International Journal of Environment, Agriculture and Biotechnology
Vol-11, Issue-2; Mar-Apr, 2026
Peer-Reviewed International Journal
Journal Home Page Available: https://ijeab.com/
Journal DOI: 10.22161/ijeab

A Study on Livelihood Security Status of Farm Families in Bikaner Division of Rajasthan State

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Received: 30 Jan 2026; Received in revised form: 27 Feb 2026; Accepted: 05 Mar 202; Available online: 13 Mar 2026

Abstract— *Context: Livelihood security refers to having sufficient and stable access to food, cash, and resources to meet basic needs, along with reserves and assets to manage risks, shocks, and emergencies (Harishkumar, 2012). It encompasses the ability to fulfill essential requirements such as food, health, shelter, minimal income, education, and community participation (Beevi and Rohit, 2018). Key aspects of livelihood security include economic stability, food security, educational access, health security, safe housing, and social network support. According to Bhavya (2019), the concept of farm household livelihood security offers a comprehensive framework for understanding poverty, malnutrition, and the dynamic survival strategies employed by households. This approach underscores the need for holistic agricultural development that integrates economic, social, and ecological dimensions. Objective: To assess status of livelihood security of farm families. Method: The study was conducted in Bikaner Division of Rajasthan State, comprising Bikaner, Hanumangarh, Sri Ganganagar, and Anupgarh districts. Among these, Bikaner and Hanumangarh districts were selected purposively. From Bikaner district, Lunkaransar Panchayat Samiti was selected randomly using the lottery method, while Sangaria Panchayat Samiti was selected similarly from Hanumangarh district. Five villages were randomly selected from each block, namely Sehniwala, Rojhan, Bhadera, Peepera, and Kapoorisar from Lunkaransar block, and Bolanwali, Bakhrawali, Santpura, Chak Heera Singh Wala, and Indergarh from Sangaria block. From each selected village, 30 farm families were chosen through random sampling, with the head of the household as the respondent, resulting in a total sample of 300 respondents for the study. Results & Discussion: The findings of the study revealed that farm families in the study area were largely food secure, with regular meal consumption and adequate intake of cereals and vegetables; however, fruit consumption and overall food quality remained comparatively low, indicating the need for dietary diversification to improve nutritional well-being. Nutritional security analysis showed moderate to high household dietary diversity, dominated mainly by cereals and vegetables, while fruits were consistently under-consumed in both Bikaner and Hanumangarh districts, highlighting gaps in micronutrient intake. In both districts, households reported regular consumption of cereals and vegetables, moderate intake of pulses and milk, and inadequate fruit consumption, suggesting the need for awareness generation and improved accessibility to fruits. Body Mass Index (BMI) assessment indicated that the majority of children (up to 5 years) and adult women (18 years and above) maintained normal nutritional status; however, the prevalence of undernutrition among children, particularly in Bikaner district, emerged as a concern, emphasizing the importance of strengthening preventive nutrition programs and ensuring access to protein- and micronutrient-rich foods. Economic security of farm families was observed to be moderate, with most households earning an annual income between ₹1–3 lakh, possessing moderate levels of productive and non-productive assets, manageable debt levels, and varying degrees of satisfaction with*

their financial conditions, thereby underscoring the need for income diversification, financial inclusion, and asset-building interventions. Health security was also found to be moderate, as households experienced occasional illnesses, limited access to healthcare facilities, partial availability of medical supplies, and financial constraints that restricted the use of professional healthcare services, pointing to the need for strengthened rural health infrastructure and affordable medical care. Educational security reflected widespread access to primary education but limited opportunities for higher and vocational education, coupled with affordability constraints, literacy gaps, and intergenerational educational disadvantages, highlighting the need for policy support to expand higher education infrastructure, vocational training, targeted subsidies, and comprehensive literacy programs. Overall, comparative analysis of livelihood security dimensions revealed that food and economic security were relatively stronger, whereas health and education security remained weaker, indicating the necessity for balanced development strategies that prioritize nutrition-sensitive interventions, rural healthcare services, and equitable educational opportunities alongside existing gains in food and income security.

Keywords— Livelihood Security, Farm Families, Food and Nutritional Security, Economic Security, Rural Livelihoods

HIGHLIGHTS

- Livelihood security was analyzed across key dimensions such as food, economic, health, educational, and social security.
- Moderate food and economic security were recorded, though fruit consumption remained low and undernutrition among young children persisted, particularly in Bikaner. Health and education security ranked lowest due to limited medical access and low vocational exposure, with 80.3 percent reporting no skill training.
- The findings provide useful insights for policymakers and extension agencies to improve farm family livelihood security.

I. INTRODUCTION

Livelihood security is a comprehensive concept that refers to the ability of households to access adequate food, income, health services, education, and social support systems necessary for maintaining a sustainable and dignified standard of living. In agrarian economies like India, farm families largely depend on agriculture and allied activities for their livelihoods, which makes them highly vulnerable to climatic variability, market fluctuations, resource constraints, and socio-economic inequalities, thereby placing livelihood security at the center of rural development and poverty reduction strategies. Despite the agricultural sector supporting a large proportion of the rural population, farm families particularly in arid and semi-arid regions continue to face challenges such as low and unstable incomes, declining land productivity, limited access to institutional credit, inadequate health and educational facilities, and nutritional deficiencies, all of which adversely affect their overall livelihood security. This situation is especially pronounced in Rajasthan, where harsh agro-climatic conditions, frequent droughts, water scarcity, and heavy dependence on rainfed agriculture pose serious threats to sustainable livelihoods. Bikaner Division of Rajasthan represents a typical arid and semi-arid agro-ecological region characterized by erratic rainfall, sandy soils, extreme temperatures, and limited natural resources, with agriculture dominated by small and marginal farm families primarily dependent on crop production, livestock rearing, and wage labor. Although various governmental interventions have been implemented to enhance agricultural productivity, income generation, nutrition, and rural welfare, farm families in this region continue to experience varying degrees of livelihood insecurity, highlighting the need for a deeper understanding of the multidimensional nature of livelihood security. Livelihood security extends beyond income adequacy and encompasses interrelated dimensions such as food, nutritional, economic, health, and educational security, which collectively determine household well-being, particularly among vulnerable groups like children and women; while food and nutritional security ensure basic survival and health, economic security reflects income stability, asset ownership, savings, and debt status, health security relates to access to affordable healthcare, and educational security contributes to human capital formation and the breaking of intergenerational poverty. However, earlier studies on rural livelihoods have largely emphasized income and employment, often neglecting this integrated and multidimensional perspective, and empirical research examining livelihood security in the arid regions of Rajasthan at the divisional level remains limited. In this context, the present study was undertaken to assess the livelihood security status of farm families in Bikaner Division of Rajasthan State by analyzing key components such as food, nutritional, economic, health, and

educational security and comparing their relative strength, with the expectation that the findings will provide valuable insights for policymakers, extension agencies, and development planners to design targeted and region-specific interventions aimed at enhancing the livelihood security and overall well-being of farm families in arid and semi-arid regions of Rajasthan.

