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Characterization of Boar Rental Schemes for Reproduction Purposes in a Swine Center in the Chinampa Region of Xochimilco, Mexico

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Abstract: Artisan pig family farms are an important mean of income, in spite of their poor performance they represent a small capital fund that can be used when faced with urgent cash flow situations, or to face immediate family feeding needs. Boar service rental in urban and rural areas is still common, this consists of renting boars for breeding in exchange of cash or in species. The objective of the present study was to carry out a retrospective analysis of the records of 63 boars, in order to characterize the frequency of use, age, preferred breed by the public of the region, and distances walked and traveled by the boars in service in the Chinampa region of Xochimilco, Mexico City. An average of 0.19 to 0.27 mountings per day was observed which corresponds to 1.36 and 1.92 mountings per week. Boars had short intervals between mountings, one or two days, or else carried out one mounting per year, registering an average of 15.94 days between breedings. Boars older than twelve months had the highest number of mountings, more than 50, and were used only for one year. Surprisingly, males staying for 3 to 4 years, were not the ones that registered more mating activity since these pigs could not overcome an average of 40 mountings during their 4 years staying at the farm. Distances walked by boars during service, varied from 0.5 km in the Chinampa region, to 25 km in urban areas. The results obtained in this study indicate that the reproductive efficiency in backyard swine breeding can not be established due to the lack of an appropriate reproductive program. It is necessary to consider hygiene and health measures in all the boars, since the increase in annual number of mountings could also rise the risk of venereal diseases during contact with females from different origin and unknown hygiene habits.

Key words: Pigs, boar use, xochimilco, Mexico

INTRODUCTION

In Mexico, family livestock production is done mostly under a low subsistence level which is of great importance to family income in some regions. An example of this is Xochimilco, in Mexico City, where family farms have become an important means of income; the facilities in these farms many times are improvised, pigs are kept in backyard conditions.

A new strategy has risen in these farms, named boar service rental, which consists of renting boars for reproduction purposes in exchange of cash or in species[1]. This type of production is mainly handled by older men, women and children, which is the reason it is known as artisan farm production[2,3]. Producers involved in this type of production, own one fattening pig up to five sows kept in backyards or pens[2,4]; few families own boars[1]. Pigs under this system have poor production performance; generally producers do not have records that allow them to quantify animal production; besides, they rarely have access to technical assistance to guide them in this and other procedures such as feeding, genetic improvement, health monitoring and marketing[5].

The feed cost for artisan farms is low due to the ingredients used[6], based on kitchen leftovers, agricultural by-products, corn, wheat bran, and in some cases balanced commercial food[4]. It is possible that the disposal of manure has environmental impact both on the soil as well as on the channels of the Chinampera region. The main problem faced by producers of this region is the low price obtained when selling their animals, resulting in a disincentive to continue producing. Nonetheless, artisan pig farms are still an important source of income so they will not easily disappear[6].

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In spite of the small scale of these farms, the sum represents an important part of overall national swine production; one million of farmer units with a diversified economy with less than 5 heads sustain 29% of the total herd[7].

The main purpose of the backyard or artisan activity is not to obtain maximum benefit at the lowest cost as in advanced confined technological farms, but rather to have a small capital fund that can be used when faced with urgent cash flow situations, or to face immediate family feeding needs or for the community[4]. Artisan pig farms should be considered a productive sector in national pig production[2,3].

The objective of the present study was to carry out a retrospective analysis of the records of 63 boars, in order to characterize the frequency of use, age, time and distances walked and traveled during boar service.

MATERIAL AND METHODS

The study was carried out in a swine center located in the Chinampa region of Xochimilco, in Mexico City. The purpose of the farm is piglets for sale and boars´ rental for breeding.

A productivity retrospective analysis of 63 boars was carried out from April, 1998 to August, 2003. All the boars were named and registered. The measured indicators were: number of mountings per boar, number of mountings per month, number of mountings per year, distances walked or traveled by car or boat per boar, and number of non effective mountings per boar.

