Original Research Article

Socio-economic Sustainability of Rearing Deoni Cattle in Bidar District of Karnataka

Abstract: Desi cow has been a part of Indian lifestyle since ages immemorial. Desi cattle is not only seen as a beneficial source, but also considered as a family member and respected with a motherly status. One such desi cattle is Deoni. The present study was undertaken in Bidar district of Karnataka, which is one of the native tracts of Deoni. The data were collected from 120 Deoni cattle owners. The socio-economic sustainability of rearing Deoni cattle was evaluated by measuring the social sustainability index and economic sustainability index. Economic efficiency was measured by 6 indicators, viz. milk productivity, net profit, lactation length, dry period, calving interval, and marketing, while social equity was measured by community relation of dairy farmers and their access to resource and support services. The socioeconomic sustainability index of rearing Deoni cattle by the dairy farmers ranges from 0 to 1. The results revealed that the majority of the respondents (47.50%) belonged to medium economic sustainability (0.47 to 0.55), 55.33 per cent of the farmers belonged to medium social sustainability (0.48 to 0.63) and 48.33 per cent of the respondents belonged to medium socio-economic sustainability group (0.50 to 0.56), and only 26.67 per cent of the respondents belonged to high socio-economic sustainability (>0.56), depicting that efforts should be made by various actors involving in Deoni cattle farming to improve the sustainability of rearing Deoni cattle through scientific dairy farming practices, marketing, better community relation, and access to resources.

Keywords: Deoni cattle, Economic efficiency, Social equity, Sustainability

Introduction

Deoni cattle are dual-purpose indigenous dairy cattle maintained under a semi-intensive system of management. They are known for their physique and drought power and Deoni cattle is most important cattle breed found in most drought prone area of India (Dongre *et al*. 2017). Dairy farming in drought prone enhance sustainable livelihood to farmers and its helps to alleviating poverty and unemployment in especially in rural area. Karnataka state is second position in

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total drought prone geographical area after Rajasthan (Gururaj *et al*., 2015). The animals are reared by grazing in fallow lands, dry lands, or on bunds of the farms. The mean lactation milk yield and peak milk yield in Deoni cattle is 881 kg and 4 kg, respectively.

Sustainable agricultural development means the management and conservation of the natural resources and also the technological orientation and institutional change in such a fashion to make sure the acquisition and the continued satisfaction of human needs for present and future generations (FAO, 1991). In sustainable agriculture, Swaminathan (1991) recognized 14 major dimensions covering social, economic, technological, environmental, and political facts of sustainability. Among these, only economic and social dimensions were considered for the present study, which is considered to be important from the livelihood security point of view. Rearing of Deoni cattle is serving as a source of income for resource-poor farmers. It provides employment to the rural community, helps in securing nutritional security as well as to overcome economic risk. Any cattle rearing practices must be sustainable so that it could be retained by future generations as an occupation. With this view, the socioeconomic sustainability of Deoni cattle rearing was studied.

Methodology

The study was conducted in Bidar district of Karnataka, which was selected purposively as there was more existence of genetically pure Deoni cattle in that region. In Bidar district, Bhalki, Basavakalyan, and Aurad blocks were selected purposively based on the maximum number of Deoni cattle. From each block, four villages were selected randomly. Thus, a total of 12 villages were selected for the study. The respondents were selected based on the criteria that a farmer should possess at least one Deoni cattle, which has completed at least one lactation at the time of investigation. Among Deoni cattle rearers, ten dairy farmers were selected by random sampling method from each village. Thus, a total of 120 Deoni cattle owners were selected for data collection.

Measurement of sustainability: The methodology, developed by Rahman (2011) for assessing the sustainability of dairy farms of Self Help Group in Assam, was adopted and modified to use in the context of Deoni cattle rearing. To calculate the socio-economic sustainability, economic sustainability index (ESI) and social sustainability index (SSI) were calculated separately, then pooled to arrive at SESI. The indicators in each dimension were selected based on Swaminathan's concept of sustainable livelihood security, that is, livelihood options that are economically efficient as well as socially equitable (Swaminathan 1991).