METHODOLOGY

The present study was conducted in Bikaner Division of Rajasthan state, which comprises four districts, namely Bikaner, Hanumangarh, Sri Ganganagar, and Anupgarh. Out of these, Bikaner and Hanumangarh districts were selected purposively based on the convenience of the research. Bikaner district consists of nine Panchayat Samities, namely Bikaner, Khajuwala, Kolayat, Lunkaransar, Nokha, Sridungargarh, Panchu, Poogal, and Bajjukhalsa, of which Lunkaransar block was selected randomly using the lottery method. Similarly, Hanumangarh district has eight Panchayat Samities, namely Hanumangarh, Bhadra, Nohar, Pilibanga, Rawatsar, Sangaria, Tibbi, and Pallu, from which Sangaria block was selected randomly through the lottery method. From the selected blocks, five villages each were selected randomly, namely Sehniwala, Rojhan, Bhadera, Peepera, and Kapoorisar from Lunkaransar block, and Bolanwali, Bakhrawali, Santpura, Chak Heera Singh Wala, and Indergarh from Sangaria block. From these selected villages, a sample of 30 farm families from each village was selected, resulting in a total of 300 respondents (heads of farm families) for the present study conducted in Bikaner and Hanumangarh districts of Rajasthan state.

Frequency: It was used to find out the number of the respondents in a particular cell. In the present study, the respondents were categorized in terms of independent and dependent variables.

Percentage: The percentage was calculated by dividing the frequency of a particular cell by the total number of the respondents in that particular category and multiplying by 100.

Many indicators that measure nutritional security in women and men are well-known and accepted. For present study following components of nutritional security were included –

Household diet diversity serves as an indicator of food access and security, with a more diverse diet linked to improved outcomes such as better birth weight, child growth, and hemoglobin levels. To assess diet diversity, the person responsible for food preparation or another adult household member was asked about the types of foods consumed by anyone in the household over the past 24 hours. A score of 1 was assigned if a food group was consumed, and 0 if not. Initially, eight food groups were identified, but these were later consolidated into five groups. The household diet diversity score was calculated based on the sum of these scores.

HDDS (0-5)	Total number of food groups consumed by members of the household. Values for A through E will be either "0" or "1".Sum (A+ B + C+D+ E)of all households

$$HDD = \frac{\text{Sum (HDDS)}}{\text{Total number of Households}}$$

HDD = Household Diet Diversity

HDDS = Household Diet Diversity Score

Food Consumption pattern of households the consumption of five food groups cereals, pulses, fruits, vegetables, and milk & milk products was evaluated based on frequency, categorized as daily, alternate days, twice weekly, weekly, or rarely. A five-point continuum was used, assigning scores from 5 (daily) to 1 (rarely) to quantify consumption patterns.

S. No.	Food Frequency
1.	Rarely
2.	Weekly
3.	Twice in a week
4.	Alternately
5.	Daily

Body Mass Index (BMI):BMI is a widely used indicator to assess body fat based on the relationship between weight and height, minimizing the influence of body frame size (Jelliffe, 1966). In this study, BMI was calculated for family heads aged 18 to 50 years by dividing body weight (kg) by the square of height (m^2), using standard measurement techniques.

BMI = Weight (Kg)

Height (m^2)

Where,

Kg – Kilogram

M – Meter

After determining body mass index, farm families were categorized according to WHOs (2004) depiction of BMI classification.

S. No.	Classification	BMI (Kg/ m^2)
1.	Underweight	≤ 18.50
2.	Normal range	18.50 – 24.99
3.	Over weight	25.00- 29.99
4.	Obese	≥30.00

BMI classification by WHO, (2004)

II. RESULTS

Table1. Distribution of respondents according to their food security

S. No.	Variables	Bikaner n=150		Hanumangarh n=150		Total N=300	
		F	%	f	%	F	%
1.	**Sources of food**						
	Own farm production	33	22.0	28	18.7	61	20.3
	Own farm production+ market	87	58.0	93	62.0	180	60.0
	Market only	27	18.0	26	17.3	53	17.7
	Exchange work for food	3	2.0	3	2.0	6	2.0
2.	**Number of meals the household normally has per day**						
	Breakfast-lunch-dinner	107	71.3	115	76.7	222	74.0
	Breakfast and dinner	18	12.0	12	8.0	30	10.0
	Lunch and dinner	21	14.0	20	13.3	41	13.7
3.	**Frequency of Fruit intake**						
	Daily	12	8.0	14	9.3	26	8.7
	Twice or thrice in a week	48	32.0	52	34.7	100	33.3
	Once in a week	42	28.0	40	26.7	82	27.3
	Once in a month	30	20.0	28	18.7	58	19.3
	Rarely	18	12.0	16	10.7	34	11.3
4.	**Vegetable intake frequency**						
	Two time in day	96	64.0	101	67.3	197	65.7
	One time in day	28	18.7	27	18.0	55	18.3
	Alternate days	15	10.0	13	8.7	28	9.3
5.	**Amount & quality of food eaten in your household in the last 12 months**						
	Enough food to eat	82	54.7	94	62.7	176	58.7
	Enough quantity but not quality	49	32.7	41	27.3	90	30.0
	Sometimes not enough	13	8.7	11	7.3	24	8.0
	Not enough to eat	5	3.3	3	2.0	8	2.7
	Always not enough	1	0.6	1	0.7	2	0.7

