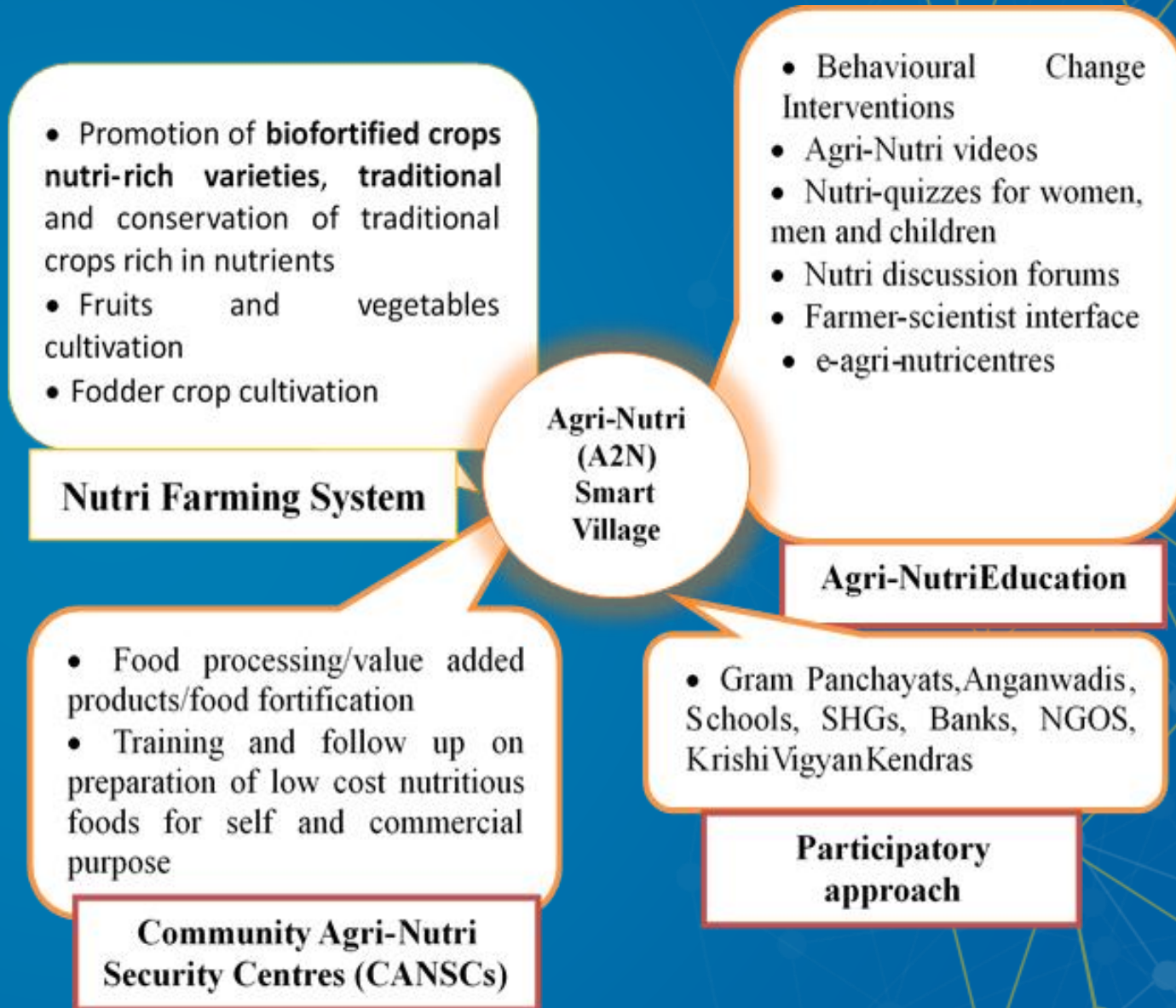


Enhancing Nutritional Security Through Agri-Nutri Smart Villages: An Index-Based Approach in Telangana and Uttar Pradesh