Pigs were housed in partial confinement in individual pens between 4.18 and 7.2 square meters, with cement floor and dividing walls (1.1 m height), until they were required for breeding or were replaced at the farm. Feeding consisted of *ad libitum* water and 2 kg of balanced commercial feed (gestation 30/70) with 14.5 MJ ME/kg and 16% of crude protein.

The information of the records was captured and processed in a Microsoft® Excel 97 spread sheet (Microsoft Corp. Redmon, WA, USES). The measured indicators were determined as follows:

- Number of mountings per boar. During the study period, total mountings per year and number of boars were counted. Averages were calculated to obtain the number of mountings per boar per year.
- Number of mountings per month. This indicator was calculated by adding the number of mountings for each month during 1998-2003, then they were averaged per month, considering the total mountings of the 63 boars under study.
- Number of mountings per year. This was obtained according to the number of total mountings carried out by the boars in one year.
- Non effective mountings per boar. The cases where the mated sow did not result pregnant were registered, and were averaged according to the number of boars per year.
- Distance walked or traveled by boar. After identifying the mating place, based on perimeter radii and distances emitted by the National Institute of Statistic, Geography and Computer Science (INEGI), the indicator was calculated by adding the distances either walked or traveled during each mounting per year. The result was averaged by the number of boars per year.
- In order to register breed, age and weight, a census was held during the boars' stay at the farm (September, 2003 to May, 2004).

RESULTS AND DISCUSSION

Boar use: To determine the number of mountings per boar per year, 63 boars were considered in a five year period. However, not all the boars remained for the 5 years. Boars like Chespirito, Tormenta and Los Chavitos registered only one to two mountings during 1998; in 1999, Colmillos and Caminante, also performed only two mountings, while Diamante and Pulgarcito performed only one. In 2002, Pietrain and Titani were identified with only one mounting, as well as Biónico and Rebelde, in 2003. These results indicate the lack of an appropriate protocol for boars' selection; consequently, the productive performance of the animals is only proven during mounting. For this reason, during the first mounting a farm employee had to be present in order to verify the boar libido.

Becerril[8] states that the libido examination is one of the main causes to replace young boars and also to evaluate the ability to perform a complete mounting. Consequently, if the expected yield is not obtained the boar is rejected. It is not profitable to keep an animal that does not accomplish the husbandry objectives required and that only represent expenses.

Boars older than twelve months had the highest number of mountings, more than 50 and were used only for one year. These males were: Caminante 3 and Caminante 5, with 84 and 52 mountings, respectively, in 1998; Mambo 8, with 59 in 2000; Champion with 103, in 2001; Cultivador and Renegado with 71 and 100, respectively, in 2002. These boars carried out an average of 0.19 to 0.27 mountings per day, which correspond to 1.36 and 1.92 mountings per week; values that are below

Becerril´s[8] recommendations, who suggests that boars older than 12 months should provide two services per day. Likewise, these results do not agree with data published by Alonso-Spilsbury *et al.*[9] who registered, 3.1 mountings/day in free-ranging conditions and 2.6 mountings/day in pens in the Mexican Hairless young boar.

The results obtained in this study indicate that the reproductive efficiency in backyard swine breeding can not be established due to the lack of an appropriate reproduction program. Becerril[8] recommends the use of an efficient reproduction program that provides mountings at the best moment during each service, allowing the programmed use of boars and adequate rest between mountings, according to age and genetic differences. Valencia[10] states that genetics is one of the factors that determines adequate efficiency of boars, specifically the breed. Some races, such as German Landrace, show spermatozoids in seminiferous tubes as of 17 weeks old, while in others, such as the miniature Göttingen, spermatozoids are present from the fourth week of age.