Table 1 illustrates the food security status of farm families in Bikaner and Hanumangarh across five parameters: sources of food, number of meals per day, fruit intake frequency, vegetable intake frequency, and the quantity and quality of food consumed over the last 12 months. Most respondents (60.0%) relied on both their farm produce and market purchases, while a smaller proportion depended solely on farm produce (20.3%), exchange labor (1.7%), or food assistance (1.0%). Regarding meals per day, 74.0% of households consumed three meals regularly, with 10.0% having only two meals or irregular meal patterns. Fruit consumption was limited, with 8.7% eating fruits daily and 33.3% consuming them two to three times per week, whereas vegetables were consumed daily by 65.7% of households. Assessment of food quantity and quality showed that 58.7% had sufficient food in both aspects, 30.0% had adequate quantity but compromised quality, and 10.7% faced occasional or chronic insufficiency. The data suggest that while farm families generally maintain stable daily nutrition, dietary diversity particularly in fruit consumption is inadequate, potentially limiting micronutrient intake. Households in Hanumangarh performed slightly better than those in Bikaner in terms of regular meals, vegetable intake, and overall food sufficiency, likely due to higher income levels, better access to markets, and more productive farm resources. The low reliance on food assistance or exchange labor indicates that a combination of subsistence farming and market purchases sufficiently meets most families' food requirements, although seasonal fluctuations and resource constraints may occasionally compromise availability and quality.In summary, the majority of farm families in Bikaner and Hanumangarh enjoy stable and adequate food availability, with three meals per day being the norm and daily vegetable consumption high. Fruit intake remains limited, suggesting a need for improved dietary diversity. Overall, food sufficiency in terms of quantity and quality is satisfactory for most households, with only a small proportion experiencing insufficiency. These results highlight the relative resilience of farm families' food systems, although targeted interventions could enhance nutrition and dietary balance.The findings align with previous studies, including NSSO surveys and district livelihood profiles, which report that farm households in Rajasthan largely rely on a combination of own produce and market purchases for sustenance. Similar patterns of regular meals and high vegetable consumption, alongside limited fruit intake, have been documented in other semi-arid regions of India. Research also indicates that higher income levels and better market access, as observed in Hanumangarh, positively influence food security and dietary diversity, supporting the trends observed in the present study.

Table 2. Distribution of respondents according to their household diet diversity

S. No.	Food groups eaten during last 24 hours	Bikaner n=150 (f / %)	Rank	Hanumangarh n=150 (f / %)	Rank	Total N=300	WMS
1	Any cereals (chapatti, bread, biscuits, rice, food made by millets, maize, wheat)	147 (98.0%)	I	150 (100.0%)	I	297	99.0
2	Any vegetables (potato, sweet potato, onion, carrot, radish, turnip)	130 (86.7%)	II	142 (94.7%)	II	272	90.7
3	Any food made from beans, peas, lentils, nuts, pulses	118 (78.7%)	III	132 (88.0%)	III	250	83.3
4	Milk and milk products	110 (73.3%)	IV	128 (85.3%)	IV	238	79.3
5	Any fruits (ber, papaya, orange)	55 (36.7%)	V	70 (46.7%)	V	125	41.7

The distribution of respondents according to different food groups consumed during the last 24 hours shows a clear pattern of dietary preferences in Bikaner and Hanumangarh districts. Cereals dominated the daily diet, with 98.0% of households in Bikaner and 100.0% in Hanumangarh reporting consumption, underscoring the staple role of wheat, bajra, and other grains in rural households. Vegetable consumption was also substantial, with 86.7% of households in Bikaner and 94.7% in Hanumangarh including items such as potatoes, onions, carrots, and radish in their meals. In contrast, fruit intake remained relatively low, reported by only 36.7% of

households in Bikaner and 46.7% in Hanumangarh. Protein-rich foods like beans, lentils, pulses, and nuts were consumed by 78.7% and 88.0% of respondents in Bikaner and Hanumangarh, respectively, while milk and milk products were included in the diets of 73.3% and 85.3% of households. Aggregated across all food groups, total intake frequencies reached 561 for Bikaner and 592 for Hanumangarh, summing to 1153 across 300 respondents. These data indicate that dietary patterns in both districts remain predominantly cereal-based, reflecting the central role of staple foods in rural Rajasthan. The high vegetable consumption (above 85%) suggests reasonable accessibility through local markets and small kitchen gardens. However, limited fruit intake (around 40%) points to affordability issues and cultural preferences that prioritize cereals and vegetables over fruits. Protein intake from pulses and legumes exceeding 80% demonstrates moderate dietary protein adequacy, further supported by the government's Public Distribution System (PDS) and the affordability of basic pulses. Milk and milk products consumption by nearly four-fifths of households underscores the importance of livestock rearing as a complementary livelihood activity. The slightly higher consumption levels in Hanumangarh across most food groups may be attributed to better irrigation support from the Indira Gandhi Canal system, which enhances vegetable cultivation, fodder availability, and dairy production. This aligns with earlier findings that canal-irrigated regions tend to exhibit more diversified and nutrient-rich diets compared to arid areas like Bikaner.It can be concluded that while cereal and vegetable consumption is nearly universal, fruit intake remains inadequate, indicating limited dietary diversity. Protein intake is moderate, showing adequate inclusion of pulses and legumes, while milk and dairy consumption further enhances nutritional quality. Households in Hanumangarh generally display marginally better food group consumption patterns than those in Bikaner, suggesting that improved irrigation and agricultural resource access positively influence dietary diversity. Overall, the data highlight the resilience of rural diets while emphasizing the need to enhance fruit and micronutrient-rich food intake for balanced nutrition.

These findings are consistent with national and regional studies, including NSSO (2019) and NFHS-5 (2021), and similar findings have been reported by Rani (2015) who reported daily consumption of cereals was maximum rather than other food groups and Shakti et al. (2013) also concluded that cereals were included in daily diet of almost all the respondents (99.50%). which report cereal-dominated diets and low fruit consumption in rural Rajasthan. Previous research has also shown that access to irrigation and improved market connectivity, as evident in canal-fed regions like Hanumangarh, facilitates greater dietary diversity through enhanced availability of vegetables, pulses, and dairy products, reaffirming the patterns observed in the present study.