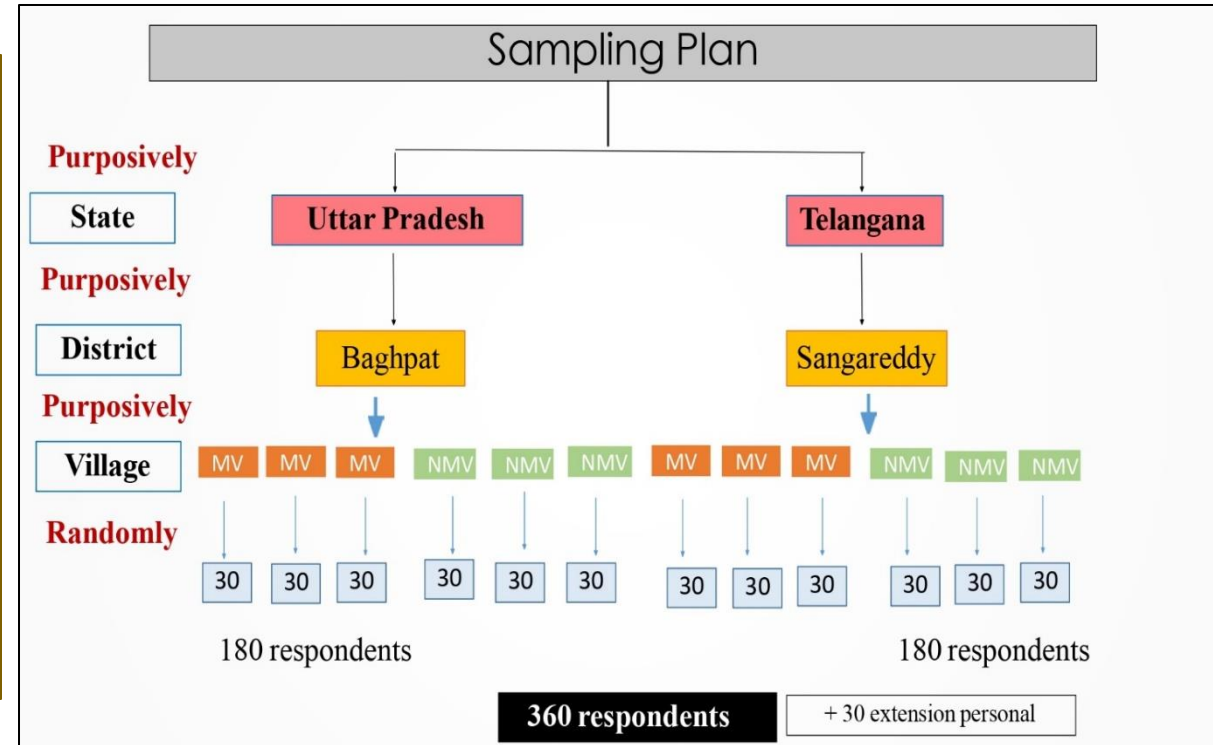
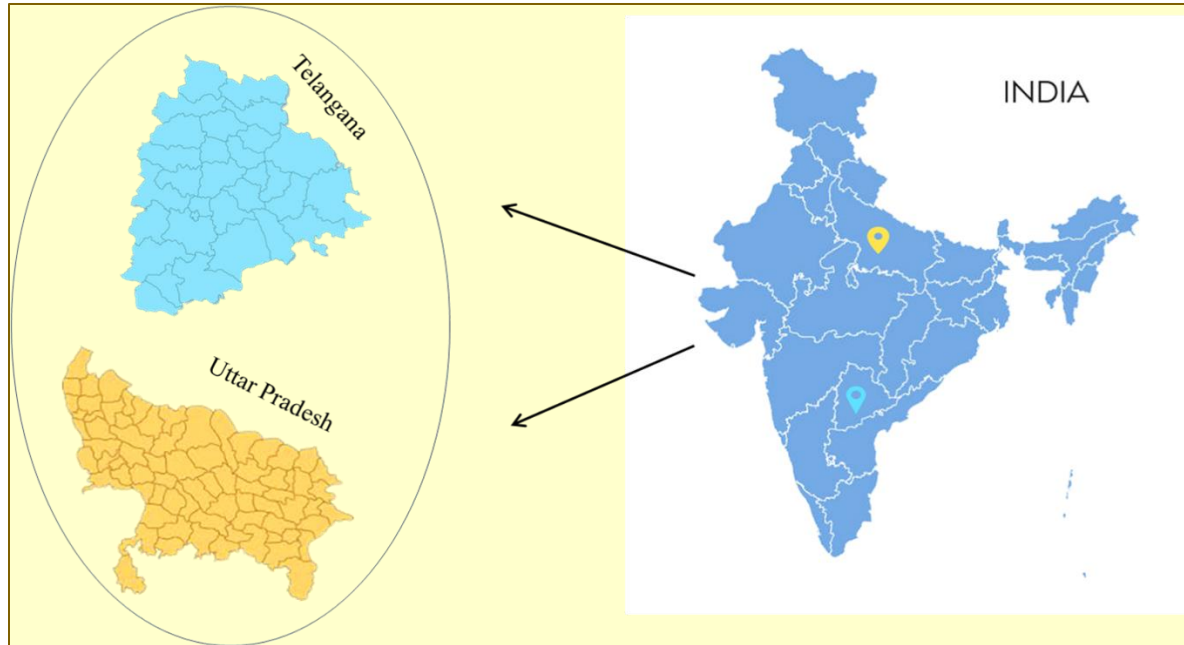
Pagadala Sai Priyanka,
Krishi Vigyan Kendra, Telangana