Regarding permanency in the farm, some boars such as: Jarocho, Landrace, Relevo, Popeye, Talismán and Pulgarcito stayed the longer period of time, 3 to 4 years, and surprisingly were not the ones that registered more mating activity since these pigs could not overcome an average of 40 mountings during their 4 years stay in the farm.

Boars under analysis showed short intervals between mountings (1, 2 days) or on the opposite, registered one mounting per year, the average interval between mountings was 15.94 days (N = 63). González *et al.*[1], registered 25.35 days between mountings (N = 17) concluding that boar work rhythm is very variable, and it can provide a daily service or at intervals of 105 days.

The time period that showed greater yield was 2 to 3 years and Caminante 3 registered an outstanding number of 86 mountings in two years, and Champion 144 in three years. This data corresponds with the maximum of fertility, 2.5 years, although it is clear that fertility for one year old boars is enough to allow regular mating[11,12].

An average of 0.19 to 0.27 mountings per day was observed (Fig. 1), this corresponds to 1.36 and 1.92 mountings per week. These values are below the records of other authors (*e.g.* González *et al.*[1] and Góngora *et al.*[4]), as well as with the recommendations of boar use in intensive production farms, carried out by Becerril[8].

The mounting average for each boar per year is shown in Fig. 2, it fluctuated between 18.68 and 26.3, taking into account that the number of boars varied per year. It is suggested that one boar should complete 3 to 4 services per week in intensive farms[8,11]; this way, an excessive use of the animals in this farm does not exist. However, it should be considered that the inadequate use of boars can originate excessive service which can cause a decrease in volume, spermatic concentration and total ejaculated spermatozoids[8], with a consequent decrease in fertility.

Fig. 1: Breeding in backyard conditions

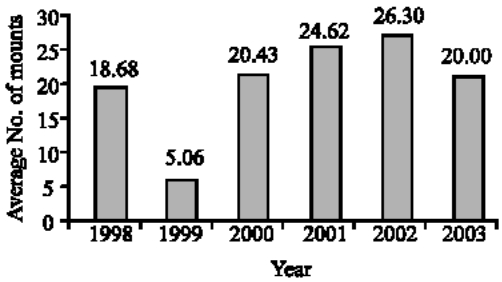

Fig. 2: Average numbers per boar during 1998-2003 (N=63)

Figure 2, taking into account that the number of boars varied each year, it was necessary to consider 22, 16, 21, 21 and 20 boars respectively, due to the constant mobilization of animals held by the owner of this farm. It is worthwhile to highlight that the results obtained during 2003, correspond only to January-August, so the rest of the year was not determined; therefore it could be possible that if the rest of the year had been registered the indicator could be surpassed. Measures of boars hygiene and health should be considered, since the increase in the annual number of mountings is directly related to the contact with more sows from different origins and unknown hygiene habits.

Results in Fig. 3, show a high number of mountings, especially during February, March and November, taking into account that the number of boars per year varies

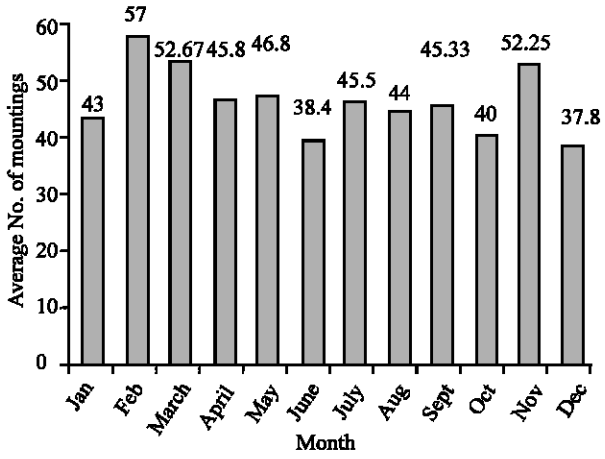

Fig. 3: Average No. Of mountings per month for the period 1998-2003 (N=63)

