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Pig multiplier units and artificial insemination at farmers' fields: Success, impact and constraints

SUNIL KUMAR[1✉], RAFIQUL ISLAM[1], PRANTIK DEKA[1], PRIYAJOY KAR[2], KESHAB BARMAN[3], P J DAS[4] and VIVEK KUMAR GUPTA[5]

ICAR-National Research Center on Pig, Rani, Guwahati, 781 131, Assam, India

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ABSTRACT

Small-scale scavenging pig farming is less economically viable and meets individual demands only. To meet the country's demands, establishment of pig multiplier units and the popularization of artificial insemination (AI) at farmers' fields are essential. In the present study, 44 households were provided with interventions such as knowledge scale-up on piggery, AI, and essential veterinary aids, along with one-time physical incentives. The success, farmers' attitudes, impact, and constraints were assessed for the establishment of pig multiplier units and use of AI in these units. Comparative production performance and economics from AI to natural breeding were also assessed separately. In results, a total of 26 farmers (59.09%) were successful while 18 farmers (40.90%) were unsuccessful in establishing the multiplier units. Pig farmers (%) had a medium to high level of favorable attitude towards the establishment of multiplier units (55.36% to 32.64%) and the use of AI (50.25 % to 42.35%). After interventions of pig multiplier units and AI, a significant ($p<0.05$) improvement in average herd size, sale of piglets, net income, B:C ratio, reduction in the cost of production and mortality was observed. In comparison to natural breeding, AI interventions were found to be significantly ($p<0.05$) more productive and cost-effective. The most common constraints faced by farmers were high feed cost, doorstep availability of semen dose/boar, distance and timely artificial or natural service. In conclusion, pig multiplier units and AI in pigs were cost-effective technologies to propagate and repopulate pigs to meet the demands of piggery stakeholders.

Keywords: Artificial Insemination, Farming, Impact, Multiplier, Pig

Pork is the preferred meat consumed in North East (NE) India; however, there is a huge gap between the demand and supply of pork (Mohakud, 2020). Most farmers rear only a very small number of pigs to meet individual needs (Haldar *et al.* 2017, Singh *et al.* 2019, 2020). Low pork yield per pig, unavailability of semen/males at farmers' doorstep, lack of multiplier farms/farmers and tendency to rear on zero input basis are major hurdles to meet the demands in the country. However, small-scale pig production systems hold good potential to reduce poverty in NE (Ahmed *et al.* 2017), as the demand for pork is substantially high in these areas (Ansari *et al.* 2013). The goals and solutions for enhancing pig production should be to optimize the number of live piglets per litter, piglet birth weight, litters per year, longevity, lifetime productivity, and to reduce the weaning-to-estrus interval in a scientific way (Kumaresan *et al.* 2009). In small holder systems, reproductive efficiency and productivity are generally low, mainly attributed to inbreeding (Kadirvel *et al.* 2013, Sharma *et al*. 2020), lack of scientific knowledge, AI, veterinary aids and initial capital investments. To prevent inbreeding and improve production, artificial insemination offers better opportunities than natural breeding (Singh *et al.* 2022). For scientific pig production at small to medium scale, knowledge scale-up of farmers, artificial insemination, feeding and health management and essential veterinary aids can help to meet the production demands. In such a situation, the establishment of multiplier units and the use of artificial insemination in pigs provide the best solutions. For the establishment of pig multiplier units, interventions such as motivation of the farmers to keep a greater number of pigs, knowledge scale-up (Kumar *et al.* 2025), initial physical incentives, essential veterinary and artificial insemination services at the farmers' doorstep need to be provided. Therefore, the objective of the present study was to estimate the success, farmers' attitude, impact and constraints for the establishment of pig multiplier units and

Present address: [1]Animal Reproduction, ICAR-National Research Center on Pig, Rani, Guwahati, 781 131, Assam. [2]Agricultural extension, ICAR-National Research Center on Pig, Rani, Guwahati, 781 131, Assam. [3] Animal Science Division, ICAR-HQ, New Delhi. [4]Animal Genetics and Breeding, ICAR-National Research Center on Pig, Rani, Guwahati, 781 131, Assam.[5]Animal Health, ICAR-National Research Center on Pig, Rani, Guwahati, 781 131, Assam. ✉Corresponding author email: skicar2200@gmail.com

AI in the units.

