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Evaluation of alternate animal identification techniques and livestock insurance products in Bengaluru rural district of Karnataka

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Abstract

Objectives: The present study evaluates different techniques used for identification of insured animals, assesses the farmers' need and their willingness to buy insurance for different livestock insurance products.
Methodology/Statistical Analysis: The data required for the study was collected by direct personal interview method based on a well-structured schedule from 120 sample households through multistage sampling technique in Bengaluru rural district of Karnataka. Scale ranging from very poor to excellent was used to assess the identification techniques based on considered parameters for the study. Conjoint analysis was used to calculate the estimated utilities for different livestock insurance products.
Findings: It was found that plastic tag was having advantages in case of cost, labour requirement, application ease and animal health compared to plastic tag plus branding while plastic tag plus branding was advantageous in case of readability and durability compared to plastic tag alone. The estimated utility for mastitis was found highest (0.765) at one teat blindness and for metritis, estimated utility was highest (1.927) up to four number of services. The most important factors determining the farmers' willingness to buy insurance were governed by the depreciation charge followed by level of teat blindness in case of mastitis and number of services in case of metritis disease.
Application/Improvements: Insurance companies should maintain regular, reliable and complete database related with animal identification techniques in order to assess the efficiency of different animal identification techniques promptly. Insurance companies and Karnataka state Department of Animal Husbandry can include alternate insurance products viz., mastitis, metritis, transit insurance and theft with affordable premium charges which do not exist in the present livestock insurance
Keywords: Garrett ranking technique, Parameters of identification techniques, Conjoint analysis.

1. Introduction

Animal identification is a major requirement for government agricultural authorities, facilitating registration of animals, recording of authorized animal movements, national herd management, payment of appropriate grants and subsidies, and as a vital tool in tracing diseases of animal health and public concern [1]. Individual identification of animals is essential to indicate the ownership of animals and it is requirement under the insurance policies. Owners of animals also use this tool for other purposes, such as genetic improvement, improving meat and milk production and general improvements to production efficiency. Different elements are used to identify animals.

These have changed in line with technological developments, and their use depends on factors like, the type of animal and the purpose of identification. Mastitis is inflammation of mammary gland affecting all the species of domestic animals and is of great concern to dairy industry.

Milk culture identifies the presence of mastitis pathogens but does not provide a measure of degree of inflammation associated with infection.

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Metritis is the inflammation of the uterus causing severe economic loss to the dairy farmers due to failure of conception at the appropriate time. The transit insurance provides a competitively priced transit cover against any damage caused to livestock animals during transit for adopters of livestock insurance. Insurance against theft also provide cover against loss or missing of animal.

2. Methodology

1. Selection of the study area

Karnataka state was purposively selected to conduct present study on the basis of better performance of livestock insurance and contribution of state to the dairy sector. In Karnataka, 3.4 lakh animals were insured with premium amount collected amounting to₹4022.14 lakhs during the period 2006-14 under National Livestock Insurance scheme. Bengaluru rural district was purposively selected from the state for the study because, Under BAMUL Group Cattle Insurance, 11 lakh animals were insured with total premium amount of ₹7266.13 lakhs.

The Bengaluru rural district has four talukas namely Hosakote, Devanahalli, Doddaballapura and Nelamangala. Among them, Doddallapura taluk was purposively selected which is having highest number of animals insured (24,536) among the four talukas of Bengaluru rural district during the year 2017-18. Devanahalli taluk was purposively selected as it is undertaking pilot project on insuring all the animals in that taluk.

2. Sampling design

A simple random sampling technique was adopted to select sampleat village level whereas state, district and talukas were selected purposively. Two villages were randomly selected viz. Kodigehalli and Nagasandra from Doddaballapura taluk, Jalagi and Bettenehalli from Devanahalli taluk. From each village, 30 farmers were selected. A total of 120 farmers were interviewed for this study.

In each taluk, designated veterinary officers in the camp office located at taluk level were contacted to know about the details of livestock insurance made by the farmers.

