**Original Research Article**

**Index approach and Livelihood security of small scale buffalo farmers in Prakasam district of Andhra Pradesh,India**

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**ABSTRACT**

The research aims to study the livelihood security status of buffalo farmers in Prakasam district of Andhra Pradesh. The information collected through direct interview using pretested structured interview schedule. A Total number of 120 buffalo farmers who possess at least two milch animals were selected from six villages using purposive and multi-stage random sampling. A composite of livelihood security index was developed for the study. The index values were further analyzed and categorized in to high, medium and low using appropriate statistical operations. The different dimensions of livelihood security studied were food, economic, livestock farming, social, institutional and environmental security. The food security (78.10%) was in better situation as compared to others and environmental security (31.20%) was in most vulnerable situation. The study inferred that most (40.80%) of the buffalo farmers were in medium livelihood security situation and the trend is towards better livelihood in the study area.

***Key words:*** *buffalo farmers, economic security, food security, livelihood security index, livestock farming security, social security*

1. **INTRODUCTION**

Comprehending the livelihood systems of the buffalo farmers is essential for tackling poverty in effective manner. Livelihood refers to the ways, pursuits, rights and possessions that people use to support themselves. Livelihood security, according to (Frankenberger, 1996) [1], can be defined as “adequate and viable access to income and other resources to empower households to meet their basic needs. Livelihood is a sufficient and feasible approach to various tools to help families take care of their fundamental requirements. Buffalo holds the greatest promise for food security in the current century as these animals form an important part of usual farming system in many regions of India. Buffalo is the largest capital asset as well as the friend of small farmers which is the backbone of rural economy in many parts of India (Manohar, 2012) [2]. Recognizing its potential, The Economic Survey 2023–24 recommended a shift toward high-value agriculture—such as dairy and buffalo meat—to uplift smallholder incomes (Firstpost, 2024) [3]. Moreover, low-input, climate-resilient breeds like the Bhadawari buffalo have proven suitable for marginal farmers (The Tribune, 2024) [4]. Government initiatives such as the National Livestock Mission and Animal Husbandry Infrastructure Development Fund are also bolstering productivity, infrastructure, and veterinary access for smallholders (PWOnlyIAS, 2024) [5]. In the light of this, the study therefore investigated the livelihood security of the buffalo farmers by using index approach.

1. **MATERIALS AND METHODS**

The current research was conducted purposively in Prakasam district of Andhra Pradesh in the year 2022. According to 20th livestock census [6], Prakasam district stands first in buffalo population with 62,19,499 and with milk production of 92.418 lakh MTs in Andhra Pradesh. It constitutes three revenue divisions namely Ongole division, Kanigiri division and Markapuram division. One mandal was selected randomly from each revenue division. Further, from each mandal, two villages were again randomly selected. Those villages were Gummalampadu and Takkellapadu from Santhanuthalapadu mandal of Ongole division, Pedaarikatla and Chinarikatla from Pedaarikatla mandal of Kanigiri division and Puchkayalapalli and B. Cherlopalli from Pedaaraveedu mandal of Markapuram division. From each village 20 farmers were selected randomly with atleast two milch animals, to form a total sample of 120 buffalo farmers. The data was collected by using a pre-tested structured interview schedule, which was scored, compiled, tabulated and analyzed using frequency and percentage. The livelihood security was calculated by developing index.

The Google forms about the proforma of dimensions of the livelihood security were sent to 60 judges through e-mail. Out of 60 judges, 30 responses were received and the ranking was given based on their relevance in the livelihood security.

The Normalized Rank Order Method suggested by Guilford (1954) [7] was used for determining the scale values. The responses received were considered for the item analysis. The ranking given were summarized and presented in the following table.

Next, the proportions were calculated for ranks assigned by all the judges by following formula

Where,

P= centile value indicating the area of dimensions in the normal distribution

Ri= rank value of the ith dimension in the reverse order as 7 to 1

n= number of dimensions ranked

Thus, the P values for ranks ranged from 91.64 to 8.37.

To find out the Correction factor (C) values for all the ranks, correct rank order (1 to 7) is given under ri column with second column Ri is the reverse order (7 to 1). The C values were determined for each rank from Table-M (Guilford, 1954. p.577) [5].

These values were obtained by putting finger on the extreme left column on the number which indicates number of dimensions (6) and also the number of stimuli to be ranked. While moving the finger from this number 6 towards right, stop at the number which indicates the rank number (ri, 6). Above the rank number you can find the respective C value 5 for 6 rank and this can be entered in the table under C column. The C values are from 1 to 9 only. Same procedure for obtaining C values for remaining ranks (ri). Next is to find out the Ʃ*fji* C value for all dimensions. This is obtained by multiplying the frequencies of the respective dimension with C values of the rank (ri), and summing up the products of each dimension.