MATERIALS AND METHODS

The animal study was reviewed and approved by the Institutional Animal Ethics Committee as NRCP/CPCSEA/l658/IAEC-66 dated 27th July, 2021. A total of 44 farmers were approached randomly in Kamrup (R) area of Assam for establishment of pig multiplier units with use of AI for breeding.

Establishment of pig multiplier units: Four types of interventions were provided to the farmers, e.g., 1. Knowledge scale up or technical guidance of farmers 2. Artificial insemination 3. Needful veterinary aids and 4. Physical incentives/inputs (provided one time only) such as dewormer, feed, supplements and mineral mixture. Under the knowledge scale-up or technical guidance, about 29 points (Suppl. Table 1) were initially provided to the selected farmers and from time to time to help in the establishment of multiplier units. Other services, such as veterinary aids and artificial insemination, were provided as and when required by the farmers. The herd size was taken into account before and after the initiation at pig multiplier units. The success rate (%) in establishment, farmers' attitude, impact assessment and constraints faced by farmers of the multiplier units was estimated.

Artificial insemination service to pig farmers: The gel-free ejaculates were collected from trained males using a dummy sow by the double-gloved hand method (Kumar *et al.* 2024). The collected semen was transported within 15 minutes to the laboratory and analyzed for quality parameters according to standard procedures. The ejaculates having >70 % of the estimated parameters were held in the BOD incubator at 22°C for 3 hours. Semen extender was prepared and kept in BOD in similar conditions. After incubation, semen was extended at a 1:4 ratio to a final motile sperm concentration of 3 billion per dose (80ml). The extended semen was packed and sealed in non spermicidal packet. The AI doses were stored at 17°C and supplied to farmers on demand.

The Farmers' attitude towards establishment of multiplier units and use of artificial insemination: The farmers' attitude towards establishment of multiplier units was estimated using a developed scale (Suppl. Table 1) as per the criteria suggested by Thurstone (1946), Likert (1932), Edward (1957) and Kumar and Ratnakar (2011). The scale development consisted of 1. Preparation of statements (32 statements under 4 categories of interventions). 2. Relevancy test. 3. Calculation of 't' value. 4. Selection of attitude statements for final scale. 5. Standardization of the scale and finally 6. Results. The respondents were asked to indicate their degree of satisfaction or dissatisfaction with each statement on the five-point continuum ranging from "strongly satisfied (5)" to "strongly not satisfied (1)". The attitude score for each respondent was calculated by summing the scores obtained on all items. The higher score indicated that the respondent had a more satisfied response towards services and vice versa. The farmers' attitude towards the use of AI in pig was explored (Diekman and Eagly, 2008) using a developed scale (Suppl. Table 2) with 10 statements. The scores to obtain the total score.

Impact assessment of Pig multiplier units and artificial insemination: To assess the impact of the establishment of multiplier units and artificial insemination, data (numbers of animals/herd size, sale of animals, mortality, income and B: C ratio) from before and after AI intervention were ascertained. AI liquid semen doses were provided as required by the farmer for animals in heat. Sometimes farmers also practiced natural breeding as per boar availability. So, the average production parameters and average cost for performance of AI (including doses cost, transportation and performance charges in a lump sum) and natural breeding (including boar service, transportation and handling charges in a lump sum) were also taken into consideration for a comparative study between AI and natural breeding. The different production parameters such as total litter (TLSB), live litter (LLSB), still birth (SB), male piglets (M), female piglets (F), size and piglet weight (PWB), along with conception % over the number of AI or natural breeding were compared at birth.

Constraints as perceived by the farmers: The challenges faced by piggery farmers were assessed using open-ended questions. The identified issues were categorized into breeding, feeding, health, and management challenges (Suppl. Table 3). The sequence of the preferences expressed by the respondents was converted into ranks using the formula below:

Percent position= 100 (Rij-0.50)/Nj; Where Rij = Rank given for the i^{th}item by j^{th} individual; Nj= Numbers of items ranked by j^{th} individual

Scores were assigned to each rank's position as percentages (Garrett and Woodworth 1981). The scores given by each respondent for each item were summed and then divided by the total number of respondents. The mean scores for all items were ranked in descending order.

