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Development and standardisation of knowledge test on entrepreneurial dairy farming

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Abstract

This study focuses on developing and standardising a reliable and valid knowledge test to assess dairy farmers' knowledge regarding entrepreneurial Dairy farming in the sub-tropics of Jammu Region. A sample size of 120 dairy farmers, comprising 60 entrepreneurial dairy farmers and 60 non-entrepreneurial dairy farmers, was used for the study, employing a multi-stage random sampling technique. A total of 104 statements covering the main facets of entrepreneurial dairy farming were initially chosen based on the criteria established by Edwards (1957). The choices were made based on the dairy producers' knowledge and comprehension levels. These 104 statements underwent a relevance check. Utilising the difficulty and discrimination index, item analysis was performed. The knowledge test's final format, as described by Mehta (1958), included statements with difficulty indices ranging from 30 to 80 and discrimination indices ranging from 0.30 to 0.55 in the current study. This process resulted in the selection of 57 statements for the final knowledge test on entrepreneurial dairy farming. The reliability of the test was assessed using the split-half approach. The correlation coefficient between forms was (r) 0.87. The test's internal consistency was calculated using Cronbach's alpha in this study, and the value was 0.83, indicating that the knowledge test was internally consistent. Therefore, the final knowledge test containing statements related to different aspects of entrepreneurial dairy farming such as Breeds and breeding management, Feeding, Housing, Health and General Management, Calf management, Government Schemes, Clean Milk Production, etc. were standardized. All the coefficients were found to be significant at a 1% level of significance.

Keywords: Cronbach's alpha, entrepreneurial dairy farming, difficulty index, discrimination index, knowledge test, reliability, validity

Introduction

Livestock is an important source of income and plays an important role in the national economy. The livestock sector has continuously been growing at a Compound Annual Growth Rate (CAGR) of 7.93% (at constant price) from 2014-15 to 2020-21, which is comparable to the CAGR of manufacturing at 4.93% (at constant price) and Services at 4.82% (at constant price) and in contrast to Agriculture (crop sector) CAGR of 2.05% (at constant price). The current situation calls for entrepreneur-driven, sustainable and profitable dairy farming that can produce income (Patel *et al.*, 2014) ^[10]. Dairying in India accounts for more than two-thirds of the total livestock output and is principally responsible for the rising importance of the livestock sector in India (Kumar *et al.*, 2011) ^[8]. Dairy farming has good potential for employment generation both in rural and peri-urban areas besides being a source of liquidity and insurance against crop failure. In other words, dairy provides employment throughout the year. Even more, profits can be earned through dairying, depending upon the breeds of animal, managerial skills and marketing (Raut and Sankhala 2014). About 80 per cent of the population in Jammu and Kashmir lives in rural areas and about 60 per cent of the UT's revenue is generated by the agriculture and animal husbandry sector (Kumari *et al.*, 2020) ^[9]. Given the

diversity of rural vocations in India, there is a lot of room for entrepreneurship development. It is crucial to research the level of information held by dairy farmers about entrepreneurial dairy production to support entrepreneurial potential. To measure the knowledge level of dairy farmers toward entrepreneurial dairy farming practices, a tool in the form of a knowledge test was designed and standardised. The test is suitable to determine whether dairy farmers' understanding of entrepreneurial dairy farming procedures is lacking and whether appropriate interventions can be undertaken to fill that gap.

Methodology

The methods outlined by Edwards (1957) were used to develop the knowledge test. A total of 104 statements covering the main facets of commercial dairy farming, including Breeds and breeding management, Feeding, Housing, Health and General Management, Calf management, Government Schemes, Clean Milk Production, etc., were initially chosen based on the criteria established by Edwards (1957). The choices were made based on the dairy producers' knowledge and comprehension levels. These 104 statements underwent a relevance check. Finally, 81 statements that the experts deemed to be "most relevant" were chosen for their answers

from the Jammu region. 30 dairy farmers from the village of Suchetgarh in the Jammu district (non-sample area) were given these 81 chosen statements to consider.

The answers were scored, with one (1) being given for the right answer and zero (0) being given if the farmers didn't know the answer. The total number of right answers a person provided, then, was his knowledge score.

