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Breeder satisfaction and cows' artificial insemination in a national cow artificial insemination program

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ADITIONAL KEYWORDS

Artificial insemination.
Customer satisfaction index.
Importance-performance analysis.
Service attributes.
Service satisfaction.

SUMMARY

The UPSUS SIWAB Artificial Insemination (Special Efforts to Accelerate Pregnant Cattle and Buffalo Populations) Program is a national scale program to ensure cows' pregnancy requires evaluation to determine its success. Farmer satisfaction is one indicator of the success of the program. The research aims were (1) to assess breeder satisfaction at Kadipiro village with service quality and artificial insemination and (2) to determine the level of artificial insemination success at Kadipiro village. This research used descriptive, quantitative methods and collected data by observation and interview using a questionnaire. The data were analyzed by importance-performance analysis (IPA) and customer satisfaction index (CSI). The results indicated satisfaction among all farmers toward the inseminator's performance based on the CSI at 0.87%, the quality of success in artificial insemination based on the conception rate at 65.15% (a fertile category), percentage of non-return rate at 65.90% (a good category), and a calving interval at, on the average, 13 months (the ideal category). In conclusion, the farmers were very satisfied with the services provided by the inseminator. This study suggested that the inseminator needed to improve the service attributes in quadrant I.

Satisfacción de reproductores e inseminación artificial de vacas en un programa nacional de inseminación artificial de vacas

PALABRAS CLAVE

Inseminación artificial.
Indice de satisfacción del cliente.
Análisis de importancia-desempeño.
Atributos del servicio.
Satisfacción del servicio.

RESUMEN

El Programa de Inseminación Artificial UPSUS SIWAB (Esfuerzos Especiales para Acelerar las Poblaciones de Ganado Preñado y Búfalo) es un programa a escala nacional para garantizar que el embarazo de las vacas requiera una evaluación para determinar su éxito. La satisfacción del agricultor es un indicador del éxito del programa. Los objetivos de la investigación fueron (1) evaluar la satisfacción del obtentor en la aldea de Kadipiro con la calidad del servicio y la inseminación artificial y (2) determinar el nivel de éxito de la inseminación artificial en la aldea de Kadipiro. Esta investigación utilizó métodos descriptivos, cuantitativos y recolectó datos por observación y entrevista mediante un cuestionario. Los datos fueron analizados por análisis de importancia-desempeño (IPA) e índice de satisfacción del cliente (CSI). Los resultados indicaron satisfacción entre todos los agricultores hacia el desempeño del inseminador basado en el CSI en 0.87%, la calidad del éxito en la inseminación artificial basada en la tasa de concepción en 65.15% (una categoría fértil), porcentaje de tasa de no retorno en 65.90% (una buena categoría) y un intervalo de parto a, en promedio, 13 meses (la categoría ideal). En conclusión, los agricultores quedaron muy satisfechos con los servicios prestados por el inseminador. Este estudio sugirió que el inseminador necesitaba mejorar los atributos de servicio en el cuadrante I.

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INTRODUCTION

One of the most familiar livestock products is beef. The demand for beef as a protein source has been steadily increasing along with increasing awareness among the public of the importance of a balanced diet and the rapid growth of the population, particularly in Indonesia. In 2017, the Indonesian people's beef consumption level reached 2.70 kg/capita/year, 19.92% increased from the level in 2015 (BPS, 2018). With the increase in beef consumption comes an increase in the demand for beef; to overcome the imbalance between beef demand and availability, an increase in beef production in Indonesia is necessary to prevent beef scarcity in the future and to reduce beef imports. Artificial mating, or arti-

ficial insemination (AI), is a strategy for overcoming the increasing demand for beef through self-breeding.

AI is an extremely helpful technology for breeders to increase beef cattle reproduction. According to Susilawati (2011), the main objective of AI is to improve the genetic quality of beef cattle available to the breeder by utilizing the semen of qualified and superior beef cattle. In Indonesia, AI was introduced by a researcher from Denmark, Prof. B. Seit, in the 1950s and performed at the Faculty of Veterinary Medicine, IPB, Bogor, for livestock development. In 2017, central Java province started to apply the UPSUS SIWAB (Special Efforts to Accelerate Pregnant Cattle and Buffalo Populations) program—a national cow artificial insemination program.

AI's success is highly affected by four interrelated and inseparable factors—selecting the acceptor cattle, testing the semen quality, accuracy of estrus detection by the breeder, and the inseminator's skills. The skills of the inseminator and the breeder spearhead AI application, and its success in the field depends on both responsible parties. The breeder naturally expects both satisfactory service from the inseminator and successful AI. Based on these factors, the breeder's satisfaction with AI service quality and success requires further research. Evaluation of success with importance-performance analysis (IPA) and Customer Satisfaction Index (CSI) is expected to provide information about inseminators' performance as seen from their service quality and AI success level.