Statistical Analysis: The data were subjected to various appropriate statistical tools for calculation of scores, percentage (%) and mean±SE of the values in the study. Differences were considered statistically significant at the 95% confidence level ($p < 0.05$).

RESULTS AND DISCUSSION

A total of 26 (59.09 %) multiplier units were successful, and 18 farmers (40.90%) were not able to establish and maintain the multiplier units in the study. Unsuccessful farmers discontinued the units and sold the animals in the initial stages due to insufficient financial resources, the emergency need for money for their daily needs, and fear of animal deaths from disease outbreaks. Farmers from 16 units were highly satisfied with scores ranging from 131.28 to 155.90, and 10 farmers were satisfied with scores 102.56 to 127.18 for the services provided for the establishment of multiplier units (Table 1). Among the services, physical inputs such as feed, dewormers, supplements, and mineral mixture have the highest satisfaction score (155.90)

Table 1. Mean score and response of farmers' attitude toward interventions for establishment of pig multiplier units

SN	Intervention	Statements	Score	Response
1		In utero care of embryos/fetuses is beneficial for pregnancy	73.85	Undecided/Neutral
2		Birth to weaning growth @300-600(g/d) is good	69.74	Undecided/Neutral
3		Deworming and vaccination of weaners is useful	127.18	Satisfied
4		Weaning is good or bad and time of weaning	127.18	Satisfied
5		Selection of male weaners for breeding	65.64	Undecided/Neutral
6		Selection of female weaners for breeding	69.74	Undecided/Neutral
7		Group housing of weaner males is not useful	53.33	Dissatisfied
8		Group housing of weaner females is useful	53.33	Dissatisfied
9		Boar effect use for puberty induction is beneficial	77.95	Undecided/Neutral
10		Hormonal use to prevent delayed puberty is beneficial	73.85	Undecided/Neutral
11		Flushing in gilts is good for multiple ovulation	106.67	Satisfied
12		Use of boar for heat detection is useful and easier	118.97	Satisfied
13		Gilts service at second heat than first heat	90.26	Undecided/Neutral
14		Boar or AI for service at door's step	131.28	Strongly satisfied
15	Knowledge scale up (average score for all sub interventions 96.06)	Single service or double service beneficial for breeding	123.08	Satisfied
16		Avoiding service between sibs to prevent inbreeding	118.97	Satisfied
17		AI/ Service with skilled knowledge to improve the conception	139.49	Strongly satisfied
18		Restricted feeding is beneficial for optimum number and growth of embryos	61.54	Dissatisfied
19		21 Days post service heat detection	102.56	Satisfied
20		Pregnancy detection should be done twice post service	106.67	Satisfied
21		Pre-farrowing care and management is beneficial to avoid farrowing complications	114.87	Satisfied
22		Farrowing care and management of dam is essential to avoid MMA (Mastitis, Metritis, Agalactia)	102.56	Satisfied
23		Supplementation of Vit-E and Se in periterm is beneficial to avoid MMA (Mastitis, Metritis, Agalactia)	65.64	Undecided/Neutral
24		Maintaining BCS of dam is beneficial to avoid lactational anestrus	61.54	Dissatisfied
25		Post-weaning restricted feeding is beneficial to suppress lactation	57.44	Dissatisfied
26		Post weaning Flushing is beneficial for multiple ovulations	114.87	Satisfied
27		Postweaning immediate service is fertile heat	131.28	Strongly satisfied
28		Use of Hormones in post weaning anestrum is beneficial treatment to reduce WEI (Weaning to estrus interval)	127.18	Satisfied
29		Record keeping is beneficial for profitable pig farming	118.97	Satisfied
30	AI service	Artificial insemination service is better than Natural Breeding	151.79	Strongly satisfied
31	Veterinary	Treatment and prevention of diseases/disorder is beneficial in pig farming	131.28	Strongly satisfied
32	Inputs	Supply of dewormer, feed, supplements, Mineral mixture was beneficial	155.90	Strongly satisfied