The mean of the total frequencies, that is for whole data of matrix was (1110/180=6.167) 6.167 and the mean of the C values was (37/6=6.167) also 6.167. Then the Ʃ*fji* C values for each dimension was divided by total number of judges (30), resulting in obtaining of Mc = Rj value for each dimension. This was the mean value (Mc) and response value (Rj) for each dimension. The mean values were shown in the row against Mc = Rj. The Mc values can be accepted and treated as scale values. The total value was 37 which was also the sum of C values, and the mean of the Mc or Rj or Rc values was 6.167.

The standard deviation and standard error of the Mc values was 0.847 and 0.154, respectively.

**Computation of the composite index**

Each dimension of LSI consists of number of indicators. So, their range of total scores varies. Therefore, the total score of each dimension was converted into unit score by using simple range and variance as given follows

Where,

Uij = unit score of the ith respondent on jth dimension

Yij= value of the ith respondent on the jth dimension

Max Yj = Maximum score on the jth dimension

Min Yj = Minimum score on the jth dimension

Thus the unit score range from 0 to 1i.e, when Yij is minimum, the score obtained was divided by the sum of the scale values in order to get the LSI for each respondent

Where

LSIi = livelihood security index of the ith respondent

Uij*=* unit score of the ith respondent on jth dimension

Sj= scale values of the jth dimension

Ʃ= sum

Chart 1. The status of the respondent’s livelihood security was calculated based on total index score of all the indicators.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ri | Ri | Six dimensions of Livelihood Security Index (LSI) | | | | | | Ʃ | P | C |
| Food security | Economic security | Livestock farming security | Social security | Institutional security | Environmental security |
| 1 | 6 | 13 | 0 | 14 | 1 | 2 | 0 | 30 | 91.67 | 8 |
| 2 | 5 | 9 | 4 | 11 | 3 | 0 | 3 | 30 | 75 | 7 |
| 3 | 4 | 3 | 17 | 2 | 6 | 1 | 1 | 30 | 58.34 | 6 |
| 4 | 3 | 4 | 6 | 0 | 17 | 1 | 2 | 30 | 41.67 | 6 |
| 5 | 2 | 1 | 3 | 0 | 2 | 16 | 8 | 30 | 25 | 5 |
| 6 | 1 | 0 | 0 | 3 | 1 | 10 | 16 | 30 | 8.34 | 5 |
| Ʃ*fji* | | 30 | 30 | 30 | 30 | 30 | 30 | 180 | 300 | 37 |
| Ʃ*fji* C | | 214 | 181 | 216 | 182 | 158 | 159 | 1110 |  | |
| Mc or Rj or Rc  (Ʃ*fji*C/Ʃ*fji* ) | | 7.134 | 6.034 | 7.2 | 6.067 | 5.267 | 5.3 | 37 | M= 6.167  𝜎=0.847 | |
| ri= correct rank order, Ri=reverse rank order, Ʃ= sum, P= proportion, C= Correction factor values of respective ranks, Mc= mean value, Rj= response value, Rc= scale value, 𝜎= standard deviation | | | | | | Standard error for  Mc= | | | | |

1. **RESULTS AND DISCUSSION**

In this study, livelihood security of the respondents was operationalized based on six dimensions. They are food security, economic security, livestock farming security, social security, institutional security and environmental security. These dimensions of livelihood security in the study area have been presented as follows

* 1. **Food security index**

Table 1 showed that nearly half (45.00%) of the respondents had high level of food security and 25.8 per cent of respondents with medium level of food security, which indicated that the buffalo farming provide secured food and nutrient requirements. The reason might be due to availability of milk from buffaloes throughout the year to their family. Smallholders own over 70% of dairy animals, and buffaloes contribute nearly 45% of the country’s total milk output, serving as a key source of rural sustenance (The Tribune, 2024) [6].

The results were in agreement with Pradhan (2019)[8], Girish (2018)[9] and Anshida Beevi (2013)[10] who reported that majority of the respondents had high level of food security.

**Table.1 Distribution of the buffalo farmers on the basis of food security**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No** | **Category** | **Frequency** | | **Percentage** |
| 1 | Low (0.67-0.75) | 35 | | 29.20 |
| 2 | Medium (0.75-0.83) | 31 | | 25.80 |
| 3 | High (0.83-1.00) | 54 | | 45.00 |
|  | **Mean** | | 0.78 | |

**Fig 1. FOOD SECURITY**

* 1. **Economic security index**

The results evinced that more than half (51.60%) of the respondents had medium level of economic security, whereas 25.80 per cent of them had low level of economic security. The low to medium economic security emphasizes that there is still scope to increase economic opportunities for the farmers. Though income was generated through buffalo farming throughout the year made them economically secure, low herd size could be reason for lower income. The extension advisory services should make farmers competent in improving their economic status.

The results were in accordance with Jhamb (2021)[11] and Parmanand (2012)[12] where the majority of the respondents had medium level of economic security.

In a study from Rajasthan, buffalo farming was shown to significantly improve household income and consumption, reinforcing its economic impact on rural families (Singh et al., 2023) [13].