MATERIALS AND METHODS

Location and time of the research

We researched between 9 January and 9 February 2019 at Kadipiro village, Jumapolo sub-district, Karanganyar regency, Central Java.

Research methods

We used a descriptive quantitative method. Quantitative analysis approaches the problem of the research with numerical data and statistical programs. Creswell (2014) suggested that quantitative research examined an objective theory by testing correlations among variables.

Sampling method

We sampled data in this research with probability sampling, using simple random sampling. Because the individuals in the research population were recognizable, the numbers required for the sample were taken using Slovin's equation (Equation 1):

$$n = N/(1+Ne^2) \quad (1)$$

Notes: n = sample size; N = population size; e = inaccuracy percentage due to sampling error is still tolerable (0.1).

Using the equation 1, the minimum number is calculated as follows:

$$n = 313/(1+313(0,1)^2) = 313/4,13 = 75 \text{ respondents}$$

Data analysis

In our quantitative data analysis, we used the importance-performance analysis (IPA) the customer satisfaction index (CSI) methods, and the Likert scale.

Importance–performance analysis (IPA)

IPA is used to gain information about the breeder's satisfaction with the inseminator's service quality by measuring expectations and implementation. The breeder's expectation level of service quality provided by the inseminator is how important the inseminator's service variables are to the breeder. The importance level of service quality is the importance of service variables as assessed by the customer. Each attribute is scored from 1 to 4.

According to Aswan *et al*. (2016), the equation for the suitability level of the respondent (Equation 2) is:

$$Tki = Xi/Yi \times 100\% \quad (2)$$

Notes: Tki = suitability level of respondent; Xi = weight of breeder's assessment of service quality by the inseminator; Yi = weight of breeder's assessment toward the expectation level of the inseminator's indicator.

Customer satisfaction index (CSI)

CSI is intended to analyze the cattle breeder's satisfaction level with the inseminator's service quality and the AI's success. According to Aswan et al. (2016), the CSI measurement is required because the result of the measurement serves as a reference to determine the target in the future.

The measurement method of the CSI includes the following steps:

1. Determine the mean important score (MIS) in Equation 3 and mean satisfaction score (MSS) in Equation 4:

$$MIS = (\sum_i^n=1Yi)/n \quad (3)$$

$$MSS = (\sum_i^n=1Xi)/n \quad (4)$$

Notes: n = number of respondents; Yi = expectation value of the–I indicator; Xi = performance value of the–I indicator.

2. Determine weight factors (WF) in Equation 5.

$$WF = MISi/(\sum_{(i=1)}^P MISi) \times 100\% \quad (5)$$

in which,

P = numbers of the expectation attributes

3. Determine weight score (WS) using Equation 6,

$$WS = Wfi \times MSSi \quad (6)$$

4. Determine *customer satisfaction index* (CSI) using Equation 7,

$$CSI = (\sum_{(i=1)}^P WSI)/HS \times 100\% \quad (7)$$

RESULTS

Characteristics of the breeders as respondents

As shown in **Table I**, 80% of the respondents were categorized as productive and considered to work well

and optimally in breeding cattle. This conforms to the statement by Mulyawati *et al*. (2016), who reported that the productive age of the cattle breeder ranges from 24 to 60 years. Aprilyanti (2017) reported that the (younger) productive age usually delivers higher productivity than the old workforce because of their physical weakness and limitations.

Sex

Table II shows conditions commonly found among breeders, particularly in Indonesia, where livestock farming is dominated by men, a tendency due to the more dominant roles played by men in the livestock business because the man is considered to be the head of the breeder's household. There were 10 female respondents; some of whose husbands worked in Jakarta and some of whose husbands had passed away. Three of the women just controlled the operation but were not involved in the cowshed because they had workers who took care of livestock farming.

Number of family dependents

Based on **Table III**, the most breeder has 3-5 family dependents. According to Purwanto and Taftazani (2018), family dependants refer to the number of family members who are still considered as dependants of the family—both siblings and relatives—who live in the household but have not yet worked. The more dependants the family has, the harder the family's responsible one will work in managing the business.