Item analysis

Utilising the difficulty and discrimination index, item analysis was performed. Two types of information, namely the item difficulty and item discrimination, are often obtained from an item analysis of a test. The index of item difficulty discloses how challenging the item is, and the index of discrimination shows how much an item separates farmers with good information from those with poor information. The scores were calculated for each of the 30 respondents, and then they were ordered in descending order. Then, six equal groups of five respondents each were created from the 30 respondents. G1, G2, G3, G4, G5 and G6 were the respective group names. The middle two groups, G3 and G4, were excluded to calculate the discrimination index. For the computation of the discrimination indices, only four extreme groups with high and low scores were taken into consideration.

Calculation of difficulty index

The percentage of right responses received for a specific question served as the difficulty index measurement. This was calculated by using the formula:

$$P_i = \frac{n_i}{N_i} \times 100$$

Where,

P_i = Difficulty index in percentage of the i^{th} item

n_i = Number of respondents giving correct answer, to i^{th} item

N_i = Total number of respondents to whom i^{th} item was administered i.e. 30 in the present study.

Calculation of discrimination index

The discrimination index was calculated by using the method suggested by Mehta (1958). The formula by which the item discrimination index was calculated by using the given formula:

$$E^{1/3} = \frac{\{(S1 + S2) - (S5 + S6)\}}{N/3}$$

Where,

S1, S2, S5 and S6 = Frequencies of correct answers in G1, G2, G5 and G6 groups respectively.

N = Total number of respondents in the sample of item analysis

Final statement selection was carried out using the difficulty and discrimination index results. When a respondent provided the right response, it was assumed that the statement was easier for him to handle than it was. The knowledge test's final format, as described by Mehta (1958), included statements with difficulty indices ranging from 30 to 80 and discrimination indices ranging from 0.30 to 0.55 in the current study. This process resulted in the selection of 57 statements for the final knowledge test on entrepreneurial dairy farming. (Table 1).

Table 1: Final knowledge statements with their values of difficulty index and discrimination index

S. No.	Statements / Items Knowledge on	Difficulty index	Discrimination Index
I	Breeds and Breeding Management		
1.	The cattle which have the highest milk-yielding capacity	72.67	0.40
2.	Which breed of cattle is best suited for commercial dairy farming?	73.33	0.40
3.	Which breed of cattle is preferred for A2 type of milk?	66.67	0.30
4.	Which breed of buffalo has highest fat% age?	63.33	0.30
5.	Which breed of buffalo is most suitable for commercial dairy farming?	73.33	0.30
6.	Hump is characteristic feature of	73.33	0.30
7.	Age at first calving should be	56.67	0.30
8.	Average lactational period and dry period in dairy animal?	53.33	0.50
9.	Animal comes in heat within days of calving?	72.67	0.40
10.	Artificial Insemination should be carried out:	73.33	0.40
11.	Ideal time of pregnancy diagnosis.....	66.67	0.30
12.	Do you know about the advanced method of Pregnancy Diagnosis in dairy animals by Ultrasonography (USG) other than normal rectal palpation?	63.33	0.30
13.	Do you know the concept of sex-sorted semen?	73.33	0.30
II	Feeding management		
14.	How much concentrate is fed to the dairy animal for every 2–2.5 liter of milk production?	46.67	0.50
15.	Concentrate feeding to animal should be practiced:	50.00	0.50
16.	Mineral mixture should be included ...% of total feed.	56.67	0.40
17.	Optimum concentrate-to-roughage ratio in high-yielding animals is:	56.67	0.30
18.	Silage is method of preserving green fodder for a long period of time	46.67	0.50
19.	High roughage diet leads to higher milk fat%?	50.00	0.50
20.	Do you know that feeding of bypass fat and bypass protein are good in commercial dairy farming?	56.67	0.40
III	Housing management		
21.	“A” shaped roof is better than a flat roof in hot climate?	46.67	0.40
22.	Heat load of animals can be reduced by artificially spraying small quantity of water on their body at	70.00	0.40