compared to other services. This was followed by responses to AI interventions (151.79), needful veterinary aids (131.28), and knowledge scale-up (96.06) in the multiplier units. These results indicated that incentives were the most liked interventions by the farmers, followed by AI and veterinary aid services. Among the knowledge scale up, the use of AI or boar (139.49) was the most liked with a strongly satisfied response and for other points there was a range of responses from disagree (53.33-61.54), undecided (69.74-90.26) and satisfied (106.67-127.18). The scores and responses indicated that knowledge scale-up is very important for the establishment of multiplier units.

It was observed that 55.36% of the pig farmers had a medium level of favorable attitude and 32.64% of the farmers had a high level of favorable attitude towards the establishment of multiplier units. Similarly, 50.25% of the

Table 2. Scores of the farmers' attitude toward artificial insemination (AI)

SN	Statements	Score
1	AI is good for production in terms of litter size and breed improvement	42.95
2	AI is cost effective than natural breeding	48.68
3	Conception is good in AI than natural breeding	35.24
4	Litter size in AI is optimum or better than natural breeding	42.67
5	Litter weight in AI is optimum or lower than natural breeding	43.56
6	It is easier to get AI dose at the farmers' door step to serve the gilt/sow	39.63
7	It is easier to perform AI than the efforts in natural breeding	40.27
8	Heat detection in AI is easier, and lesser animals are detected than boar parading	40.38
9	Time of AI should be proper in gilts (12-24h) and sows (24-36h) after heat detection	38.62
10	Storage of AI dose is easier at 17°C for maintaining the optimum fertility of sperm	28.68

times) after interventions in multiplier units, along with a higher (1.19 times) gross income (763742.30±212773.34 v/s 192288.46±24509.78), net income (451190.76± 195770.54 v/s 74576.92±10477.51) and B:C ratio (2.46±0.42 v/s 1.68±0.10). The production cost per animal (Rs.) was reduced significantly ($p<0.05$) after interventions (7092.07±1093.85) compared with before interventions (13257.77±1843.96), resulting in higher (1.32 times) net income per animal (Rs.) (10885.08±4531.20 vs 8219.32± 1152.58) as economic benefit in the unit.

This indicated that interventions might have motivated pig farmers had a medium level of favorable attitude, and 42.35% had a high level of favorable attitude towards the use of AI. The mean score for attitude towards AI statements was in range from 28.68 to 48.68. It is proposed that an "attitude is the mental state of readiness" (Allport, 1935) and the learned predispositions towards various aspects of our environment, that may be adoption of scientific pig farming along with AI in the present study. Hence, the favorable attitude may be due to better managemental practices, economic farming, cost reduction, disease control, physical inputs and veterinary aids. From the observations, it could be stated that the establishment of multiplier units and promoting use of AI might bring a more holistic improvement to the piggery sector as a whole, as farmers have a positive attitude towards the establishment of multiplier units and AI.

The impact of interventions per multiplier unit over a one-year period is shown in Tables 3 and 4. Interventions for the establishment of multiplier units significantly ($p<0.05$) improved the number of animals and income, and reduced animal mortality in the units. It was observed that the total average herd size (44.60±1.65 vs 8.96±0.33) including for male (14.88±0.62 v/s 2.03±0.18) and female (14.62±0.56 v/s 2.23±0.17) piglets, gilts (5.84±0.39 v/s 1.53±0.09), sows (7.24±0.90 v/s 1.80±0.11) and boars (1.96±0.26 v/s 1.34±0.11) after intervention of the multiplier unit was higher (4.97 times) than before intervention. The sale of piglets (24.20±2.96 v/s 3.5±0.47) was observed to be higher after the intervention, leading to a 7.58 times higher income {Rs. (75.20±3.63 v/s 09.92±0.56) (x1000)} when compared to income before intervention of the multiplier unit. The rate of mortality (%) of piglet (36.83 v/s 22) %, adult (14.5 v/s 8.43) % was seen to be higher before intervention.