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Economic efficiency was measured by 6 indicators; viz. milk productivity, net profit, lactation length, dry period, calving interval, and marketing, while social equity was measured by community relation of dairy farmers and their access to resource and support services.

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Construction of socio-economic sustainability index: The first step is to construct the index (I_{ij}) for each i^{th} indicator representing the j^{th} dimension of the socio-economic sustainability index.

$$I_{ij} = \frac{X_{ij} - MinX_{ij}}{MaxX_{ij} - MinX_{ij}} \quad \ldots\ldots\ldots (1)$$

$$I_{ij} = \frac{MaxX_{ij} - X_{ij}}{MaxX_{ij} - MinX_{ij}} \quad \ldots\ldots\ldots (2)$$

Where, i = 1, 2, 3……..n indicators

j = 1, 2 dimension of sustainability

X_{ij} = Value of i^{th} indicator of j^{th} dimension

Equation (1) is for indicators having a positive implication on sustainability

Equation (2) is for indicators having a negative implication on sustainability

After obtaining the I_{ij} for all the indicators, the second step is to calculate the indices for various dimensions of the socio-economic sustainability index. It is calculated as the simple mean of their respective variables, that is:

$$ESI = \frac{\sum_{i=1}^{6} I_{ij}}{6} \quad , \quad SSI = \frac{\sum_{i=1}^{2} I_{ij}}{2}$$

Then, the socio-economic sustainability index for Deoni cattle rearing for each respondent was determined as a weighted mean of the indices obtained from the equations:

$$SESI = \frac{W_1 \times ESI + W_2 \times SSI}{2}$$

Where, W denotes the weight assigned to the respective dimension of the socio-economic sustainability index.

Results and Discussion

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Socio-economic profile of Deoni cattle owners: Table 1 revealed that more than half of the respondents (55.83%) belonged to the middle age group (36 to 50 years). This research observation was similar to the findings of Thombre *et al*. (2010); Paul *et al*. (2016); Bukya *et al*. (2019). About 82.50 per cent of the respondents interviewed were male, while 17.50 per cent were female. It was observed that about 23.33 per cent of the respondents had education up to primary level. This was similar to the research findings of Mande and Thombre (2009); Patel *et al*. (2013); Kuralkar *et al*. (2015). Almost half of the respondents (47.50%) were having medium landholding ranging from 2 to 4 hectares. Nearly 44.17 per cent of the respondents were having a medium herd size of 3 to 4 animals per household. This was almost similar to the findings of Kumar and Chand (2008); Patel *et al.* (2013). More than half of the respondents (59.17%) were a member in one or the other organizations, 01.67 per cent of the respondents had occupied the position of office bearer and 39.17 per cent of the respondents were not the member in any organization. These findings were found to be similar to the findings of Sathyanarayan *et al*. (2010); Singh (2014). The majority of the respondents (60.83%) had medium extension contact and this was in line with the findings of Mali (2013); Singh *et al.* (2016). About 60.00 per cent of the respondents had a medium level of mass media exposure.

Sl. No.	Variables	Categories	Frequency	Percentage (%)
1	**Age (in years)** Range: 28-63 Mean: 43.21	Young (up to 35)	22	18.33
		Middle (36 to 50)	67	55.83
		Old (>50)	31	25.83
2	**Gender**	Male	99	82.50
		Female	21	17.50
3	**Education**	Illiterate (0)	18	15.00
		Functionally literate (1)	13	10.83
		Primary (2)	28	23.33
		Middle (3)	24	20.00
		High school (4)	21	17.50
		Higher Secondary (5)	14	11.67
		Graduate and above (6)	02	1.67
4	**Landholding (ha)**	Landless (0 ha)	4	3.33
		Marginal (<1 ha)	8	06.67
		Small (1-2 ha)	30	25.00
		Semi-medium (2-4 ha)	57	47.50
		Medium (4-10 ha)	18	15.00
		Large (>10 ha)	3	2.50
5	**Herd Size (SAU)** Mean: 4.4 Range: 1-25	Small (Up to 3.15)	50	41.67
		Medium (3.16 to 5.59)	53	44.17
		Large (> 5.59)	17	14.17