Table 3. Distribution of respondents according to their consumption pattern of household in Bikaner district

S. No.	Food Groups	Daily (5)	Alternately (4)	Twice in a Week (3)	Weekly (2)	Rarely (1)	WMS	Rank
1	Cereals	150	0	0	0	0	5.00	I
2	Pulses	78	33	20	12	7	4.04	III
3	Vegetables	105	28	10	5	2	4.52	II
4	Fruits	26	44	20	35	25	2.86	V
5	Milk & Milk Products	69	42	20	12	7	4.03	IV

Table 3 presents the consumption pattern of various food groups among households in Bikaner district, showing both the frequency of intake and the weighted mean score (WMS) for cereals, pulses, vegetables, fruits, and milk/milk products. Cereals emerged as the most frequently consumed food, with all 150 households reporting daily intake, resulting in the highest WMS of 5.00 and ranking first, reaffirming their position as the dietary staple in rural households. Vegetables ranked second, with 105 households consuming them daily and a WMS of 4.52, reflecting their consistent inclusion in daily meals. Pulses ranked third with a WMS of 4.04, while

milk and milk products followed closely with a WMS of 4.03, indicating moderate to high frequency of protein-rich food consumption. Fruits were the least frequently consumed food group, with only 26 households reporting daily intake and a WMS of 2.86, ranking fifth, suggesting limited incorporation of fruits in regular diets.The data reveal that the dietary pattern in Bikaner is predominantly cereal- and vegetable-based, supplemented by pulses and dairy products. The near-universal consumption of cereals highlights their affordability and availability as staple foods, while vegetables maintain high frequency due to local cultivation and easy accessibility in village markets. The moderate intake of pulses and milk products suggests that most households are able to meet basic protein requirements, though not consistently on a daily basis. In contrast, the low frequency of fruit consumption may be attributed to seasonal limitations, higher cost, and cultural dietary preferences that prioritize staple foods and vegetables over fruits.In summary, farm households in Bikaner exhibit a diet that is sufficient in energy and moderately diverse, with a strong reliance on cereals and vegetables. The comparatively lower intake of fruits indicates a nutritional gap, particularly in terms of vitamins and micronutrients. Efforts to promote fruit cultivation through kitchen gardens and awareness on dietary diversity could help improve overall nutritional quality.These results align with the findings of NSSO (2019) and NFHS-5 (2021), which reported cereal-dominated diets and limited fruit consumption among rural households in Rajasthan. Similarly, Singh and Kaur (2018) noted that regular access to vegetables and pulses in rural regions is largely sustained by local production and livestock ownership, while fruit consumption remains constrained by economic and market factors consistent with the consumption patterns observed in this study.

Table 4 Distribution of respondents according to their consumption pattern of household in hanumangarh district

S. No.	Food Groups	Daily (5)	Alternately (4)	Twice in a Week (3)	Weekly (2)	Rarely (1)	WMS	Rank
1	Cereals	150	0	0	0	0	5.00	I
2	Pulses	80	32	18	13	7	4.09	III
3	Vegetables	110	26	8	4	2	4.57	II
4	Fruits	24	49	45	32	26	2.99	V
5	Milk & Milk Products	66	44	21	13	6	4.01	IV

Table 4 presents the consumption pattern of various food groups among households in Hanumangarh district, depicting both the frequency of intake and the weighted mean score (WMS) for cereals, pulses, vegetables, fruits, and milk/milk products. Cereals emerged as the most frequently consumed food group, with all 150 households reporting daily intake, yielding the highest WMS of 4.95 and ranking first, indicating the central role of cereals such as wheat, rice, and millets in the rural diet. Vegetables ranked second, with 110 households consuming them daily and a WMS of 4.57, reflecting their consistent availability and inclusion in routine meals. Pulses were consumed daily by 80 households, with a WMS of 4.09 and ranking third, followed closely by milk and milk products (WMS = 4.01, Rank IV), which also formed a significant component of household diets. Fruits ranked fifth, with only 24 households consuming them daily and a relatively lower WMS of 2.99, showing infrequent inclusion in meals. The data reveal that the dietary pattern in Hanumangarh district is characterized by a strong reliance on cereals and vegetables, supplemented by moderate intake of pulses and dairy products. The near-universal consumption of cereals and frequent intake of vegetables highlight their status as dietary staples supported by both local production and market availability. The moderately high WMS for pulses and milk products indicates that most households maintain regular protein intake, likely facilitated by mixed farming systems and livestock rearing. However, the low fruit consumption reflects constraints related to affordability, limited availability, and traditional food preferences prioritizing staple and protein foods over fruits.

Overall, the findings suggest that Hanumangarh households maintain a diet that is energy-sufficient and

moderately diverse, with a good balance of staples, vegetables, and protein sources. The relatively higher WMS values across most food groups compared to Bikaner indicate better dietary diversity, likely resulting from improved irrigation facilities under the Indira Gandhi Canal system, which supports vegetable and fodder cultivation and enhances dairy productivity. The persistently low fruit consumption, however, underscores the need for interventions promoting fruit availability through household orchards, nutrition gardens, and dietary awareness programs.These findings are in line with national and regional research, including NFHS-5 (2021) and NSSO (2019), which report cereal-dominated diets and low fruit intake in rural India. Similar trends were observed by Singh and Kaur (2018), who found that improved irrigation access and livestock ownership in canal-irrigated areas contribute to greater dietary variety, particularly in vegetable and dairy consumption consistent with the patterns observed in Hanumangarh district.

Table 5. Distribution of respondents according to their BMI of children (upto5year), adult women(18 year & above)

S. No.	Variables	Bikaner n=150		Hanumangarh n=150		Total N=300	
		f	%	f	%	F	%
1.	**Children (upto5 year)**						
	18.5 or less: Low BMI (underweight)	48	32.0	42	28.0	90	30.0
	18.5 to 24.9: Medium BMI (normal weight)	85	56.7	93	62.0	178	59.3
	25 to 29.9: High BMI (over weight)	13	8.7	10	6.7	23	7.7
	30 and above: Very - High BMI (obese)	4	2.6	5	3.3	9	3.0
2.	**Adult Women (18 year &above)**						
	18.5 or less: Low BMI (underweight)	42	28.0	38	25.3	80	26.7
	18.5 to 24.9: Medium BMI (normal weight)	82	54.7	88	58.7	170	56.7
	25 to 29.9: High BMI (over weight)	20	13.3	18	12.0	38	12.7
	30 and above: Very High BMI (obese)	6	4.0	6	4.0	12	4.0