3. Data collection

The study is based on primary data. Primary data was collected with the help of a well-structured interview schedule consisting of information related to different aspects of the study in order to get reliable information by personal interview method.

The information related to techniques used in the identification of animals, their feasibility and various needs of farmers for insurance was assessed and information related to their willingness to buy insurance for different livestock insurance products was collected from 120 farmers and four public insurance companies viz., New India Assurance Company (NIAC), National Insurance Company (NIC), United India Insurance Company (UIIC) and Oriental Insurance Company (OIC).

4. Analytical framework

1. Tabular analysis

To evaluate different techniques used for identification of insured animals, insurance companies and veterinary officers were contacted. Table 1 indicates that each characteristic of identification technique was assessed on a scale from 0 to 5 (Very poor to Excellent).

Table 1. Scores for assessment of animal identification techniques on different parameters

Scale	Parameters
0	Very poor
1	Poor
2	Average
3	Good
4	Very good
5	Excellent

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Identification techniques were assessed based on application ease, readability, cost, animal health, labour requirement and durability. Ascending order of scores was used to rank the identification techniques based on various parameters considered with respect to their efficiency.

Four public insurance companies Viz., New India Assurance Company (NIAC), National Insurance Company (NIC), United India Insurance Company (UIIC) and Oriental Insurance Company (OIC) were contacted along with two veterinary officers from two talukas each i.e., Devanahalli and Doddaballapura to assess different identification techniques.

2. Garrett ranking technique

In order to find out the need of farmers for alternate livestock insurance products [2] which are not covered under the existing livestock insurance, broad categories of alternate products were made namely;

1. Mastitis
2. Metritis
3. Transit insurance
4. Theft

For ranking of these alternate insurance products, Garrett Ranking technique was used. A questionnaire of alternate products was used to assign the rank to all the products and the outcome of such ranking was converted into score value with the help of the following formula:

Percent position = $100^* (R_{ij} - 0.5)/ N_j$

Here, R_{ij}= Rank given for the i^{th} variable by j^{th} respondent,

N_j = Number of variable ranked by j^{th} respondent.

With the help of Garrett's Table, the percent position estimated was converted into scores. Then for each factor, the scores of each individual respondent were added together and divided by the total number of the respondents for whom scores are added.

These mean scores for all the factors were arranged in descending order and the alternate products were ranked accordingly. The product having highest mean score was considered to be the most important alternate products required by the farmers.

3. Conjoint analysis

Willingness to buy insurance is the maximum depreciation charges that farmers are ready to pay for insuring their cattle against disease. The major alternate insurance products were assessed for willingness to buy insurance. For assessing the farmers willingness to buy insurance for mastitis and metritis diseases conjoint analysis was carried out. Conjoint analysis [3] is a multivariate technique developed specially to understand how farmers develop preferences for different livestock insurance products.

Choice based conjoint analysis was used. The choices were based on depreciation charge, level of teat blindness in case of mastitis disease and number of services in case of metritis disease. Table 2 indicates the attributes of mastitis and metritis disease.

Table 2. Selection of attributes and their levels for mastitis and metritis disease

Particulars	Attributes	
	Levels	Depreciation Charge
Mastitis	One teat blind	15%
	Two teat blind	40%
	Three teat blind	60%
	Four teat blind	90%
Metritis	Upto 4 services	Nil
	5-7 services	5%
	8-10 services	10%
	Above 10 services	25%

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A total of 16 combinations were obtained both in case of mastitis and metritis disease. The farmers' were asked to rank these combinations from 1 to 16 in case of both insurance products. Rank 1 was given to most preferred product and rank 16 to the least preferred product.

Using random utility framework, consumer behavior model was constructed. The co-efficient of the model were used to assess their willingness to buy insurance.