Education level of the breeder

The education level of the breeder is significant because more highly educated individuals more easily adopt innovation, whereas those with lower education levels usually adopt traditional livestock farming systems and are resistant to innovation. However, as shown by **Table IV**, around 40% of the breeder population are elementary school graduates. Mulyawati *et al*. (2016) reported that the higher the breeder's education level, the higher the level of livestock farming will be because educated breeders will more easily adopt innovation change their way of thinking, and solve problems wisely.

Scale of business

Table V shows that 76% were small-scale breeders and that the scale of the beef cattle business in Kadipiro village was still small because beef cattle farming in this village was generally a side business. Additionally, the breeders still faced a lack of capital to invest in more cattle. Hastang and Asnawi (2014) reported that cattle farming is a household business of farmers with limited capital, workforce, and management.

Other professions of beef farmers

Table VI shows that the cattle breeders in Kadipiro village had diverse professions. Of the cattle breeders, 56% worked as farmers because, in general, the cattle breeders lived in a village where most of the population worked as farmers.

Period of beef cattle farming experience

Table VII shows that, in general, the cattle breeders had bred cattle for a long time. Only 12% of the respondents had bred cattle for less than 5 years. Cattle breeders with a longer period in beef cattle farming understandably had more experience. According to

Table I. Distribution of age group in breeders population (Distribución del grupo de edad en la población de reproductores).

Age (years old)	Amount (person)
25–35	6
36–50	30
51–65	25
>65	14
Total	75

Table II. Sex distribution of breeder (Distribución por sexo del criador).

Sex	Number (persons)
Male	65
Female	10
Total	75

Table III. Number of breeder's family dependents (Número de familiares dependientes del criador).

Number of family dependents	Number (persons)
0	0
1 to 2	9
3 to 5	47
>5	19
Total	75

Table IV. Education level of breeder (Nivel de educación del criador).

Education level	Number (persons)
Not graduated from elementary school	7
Elementary school	30
Junior high school	15
Senior high school	12
Diploma	4
Scholar/bachelor	7
Total	75

Table V. Scale of business (Escala de negocio).

The scale of business (animals)	Number (persons)
<3	57
3–10	17
>10	1
Total	75

Table VI. Side profession of cattle breeders in Kadipiro village (Profesión secundaria de ganaderos en el pueblo de Kadipiro).

Kinds of professions	Number (persons)
Farmer	42
Skilled laborer	4
Entrepreneur	9
Civil servant	5
Private employee	4
Merchant	6
Housewife	5
Total	75

Table VII. Period of beef cattle farming experience (Período de experiencia en la cría de ganado de carne).

Experience in beef cattle farming	Number (persons)
2–5 years	9
5–10 years	11
>10 years	55

Utami *et al*. (2016), the knowledge and skill of the cattle breeder with experience in cattle maintenance management conferred better cattle farming abilities on the breeder.

Assessment of level of interest and performance

We assessed the level of interest and performance of the inseminator by assessing the beef cattle breeder's attitudes toward the service attributes of AI. We individually measured the breeders' administration of service attributes, which we categorized into three groups as follows: service attributes of production means, technical services, and services as the result of AI. Those three groups comprised 15 attributes of service used for assessment in this research. Based on **Table VIII**, the actual performance accepted by the breeder did not conform to the expectation of the breeder because of the performance of most of the servicing attributes of the inseminator being lower than the desire of the beef cattle breeders. A suitability value of 100% or more indicates that the available attributes conformed to the cattle breeders' desire.

Based on the result of suitability analysis on the attribute of price per AI injection, the lowest suitability score was 63.60%. This was due to the attributes' very low-performance score, although these attributes had a high level of interest for the cattle breeder. The low score for performance attributes was due to the lack of any discount for the cattle breeder or guarantee of success of the AI.

Calculation of importance-performance analysis (IPA)

Through the analysis, we identified items that required improvement by the inseminators to satisfy the cattle breeders. We present the 15 attributes investigated in this research in proper order from 1 to 15 as follows: price per injection of AI, price of medicine and vitamins, straw availability, availability of medicine and vitamins, the appearance of the inseminator, attitude of the inseminator, skills of the inseminator, punctual arrival time, ease of contact with the inseminator, the honesty of the inseminator, equipment completeness, success of AI (S/C), productivity of AI results, calf appearance, and recording cattle.

The IPA Matrix comprises four quadrants—namely, quadrant I (main priority), quadrant II (maintain achievement), quadrant III (low priority), and quadrant IV (exaggerated). Those quadrants are separated by a point of intersection, which is derived from average values of interest and performance.

The IPA method targets mainly quadrant I, which contains attributes of service that are considered important by the cattle breeder. In our study, however, they did not conform with the cattle breeder's expectation because their performance was not good enough. We applied the quadrant analysis to assess attributes in quadrants I, II, III, and IV and their implications for the results. In **Figure 1**, we present attributes in each quadrant.

