

**Original Research Article**

**PERCEPTION OF VETERINARIANS TOWARDS CONSEQUENCES  
AND SUITABILITY OF SEX SORTED SEMEN TECHNOLOGY**

**Abstract**

An ex-post-facto exploratory research study was carried out in the state of Andhra Pradesh with the specific objective to know the perception of veterinarians towards consequences and suitability of sex sorted semen technology. These consequences include Desirable vs Undesirable, Anticipated vs Unanticipated, Direct vs Indirect and in addition suitability was also assessed in terms of sustainability, compatibility, socio-cultural and economical aspects. It was found that three-fourth of the veterinarians (76.67%) had medium level of perception towards sex sorted semen technology in terms of its consequences and suitability to dairy farmers. The study thus, reveals that innovations which are compatible and in accordance with farmers' situations will be adopted following its diffusion. Consequences and suitability also need to be taken care of while diffusing any innovation among the farming community.

**KEY WORDS:** Consequences, dairy farmers, perception, sex sorted semen technology, Veterinarians, Andhra Pradesh

**INTRODUCTION**

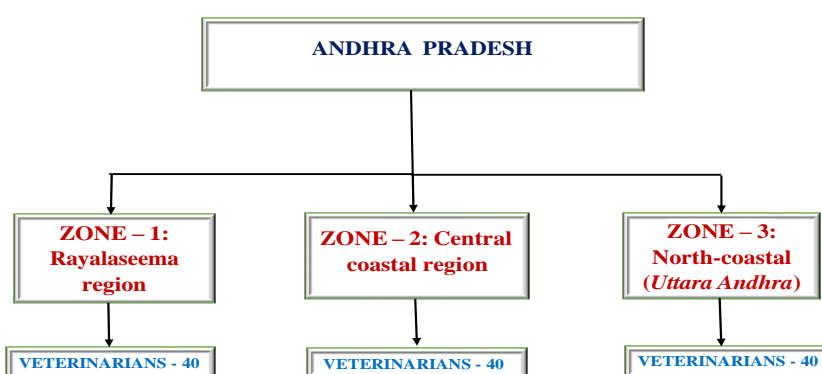
Today, India is the world's largest producer of milk, with 22 per cent of global production which is mainly due to adoption of innovative technologies that are being diffused for adoption by the farmers through different channels. In recent past, the advanced reproductive technology i.e., sex sorted semen technology was diffusing at appreciable rate throughout India as its benefits were visible over the years in other countries. sex sorted semen technology comprises

the separation of sperm into male/Y bearing and female/X bearing sperm cells and then artificially inseminating female with the desired sexed-sorted semen. Adoption of these advanced reproductive technologies has significant economic value in dairy performance (De Vries *et al.* 2008; Seidel 2014). Farmer's adoption decision of these innovative technologies is affected by a number of demographic and socio-economic factors such as age, education, farm size, experience etc. The field veterinarians who are the middle level extension functionaries also play a major role in the diffusion and adoption of an innovation among the farming community and also their perception and knowledge about an innovation play major role in educating and motivating the farmers in taking up that particular innovation. Thus, the perception studies of veterinarians about innovations helps to identify the barriers that may face by the farmers. In this regard the study has been taken up in assessing the consequences and suitability of sex sorted semen technology to dairy farmers.

## MATERIALS AND METHODS

Stratified random sampling method was followed for the selection of the respondents. All the three administrative zones (Rayalseema region, central coastal region, North-coastal (*Uttara Andhra*) region) of Andhra Pradesh were selected for the study and from the three zones together, a total of 120 veterinarians were selected through random sampling with confidence level (90%) and Margin of error (10%). The data was collected from the veterinarians by administering questionnaire through printed and digital forms (Google forms). Appropriate statistical procedures like frequency, percentage, mean and standard deviation were employed to analyze and interpret the data.

**Fig. 1 selection of veterinarians for the study**



To study the findings related to perception of veterinarians towards sex sorted semen technology in terms of its consequences and suitability to dairy farmers mentioned above, a schedule was developed consisting of Agree/Disagree type of statements arranged in “18” individual items. The schedule possess both positive and negative statements with respective scores 1, 0 for Agree and Disagree to the positive items and for negative items the reverse way of scoring was followed. Thus, an individual could get a maximum of “18” and minimum score of “0”. Based on the scores obtained, perception of dairy farmers were categorized into low, medium and high level groups based on mean and standard deviation. The data collected from the respondents were coded, tabulated, analyzed and presented in the form of tables. The inferences were drawn in light of the results obtained, keeping in view the objectives laid in the study.