The production cost per animal was reduced (1.86

Table 3. Impact of establishment of multiplier units on herd size (n), income (Rs. x1000) from sale of piglets and total mortality per unit per year before and after interventions

Impact	Piglets		Gilts (n)	Sows (n)	Boars (n)	Total (n)	Piglet Sale (n)	Income from piglet sale	Total Mortality	
	Male (n)	Female (n)							Piglet(n)	Adult(n)
Before intervention	2.03±0.18^b	2.23±0.17^b	1.53±0.09^b	1.80±0.11^b	1.34±0.11	8.96±0.33^b	3.5±0.47^b	09.92±0.56^b	3.30±0.44^b	1.30±0.19^b
After intervention	14.88 ±0.62^a	14.62 ±0.56^a	5.84 ±0.39^a	7.24 ±0.90^a	1.96 ±0.26	44.60 ±1.65^a	24.20 ±2.96^a	75.20 ±3.63^a	9.83±0.98^a	3.76±0.68^a

Means with different superscripts in a column differ significantly ($P < 0.05$).

Table 4. Impact of establishment of multiplier units on production cost (Rs.), gross income (Rs.), net income (Rs.) and B: C Ratio in one year per multiplier unit

Impact	Production Cost	Gross income	Net income	B:C Ratio	Production cost/ animal	Gross income/ animal (Rs.)	Net income/ animal (Rs.)
Before Intervention	117711.53± 16362.43^b	192288.46± 24509.78^b	74576.92± 10477.51^b	1.68± 0.10^b	13257.77± 1843.96^b	21477.09 ±2751.44	8219.32± 1152.58
After Intervention	312551.53± 42232.20^a	763742.30± 212773.34^a	451190.76± 195770.54^a	2.46± 0.42^a	7092.07± 1093.85^a	17977.16 ±5057.85	10885.08± 4531.20

Means with different superscripts in a column differ significantly ($P < 0.05$).

Table 5. Impact of use of AI in multiplier units on herd size, production cost (Rs.), gross income (Rs.), net income (Rs.) and B:C ratio in one year per multiplier unit

Impact	Herd Size						Gross Income	Average cost of production	Average net income	B:C ratio
	Sows	Gilts	Boars	Piglets	Fattener	Total				
Before AI	1.90 ±0.17[b]	1.39 ±0.17[b]	0.40 ±0.08[b]	13.93 ±1.65[b]	2.72 ±0.36[b]	20.34 ±2.21[b]	83454.55 ±5820.56[b]	123795.45 ±10206.77[b]	43295.45 ±7222.57[b]	1.53 ±0.08[b]
After AI	3.59 ±0.37[a]	5.50 ±0.77[a]	1.31 ±0.25[a]	80.93 ±12.36[a]	12.84 ±1.50[a]	104.18 ±14.15[a]	373852.27 ±54566.5085[a]	699345.45 ±75337.64[a]	324425.56 ±35586.94[a]	2.03 ±0.09[a]

Means with different superscripts between rows differ significantly (P < 0.05) before and after intervention for respective parameter.

Table 6.The comparative analysis between AI and NB for conception (%), production parameters and expenses (Rs.) per AI or NB in pig multiplier units

Service type (n)	Conception (%)	TLSB	M	F	LLSB	SBP	LWB	Expenses/ AI or NB
NB (90)	78.88	8.73±0.63[b]	4.41±0.38[b]	4.29±0.38	8.09±0.59[b]	0.70±0.06	1.15±0.06	2077.08±112.04[a]
AI (149)	71.81	11.42±0.62[a]	6.01±0.30[a]	5.51±0.31	10.68±0.59[a]	0.65±0.09	1.30±0.05	431.47±25.20[b]

Means with different superscripts in a column differ significantly (P < 0.05). AI, Artificial insemination; NB. Natural breeding; TLSB, total litter size at birth; LLSB, live litter size at birth; SBP, stillborn piglets; LWB, litter weight at birth; M, Male; F, Female.