**Table.2 Distribution of buffalo farmers based on economic security**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Category** | **Frequency** | **Percentage** |
| 1 | Low (0.31-0.43) | 31 | 25.80 |
| 2 | Medium (0.43-0.62) | 62 | 51.60 |
| 3 | High (0.62-0.94) | 27 | 22.50 |
|  | **Mean** | 0.51 | |

**Fig 2. ECONOMIC SECURITY**

* 1. **Livestock farming security**

From table 3, it was depicted that most (41.67%) of the farmers had high level of livestock farming security, followed by 30.83 per cent low level of livestock farming security. The results indicated that livestock farming security was better among buffalo farmers. The reason might be attributed to availability of veterinary services and marketing through cooperatives in the study area.

The results were in line with the findings of Kumar et al*.* (2018), [14] who reported that majority of the respondents had high level of livestock farming security.

**Table.3 Distribution of buffalo farmers on the basis of livestock farming security**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Category** | **Frequency** | **Percentage** |
| 1 | Low (0.50-0.64) | 37 | 30.83 |
| 2 | Medium (0.64-0.78) | 33 | 27.50 |
| 3 | High (0.78-1.00) | 50 | 41.67 |
|  | **Mean** | 0.71 | |

**Fig 3.LIVESTOCK FARMING SECURITY**

* 1. **Social security**

Table 4 indicated that more number (43.30%) of buffalo farmers possessing high level of social security, whereas 40 per cent of the respondents were having medium level of social security. This could be due to that majority might have felt themselves privileged and ‘socially secure’, being a part of farmers’ organizations such as cooperatives.

The results were in concordance with Barela (2017) [15] and Kumar et al*.* (2018) [14] who found that majority of the respondents had high level of social security.

**Table.4 Distribution of buffalo farmers on the basis of social security**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Category** | **Frequency** | **Percentage** |
| 1 | Low (0.25-0.49) | 20 | 16.66 |
| 2 | Medium (0.49-0.66) | 48 | 40.00 |
| 3 | High (0.66-1.00) | 52 | 43.33 |
|  | **Mean** | 0.60 | |

**Fig 4. SOCIAL SECURITY**

* 1. **Institutional security**

From table 5, it was found that majority (60.00%) of buffalo farmers had medium level followed by 30.83 per cent had high institutional security. The reason might be due to better accessibility to rural institutions such as Cooperative societies, Veterinary Health Centres, Primary Health Centres, Rythu Bharosa Kendras and Panchayat personnel.

**Table.5 Distribution of buffalo farmers based on institutional security**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Category** | **Frequency** | **Percentage** |
| 1 | Low (0.25-0.56) | 11 | 09.17 |
| 2 | Medium (0.56-0.75) | 72 | 60.00 |
| 3 | High (0.75-0.88) | 37 | 30.83 |
|  | **Mean** | 0.66 | |

**Fig 5. INSTITUTIONAL SECURITY**

* 1. **Environmental security**

Table 6 showed that 54.17 per cent of buffalo farmers were having medium level of environmental security index, whereas 35.83 per cent of them with high level of environmental security. This might be due to the reason that most of them use farm manure in their fields to improve soil fertility which in turn enhances growth of the crop.

**Table.6 Distribution of buffalo farmers based on environmental security**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Category** | **Frequency** | **Percentage** |
| 1 | Low (0.13-0.25) | 12 | 10.00 |
| 2 | Medium (0.25-0.37) | 65 | 54.17 |
| 3 | High (0.37-0.50) | 43 | 35.83 |
|  | **Mean** | 0.31 | |

**Fig 6. ENVIRONMENTAL SECURITY**

**Livelihood security index**

The results showed that 40.80 per cent of buffalo farmers had medium level and the rest following on either low or high livelihood security category. The picture is bright when medium and high categories put together. However, strengthening its buffalo production system and their herd size (scale of operation) would further improve the livelihood security index. Efforts of the extension system could focus on these aspects.

**Table.7 Distribution of buffalo farmers on the basis of overall livelihood security**

|  |  |  |  |
| --- | --- | --- | --- |
| **S.No** | **Category** | **Frequency** | **Percentage** |
| 1 | Low (0.46-0.58) | 38 | 31.70 |
| 2 | Medium (0.58-0.65) | 49 | 40.80 |
| 3 | High (0.65-0.83) | 33 | 27.50 |
|  | **Total** | 120 | 100.00 |
|  | **Mean** | 0.61 | |

**Fig 7. LIVELIHOOD SECURITY**

**FIG.8 DIMENSIONS OF LIVELIHOOD SECURITY**

1. **CONCLUSION**

It was evident that among all the dimensions, food security was contributing more towards improvement of overall livelihood security and environment security was contributing least towards overall livelihood security.

As the environmental security was contributing least towards improving overall livelihood security, there seems to be urgent need to increase awareness regarding organic farming practices in the study area and also promoting the value-added products or further processing of foods is essential to improve economic conditions of farmers.

Since majority of farmers had medium and high level of livelihood security through buffalo farming, there is a need for motivating a greater number of farmers towards carrying out more buffalo rearing activities or up scaling the buffalo rearing for improving their overall livelihood security.

**COMPETING INTERESTS:** Authors have declared that no competing interests exist.

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Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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Details of the AI usage are given below:

1.

2.

3.

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