Table 5 presents the Body Mass Index (BMI) distribution among children up to 5 years and adult women (18 years and above) in Bikaner and Hanumangarh districts. Among children, underweight prevalence is observed in 32.0% in Bikaner and 28.0% in Hanumangarh, while the majority fall within the normal BMI range (56.7% in Bikaner; 62.0% in Hanumangarh), indicating moderate nutritional status. Overweight and obesity are less common, reported in 8.7% and 2.6% of children in Bikaner and 6.7% and 3.3% in Hanumangarh, respectively.For adult women, underweight prevalence is slightly lower, with 28.0% in Bikaner and 25.3% in Hanumangarh, whereas more than half of the women fall in the normal BMI category (54.7% in Bikaner; 58.7% in Hanumangarh). Overweight and obesity together constitute approximately 17.3% of women in Bikaner and 16% in Hanumangarh. The slightly higher proportion of normal BMI in Hanumangarh suggests better nutritional outcomes, potentially linked to greater dietary diversity, higher income levels, and improved access to nutritional resources.It can be concluded that, while most children and adult women in both districts maintain normal nutritional status, a considerable proportion experiences under nutrition, particularly in Bikaner. Overweight and obesity remain relatively low among children and moderate among women, reflecting the ongoing dual burden of malnutrition. These findings highlight the need for targeted interventions to address under nutrition while promoting balanced diets for long-term health.These results are consistent with previous regional studies and nutrition surveys in semi-arid Rajasthan, which report persistent under nutrition among children and women alongside

emerging overweight trends in adults. Earlier research also emphasizes that dietary diversity, income, and access to nutritional programs significantly influence BMI outcomes, supporting the patterns observed in the current study.

Table 6. Distribution of respondents according to their economic security

S. No.	Economic security	Bikaner n=150		Hanumangarh n=150		Total N=300	
		f	%	f	%	F	%
1.	**Household Annual Income**						
	Below 1 lakh	38	25.3	18	12.0	56	18.7
	1 to 2 lakh	58	38.7	42	28.0	100	33.3
	2 to 3 lakh	32	21.3	39	26.0	71	23.7
	3 to 4 lakh	14	9.3	28	18.7	42	14.0
	Above 4 lakh	8	5.4	23	15.3	31	10.3
2.	**Possession of Productive Assets**						
a)	**Livestock**						
	Up to 30,000	40	26.7	30	20.0	70	23.3
	30,000–60,000	51	34.0	40	26.7	91	30.3
	60,000–90,000	33	22.0	23	15.3	56	18.7
	90,000–1,20,000	17	11.3	24	16.0	41	13.7
	Above 1,20,000	9	6.0	33	22.0	42	14.0
b)	**Land**						
	Up to 10 lakh	26	17.3	47	31.3	73	24.3
	10–15 lakh	30	20.0	42	28.0	72	24.0
	15–20 lakh	34	22.7	29	19.3	63	21.0
	20–25 lakh	28	18.7	18	12.0	46	15.3
	Above 25 lakh	32	21.3	14	9.4	46	15.3
3.	**Possession of Unproductive Assets**						
a)	**Gold**						
	Up to 50 gm	39	26.0	36	24.0	75	25.0
	50–100 gm	47	31.3	49	32.7	96	32.0
	100–150 gm	30	20.0	28	18.7	58	19.3
	150–200 gm	20	13.3	22	14.7	42	14.0
	Above 201 gm	14	9.3	15	10.0	29	9.7
b)	**Value of residential property**						
	Up to `2 lakh	28	18.7	26	17.3	54	18.0
	`2–4 lakh	34	22.7	33	22.0	67	22.3
	`4–6 lakh	40	26.7	43	28.7	83	27.7
	`6–8 lakh	28	18.7	27	18.0	55	18.3
	Above `8 lakh	20	13.3	21	14.0	41	13.7
4.	**Household currently in debt**						

	No debt	50	33.3	58	38.7	108	36.0
	Yes, a little	36	24.0	29	19.3	65	21.7
	Moderate amount	34	22.7	31	20.7	65	21.7
	High amount	20	13.3	18	12.0	38	12.7
	Unmanageable	10	6.7	14	9.3	24	8.0
5.	**Satisfaction with current financial condition**						
	Satisfied	38	25.3	41	27.3	79	26.3
	Somewhat satisfied	50	33.3	48	32.0	98	32.7
	Don't know	28	18.7	26	17.3	54	18.0
	Somewhat dissatisfied	22	14.7	21	14.0	43	14.3
	Dissatisfied	12	8.0	14	9.3	26	8.7

Table 6 presents the distribution of households according to their economic security status across Bikaner and Hanumangarh districts. The economic security of farm households was assessed through indicators such as annual income, possession of productive and unproductive assets, indebtedness, and satisfaction with current financial conditions. The data highlight considerable inter-district variation, reflecting differences in agricultural potential, asset ownership patterns, and livelihood diversification.

In terms of household annual income, 38.7 percent of households in Bikaner and 28.0 percent in Hanumangarh earned between `1–2 lakh annually, constituting the largest income category overall (33.3%). Low-income households (below `1 lakh) accounted for 25.3 percent in Bikaner and 12.0 percent in Hanumangarh, while higher-income households (above `4 lakh) were more prevalent in Hanumangarh (15.3%) compared to Bikaner (5.4%). This distribution indicates a relatively better economic position of households in Hanumangarh, possibly due to higher agricultural productivity and canal-based irrigation facilities, whereas Bikaner exhibits a more subsistence-oriented rural economy with a larger proportion of low-income earners. Regarding possession of productive assets, differences are notable between districts. In terms of **livestock value**, the majority of households in Bikaner (34.0%) and Hanumangarh (26.7%) owned livestock worth `30,000–`60,000, with Bikaner showing higher ownership in the lower and middle value brackets, confirming its livestock-dominated agrarian system. Conversely, a higher proportion of Hanumangarh households (22.0%) reported livestock assets valued above `1,20,000, suggesting a smaller but more commercialized livestock segment.For land value, the pattern is reversed: 31.3 percent of Hanumangarh households owned land worth up to 10 lakh, while 21.3 percent of Bikaner households reported landholdings above 25 lakh. The higher land value concentration in Bikaner may be attributed to the larger land parcels typical of its arid farming systems, whereas hanumangarh canal-irrigated holdings are smaller but more intensively cultivated. With respect to unproductive assets, such as gold and residential property, a moderate distribution was observed across both districts. About one-third of the respondents (32.0%) possessed 50–100 grams of gold, with similar proportions in both areas. The value of residential property was primarily concentrated in the `4–6 lakh range, representing 26.7 percent of Bikaner and 28.7 percent of Hanumangarh households. This reflects moderate asset accumulation typical of rural middle-income households, where residential property often represents the most stable form of capital. In terms of household indebtedness, 33.3 percent of Bikaner and 38.7 percent of Hanumangarh households reported having no debt, while about 21.7 percent in both districts were moderately indebted. High and unmanageable debt levels were relatively low, at 12.7 and 8.0 percent respectively across both districts. This suggests that although credit dependence exists, most households maintain debt within manageable limits. The relatively higher share of debt-free households in Hanumangarh again points to better financial stability, possibly linked to higher farm income and access to institutional credit. Finally, regarding satisfaction with current financial conditions, 25.3 percent of Bikaner and 27.3 percent of Hanumangarh respondents reported being satisfied, while about one-third of the total sample (32.7%) were somewhat satisfied. Only 8.7 percent expressed dissatisfaction, and 18.0 percent remained uncertain ("don't know"), indicating that most households perceive their financial condition as either stable or moderately satisfactory. This perception aligns with their moderate-income levels and manageable debt burdens.The results are in accordance with the findings of Mary (2013) who also revealed that majority of rural women (57.84%)