those farmers to enhance pig production. Which, in turn, could be attributed to increased scientific knowledge of farmers that resulted in better management practices to enhance the production (44.60±1.65 vs 8.96±0.33) and reduced mortality per herd size in the unit. The gross and net income (Rs.) per multiplier unit was also enhanced significantly (p<0.05), which may be attributed to the fact of increased production, increased sale of piglets (24.20±2.96 vs 3.5±0.47) and reduced cost of production (Rs.) (13257.77±1843.96 vs 7092.07±1093.85). This ultimately led to a significant (p<0.05) increase in the B:C ratio after intervention (2.46±0.42 vs 1.68±0.10). The B:C ratio indicated that multiplier pig farming is a profitable business in farmers' fields. The results are supported by previous studies that reported establishment of larger farms from the smallholder production system (Kumaresan *et al*. 2007, Chauhan *et al*. 2016, Thomas *et al*. 2021). Meghalaya government also operates and supports pig multiplier units (30 Sows units) through the state's Animal Husbandry and Veterinary Department (HP News Service, 2022) with an objective to increase the local supply of high-quality, purebred piglets to farmers, helping to improve the state's piggery industry. Hence, the concept of multiplier units should be expanded to bridge the gap in demand and supply in the NE region.

Although farmers have practiced natural breeding and artificial inseminations in the pig multiplier units, AI were instrumental in the establishment, along with the economic production of units. So, the impact of AI on production and economics was assessed separately and compared with natural breeding. The herd size of pigs reared by farmers before and after the AI intervention was recorded and is shown in Table 5. The average herd size increased significantly (p<0.05) after each subsequent intervention (104.18±14.15). Gross income, net income and BC ratio also increased significantly after the intervention of AI in the units (p<0.05). The production and economic impacts of AI are consistent with previous reports (Singh *et al.* 2022, Kadirvale *et al.* 2013). The higher (7.49 times) Net income after AI intervention may be attributed to a favorable attitude, higher production, reduced production costs (5.64), and economic benefits, thereby leading to an increase in farm size, which ultimately results in higher income for pig farmers.

The results of the comparative analysis of AI and natural breeding are shown in Table 6. Compared with natural breeding (78.88%), the conception rate was not significantly different (p>0.05) between artificial insemination (71.81%). Total (8.73± 0.63 vs 11.42±0.62) and live (8.09± 0.59 vs 10.68±0.59) litter size were significantly (p< 0.05) higher in the AI than in natural breeding. There was no significant (p>0.05) difference in the male and female born piglets, still birth and average litter weight at birth between AI and NB. However, a significant (p<0.05) difference was observed in the expenses (Rs) incurred per unit service between AI (431.47±25.20) and NB (2077.08±112.04). The results were in accordance with previous reports (Singh *et al.* 2022, Kadirvale *et al*. 2013). The improved conception and production in AI-bred sows may be attributed to superior boars and semen quality (Visalvethaya *et al.* 2011). The naturally bred sow has lower production, which may be due to poor health status (Hodel *et al*. 2021), poor semen quality (Am-in *et al.* 2010), and increased inbreeding (Kadirvel *et al*. 2013, Singh and Mollier 2020). This revealed that the intervention of AI has significantly impacted the production and income of the pig farmers more than the use of natural

Table 7. Rank and mean score of the different constraint faced by the farmers for establishment of multiplier units and use of AI in their units