Rationale

- ✓ Gaps identified in measurement of the full pathway of change from agricultural inputs and practices to nutrition outcomes. To improve the evidence base, there is a **need to develop indicators of outcomes** that are not being fully measured (Herforth & Ballard, 2016).
- ✓ Empirical studies at village level to monitor and evaluate nutrition sensitive farming approaches and nutri-sensitive behavior of individuals were not carried out.
- ✓ A model A2N smart village is a rural area that uses **technology to maximize agricultural productivity, improve nutrition, and promote economic development**. It is a model village that has adopted sustainable farming practices and is actively promoting access to healthy foods and nutrition education, use of digital tools to improve agricultural production and access to markets.

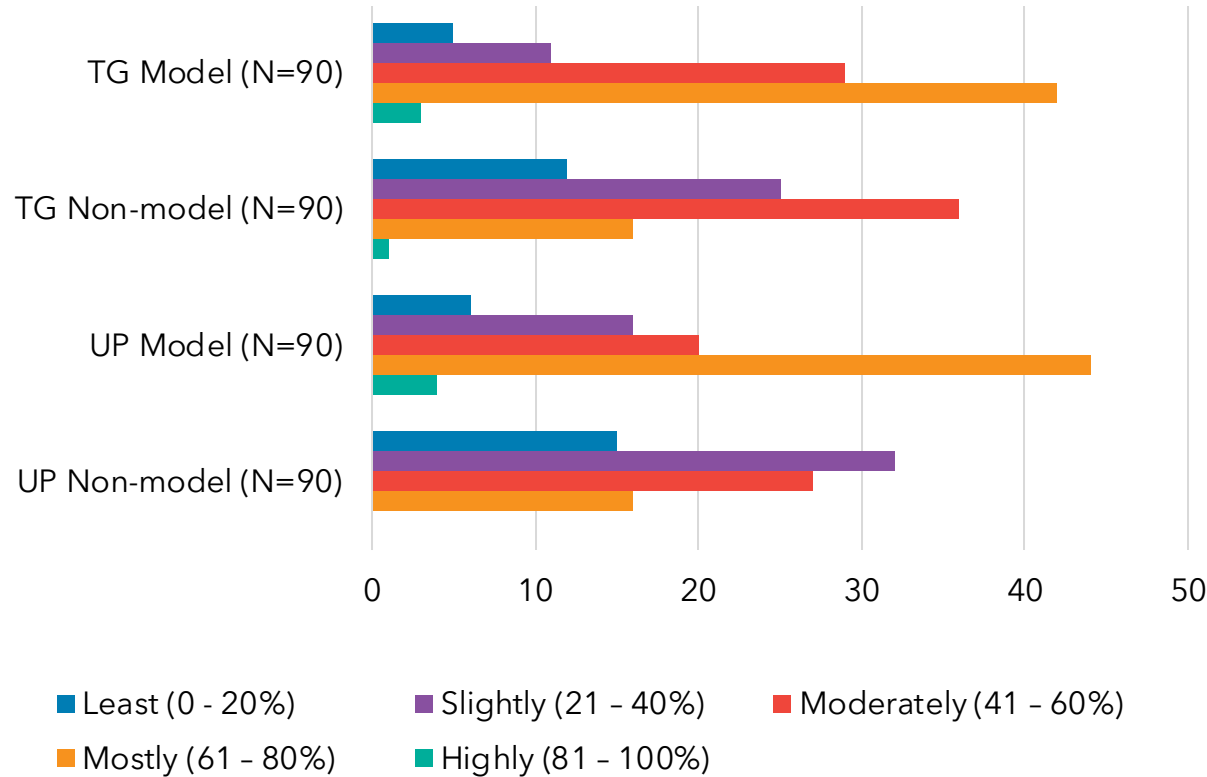


Research Methodology

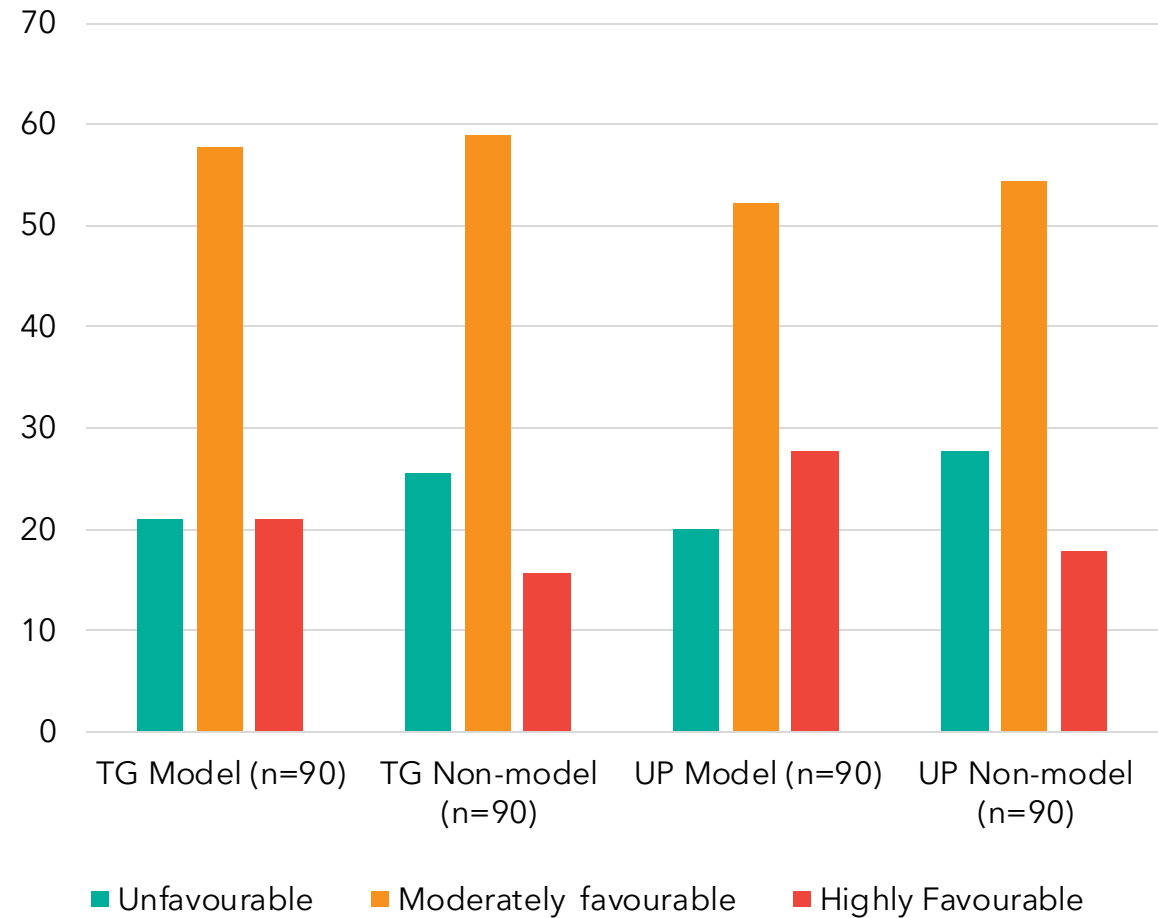


- Mixed method approach to identify the indicators adopting qualitative thematic analysis (6 thematic areas) of literature review (61) and quantitative Q-sorting (42) by experts with mean \geq median. PCA reduced to 40 indicators under 12 dimensions.
- Indicators were validated in 3 model and 3 non-model villages (purposive) from two agro-climatic regions of Uttar Pradesh (IARI) and Telangana (DDS) on a total sample of 360 farmers (random) using an index developed through Alkire-foster method of counting.