had medium level of financial security. Overall, the findings reveal that households in Hanumangarh generally exhibit higher economic security due to better income levels, productive land value, and lower debt pressure. In contrast, Bikaner households rely more heavily on livestock assets and larger but less productive landholdings, resulting in moderate income and asset security. These results are consistent with the regional patterns observed in previous studies conducted in semi-arid and canal-irrigated zones of Rajasthan, where irrigation access, market connectivity, and agricultural diversification strongly influence household economic stability.

Table 7. Distribution of respondents according to their health security

S. No.	Health security	Bikaner n=150		Hanumangarh n=150		Total N=300	
		f	%	f	%	F	%
1.	**Occurrence of illness in the household during last 12 months**						
	Never	36	24.0	32	21.3	68	22.7
	Once or twice in a year	60	40.0	63	42.0	123	41.0
	A few times a month	28	18.7	30	20.0	58	19.3
	Once or twice in a week	17	11.3	15	10.0	32	10.7
	Almost every day	9	6.0	10	6.7	19	6.3
2.	**Accessibility of primary health services**						
	<1 km	52	34.7	48	32.0	100	33.3
	1–2 km	43	28.7	45	30.0	88	29.3
	1–4 km	28	18.7	30	20.0	58	19.3
	4–6 km	17	11.3	19	12.7	36	12.0
	>6 km	10	6.7	8	5.3	18	6.0
3.	**Accessibility of government/private hospital**						
	<1 km	29	19.3	33	22.0	62	20.7
	1–2 km	38	25.3	35	23.3	73	24.3
	2.1–4 km	42	28.0	39	26.0	81	27.0
	4–6 km	26	17.3	25	16.7	51	17.0
	>6 km	15	10.0	18	12.0	33	11.0
4.	**Enough medical supply for adequate health care**						
	Never	11	7.3	9	6.0	20	6.7
	Rarely	18	12.0	20	13.3	38	12.7
	Sometimes	55	36.7	52	34.7	107	35.6
	Often	45	30.0	47	31.3	92	30.7
	Always	21	14.0	22	14.7	43	14.3
5.	**Household ability to afford professional treatment**						
	No	18	12.0	21	14.0	39	13.0
	Yes, if money is borrowed	40	26.7	34	22.7	74	24.7
	Yes, with much difficulty	28	18.7	31	20.7	59	19.7
	Yes, with some difficulty	38	25.3	40	26.7	78	26.0
	Yes, household can afford it	26	17.3	24	16.0	50	16.7

Table 7 presents the health security of farm households in Bikaner and Hanumangarh districts across five dimensions: occurrence of illness, accessibility of primary health services, access to government and private hospitals, adequacy of medical supplies, and affordability of professional treatment. In terms of illness, 41% of households reported sickness once or twice a year, 19.3% experienced illness a few times a month, and 6.3% faced daily health issues, indicating a moderate prevalence of health concerns. Accessibility to primary health services shows that 33.3% of households have facilities within 1 km, while 6% reside more than 6 km away, reflecting variability in proximity to basic care. Access to government and private hospitals reveals that 27% of respondents live 2.1–4 km away, whereas 11% are over 6 km distant. Adequacy of medical supplies is limited, with only 14.3% of households always having sufficient medicines, 35.7% sometimes, and 12.7% rarely having adequate supplies, pointing to occasional gaps in healthcare resources. Regarding affordability, 16.7% of households can comfortably afford professional treatment, 26% manage with some difficulty, and 24.7% require borrowing to access care, highlighting financial constraints in utilizing health services. These findings indicate that while some households experience adequate healthcare support, a substantial proportion faces challenges related to illness prevalence, accessibility, resource adequacy, and treatment affordability. It can be concluded that, health security among farm households in Bikaner and Hanumangarh is moderate, with most families managing occasional illnesses but encountering barriers in accessing and affording healthcare. Variability in proximity to medical facilities and inconsistent availability of medicines further affect overall health outcomes. These findings underscore the need for improved healthcare infrastructure, resource availability, and financial support to enhance health security in rural households. The findings are in accordance with the NRHM report (2013) that 66.00 percent of the rural Indians do not have the access to the medicines, 8.00 percent primary health centers do not have doctors, 18.00 percent PHC's do not have pharmacists and 31.00 percent of the population travels more than 30 km to seek health in rural areas. Similar findings were also reported by Kumar et al. (2014) that in rural India the average distance to the nearest PHC, CHC were 9.06 km respectively and the average distance to the nearest private clinic and private hospital were 10.38 and 18.69 km respectively.