**Fig. 2 Map of Andhra Pradesh showing the three administrative zones selected for the study**



## RESULTS

### Socio-personal, economic and psychological characters of Veterinarians

Table 1 depicts that majority of the veterinarians in the study area belonged to old age group and were male. Most of the veterinarians were with graduation and working as veterinary assistant surgeons at veterinary dispensaries. The study also indicated that, majority of the respondents had medium level of work experience and knowledge (Naidu Baadireddy 2017). The study also revealed that majority of the veterinarians did not receive trainings on sex sorted semen technology.

**Table 1: Socio-personal, economic and psychological characters of veterinarians (N=120)**

| Variables                  | Categories                     | Frequency (%) | Mean $\pm$ S. D |
|----------------------------|--------------------------------|---------------|-----------------|
| Age                        | Young age (25-35)              | 42 (35.00%)   |                 |
|                            | Middle age (36-46)             | 29 (24.17%)   |                 |
|                            | Old age (47-57)                | 49 (40.83%)   |                 |
| Gender                     | Male                           | 90 (75.00%)   |                 |
|                            | Female                         | 30 (25.00%)   |                 |
| Educational qualification  | B.V. Sc & A.H                  | 69 (57.50%)   |                 |
|                            | M.V. Sc                        | 49 (40.83%)   |                 |
|                            | Ph. D                          | 02 (01.67%)   |                 |
| Present designation        | VAS                            | 65 (54.17%)   |                 |
|                            | AD                             | 25 (45.83%)   |                 |
| Name of the Working agency | Veterinary Dispensary (VD)     | 60 (50.00%)   |                 |
|                            | Area Veterinary Hospital (AVH) | 51 (42.50%)   |                 |
|                            | Others (DLDA)                  | 09 (07.50%)   |                 |

|                         |                            |             |              |
|-------------------------|----------------------------|-------------|--------------|
| Experience              | Low (<7 Years)             | 33 (20.00%) | 15.78 ± 9.45 |
|                         | Medium (7-25)              | 52 (43.33%) |              |
|                         | High (>25 Years)           | 35 (29.17%) |              |
| Trainings received      | Trainings not received     | 80 (66.67%) |              |
|                         | Trainings received         | 40 (33.33%) |              |
| Knowledge (Score range) | Low level (<11.62)         | 15 (12.50%) | 12.98 ± 1.36 |
|                         | Medium level (11.62-14.34) | 84 (70.00%) |              |
|                         | High level (>14.34)        | 21 (17.50%) |              |

The results from the study indicate that 76.67 per cent of veterinarians had medium level of perception towards sex sorted semen technology in terms of its consequences and suitability to dairy farmers.

**Table 2: Consequences of sex sorted semen technology as perceived by veterinarians**

| Consequences   |                 | Veterinarians (N=120) |                   |                           |
|--|-----------------|-----------------------|-------------------|---------------------------|
|  |                 | Frequency<br>(F)      | Percentage<br>(%) | Total<br>Frequency<br>(%) |
| <b>A. Desirable vs Undesirable consequences</b>                    |                 |                       |                   |                           |
| 1. Production of only female calves is much desirable              | <b>Agree</b>    | 90                    | 75.00             | 120<br>(100.00)           |
|  | <b>Disagree</b> | 30                    | 25.00             |                           |
| 2. Sex sorted semen technology offers greater genetic distribution | <b>Agree</b>    | 73                    | 60.83             | 120<br>(100.00)           |
|  | <b>Disagree</b> | 47                    | 39.17             |                           |
|  | <b>Agree</b>    | 56                    | 46.67             |                           |