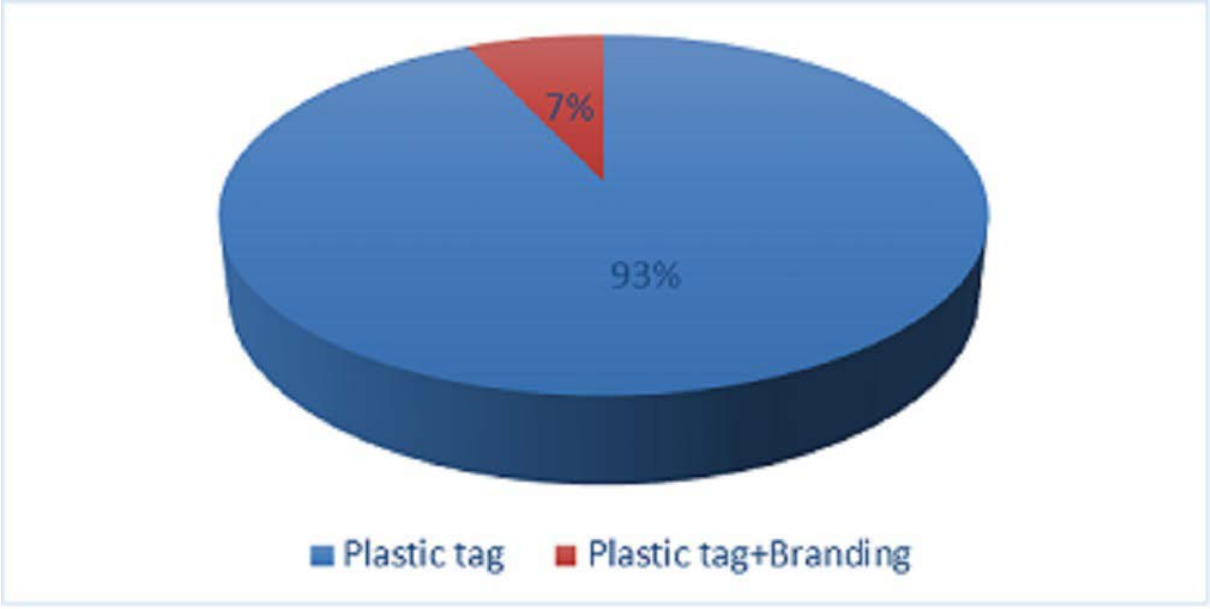
5. Results and Discussion

Animal identification is a major requirement for government agricultural authorities, facilitating registration of animals, recording of authorized animal movements, national herd management, payment of appropriate grants and subsidies, and as vital tool in tracing diseases of animal health and public concern [1].

The plastic tag is a very common method of identifying animals, and the bar code system can be incorporated into the tag, which facilitates reading, transmission and registration of data. The tag is easy to remove but cannot easily be used again. Freeze branding offers a permanent form of identification that is easy to read at a great distance, causes minimal damage to the hide, and is less painful than hot branding. Freeze branding requires, freeze-branding iron, coolant, coolers, clippers, brush and plastic squeeze bottle, gloves and safety goggles.

Figure 1 indicates that, out of the total animals insured 93% of the animals were having only plastic tag while 7% of the animals were having both plastic tag and branding together. Higher proportion of plastic tag was due to its ease of application, comparatively less labour requirement, cost effectiveness and not having adverse effects on animal health.

Figure 1. Proportion of animals with different identification technique



From Table 3 it was found that, from the perspective of all the insurance companies (NIAC- New India Assurance Company, NIC- National Insurance Company, OIIC-Oriental Insurance Company, and UIIC- United India Insurance Company) and veterinary officers from each taluk, were contacted to know about the animal identification techniques. Out of all the parameters considered, plastic tag was found to have more advantages in case of application, cost, animal health and labour requirement compared to plastic tag plus branding.

Plastic tag plus branding was advantageous over plastic tag in case of both readability and durability because freeze branding offers a permanent form of identification that is easy to read at a great distance.