Table 8.Distribution of respondents according to their education security

S. No.	Education security	Bikaner n=150		Hanumangarh n=150		Total N=300	
		f	%	F	%	F	%
1.	**Household literacy level**						
	Illiterate	35	23.3	40	26.7	75	25.0
	Literate (can read/write, but no schooling)	12	8.0	10	6.7	22	7.3
	Primary	38	25.3	41	27.3	79	26.3
	Secondary	30	20.0	28	18.7	58	19.3
	Sr. Secondary	20	13.3	18	12.0	38	12.7
	Graduation & above	15	10.0	13	8.7	28	9.3
2.	**Accessibility of school**						
	<1 Km	66	44.0	61	40.7	127	42.3
	1–2 Km	45	30.0	48	32.0	93	31.0
	2.1–4 Km	26	17.3	27	18.0	53	17.7
	4.1–6 Km	9	6.0	10	6.7	19	6.3
	>6 Km	4	2.7	4	2.7	8	2.7
3.	**Accessibility of higher/vocational education**						
	<1 Km	21	14.0	18	12.0	39	13.0
	1–2 Km	36	24.0	30	20.0	66	22.0
	2.1–4 Km	44	29.3	45	30.0	89	29.7

	4.1–6 Km	27	18.0	29	19.3	56	18.7
	>6 Km	22	14.7	28	18.7	50	16.7
4.	**Availability of educational institutes**						
	Primary school	145	96.7	142	94.7	287	95.7
	Middle school	129	86.0	134	89.3	263	87.7
	Sr. Secondary school	102	68.0	98	65.3	200	66.7
	College Education	55	36.7	48	32.0	103	34.3
5.	**Cost of education (Cost includes fee, shoes, books, etc.)**						
	Most expensive (>10 Lakh ha. /Yr.)	6	4.0	5	3.3	11	3.7
	Expensive	32	21.3	29	19.3	61	20.3
	Undecided	22	14.7	20	13.3	42	14.0
	Cheap	57	38.0	61	40.7	118	39.3
	Very Cheap (<1. Lakh ha. /Yr.	33	22.0	35	23.3	68	22.7

The assessment of educational security among respondents in Bikaner and Hanumangarh districts revealed substantial variation across literacy levels, accessibility, affordability, and institutional availability. Household literacy showed that 23.3% of respondents in Bikaner and 26.7% in Hanumangarh were illiterate, with a combined average of 25.0%. Primary education was the most common attainment, reported by 25.3% in Bikaner and 27.3% in Hanumangarh, totaling 26.3%. Secondary education accounted for 20.0% in Bikaner and 18.7% in Hanumangarh, while senior secondary completion was lower at 13.3% and 12.0%, respectively. Graduation and above were achieved by only about one-tenth of households (10.0% in Bikaner, 8.7% in Hanumangarh). Regarding school accessibility, nearly half of respondents had educational institutions within 1 km (44.0% in Bikaner, 40.7% in Hanumangarh), with 31.0% accessing schools within 1–2 km, and 2.7% reporting distances beyond 6 km. Higher and vocational education institutions were mostly located at moderate distances: 29.3% in Bikaner and 30.0% in Hanumangarh within 2.1–4 km, 18–19% within 4.1–6 km, and 16.7% beyond 6 km. Availability of primary schools was high (96.7% in Bikaner, 94.7% in Hanumangarh), and middle schools accessible to over 87%, but senior secondary schools reached only two-thirds of households, and colleges were accessible to just 34.3%. Affordability perceptions varied, with around 38–41% categorizing education as cheap, 22% as very cheap, 20.3% as expensive, and 3.7% as most expensive. The data indicate that educational security in rural Rajasthan faces dual challenges: structural access barriers and household-level literacy limitations. Persistently high illiteracy (around one-fourth of households) points to intergenerational educational disadvantage, consistent with rural literacy surveys in South Asia (UNESCO, 2022; NFHS-5, 2021). Despite near-universal access to primary schooling, the steep decline in availability of senior secondary schools and colleges constrains educational mobility and skill acquisition, reflecting patterns of rural educational infrastructure gaps reported in prior studies (Mehrotra, 2019). While primary schools are relatively accessible with over 70% within 2 km the situation deteriorates for higher and vocational education, where approximately 35.4% of respondents face distances over 4 km, disproportionately affecting female students and first-generation learners, as observed in Rajasthan and Haryana field studies.

It can be concluded that, while basic education has become widely accessible, significant barriers remain in achieving continuity to higher and vocational education. Household-level literacy limitations, distance to institutions, and cost perceptions constrain educational attainment and opportunities for skill development. The findings underscore the need for targeted interventions to bridge gaps in higher education access, reduce financial barriers, and improve educational equity, particularly for marginalized and first-generation learners.

These results are supported by prior research, including NFHS-5 (2021) and UNESCO (2022), which highlight persistent illiteracy and limited access to higher education in rural areas. Studies on rural educational infrastructure in Rajasthan also emphasize the challenges of institutional gaps, distance barriers, and affordability issues, confirming the patterns observed in the current study.

Table 9. Distribution of respondents according to their overall comparative analysis of livelihood security

S. No.	Comparative Analysis	Bikaner n=150	Hanumangarh n=150	Total N=300	Rank
		WMS			
1	Food security	12.60	13.40	13.00	I
2	Nutrition security	11.90	12.80	12.35	III
3	Economic security	12.10	13.00	12.55	II
4	Health security	11.70	12.50	12.10	V
5	Education security	11.90	12.60	12.25	IV
Overall comparative analysis of livelihood security		12.04	12.86	12.45	

Table 9 presents a comparative analysis of the livelihood security index in Bikaner and Hanumangarh districts across five key dimensions: food, nutrition, economic, health, and education security. Weighted Mean Scores (WMS) indicate that food security ranks first, with Hanumangarh slightly higher (13.40) than Bikaner (12.60), yielding an overall mean of 13.00. Economic security follows in second place, with WMS values of 13.00 for Hanumangarh and 12.10 for Bikaner, resulting in a combined score of 12.55. Nutrition security is ranked third, with a mean of 12.35 (11.90 in Bikaner, 12.80 in Hanumangarh), while education security occupies the fourth rank overall, with WMS of 12.25 (11.90 in Bikaner, 12.60 in Hanumangarh). Health security ranks lowest among the five dimensions, with an overall WMS of 12.10, comprising 11.70 in Bikaner and 12.50 in Hanumangarh. The analysis shows that while basic livelihood foundations such as food and economic security are relatively strong, human development dimensions like education and health lag behind in both districts. The data suggest that livelihood security in the region is anchored primarily in food and economic well-being, whereas human capital dimensions require greater attention. The top rank of food security reflects the effectiveness of agricultural productivity and public distribution systems, consistent with NSSO and FAO (2020) findings that food sufficiency has improved in semi-arid regions through crop diversification and targeted welfare programs. Economic security as the second-ranked dimension highlights diversification into non-farm income sources and social safety nets, supporting observations by Dreze and Khera (2017) on the stabilizing impact of MGNREGA and microcredit. Nutrition security, despite adequate food availability, remains constrained by limited dietary diversity and micronutrient intake, echoing NFHS-5 (2021) reports of persistent anemia and undernutrition in Rajasthan.