|   |                 |     |       |                 |
|---|-----------------|-----|-------|-----------------|
| 3. Sex sorted semen technology not suitable to Indian conditions which is mostly mixed farming      | <b>Disagree</b> | 64  | 53.33 | 120<br>(100.00) |
| 4. Lack of trained technicians affecting sorting and efficiency accuracy                            | <b>Agree</b>    | 110 | 91.67 | 120             |
|   | <b>Disagree</b> | 10  | 08.33 | (100.00)        |
| 1. High costs and low fertility have limited the use of sex sorted semen technology                 | <b>Agree</b>    | 111 | 92.50 | 120             |
|   | <b>Disagree</b> | 09  | 07.50 | (100.00)        |
| <b>B. Anticipated vs Unanticipated consequences</b>   |                 |     |       |                 |
| 1. Sex sorted semen is a revolutionary technology for Indian cattle breeding                        | <b>Agree</b>    | 100 | 83.33 | 120             |
|   | <b>Disagree</b> | 20  | 16.67 | (100.00)        |
| 2. Well established policies have a positive impact on adoption rate of sex sorted semen technology | <b>Agree</b>    | 105 | 87.50 | 120             |
|   | <b>Disagree</b> | 15  | 12.50 | (100.00)        |
| 3. Farmers acceptance on sex sorted semen technology is still improving                             | <b>Agree</b>    | 106 | 88.33 | 120             |
|   | <b>Disagree</b> | 14  | 11.67 | (100.00)        |
| 4. There is a need for standardization of sex sorted semen technology in Indian conditions          | <b>Agree</b>    | 108 | 90.00 | 120             |
|   | <b>Disagree</b> | 12  | 10.00 | (100.00)        |
| <b>C. Direct vs Indirect consequences</b>   |                 |     |       |                 |
| 1. Change in social status of farmers   | <b>Agree</b>    | 79  | 65.83 | 120             |
|   | <b>Disagree</b> | 41  | 34.17 | (100.00)        |
| 2. Change in self-sufficiency of farmers  | <b>Agree</b>    | 92  | 76.67 | 120             |
|   | <b>Disagree</b> | 28  | 23.33 | (100.00)        |

|  |                 |    |       |          |
|--|-----------------|----|-------|----------|
| 3. More demand for good quality sex sorted semen born calves in the market | <b>Agree</b>    | 89 | 74.17 | 120      |
|  | <b>Disagree</b> | 31 | 25.83 | (100.00) |

**Table 3: Suitability of sex sorted semen technology as perceived by veterinarians**

| Suitability   | Veterinarians (N=120) |                  |                   |                           |
|---|-----------------------|------------------|-------------------|---------------------------|
|   |                       | Frequency<br>(F) | Percentage<br>(%) | Total<br>Frequency<br>(%) |
| <b>A. Economic Suitability</b>  |                       |                  |                   |                           |
| 1. Sex sorted semen technology has the potential to produce large number of heifers in a herd as compared to using conventional semen | <b>Agree</b>          | 90               | 75.00             | 120<br>(100.00)           |
|   | <b>Disagree</b>       | 30               | 25.00             |                           |
| 2. Sex sorted semen technology meets the scope of increasing milk production  | <b>Agree</b>          | 103              | 85.83             | 120<br>(100.00)           |
|   | <b>Disagree</b>       | 17               | 14.17             |                           |
| 3. Resources spent on female calf gives better returns than on male calf  | <b>Agree</b>          | 107              | 89.17             | 120<br>(100.00)           |
|   | <b>Disagree</b>       | 13               | 10.83             |                           |
| <b>B. Sustainability</b>  |                       |                  |                   |                           |
| 1. Sex sorted semen technology is the most efficient way to increase female population leading to farm sustainability                 | <b>Agree</b>          | 111              | 92.50             | 120<br>(100.00)           |
|   | <b>Disagree</b>       | 09               | 07.50             |                           |
| <b>C. Socio-cultural suitability</b>  |                       |                  |                   |                           |

|   |                 |     |       |                 |
|---|-----------------|-----|-------|-----------------|
| 1. Use of sex sorted semen will not have an effect on social values/culture/norms of the farmer | <b>Agree</b>    | 76  | 63.33 | 120<br>(100.00) |
|   | <b>Disagree</b> | 44  | 36.67 |                 |
| <b>D. Compatability with needs</b>  |                 |     |       |                 |
| 1. Need for female animal over male animal is achieved through sex sorted semen technology      | <b>Agree</b>    | 109 | 90.83 | 120<br>(100.00) |
|   | <b>Disagree</b> | 11  | 09.17 |                 |

Out of the various consequences as expressed by veterinarians with respect to sex sorted semen technology, though there are desirable consequences like more female calves and improved genetic distribution which fulfills the need of improving milk production (Bhalakiya *et al.* 2018 and Cooke *et al.* 2014), there is need to improve the skills and manpower to further facilitate the adoption of this technology (Khanal *et al.* 2010 and Kumar *et al.* 2016). This may also reduce the cost and improve fertility rate.

Veterinarians were of the opinion that the innovation sex sorted semen technology will definitely bring revolutionary changes like that of Artificial Insemination (A.I) as it is the most efficient way to increase female population leading to farm sustainability (Patel and Jethva 2019). In addition, sex sorted semen technology offers advantages in terms of meeting the scope of increasing milk production, having potential to produce large number of heifers in a herd as compared to conventional semen and there by resources spent on female calf gives better returns than on male calf (Balzani *et al.* 2020 and Campanile *et al.* 2011). Hence, this technology more suitable to Indian farmers who were mostly small and marginal farmers and thereby compatible to Indian farming community (Mallory *et al.* 2013).