Calculation of the cattle breeder satisfaction index

We measured breeder satisfaction as a whole by calculating the CSI, to obtain the value of which we calculated the *mean importance satisfaction* (*MIS*) score and the *mean satisfaction score* (*MSS*). In **Table IX**, we present the CSI calculation results for the service provided by the inseminator.

Based on the calculation results, attributes that required improvement in terms of performance to improve the satisfaction indexes were those with scores lower than the total weighted score of 3.52. Based on the results of the cattle beef breeders' assessment of the performance of the inseminators' services, the CSI score was 87.89%. This score ranges between 0.81 and 1.00, which means that on the whole, cattle breeders were satisfied with the performance provided by the inseminator.

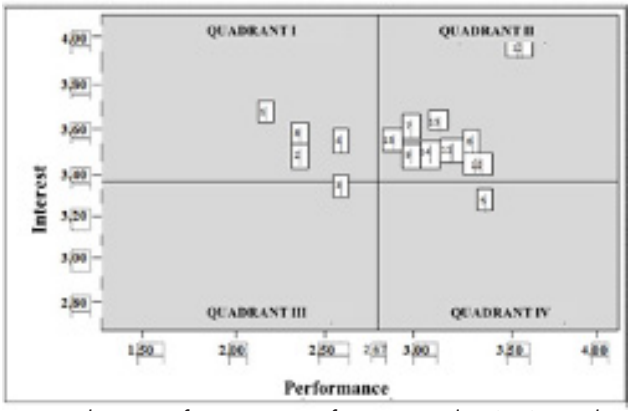

Figure 1. *The matrix of Importance–Performance Analysis (IPA). Quadrant I represent main priority, quadrant II represents maintain achievement, quadrant III represents low priority, and quadrant IV represents exaggerated (La matriz de Análisis de Importancia-Desempeño (IPA). El cuadrante I representa la prioridad principal, el cuadrante II representa mantener el logro, el cuadrante III representa la baja prioridad y el cuadrante IV representa exagerado.*

Table VIII. Suitability score between the levels of interest and performance on each attribute (Puntaje de idoneidad entre los niveles de interés y desempeño en cada atributo).

No.	Service attributes of artificial insemination (AI)	Score of performance	Score of interest	The score of suitability (%)
1	Price per injection of AI	173	272	63.60
2	Price of medicine and vitamins	185	261	70.88
3	Straw availability	194	250	77.6
4	Availability of medicine and vitamins	180	262	68.70
5	The appearance of the inseminator	259	245	105.71
6	The attitude of the inseminator	255	261	97.70
7	Skills of the inseminator	227	269	84.38
8	Punctual arrival time	185	263	70.34
9	Ease of contact with the inseminator	223	260	85.76
10	The honesty of the inseminator	260	260	100
11	Equipment completeness	242	262	92.36
12	Success of AI	205	300	68.33
13	Productivity of AI results	237	270	87.77
14	Calf appearance	235	265	88.67
15	Recording cattle	223	260	85.76

Table IX. Results of calculation on the *customer satisfaction index* (CSI) (Resultados del cálculo del índice de satisfacción del cliente (CSI).

No.	The attribute of service on AI	MIS	WF	MSS	WS
1	Price per injection of AI	2.31	5.27	3.63	0.19
2	Price of medicine and vitamins	2.47	5.63	3.48	0.20
3	Straw availability	2.59	5.91	3.33	0.20
4	Availability of medicine and vitamins	2.40	5.48	3.49	0.19
5	The appearance of the inseminator	3.45	7.88	3.27	0.26
6	The attitude of the inseminator	3.40	7.76	3.48	0.27
7	Skills of the inseminator	3.03	6.91	3.59	0.25
8	Punctual arrival time	2.47	5.63	3.51	0.20
9	ease of contact with the inseminator	3.00	6.85	3.47	0.24
10	The honesty of the inseminator	3.47	7.91	3.47	0.27
11	Equipment completeness	3.23	7.37	3.49	0.26
12	The success of AI (S/C)	2.73	6.24	4.00	0.25
13	Productivity of AI results	3.16	7.21	3.60	0.26
14	Calf appearance	3.13	7.15	3.55	0.25
15	Recording cattle	2.97	6.79	3.47	0.24
	Total	43.80			3.52
	CSI				87.89

The success of AI

Based on our results, of 132 broodstock that had undergone AI, the impregnation rate, or CR, was 65.15%, and the S/C was 1.63—very good scores conforming to Fanani *et al*. (2013), who reported that a good CR reaches 60%–70%, with good results based on the CR.