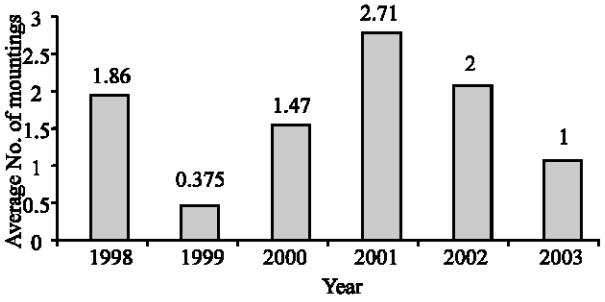

Fig. 4: Non effective average mountings per boar during 1998-2003 (N=63)

considerably, as well as the number of mountings per boar. Possibly, this can be attributed to cultural or gastronomic factors of the site, or because sows are weaned without any pre-established plan and the presence of post-weaning estrus is given in an irregular way, which causes a sudden increase in boars demand, or an extended inactivity in these pigs[1].

For the average of non effective mountings during 1998 to 2003 (Fig. 4), a value of 2.71 was registered in 2001, as the highest per boar. However, in 2002 and 2003 (until August), the average of non effective mountings per boar was 2 and 1, respectively. These results indicate that the possibilities to exceed the average registered in 2001 are not feasible. It is worth mentioning that the number of boars during 2003 was smaller (11 boars) compared with those of the previous five years.

With regard to pigs performing more non effective mountings (nem), during 1998, 41 non effective mountings were registered by 12 boars, Caminante 3 with 14, in 1999, and due to lack of information only 6 nem by 3 boars, were registered during January 6 to October 27. In 2000, 31 nem by 9 boars were obtained. In 2001, 57 nem by 11 boars were registered; Champion stands out with 14. In 2002, Renegado, Pietrain 2 and Galán stood out with 5 and 6 repetitions. Renegado was 26 months old and weighed 270 kilograms; its excessive body weight could have been a decisive factor in its sexual behavior[13], because the mounting is not easily performed[14] and it can cause hind problems due to excessive pressure[15].

The first mountings in Colmillo, Conquistador, Pandita and Relevo were registered as non effective, because the mated sows were not pregnant; for this reason the sows had to be mated again with the same boar or with another from different breed, at 34, 20, 27 and 21 post-mounting days, respectively. Although the age of these boars was not determined in the first mounting, it was probably an important factor for such failure, considering that it was not the best moment regarding puberty in these pigs. Houpt[16] recommends that the first mounting should be supervised, since a sow recently mated by a mature male should be used for the first breeding. Non effective mountings are related to boars' reproductive behavior regarding weight, libido or sexual immaturity, because in their first mounting the pigs have not reached puberty yet[8,13]. Another important factor was that some mated sows were small, anorexic or their heat was not detected on time by the owner[1].

Breed and age: An inventory of boars was obtained on the farm in order to characterize the average age in the herd, as well as individual weight and breed. Becerril[8] states that this procedure can have a significant effect on productivity. Regarding breed, the white ones such as Landrace and Yorkshire prevailed. White boars older than 12 months such as: Caminante 3, Caminante 5, Mambo 8, Champion, Cultivador and Renegado registered the highest number of mountings, and overcame 50 mountings. Due to cultural reasons people who request boar services prefer mostly white breeds, probably because these races produce more piglets by litter. Usually, in this production center, each boar has a name and an identification ear notch in order to be distinguished by all the farm employees and to favor handling.

According to the age of the animals in the herd, it was observed that many males that were 6 months old had not yet performed the first mounting. This indicates that future boars are bought before reaching puberty; the owners should use the following selection criteria: piglets for substitution shall come from another region and must be pure breed piglets; parents must show the best production indicators, -boar parents with excellent sexual libido, animal appearance, non-lameness, testicles symmetry- and must be 9 to 72 months old.

