08^{A}$ |

Test $\chi^2$ A-a $p<0.001$; A-b $p<0.01$; A-c $p<0.05$; a-a $p>0.05$

**Table 3.** Work programme in our swine farm management programme

| Weaning days | Oestrus days | 1st artificial insemination (h) | 2nd artificial insemination (h) | Immobility syndrome |
|---|---|---|---|---|
| Monday | Friday | 10:00-11:00 am | 3:00-4:00 pm | Yes |
| Thursday | Monday | 10:00-11:00 am | 3:00-4:00 pm | Yes |
| - | Saturday | 9:00-11:00 am | 7:00-9:00 am | No |
| - | Sunday | 9:00-11:00 am | 7:00-9:00 am | No |

It is obvious that, after weaning the piglets, oestrus appears in 78-87% of the cases the fifth day after weaning; females weaned on Mondays will be in oestrus on Fridays, when the work programme is from 7:00 am to 4:00 pm, when we can operate new identifications. The same goes for the sows weaned on Thursdays, when the largest share of sows in oestrus is on Mondays.

On weekend days (shorter work programme), sows in oestrus are identified as such once a day and they are inseminated artificially for the first time between 10:00 am and 11:00 am, and for the second time the next day, between 7:00 am and 9:00 am.

Though the number of sows in oestrus is low and the interval between the two artificial inseminations is rather large, we believe that using our swine farm management programme will not have negative effects on the value of the reproduction indices analysed or on the intensification of reproduction on swine farms.

## Conclusions

Practicing artificial insemination on sows at shorter intervals of time after oestrus identification allows us to reach the optimum time when reproduction indices also have reached higher values.

In sows in oestrus identified between 4:00 pm and 7:00 am, we recommend identification of oestrus in the morning because a longer interval between artificial inseminations reduces considerably the possibility of fecundating the ovules in the classical swine farm management programme (with over 15 hours between artificial inseminations).

For weekend days (shorter work period between 7:00 am and 12:00 am), sows in oestrus need to be identified once a day and artificially inseminated for the first time between 9:00 am and 12:00, and for the second time the next day in the morning because of the low number of sows in oestrus (weaning is done on Mondays and Thursdays alone and oestrus is manifest intensely the fifth day, when the work programme is again normal).

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