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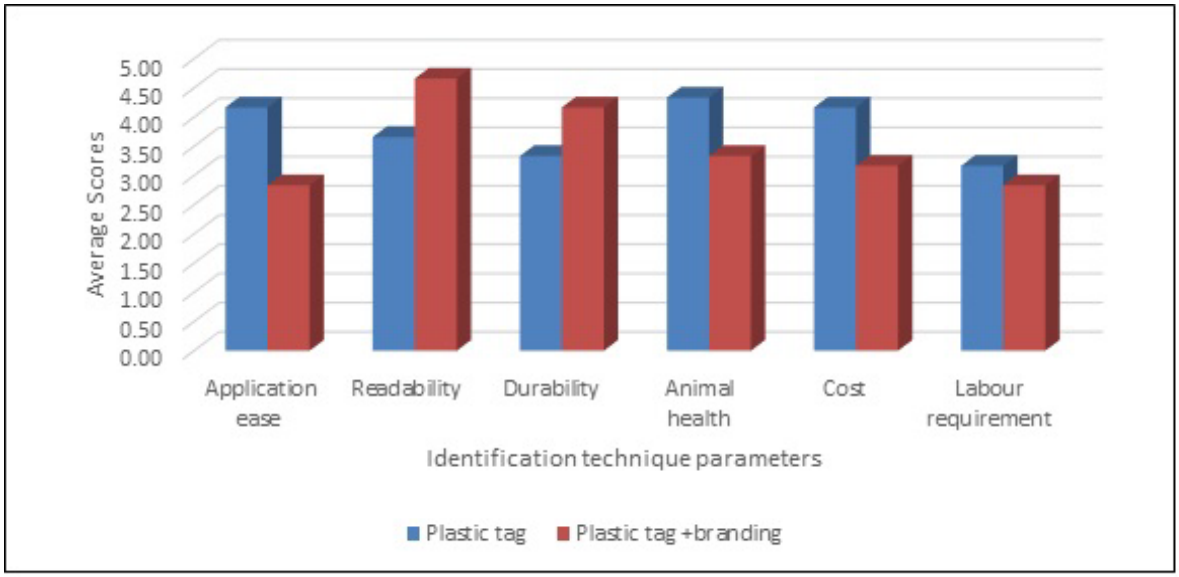
Table 3. An assessment of identification techniques on different parameters

Particulars	Plastic tag	Plastic tag +branding
Application ease	5	2
Readability	3	5
Durability	3	5
Animal health	4	2
Cost	4	3
Labour requirement	4	2

Each characteristic was assessed on a scale from 0 to 5 (Very poor to Excellent). Figure 2 indicates the average scores of identification techniques on the parameters considered for the study. Average scores of plastic tag pertaining to application, cost, animal health, labour requirement was found to be higher when compared to plastic tag plus branding.

Average score for plastic tag plus branding pertaining to readability and durability was found higher compared to plastic tag alone.

Figure 2. Average scores of identification techniques on different parameters



6. Assessing the farmer's need for different livestock insurance products

Farmers' need for different livestock insurance products was assessed which are not currently covered under livestock insurance. List of required products was prepared after discussing about the affordability of insurance premium charges and requirement of the farmers with insurance companies, veterinary officers from each talukas and livestock insurance in charge of Bengaluru Milk Union Limited.

The responses on alternate products which do not exist in the present livestock insurance given by the respondents in the study area were arranged and analyzed by using Garret ranking technique and results along with mean scores are presented in Table 4.

It indicates that mastitis was the most preferred product (67.04), metritis as second product (54.84), transit insurance was the third preferred product (52.17) and theft of the animal was fourth preferred product (46.50).