	repeated interval of 15-30 minutes during summers?		
23.	Do you know about the latest equipment's for the heat stress management such as sprinklers, foggers etc?	46.67	0.30
24.	Do you know the methods to overcome cold stress by putting blankets or cattle jackets?	73.33	0.40
IV.	Health Management		
25.	Vaccination against brucellosis should not be done for pregnant animal & breeding bull?	46.67	0.30
26.	Deworming of animals is not mandatory in dairy management?	46.67	0.50
27.	The animal disease name in which proper disposal of animal carcass is very much important:	50.00	0.50
28.	Improper milking method leads to which disease	43.33	0.40
29.	Do you know about the hazards (like anti-microbial resistance and antibiotic residues in milk) due to excessive use of Antibiotics in dairy animals?	43.33	0.30
30.	Do you know about some indigenous /herbal/ayurvedic/ethnoveterinary practices for treatment of sick dairy animals?	60.00	0.40
V.	General Management		
31.	Dry muzzle is a sign of healthy animal:	50.00	0.30
32.	Which system of housing is ideal for scientific housing:	46.67	0.30
33.	Do you know that certain scientific reports says that the soft music acts as a stimulus for better milking:	46.67	0.30
34.	Record keeping is an essential component of commercial and profitable dairy farming	66.67	0.30
35.	What are the features of a good dairy animal?	46.67	0.50
36.	Do you know the concept of calving box for pregnant dairy animals	50.00	0.30
VI.	Clean milk production		
37.	Techniques of Clean Milk Production provide longer shelf life and keeping quality of milk	66.67	0.30
38.	Clean Milk has high commercial value and helps to produce good quality dairy products	46.67	0.50
39.	Fore-stripping should be collected in separate utensil/cup for examination and abnormal milk should be discarded to avoid flies and insects	43.33	0.50
40.	Milk should be cooled immediately after milking so that bacterial growth is retarded by cooling milk within 2 hours of milking	50.00	0.50
41.	Automatic milking system (AMS) saves labour costs and enhances overall farm management in CDF	46.67	0.50
VII.	Calf management		
42.	Colostrum is fed to calf because	70.00	0.40
43.	How much colostrum should be fed to the calf and for how many days	46.67	0.30
44.	Which is the most preferred time for weaning in commercial dairy farms	73.33	0.40
45.	Which disease causes maximum mortality in neonatal calf	46.67	0.30
VIII.	Govt. Schemes and outreach programmes for dairy development		
46.	Do you know about the government scheme of Pashu/ Kisan credit card	50.00	0.30
47.	Do you know about the livestock insurance scheme?	46.67	0.30
48.	Do you know about the Integrated Dairy Development Scheme (IDDS) scheme run by the UT govt. of J&K?	46.67	0.30
49.	Do you know about the Dairy Entrepreneurship Development scheme (DEDS) scheme of NABARD?	66.67	0.30
50.	Do you know about the Galvanizing Organic Bio-agro Resources Dhan (GOBAR-DHAN) scheme?	46.67	0.50
IX.	Recent trends in Dairy Farming		
51.	Do you know about the concept of Contract farming?	73.33	0.40
52.	Do you know about the concepts and standards of Organic dairy farming?	46.67	0.30
53.	Do you know that value addition of the milk (ghee, butter, curd, paneer, kaladi, khoa, cheese etc.) leads to higher profit margin in a commercial dairy farm?	46.67	0.50
54.	Do you know that the income of your dairy farm can be enhanced by adopting waste to wealth approaches like making biogas, vermicompost, cow dung logs and eco-friendly products like incense sticks, flower pots, diyas etc. from cattle dung?	46.67	0.50
55.	Do you know that milk and milk products can be marketed through online portals?	50.00	0.50
56.	Do you know about the concept of RFID in dairy animals' identification and monitoring?	56.67	0.40
57.	Do you know about the somatic cell count to know about the quality of the milk?	73.33	0.40

Results and Discussion

Selection of Respondents

For the selection of entrepreneurial dairy farmers, a list of dairy farmers having more than 10 dairy animals was prepared with the help of Veterinary Assistant Surgeons (VAs), and Livestock Assistants (LAs) and also known as progressive dairy farmers, present in the study areas. Sixty progressive dairy farmers having more than 10 dairy animals were selected purposively from the prepared list, and an equal number of non-entrepreneurial dairy farmers (mainly resource-poor farmers) having 1-5 dairy animals were selected randomly from the same area. Thus, a total sample size of 120, comprising 60 entrepreneurial and 60

non-entrepreneurial dairy farmers, was selected for the study.