6	**Social Participation**	Not a member (0)	47	39.17
		Member (1)	71	59.17
		Office bearer (2)	02	1.67
7	**Extension Contact** Mean: 1.85 Range: 1-4	Low (< 1.80)	33	27.50
		Medium (1.81 to 2.08)	73	60.83
		High (> 2.08)	14	11.67
8	**Mass Media Exposure** Mean: 3.88 Range: 2-10	Low (Up to 3.17)	36	30.00
		Medium (3.18 to 4.05)	72	60.00
		High (> 4.05)	12	10.00

Table 1. Socio-economic profile of Deoni cattle owners (n=120)

Economic Sustainability Index (ESI): Milk productivity, Net profit, Lactation length, Dry period, Calving interval, and Marketing were considered as economic indicators to measure the productivity, profitability, and viability of the cattle rearing practices.

Table 2 indicates that average milk productivity of Deoni cattle was found to be 3.07 ± 0.08 liters. This finding was in line with the findings of Meena *et al.* (2015). The productivity of the animal could be improved by proper nutritional management. Since owners of Deoni were mostly small and medium farmers, they tried to optimize profit by using their available resources. The average net profit per annum from the Deoni cattle rearing for the respondents was found to be ₹5,107 (for the year 2018-19). Das (2010) studied indigenous cattle rearing in Assam and reported the net profit from cattle rearing as ₹2,447.28 per annum. The mean lactation length in Deoni cattle was found to be 251.88 ± 0.87 days. This was found similar to the findings of Kuralkar *et al.* (2015) and high compared to the findings of Bhutkar *et al.* (2014) and Basak and Das (2018). The mean dry period was found to be 162.63 ± 1.33 days. The finding was similar to the findings of Prakash *et al*. (2008) and high as compared to the findings of Mayekar *et al.* (2017). The mean calving interval was found to be 413.75 ± 0.77 days. This result was low compared to the findings of Basak and Das (2018). The study revealed that the majority of the respondents (65.83%) used to sell milk through informal milk channels like milk vendors, halwai, and tea stalls, etc., while 34.17 per cent respondents used to sell milk through the formal channel like milk cooperative society. There was no proper marketing channel for the milk. Farmers were selling milk at distress prices.

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Table 2. Economic parameters to measure economic and social sustainability of rearing Deonicattle (n=120)

Sl. No.	Variable	Category	Frequency	Percentage
1.	**Milk Productivity** (l/day/animal) Mean value: 3.07 ± 0.08	Low (Up to 2.40)	21	17.50
		Medium (2.41 to 3.51)	68	56.67
		High (>3.51)	31	25.83
2.	**Net Profit (**Rs.) Mean: 5106.74	Low (Up to 4443.10)	40	33.33
		Medium (4443.11 to 6038.47)	52	43.33
		High (>6038.47)	28	23.33
3.	**Lactation (days)** Mean: 251.88 ± 0.87	Low (Up to 245.31)	37	30.83
		Medium (245.31 to 258.60)	44	36.67
		High (>258.60)	39	32.50
4.	**Dry Period (day)** Mean: 162.63 ± 1.33	Low (Up to 151.54)	29	24.17
		Medium (151.54 to 170.28)	55	45.83
		High (>170.28)	36	30.00
5.	**Calving Interval (days)** Mean: 413.75 ± 0.77	Low (Up to 411.17)	42	35.00
		Medium (417.18 to 419.13)	44	36.67
		High (>419.13)	34	28.33
6.	**Milk selling (Channels)**	Formal	41	34.17
		Informal	79	65.83
		Medium (2.89 to 4.07)	93	77.50
		High (>4.07)	14	11.67

