THE IMPORTANCE OF ARTIFICIAL INSEMINATION TO THE PHILIPPINE SWINE INDUSTRY

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Introduction

Artificial insemination (AI) is considered as among the first biotechniques that was developed and adopted by livestock industries to enhance reproductive efficiency of domesticated animals. AI in swine was first introduced to the Philippines in the 1930’s. However, its field application began only in 1954 (Baguio, S.S. and Argañosa, A.S., 1994) through the Bureau of Animal Industry (BAI) of the Department of Agriculture (DA). Henceforth, experiments and field trials were conducted by the National Artificial Breeding Center (NABC) of the BAI, the University of the Philippines Los Baños (UPLB) and by other universities in the country.

During the 1960’s, 70’s and the early 80’s adoption of the AI technology by the local swine industry was generally low. Among the reasons for its low adoption were lack of technical expertise to perform the procedure, unavailability of equipment and other materials needed to perform AI and lack of technology to process and preserve semen for an appreciable period of time. Moreover, observations of low conception rate, low litter size and occasional abortion in gilts and sows that were subjected to AI were also cited as among the barriers to its adoption.

However, starting the late 80’s and up to the present, interest on AI by the Filipino swine industry players was rekindled by their desire to acquire, introduce and multiply superior genetics from developed countries in their breeding herds. The development of techniques to extend the volume of semen from one ejaculation to 10-30 doses and to lengthen the shelf life of fresh refrigerated semen doses for several days are considered among the major factors that encouraged adoption of the technology. Moreover, easy access of materials (i.e. extenders, disposable catheters, squeeze bottles, sterile lubricants) needed for AI has contributed to its adoption by industry players.

To date, the AI technology is considered part of the standard operating protocol of swine breeder and commercial farms. The 2015 and 2016 data gathered thru the Swine Breeder Farm Accreditation Program (SBFAP) of the DA-BAI indicated that 100% of the 33 accredited swine breeder farms (Appendix 1) are practicing AI to inseminate gilts and sows. These farms are using semen that are produced and processed in-house, acquired from local stud farms and/or purchased from foreign semen laboratories. However, a few still practice natural mating in gilts and sows that return to estrus after AI.

On the other hand, adoption of AI by commercial hog producers is observed to be lower than that of the breeder farms. Estimates made by local swine industry groups indicated that only about 70-80% of commercial hog producers are adopting the AI technology. While adoption of AI by small scale or backyard swine raisers is estimated to be as low as 20-30% only. The boar for hire service remains popular among small scale swine raisers particularly in hard to reach areas. Nevertheless, AI as an assisted reproduction technology is continuously gaining popularity among large commercial and small scale swine raisers. The AI technology is also perceived by both government and private industry players as vital in achieving the desired productivity, efficiency and growth of the Philippine swine industry.

The Philippine Swine Industry

The Philippine swine industry is the largest animal industry in the country. In 2016, total hog inventory is estimated at 12.48 M hd of which 63.78% (7.96 M hd) are kept in small scale farms while the remaining 36.22% and hd (4.52 M) are kept in large commercial farms (PSA, 2017). In the same year, total pork production is estimated at 2.23 million MT, which is valued at Php211.43 B. In terms of its contribution to the economy, the swine industry
contributes 14% of the gross value added in agriculture that puts it at 3rd place after rice (20%) and fishery (18%) industries. The industry also plays an important role in ensuring food security. In 2015, per capita pork consumption is estimated at 15.05 kg, representing 46.11% of the total animal meat consumption of Filipinos (Figure 1). Self-sufficiency on pork is estimated at 90% (PSA, 2017). Over the years, pork imports are limited to specific cuts (mostly fats and skin) that are utilized in meat processing.

The Philippine swine industry is ranked number 8 by the Pig International both in volume of production and in the number of sows (Appendices no. 2a and b) kept in farms. Monitoring of swine production performance in commercial swine farms has been done since 1992 to assess the productivity and efficiency of the industry (Appendix 3.)

To date, the Philippines maintains its FMD-free (without vaccination) status which was declared by OIE in May of 2015 (Fig. 2).

The importance of the swine industry to the Philippines extends beyond maintaining stable meat supply. The industry also provides employment to those working in allied industries (i.e. meat processing, feed milling, veterinary drug distribution). Being the major consumer of feed crops and crop by products, the industry also supports crop farmers. Thus, ensuring sustainability of the industry and enhancing its productivity, efficiency and product quality becomes nonnegotiable. Given this scenario, application of updated science-based technologies in pork production is no longer a matter of choice but a necessity.

**Recent technologies in pork production**

The development of new technologies in swine breeding, nutrition, health care and in housing and management and their application in farm operations have significantly improved the productivity, production efficiency and product quality of the swine industry. Technologies on molecular methods of selection and breeding are among the most widely used in recent years. Thru molecular methods, selection efficiency of specific traits is significantly improved. Moreover, molecular methods of selection offer the opportunity to select specific traits that are expressed only by females (e.g. litter size) in males. DNA marker aided selection also facilitates culling of individuals that carries negative genes (e.g. PSS, scrotal hernia, acid meat, etc.).

Application of molecular methods of selection and breeding entails cost. Thus, potential benefits from this technology have to be optimized. Assisted reproduction techniques offer the opportunity to maximize the utilization of breeder animals that are identified to carry superior genes. In swine production, AI using refrigerated extended semen is extensively practiced worldwide. On the other hand, AI with frozen-thawed semen is practiced in a limited scale and often limited to specific objectives.