Validity and reliability

All knowledge items were also tested for validity and reliability. To improve the accuracy of their assessment, measurement instruments are evaluated for their validity and reliability. Instruments for measuring should be valid and dependable to be effective. The degree to which an instrument consistently measures what it is supposed to measure is referred to as reliability. While reliability necessitates validity, the opposite is not true because an instrument can be reliable without being valid.

In the current study, reliability was assessed using the split-half approach, wherein the format of 57 items was divided into two halves of 29 and 28. Two sets of scores were obtained and a correlation between forms was used to compare them (r). Spearman-Brown Prophecy Formula (also known as Spearman-Brown Prediction Formula) was used to calculate the reliability of the full test and is given as under:

$$R = \frac{2r}{1+r}$$

Where,

R = Reliability of full test

r = Correlation between two half tests

For testing the internal consistency of the test, Cronbach's alpha was calculated given by the formula:

$$\alpha = \frac{N \times c}{v + (N - 1) \times c}$$

Where,

N = Number of items.

c = Average covariance between item-pairs.

v = Average variance

Reliability of the knowledge test

In the current study, reliability was assessed using the split-half approach. It was discovered that the correlation coefficient between forms was (r) 0.87. The reliability of the half-test is determined by this correlation coefficient. The reliability estimates are raised because these coefficients undervalue the dependability of full-length measures, which offer a bigger sample of the content domain and have a tendency to produce a wider range of results. To obtain the stepped-up dependability of the entire measure or the reliability of the full-length test, the aforementioned coefficient must be rectified (R). Therefore, the Spearman-Brown Prophecy Formula (also known as the Spearman-Brown Prediction Formula) was used. The value of R was found to be 0.93.

The reliability of knowledge test was worked out by

1. Pearson correlation for half test [Split half (odd-even) method for testing reliability]

$$r_{xy} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2)}}$$

Where,

r = Coefficient of correlation between odd and even items

X and Y = Odd and even score of the respondents

N = Total numbers of respondents

2. Spearman-Brown Prophecy formula for total test or testing corrected reliability

The correct reliability of the total test was worked out by using the 'Spearman-Brown prophecy' formula

$$r_{n=} = \frac{nr}{(n-1)+1}$$

Where, r_n = The reliability of total test

n = Number of parts of scale (odd, even i.e. $n=2$)

r = Coefficient of correlation between odd and even items

Internal consistency of the knowledge test

The internal consistency of the test was calculated using Cronbach's alpha in this study, and the value was 0.83, indicating that the knowledge test was internally consistent. All the coefficients were found to be significant at 1% level of significance. Hence the knowledge test constructed was highly stable and reliable.

Content Validity of Knowledge Test

The validity of the knowledge test was established through content validity, which means the representativeness or sampling adequacy of the content of a measuring instrument. The content validity of the knowledge test was derived from a long list of test items representing the whole universe of information available on breeds and breeding management, feeding, housing management, health management, general management, clean milk production, calf management, government schemes and outreach programmes for dairy development and also in consultation with experts who knew various aspects of entrepreneurial dairy farming practices. It was assumed that the score obtained by administering the knowledge test of this study measures what was intended to be measured.

Conflict of Interest

The authors have no conflict of interest in this study.

Conclusion

To measure the knowledge level of dairy farmers toward entrepreneurial dairy farming practices, a tool in the form of a knowledge test was designed and standardised. The application of this test to assess the knowledge level of dairy farmers on entrepreneurial dairy farming will give an idea of the existing knowledge level of dairy farmers. The test can be used to determine whether dairy farmers' understanding of entrepreneurial dairy farming procedures is lacking and appropriate interventions can be undertaken to fill that gap. This knowledge test is highly stable, reliable and content validated for measurement of the level of knowledge of dairy farmers on entrepreneurial dairy farming.

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