Table 3 shows the mean scale value of above discussed economic indicators after multiplying the value of economic indicators with their respective weights. Here we can notice that milk productivity, net profit, and lactation were contributing to the economic sustainability of Deoni cattle. But marketing has got low value due to improper marketing channels. Hence, providing proper marketing channel helps further to boost economic sustainability. The low value of the dry period and calving interval was a good indicator of economic sustainability.

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Table 3. Mean scale value of economic indicators

Sl. No.	Economic Indicators	Mean scale value
1.	Milk productivity	0.54
2.	Net profit	0.47
3.	Lactation length	0.56
4.	Dry period	0.37
5.	Calving interval	0.40
6.	Marketing	0.37

A majority of the respondents (47.50%) belonged to medium economic sustainability category (0.47 to 0.55), followed by high (>0.55) and low (up to 0.46) economic sustainability categories which consist of 26.67 per cent and 25.83 per cent of the respondents, respectively (Table 6). The economic sustainability of rearing Deoni cattle can be increased by improved scientific dairy farming practices to increase the milk production and by strengthening market infrastructure.

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Social Sustainability Index (SSI): Respondents' relationship and participation in their social system, access to resources such as water, markets, transport, and veterinary aid, etc. and support services such as extension and finance services were taken as underlying factors to measure social sustainability of Deoni cattle rearing.

From table 4, it was found that majority of the farmers (61.67%) were having medium community relation, followed by a low (35.00%) and high (3.00%) community relationship. A high value of community relationship means a strong relationship and high participation in the social system. It enhances one's social mobility and has a similar effect on the others in their social system. The support received from the community can considerably affect the farming activity of respondents, so inspection of respondents' association with their social system is very essential. A majority of the respondents (77.50%) had a medium access to resources and support services, followed by 11.67 per cent and 10.83 per cent of respondents were having a high and low access to resources and support services, respectively. During the study, it was observed that there was fair road connectivity to some villages, and banking services, water supply, and veterinary services were medium, and there was a very poor marketing facility for disposal of Deoni cow milk. The region is resource-rich, but the resources were underutilized. Hence, the government and the local organizations should make an effort for mobilization and proper utilization of available resources.

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Table 4. Social parameters to measure economic and social sustainability of rearing Deoni cattle (n=120)

Sl. No.	Variable	Category	Frequency	Percentage
1.	**Community relation**	Low	42.00	35.00
		Medium	74.00	61.67
		High	04.00	03.33
2.	**Access to resources and support services** Mean: 3.23	Low (Up to 2.88)	13	10.83
		Medium (2.89 to 4.07)	93	77.50
		High (>4.07)	14	11.67

The mean scale values of social indicators for the Deoni cattle rearers are shown in table 5. The community relation has got scale value of 0.55. So, we can say that the respondents were having medium community relation in the village with their fellow farmers and the access to resources and support services has got a value of 0.46, which indicates that the respondents were having low access to the resources and thus efforts should be made to help farmers in proper and efficient utilization of available resources in the village.

Table 5. Mean scale value of social indicators

Sl. No.	Social Indicators	Mean scale value
1.	Community relation	0.55
2.	Access to resources and support services	0.46

A majority of the farmers (53.33%) were falling under a medium level (0.48 to 0.63) of social sustainability, followed by low level (up to 0.47) and high level (>0.63) of social sustainability comprising of 25.00 per cent and 21.67 per cent of the respondents, respectively (Table 6). Social sustainability can be improved by increasing access to resources and support services, good community relation in society, and increasing the herd size per household.