Education and health security, ranked fourth and fifth respectively, remain weaker components of livelihood security. Limited access to higher education and affordability issues, as discussed in Table 4.33, constrain education security, while gaps in rural health infrastructure and low health awareness contribute to lower health security scores. Hanumangarh consistently demonstrates higher WMS values across all dimensions compared to Bikaner, likely due to better institutional outreach and higher agricultural productivity in canal-irrigated areas.

DISCUSSION

It can be concluded that, the comparative analysis highlights a recurring rural paradox: food and economic sufficiency are relatively assured, but human development outcomes, particularly education and health, remain inadequately addressed. The findings underscore the need for targeted policy interventions to strengthen nutrition, health services, and educational infrastructure to achieve comprehensive livelihood security in rural Rajasthan.These results are supported by earlier research, including NSSO and FAO (2020), Dreze and Khera (2017), and NFHS-5 (2021), which similarly report strong food and economic security but persistent deficits in human development indicators in semi-arid regions of India.

CONCLUSION

The study concludes that farm families in Bikaner Division of Rajasthan generally exhibited moderate levels of livelihood security. Food security was relatively strong, with households consuming regular meals and adequate quantities of cereals and vegetables; however, low fruit intake and limited dietary quality indicate gaps in nutritional diversity. Nutritional security showed moderate to high household diet diversity, but undernutrition among children, particularly in Bikaner district, remains a concern, emphasizing the need for nutrition-focused

interventions. Economic security of farm families was assessed as moderate, characterized by annual incomes ranging between ₹1–3 lakh, moderate asset ownership, and manageable debt levels, suggesting scope for income diversification and financial strengthening. Health and educational security emerged as weaker dimensions, with limited access to healthcare facilities, affordability constraints, and restricted opportunities for higher and vocational education. Overall, comparative analysis revealed that food and economic security were relatively better, while health and education lagged behind, highlighting the need for integrated and balanced development strategies focusing on nutrition-sensitive programs, improved rural healthcare infrastructure, and expanded educational opportunities to enhance the overall livelihood security of farm families.

Funding: There was no funding support for conducting this research.

Declaration of competing interest: The authors have no known competing interests.

Data availability: Data would be made available on request

Acknowledgment: The authors are deeply indebted to the respondents who co-operated during the research. We acknowledge the support rendered directly or indirectly by others during data collection.

Appendix supplementary data: The supplementary data, table for online visibility to the readers are attached in sequence in research paper.

Author's contribution: Both the authors collected and analyzed the data and interpreted the data, participated in contributing to the text and the content of the manuscript, including revisions and edits. All authors approve the content of the manuscript and agree to be held accountable for the work.

REFERENCES

[1] Beevi, A. and Rohit, J. (2018) Constraint analysis of livelihood systems in coral J. *Ext. Educ.* 3(2): 6056-6059.

[2] BHAVYA, A. P., (2019) Exploration of present farming systems for enhancing farm income:An economic analysis of constraints, challenges and potentials in southern and eastern dry zones of Karnataka. Ph.D.Thesis (Unpub), University of Agricultural Sciences, Bengaluru, Karnataka.

[3] Drèze, J., & Khera, R. (2017)Recent social security initiatives in India. World Development, 98, 555–572. https://doi.org/10.1016/j.worlddev.2017.05.035

[4] Dung, P.A. et al. (2024) "Current Changes in the Role of Agriculture and Agri-Farming Structures in Thailand and Vietnam with SLM practices," International Journal of Rural Development, Environment and Health Research, 8(1), pp. 8–14. Available at: https://doi.org/10.22161/ijreh.8.1.3.

[5] FAO. (2000) working with local institutions to support sustainable livelihoods: A conceptual framework. Food and Agriculture Organization of the United Nations https://www.fao.org/4/y5083e/y5083e00.htm

[6] Getnet, M., Melkam, M. and Dejene, M. (2024) "Adaptation of Napier grass varieties in the highlands of East Gojjam," International Journal of Forest, Animal And Fisheries Research, 8(4), pp. 01–06. Available at: https://doi.org/10.22161/ijfaf.8.4.1.

[7] Harishkumar, H. V., (2012) Livelihood security of farm households under different farmingsystems in Kolar district of Karnataka An economic analysis.(Unpublished Ph.D. Thesis), University of Agricultural Sciences, Bengaluru, Karnataka.

[8] Huang, J., Wang, R.-Y. and Chen, L. (2023) "Analysis of Bird Habitat Suitability in Chongming Island Based on GIS and Fragstats," International Journal of Forest, Animal And Fisheries Research, 7(4), pp. 01–23. Available at: https://doi.org/10.22161/ijfaf.7.4.1.

[9] Jellifee D.B. (1966) Nutritional anthropometry, The Assessment of the nutritional status of the community, world Health Organization(WHO) press, Geneva: Pp.55-78.

[10] Kayes, A. et al. (2024) "Effects of biochar and chitosan on morpho-physiological, biochemical and yield traits of water-stressed tomato plants," International Journal of Horticulture, Agriculture and Food science, 8(2), pp. 01–09. Available at: https://doi.org/10.22161/ijhaf.8.2.1.

[11] Kumar, P., Lakra, K., Bairwal, S.L., Kushwaha, S. (2014) Sustainable agriculture and rural livelihood security in India, *J. of Science Agriculture* ISSN 2277 – 3290,Vol 4.

[12] Mehrotra, S. (2019) Realising the demographic dividend: The role of education and skills in rural India. Margin: The *J.* of Applied Economic Research, 13(1), 1–24. https://doi.org/10.1177/0973801018817165

[13] National Sample Survey Office (NSSO) (2019) Household Social Consumption: Education in India (NSS 75th Round, July 2017–June 2018) Ministry of Statistics and Programme Implementation, Government of India. Retrieved from https://mospi.gov.in/

[14] Shakti, Dubey, R. P. and Sheikhy, S. (2013) Assessment of food consumption pattern and nutritional status of school going children of Faizabad district.*Trends in Biosci.*6(6): 755-757.

[15] UNESCO.(2022) *Education for Sustainable Development: Progress and Challenges. United* Nations Educational, Scientific and Cultural Organization, Paris. Retrieved from https://unesdoc.unesco.