SN	Constraints	Sub-constraints	Mean Score	Rank
I	Breeding	Door step availability of semen dose is difficult	78.6	2
		Door step availability male for breeding is difficult	74.6	3
		Distance and time to get AI dose/boar is cumbersome	75.6	4
		Cost of breeding or AI dose is bearable to farmer	35.2	7
		Delayed puberty in gilts leads to low production	31.6	9
		Anestrus in sows causes economic losses	29.6	10
		Repeat breeding causes economic losses	21.2	17
		Dystocia is commonly seen in farm	10.8	28
		Heat detection is very difficult	11.4	27
		Pregnancy detection is essential for profitable farming	33.6	8
		Storage of AI dose is difficult at 17°C temperature at the house	41.6	5
II	Health	Agalactia is common problem leading to death of piglets	21.6	16
		Mortality of piglets is common problem due to non-infectious reasons	13.2	23
		Mortality of adult pigs is common due to infectious diseases	29.2	11
		Cost of treatment is bearable to farmers	14.6	22
		Availability of Veterinary aids at time and doorstep is essential	25.6	13
		Vaccination of the pigs is done routinely	14.8	21
		Diarrhoea is the most common cause of pig death	15.6	19
III	Feeding	Cost of feed is higher than other costs and is a major burden to farmer	81.6	1
		Market availability of good quality pig feed is difficult	11.2	26
		Transportation of feed is a major problem	12.8	24
		Storage of feed in rainy season is difficult	11.6	25
		Balance feeding is easier	26.6	12
IV	Management	Routine farm operations such as cleaning, feeding, watering etc., are difficult	9.6	29
		Record maintenance is difficult	8.4	30
		Poor growth (runt, etc.) is not common in occurrence	25.2	15
		Scientific Housing and its cost is a major burden to farmers	35.6	6
		Disposal of waste is major issue	25.4	14
		Cost and Sale of animals is easier in marketing	20.8	18
		Extreme summer/winter is easily managed for profitable farming	15.2	20

breeding.

The rank and mean score of different constraints faced for the establishment of multiplier units and the use of AI are given in Table 6. In the present study, the high cost of feed was the major constraint (rank 1) faced by the farmers. So, incentivising feed inputs or alternate feed resources with high nutritive value needs to be promoted. High cost of feed was followed by constraints such as doorstep availability of AI doses (rank 2), superior males for natural mating (rank 3), distance and time to get AI dose/boar (rank 4) and storage of AI dose (5^{th} rank) to breed the female. In previous reports, constraints about feeding and breeding were reported at first and second rank, respectively (Saikia *et al.* 2019, Pooja *et al.* 2024). Insufficient production of crops for feed ingredients in the region, and milling of feed ingredients, may be reasons behind the high cost of feed. In the breeding constraints, as only a very few boars were reared in a village over the breedable females, subsequent to which mating could not occur at the time of heat for the required number of gilts or sows. Farmers had to travel long distances to collect the A.I. dose, so it became very hectic, costly and difficult to perform the A.I. at the right time of heat in all the females. These factors predisposed the timely availability of superior germplasm (AI dose/boar) to serve the female for breeding. This problem could be overcome by the establishment of regional or local AI doses storage and delivery centres to provide the doses on time and at the doorstep. The commercial use of liquid-stored semen included do-it-yourself AI (Johnson *et al.* 2000), establishment of AI centers (~172 in Europe) and wider AI coverage (65-99 %) (Khalifa *et al.* 2014). In contrast, it is envisaged that fewer than 1% of females, or even fewer, are bred using liquid semen through A.I. in India. There is a need to establish 707 AI laboratories in the country (NAP, 2017), the existing laboratories are in a single digit number.

Making of scientific housing was the most common constraint in the management category and ranked 6th among all the constraints. Infrastructure development for pig farming needs to be promoted (NLM, 2021). In the health constraint category, the common constraints were about the adult pig mortality (11th rank) and the timely availability of veterinary aids (13th rank). The adult pig mortality was attributed to an ongoing outbreak of African swine fever in the region. Other constraints were in the mid to low ranks and were managed from time to time by the farmers. To minimize the risk of constraints, training and capacity building (Kumar *et al.* 2025) needs to be done before initiation of the farm.

Consecutive livestock censuses have shown a declining trend of pig population (Basic Animal Husbandry Statistics, 2019). There is a need to establish pig multiplier units and popularise AI in farmers' fields to enhance pig and pork production. There was a medium to high positive attitude of farmers towards the establishment of multiplier units and the use of AI. Provided inputs and services were effective in establishing pig multiplier units. Pig herd size, number of piglets sold, net income, and B:C ratios were significantly higher after the intervention of multiplier units and the use of AI in the farmers' fields. AI was found to be more cost-effective than natural service for breeding the animals. Major constraints faced by the farmers were high feed cost and doorstep availability of artificial insemination doses. It was perceived that the nationwide establishment of AI centers or laboratories is the need of the hour. In conclusion, pig multiplier units and AI in pigs are the best technologies to propagate and repopulate pigs to meet the demands of piggery stakeholders, particularly in the NE region of India.

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