Results of recent research activities have demonstrated potentials to further improve and widen the application of AI. The report of Valete, et.al. (2015) that outlined the technique for post mortem collection of viable sperm from the epididymis of buffaloes opens the opportunity utilize the spermatozoa from a genetically superior sire even after it dies. The effect of season on semen quality as reported by Petrocelli, et.al. (2015) provides a guide to ensure consistent productivity throughout the year. Technology related to improving the success rate of AI using frozen-thawed semen as reported by Silva, et.al. (2015) highlighted the influence of individual boars on the ability of spermatozoa to resist membrane damage from cold shock during processing and preservation. Among the recent studies that seek to maintain the viability of spermatozoa and improve the breeding success rate of AI with frozen thawed semen are on the development of extenders that effectively protects the sperm during cryopreservation (Silva, et.al. 2015); on semen volume and sperm density to maintain post thaw viability of semen samples (Ramos, 2004) and on precooling of semen samples prior to cryopreservation (Ancheta, et.al., 2015).
The effects of semen extenders and duration of storage on the membrane integrity of boar spermatozoa (Frydrychová, et.al. 2010) and of sperm density, storage duration and temperature of liquid boar semen (Reddy, et.al. 2017) were evaluated to optimize the liquid semen processing and preservation protocols to achieve improvement on the success rate and efficiency of AI.

To complement research activities that seek improvement in the assessment, processing and preservation of boar semen, Wilson, et.al. (2004) evaluated the nutritional requirements of boars to ensure production of semen with a quality that would match current evaluation, processing and preservation protocols that would lead to significant improvement in the efficiency of AI in pigs.

Conclusion

The importance of the swine industry can to the country can never be underestimated. It ensures stable supply of meat and provides employment. It also supports crop farmers and those engaged in industries allied to pork production. Hence, sustainability and further enhancement of its productivity and production efficiency is imperative. Molecular methods of breeding and selection have significantly improved the efficiency of selecting individuals that possess desired traits and culling of negative genes from swine breeding herds. These methods facilitate identification of genetically superior breeder animals. However, the potential benefits from these superior animals will only be realized if their genes are multiplied and distributed to as many swine farms as possible. AI offers the opportunity to efficiently multiply and distribute superior genetics. Thus further development of AI and its component technologies that complements genetic improvement efforts needs to be pursued.

References


Bureau of Animal Industry (BAI) 2017. Farm Inspection Reports. Swine Breeder Farm Accreditation Program (SBFAP).


Appendix 1. Accredited Swine Breeder Farms in the Philippines as of February 2017

Region 1
1. Quickgrow Genetics Phils., Inc.
2. Venvi Agro Industrial Ventures Corp.

Region 3
1. Depo Breeding Center
2. Hypig Genetics
3. Mc Quarry
4. IMI, Inc.
5. Edward Agri Farm
6. Vergel de Dios Pig Farm
7. PILMICO
8. URC

Region 7
1. Wellisa Farm
2. Excelsior Farm

Region 4a & b
1. John and John Farms, Inc.
2. Luz Farm, Inc.
3. PIC Philippines, Inc.
4. Foremost Farms, Inc.
5. Creekview Stock Breeding Farm
6. Holiday Hills Stock and Breeding Farm
7. Cavite Pig City
8. Jaro Development Corporation
9. Victoria Foods Company
10. Infarmco
11. Europhil Swine Genetics
12. International Swine Genetics, Inc.
13. 3J Sireline Nucleus Farm
14. Coral Agri Venture Farm, Inc.

Region 6
1. Genetico Progreso
2. Jamarli, Inc.
3. V4 Farm

Region 11
1. Cecilia Stock Farms, Inc.
2. Surico Farm, Inc.
3. Davao Cresta Farm, Inc.

ARMM
1. Progressive Farm, Inc.
### Appendix 2a. Ranking of countries with the largest volume of pork production (’000 Tons)

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Source: Pig International July/August 2015

### Appendix 2b. Ranking of countries with most number of sows (’000 sows), head

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Source: Pig International July/August 2015
Appendix 3. Swine farm production performance in the Philippines, 2016*

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<th>Parameters</th>
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<th>High</th>
<th>Total/Average</th>
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<td>Litters farrowed</td>
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<td>6,254</td>
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<td>Litter size at birth:</td>
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<td>Alive</td>
<td>8.56</td>
<td>11.94</td>
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<tr>
<td>Total</td>
<td>9.00</td>
<td>12.67</td>
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<tr>
<td>Average birth weight, kg.</td>
<td>1.26</td>
<td>1.59</td>
<td>1.43</td>
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<td>Litter size at weaning, hd</td>
<td>7.14</td>
<td>11.02</td>
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<td>Age at weaning, d</td>
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<td>Average weaning weight, kg.</td>
<td>5.72</td>
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<td>Adjusted 30-day weight, kg</td>
<td>6.55</td>
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<td>Weaning to breeding interval, d</td>
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<td>Farrowing rate, %</td>
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<td>Average daily gain, g</td>
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<td>Adjusted 180-day weight, g</td>
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<td>Live weight produced/sow/year, t</td>
<td>0.95</td>
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* data taken from 35 commercial swine farms.
Source: Apo, et.al., 2017.