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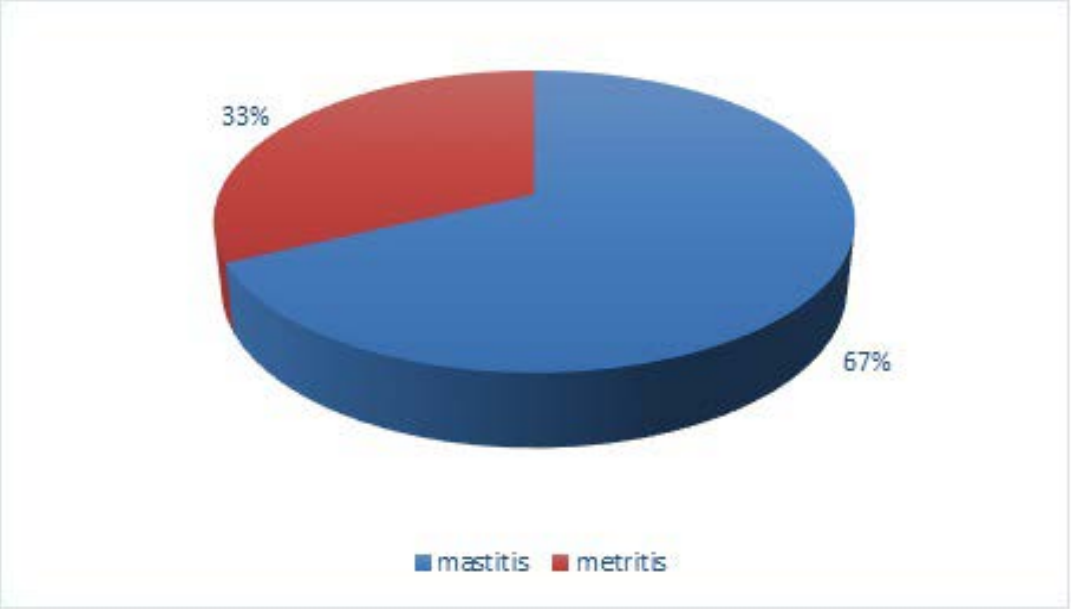
Table 4. Alternate products preferred by farmers

Particulars	Avg score	Rank
Mastitis	67.04	1
Metritis	54.84	2
Transit insurance	52.17	3
Theft	46.50	4

Figure 3. Proportion of insured animals having the incidence of mastitis and metritis diseases



Mastitis is inflammation of mammary glands affecting all the species of domestic animals and is of great concern to dairy industry. Milk culture identifies the presence of mastitis pathogens but does not provide a measure of degree of inflammation associated with infection. Metritis is the inflammation of the uterus causing severe economic loss to the dairy farmers due to failure of conception at the appropriate time.

Figure 3 indicates that, among the sample households, around 67% of the animals insured faced the problem of mastitis and 33% of the insured animals faced the problem of metritis. Variety of microorganisms is responsible for causing metritis.

The transit insurance provides a competitively priced transit cover against any damage caused to livestock animals during transit for adopters of livestock insurance. Insurance against theft also provide cover against loss or missing of animal.

7. Willingness to buy insurance for different livestock insurance products

1. Willingness to buy insurance for Mastitis disease

Mastitis is the most important disease in dairy cows leading to huge economic losses to dairy farmers through loss of milk yield and quality and culling of mastitis affected animals. Mastitis is the single largest cause of economic losses in India, affecting 50% of the herd. Mastitis causes 70% of all avoidable losses during milk production and reduces milk by 21% and fat by 25%.

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In Karnataka, losses due to mastitis are double than those incurred due to infertility; profits for a dairy farm are seriously affected by mastitis. Sub-clinical mastitis alone resulted in losses of ₹4,300 crore.

A study [4] conducted in Dharwad district of Karnataka reported that, subclinical mastitis is directly associated with age, lactation period, and environmental factors of the cow and clinical mastitis is more associated with the breed of the cow and environmental conditions. The breed-wise prevalence of bovine mastitis showed the exotic breeds like HF and Jersey were more prone to bovine mastitis than indigenous cows. Annual losses in dairy industry due to mastitis was approximately 526 million dollars in India, in which subclinical mastitis is responsible for approximately 70% of economic losses as most dairymen and farmers are still unaware of impact of SCM (Subclinical mastitis).