Based on **Table X**, the average calving interval was 13 months. The calving interval is defined as an interval between one partus to the next one or the one before. The normal calving interval for beef cattle in tropical and subtropical areas is expected between 12–14 months (Khotimah *et al*., 2018).

DISCUSSION

Kadiprio village covers an area of 417,790 Ha at an altitude of 550 m above sea level. It lies between 110° 40″ and 110° 70″ east longitude and 7° 28″ and 7° 46″ south latitude. Kadipiro village has an average rainfall of approximately 2500 mm/year and a tropical climate, with temperatures between 19°C and 27°C.

Table X. Data of calving interval of the beef cattle in Kadipiro village (Datos del intervalo entre partos del ganado vacuno en la aldea de Kadipiro).

Calving interval	Number (productive cows)	Percentage (%)
12–13 months	97	73.48
14–15 months	18	13.62
>15 months	17	12.9
Total	132	100.00

Among four regencies in Central Java (Wonogiri, Karanganyar, Grobogan, and Kebumen), Karanganyar regency has funded self-supporting AI services by accepting incentives from the State Budget funding agency (APBN) 2019 to the value of approximately Rp 20.000,-. The remaining support and infrastructure of UPSUS SIWAB in the regency/municipality were stock allocated by the end of the year to be utilized in the following year. Several items were addressed to optimize the implementation of UPSUS SIWAB in the Karanganyar regency in 2019. They included providing and using means and infrastructures (frozen semen, liquid N2), operating costs for implementation of UPSUS SIWAB, technological guidance (Bimtek) of the technical officer (AI, PKB, officers who handled the semen), providing fodder forage, controlling the productive beef slaughtering, monitoring and reporting on the UPSUS SIWAB, and implementing continual SPIP (the Government Internal Controlling System).

Sa'adah *et al*. (2019) research in Jepara Regency (Donorojo District, Bangsri District, and Pakis Aji District) used IPA and CSI to measure farmers' satisfaction with the UPSUS SIWAB program in different areas. Although there are differences in the results regarding the attributes that need to be prioritized for improvement, it shows that the IPA and CSI evaluation methods are suitable for measuring program success.

The success level of AI is a percentage of impregnation that can be achieved during AI implementation. Supriyanto (2016) argues that evaluating the efficiency of existing IB activities commonly practiced, namely S/C, CR, and NRR, the better the number of the three parameters. Hence, biotechnology insemination will achieve efficiency the better reproduction that can affect the population development of cattle in an area.

Mouffok *et al*. (2019) state that fertility is relative to the conception rate (CR) at the first insemination. This parameter determines the attractiveness and sustainability of the practice among breeders. Indeed, this parameter is not isolated from other conduct parameters such as the level of food, the insemination period's choice, and the quality of the semen used.

The non-return rate (NRR) is defined as the proportion of cows that are not subsequently re-bred within a specified period after insemination (Fouz *et al*., 2011). The result of the NRR calculation was 65.90%; according to Wahyudi *et al*. (2014), a good score for NRR was 79.53 ± 18% that higher than 60%. Based on this statement, we concluded that the NRR score in Kadipiro village was good because it still fell within the range of 79.53 ± 18%. It is also shown by San *et al*. (2015) on the implementation of AI in Patean and Plantungan Districts, Kendal Regency, Central Java, respectively, showed NRR values of 86.66% and 83.33% and were then categorized as high because the value was more than 60%. Thus the implementation of AI in the region is considered successful.

According to Rusdi *et al*. (2016), the ideal calving interval is 12–13 months, including the interval between calving and the first post-calving mating. Based on this finding, the calving interval reflecting the cattle's fertility in Kadipiro village is still ideal.

Gunawan *et al*. (2019) state that calving interval is used to indicate UPSUS SIWAB program success. The research shows that program assistance done by Agricultural Technology Research Center East Kalimantan has helped increase production performance and livestock reproduction, especially in the Istiqomah farmer group. There was an increased population of 26 heads, the birth rate of 40%, 56.5% pregnancy rate, S / C 1.8, days open to 2–4 months, calving the interval to be 11–13 months.

CONCLUSION

The cattle breeders have, on the whole, been satisfied with the performance of the inseminator, as reflected in the CSI value, 87.89%. AI success based on the CR was 65.15%, a good result; the result of service per conception was 1.63, which means that cattle in Kadipiro village are categorized as fertile, with a good non-return rate of 65.90% based on the CI of 13 months on average, which is categorized as ideal.

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