It was observed from the study that the need for female animal over male animal is achieved through sex sorted semen technology which was mainly developed to have farmer's choice i.e., female calf (Herbst *et al.* 2009 and Joshi *et al.* 2021).

## CONCLUSION

Sex sorted semen technology is relatively newer and still diffusing technologies on dairy farms and is suggested to have a wider adoption and impact in the near future (Weigel, 2004; De Vries *et al.* 2008). Thus, the study reveals that innovations which are compatible and in accordance with farmers' situations will be adopted following its diffusion. Consequences and suitability also need to be taken care of while diffusing any innovation among the farming community (Bhuva 2014).

### Highlights:

- Field veterinarians in the study area were willing to learn about advanced reproductive technologies like sex sorted semen technology. Therefore, Periodical trainings and workshop sessions can be organized at various levels in order to update veterinarians regarding the advanced technologies so that they can enlighten the farmers about its advantages.
- State Department of Animal Husbandry has to put more efforts in training all the veterinarians to serve the farming community in time to enhance livestock production

## REFERENCES

- Balzani A, Do Amaral C A V and Hanlon A 2020. A perspective on the use of sexed semen to reduce the number of surplus male dairy calves in Ireland: A pilot study. *Frontiers in Veterinary Science*, 7.
- Bhalakiya, Haque, Patel, Chaudhari, Patel, Madhavatar and Kumar R 2018. Sperm sexing and its application in livestock sector. *International Journal of Current Microbiology and*

*Applied Science*, 7, 259-272.

- Bhuva R M 2014. Consequences of Scientific Management of Pregnant Dams and Calves for Strengthening Livelihood among Livestock Beneficiaries of RKVY Project (*Doctoral Dissertation, Extension Education dept., NM college of Agriculture, Navsari agricultural university, Navsari*).
- Campanile G, Gasparini B, Vecchio D, Neglia G, Senatore E M, Bella A and Zicarelli L 2011. Pregnancy rates following AI with sexed semen in Mediterranean Italian buffalo heifers (*Bubalus bubalis*). *Theriogenology*, 76(3), 500-506.
- Cooke R F, Bohnert D W, Cappellozza B I, Marques R S, DelCurto T and Mueller C J 2014. Incorporation of sexed semen into reproductive management of cow-calf operations. *Livestock Science*, 163, 165-171.
- De Vries A, Overton M, Fetrow J, Leslie K, Rogers G et al., 2008. Exploring the impact of sexed semen on the structure of the dairy industry. *Journal of Dairy Science*, 91(2): 47-856.
- Herbst B K, Anderson D P, Outlaw J L, Richardson J W and Bilby T 2009. The Effects of Sex-Sorted Semen on Southern Dairy Farms (No. 1369-2016-108678).
- Joshi, S., Bhave, K., Potdar, V., Gaundare, Y., Punde, N., Shirsath, T., & Swaminathan, M. (2021). Performance of sex sorted semen under Indian Small Holder Dairy Farming Systems. *Int. J. Curr. Microbial. App. Sci*, 10(02), 1335-1343.
- Khanal A R 2010. Adoption of Breeding Technologies in the US Dairy Industry and their influences on Farm Profitability.
- Kumar A, Vineeth M R, Sinha R, Singh R K, Thakur A and Gupta S K 2016. Current status, scope and constraints of sexed semen-An Indian perspective. *Agricultural Reviews*, 37(3), 240-244.
- Mallory D A, Lock S L, Woods D C, Poock S E and Patterson D J 2013. Hot topic: Comparison of sex-sorted and conventional semen within a fixed-time artificial insemination protocol designed for dairy heifers. *Journal of dairy science*, 96(2), 854-856.
- Naidu Baadireddy S 2017. Status of Organic Dairy Farming-An Exploratory Study in Andhra Pradesh (*Doctoral Dissertation, Sri Venkateswara Veterinary University Tirupati-517 502. (Ap) India*).
- Patel S B and Jethva P C 2019. Use of Sexed Semen in Indian Dairy Cattle: A Case Study. *Indian Journal of Veterinary Sciences & Biotechnology*, 14(3).
- Weigel K A 2004. Exploring the role of sexed semen in dairy production systems. *Journal of Dairy Science*, 87, E120-E130