Study [5] conducted on incidence and economics of clinical mastitis in Kolar district of Karnataka reported that highest incidence of clinical mastitis was on crossbred cows (9.28%). The number of clinical mastitis cases differed significantly over different seasons, lactation and stage of lactation. Mastitis incidence was highest during the rainy season, followed by winter and summer. Animals in 30 to 90 days of lactation had a higher incidence. For estimation of the willingness to buy insurance for mastitis disease, the following model in Table 5 was considered.

Table 5. Model for determining willingness to buy insurance for mastitis disease

Attributes	Number of Levels	Relation to ranks or scores
Level of teat blind	4	Discrete
Depreciation charge	4	Discrete

The utility index for different levels of the mastitis attributes are represented below (Table 6)

Table 6. Utility index of various attributes of mastitis disease

Attributes	Levels	Estimated Utility
Teat blindness	One	0.765
	Two	0.508
	Three	-0.194.
	Four	-0.465
Depreciation Charge (in %)	15	0.788
	40	-0.067
	60	-0.215
	90	-0.506

The study revealed that the farmer's willingness to buy insurance for mastitis disease was found highest at one teat blindness followed by two teat blindness with depreciation charge of 15% and 40% respectively. The most important factors determining the farmers willingness to buy insurance for mastitis was governed by the depreciation charge followed by level of teat blindness.

2. Estimation of willingness to buy insurance for mastitis disease

If the farmer wishes to undertake insurance at three teat blindness level:

1. The change in utils with respect to level of teat blindness from one to three teat blindness will be = -0.194-0.765 = -0.9598
2. The change in utils with respect to depreciation charge = -0.215-0.788 = -1.003
3. The utility spread in the depreciation charge range = -1.003/-0.9598 = 1.045
4. Willingness to buy insurance = Utility spread × Depreciation charge difference = 1.045×45 = 47.025 ~48
5. Hence the farmers' willingness to buy insurance for three teat blindness level turned positive, if depreciation charge reduced from 60% to 48% of value of animal.

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If the farmer wishes to undertake insurance at four teat blindness level:

1. The change in utils with respect to level of teat blindness from one to four teat blindness will be = -0.465 – 0.765 = -1.23
2. The change in utils with respect to depreciation charge = -0.506 - 0.675 = -1.181
3. The utility spread in the depreciation charge range = -1.098/-1.181 = 1.04
4. Willingness to buy insurance = Utility spread × Depreciation charge difference = 1.04×75 = 78.11 ~78
5. Hence the farmers' willingness to buy insurance for four teat level blindness turned positive, if depreciation charge reduced from 90% to 78% of value of animal.

3. Willingness to buy insurance for metritis disease

Metritis is the inflammation of the uterus causing severe economic loss to the dairy farmers due to failure of conception at the appropriate time. Variety of microorganisms is responsible for causing metritis.

Study [6] reported that, the economic loss due to decreased reproductive efficiency was found to be 87.25%. One of the major reasons for shortened "life-time milk production" of dairy animal is the transient loss of fertility (infertility).

It has been calculated that high yielding cows with mild and severe metritis, produced 5.7 and 8.3 kg/day less milk, respectively than healthy cows during the initial 3 weeks of postpartum period [7]. For estimation of the willingness to pay for metritis disease, the following model in Table 7 was considered.

Table 7. Model for determining willingness to buy insurance for mastitis disease

Attributes	Number of Levels	Relation to ranks or scores
Number of services	4	Discrete
Depreciation charge	3	Discrete

The utility index for different levels of the metritis attributes are represented below (Table 8).

Table 8. Utility index for different levels of metritis disease

Attributes	Levels	Estimated Utility
Number of services	Upto 4	1.927
	5 to 7	0.573
	8 to 10	-0.969
	Above 10	-1.531
Depreciation Charge (in %)	Nil	0.929
	5	0.498
	10	-0.8921
	25	-1.535

The study revealed that the farmers were willing to buy insurance for metritis disease was found highest at number of services up to 4 followed by 5 to 7 number of services with depreciation charge of 0 per cent and 5% respectively. The most important factor determining the farmers' willingness to buy insurance was governed by the depreciation charge followed by number of services.