Socio-economic Sustainability Index (SESI): The socio-economic sustainability index of rearing Deoni cattle was worked out by considering both economic and social dimensions of sustainability (Table 6). It was observed that majority of the respondents (48.33%) were falling under medium socio-economic sustainability group (0.50 to 0.56), followed by high (>0.56)

and low (up to 0.49) socio-economic sustainability group, comprising of 26.67 per cent and 25.00 per cent of the respondents, respectively.

Table 6. Economic Sustainability Index (ESI), Social Sustainability Index (SSI) and Socio-economic sustainability index (SESI) of Deoni cattle rearing (n = 120)

Variable	Category	Frequency	Percentage (%)
Economic Sustainability			
ESI Mean: 0.50	Low (Up to 0.46)	31	25.83
	Medium (0.47 to 0.55)	57	47.50
	High (>0.55)	32	26.67
Social Sustainability			
SSI Mean: 0.53	Low (Up to 0.47)	30	25.00
	Medium (0.48 to 0.63)	64	53.33
	High (>0.63)	26	21.67
Socio-economic sustainability			
SESI Mean: 0.51	Low (Up to 0.49)	30	25.00
	Medium (0.50 -0.56)	58	48.33
	High (>0.56)	32	26.67

Sustainability of rearing Deoni cattle means degree up to which it cannot be replaced with any other source of income available and affordable to the respondents. If the index value is 1, it means that it should not be replaced and it is the best option for livelihood security out of all the options available and affordable to the respondents. Deoni cattle rearing was a traditional practice for farmers' livelihood security and were rearing Deoni cattle from generations mainly on low or zero input system by utilizing natural resources available in the study area. The main question was that whether it should be replaced with another high yielding breed of cattle or not. The answer was that, for maintaining high yielding exotic cattle breed, there was a requirement of financial resources, which the farmer was unable to bear those expenses. The bullock of a crossbred cow has got the poor draft performance. By rearing Deoni cattle, respondents had the following advantages:

- These animals were well acclimatized to the region and have got high disease tolerance and can thrive well and perform better under low resource condition.
- Milk was a cheaply available and most acceptable animal protein source for the vegetarian population.
- Regular income from the sale of milk, manure, dung cake, and use of bullocks for agricultural operations on other farmers' fields.

- The maintenance cost of rearing Deoni cattle was very low.
- Being indigenous cattle, milk of Deoni cattle has A_2 β casein, which is considered to be safe for human health. Nowadays, consumers are health-conscious and they preferred to buy A_2 milk for their good health even at high prices.

Relationship of independent variables with socio-economic sustainability of Deoni cattle rearing

The result of the correlation analysis between eight independent variables and socio-economic sustainability index of Deoni cattle rearing was depicted in table 7. It was observed milk production, social participation, extension contact, and landholding were strongly correlated to socio-economic sustainability. Education and herd size was also having a positive correlation with socio-economic sustainability. Age and mass media exposure were not correlated with socio-economic sustainability and found to have a non-significant relationship with socio-economic sustainability at the 0.01 significance level.

Table 7: Relationship between independent variables and socio-economic sustainability of Deoni cattle rearing

Sl. No.	Variables	Correlation coefficient "r"
1	Age	0.130
2	Education	0.238**
3	Landholding	0.552**
4	Herd size	0.318**
5	Social participation	0.579**
6	Extension contact	0.563**
7	Mass media exposure	0.168
8	Milk production	0.638**

** Significant at 0.01 level of probability

Conclusion

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The majority of the respondents were resource-poor farmers; they could not afford crossbred animals with high maintenance cost. It is better to improve the performance of Deoni cattle, which was well acclimatized, by focusing on extension services for regular training of farmers and for disseminating knowledge on improved cattle rearing practices. The education, large herd size, large land holding, social participation, extension contact, and milk production play

an important role in improving the sustainability of Deoni cattle rearing. By improving the sustainability, it would provide better option for livelihood security for the future generations.

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