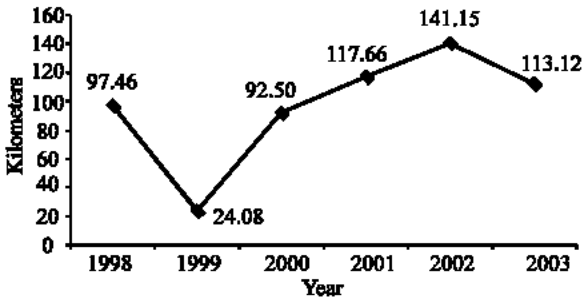

Fig. 5: Average distance walked traveled per boar per year during 1998-2003 (N= 63)

Fig. 6:Walking a boar through a neighborhood

Regarding weight, Aventurero and Cultivador were over-weighted, but in spite of this, they did not show lameness problems, and in the case of Cultivador, it registered the highest number of mountings in 2002.

Walked and traveled distances: The average walked distance per boar (Fig. 5) increased from 2000 to 2002 because the number of pigs used for boar service also increased in the Chinampera region. On the contrary, in 2003, the average walked distance decreased because the number of boars was lower than the previous years. In spite of an erroneous handling of the boar service and the lack of an appropriate protocol for boar selection, the expansion of this business in rural areas of the country is remarkable.

This husbandry on walking boars through different neighborhoods (Fig. 6) and also in the rural areas, causes irreversible consequences such as the possible dissemination of venereal diseases, affecting sows as well as the productive and reproductive performance at the farms where this service is rendered, resulting in economic losses and contamination. Besides, it must be considered that boars still have an important role in the dissemination of diseases in the new herds[17]. Although investment to sustain these animals does not seem significant, backyard swine breeding as we already mentioned is an important part of overall national pig production[2,3,18].

Distances walked by boars while mating were: 0.5 km in the Chinampa region up to 25 km, which is the approximate distance between the farm and Villa Olímpica in the Tlalpan Delegation in Mexico City. Texano was the boar that traveled more km during its stay in the farm, reaching 598 km in three years (Fig. 7), and making a total of 96 mountings.

Fig. 7:Boar climbing in truck for a service at home

Fig. 8: Placing boar in a boat (trajinera) for transportation in the channels

Most of the services were provided at noon and journeys were long, therefore boars´ behavior could be affected since high temperatures are related to a reduction on the mobility and spermatic concentration, therefore reducing fertility[2,3,8,12,14,19,20].

CONCLUSIONS

Boar service in the Chinampa region of Xochimilco has a very peculiar husbandry, the same applies for boar selection and frequency of use, due to the fact that boars can be allowed to only one mounting or can be frequently used and either way obtaining optimal results. Sites where mountings were carried out are characteristic of this region, especially because a trajinera (Fig. 8) must be used to arrive to some backyard farms. It is worth mentioning that culture and habits of people from this place influence the whole boar service process.

During the study, boars from white breeds were kept for 3 to 4 years at the farm and others of dark breeds did not surpass 40 mountings in 4 years. This is probably due to the preference of producers to raise white races (Landrace and Yorkshire) in this region, besides boars that showed best yield remained in the farm 2 to 3 years.

Boars under analysis had short intervals between mountings, one or two days, or else carried out one mounting per year, registering an average of 15.94 days between mountings (N = 63). These results correspond with other authors, showing that performance is very variable.

Regularly the first mounting of some young boars was registered as non effective; the failure in the first mounting is related to the boars' reproductive behavior, weight, libido or sexual immaturity because these animals have not reach puberty by the first breeding. Another important factor was that some mated sows were small, anorexic or their heat was not detected on time by the owner.

Distances walked by boars during service, varied from 0.5 km in the Chinampa region, to 25 km in urban areas. The most frequent critical sites to perform mountings were: urban, chinampa and rural regions. It is necessary to consider hygiene and health measures in all the boars, since the increase in annual number of mountings could also increase the risk of venereal diseases during contact with females from different origin and unknown hygiene habits.

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