4. Estimation of willingness to buy insurance for metritis disease

If the farmer wishes to undertake insurance at 8 to 10 number of services:

1. The change in utils with respect to number of services from 4 number of services to 8 to 10 number of services will be = -0.969 - 1.927= -2.896
2. The change in utils with respect to depreciation charge = -0.8921 - 0.929 = -1.8211
3. The utility spread in the depreciation charge range = -1.8211/-2.896 = 0.62
4. Willingness to buy insurance = Utility spread × Depreciation charge difference = 0.628 × 10 = 6.28 ~ 7
5. Hence at 8 to 10 number of services, the farmers' utility index, which has negative utility otherwise, turned positive if depreciation rate of value of animals is reduced from 10 to 7%.

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If the farmer wishes to undertake insurance at above 10 numbers of services:

1. The change in utils with respect number of services from 4 number of services to above 10 number of services will be = -1.531 - 1.927= -3.458
2. The change in utils with respect to depreciation charge = -1.535 - 0.927 = -2.462
3. The utility spread in the depreciation charge range = -3.458/-2.462 = 0.7119
4. Willingness to buy insurance = Utility spread × Depreciation charge difference = 0.7119 × 25 = 17.79 ~ 18
5. Hence at above 10 numbers of services, the farmer's utility index, which has negative utility otherwise, turned positive if depreciation rate of value of animals is reduced from 25 to 18%.

8. Conclusions

From the study, it was found that average score for plastic tag was found higher compared to plastic tag plus branding together in case of application ease, cost, labour requirement and animal health while plastic tag plus branding was advantageous in case of both readability and durability compared to plastic tag alone. Mastitis was the most preferred alternate product with score of 67.04 followed by metritis (54.83), transit insurance (52.16) and finally theft (46.5) by farmers which are not covered under the existing livestock insurance. The estimated utility to buy insurance for mastitis disease was found to be highest with higher value of estimated utility (0.765) at one teat level of blindness and for metritis disease, it was found to be highest with estimated utility of 1.927 up to four numbers of services with zero depreciation.

The estimated utility to buy insurance for three teat level of blindness turned positive, if depreciation reduced from 60% to 48% depreciation of value of animal. The estimated utility to buy insurance for four teat level of blindness turned positive, if depreciation reduced from 90% to 78% depreciation of value of animal. At 8 to 10 number of services in metritis, the farmer's utility index, which has negative utility otherwise, turned positive if depreciation rate of value of animals is reduced from 10 to 7%.

At above 10 numbers of services, the farmer's utility index, which has negative utility otherwise, turned positive if depreciation rate of value of animals is reduced from 25 to 18%.

9. References

1. A. Allen, B. Golden, M. Taylor. Evaluation of retinal imaging technology for the biometric identification of bovine animals in Northern Ireland. *Livestock Science*. 2007; 116(1-3), 42-52.
2. S.P. Singh. Factors influencing adoption of livestock insurance among dairy farmers in Karnal district of Haryana. *Agricultural Economics*. M.Sc. thesis, ICAR-NDRI, Karnal, Haryana. 2015; 1-125.
3. J. Das, R. Raju. Determinants of consumption and willingness to pay for fermented probiotic dairy products in metropolitan Delhi. *Indian Journal of Economics and Development*. 2018; 14(2a), 447-452.
4. M. Kurjogi, B. Kaliwal. Epidemiology of bovine mastitis in cows of Dharwad district. *International Scholarly Research Notices*. 2014; 1-9.
5. S.S.N. Kumar, M.M. Appannavar, M.D. Suranagi. Study on incidence and economics of clinical mastitis, Karnataka. *Journal of Agricultural Sciences*. 2010; 23(2), 407-408.
6. A. Singh. Development and validation of bilingual information module on transition period of dairy animals, Ph.D. thesis, ICAR-NDRI, Karnal, Haryana. 2015; 1-210.
7. ICAR National Dairy Research Institute, Karnal. http://ndri.res.in/ndri/Documents/Newsletter_jan_march_2014.pdf. Date accessed: 03/2014.

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