Agri-Nutrition Knowledge Level

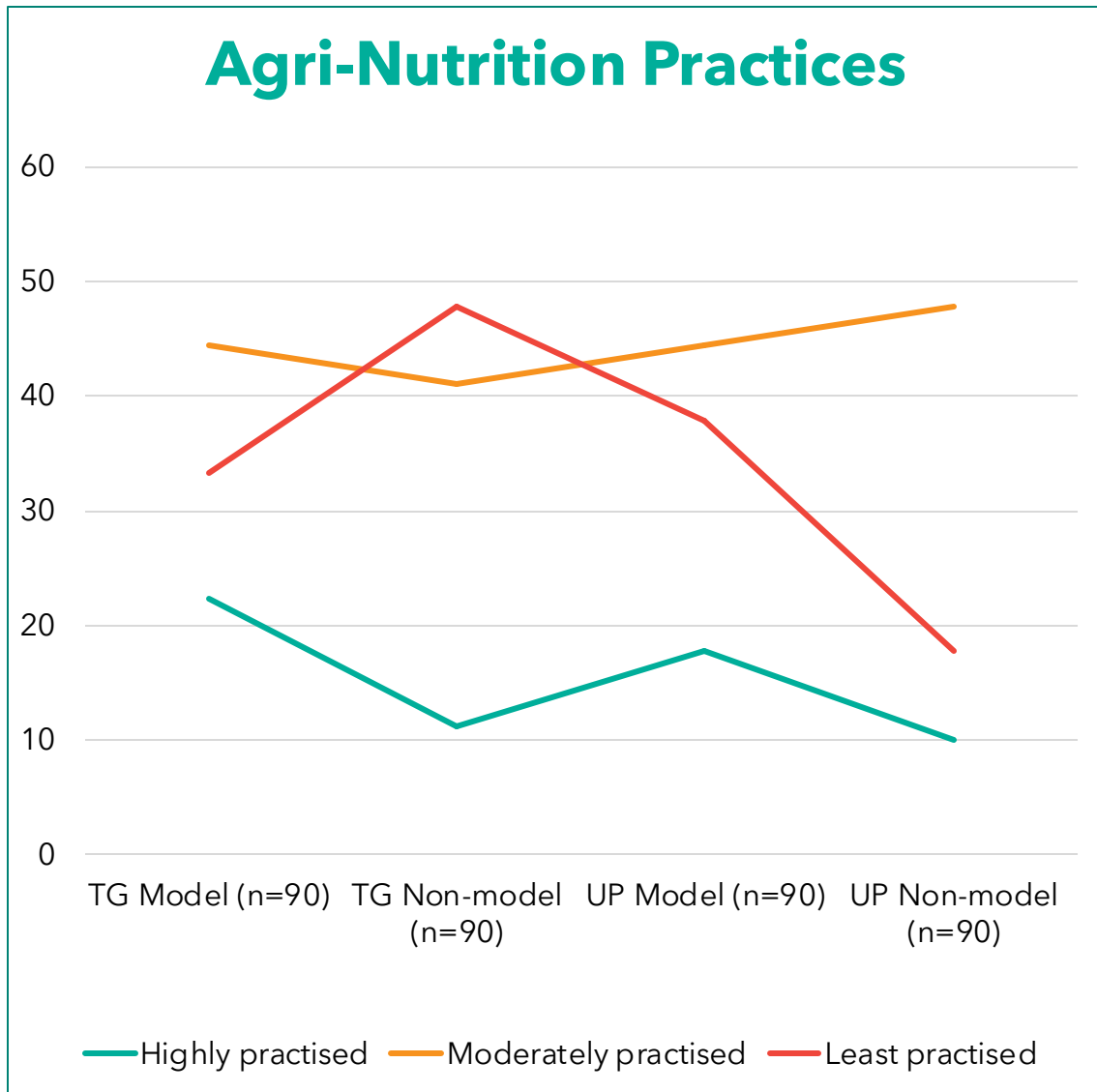


Agri-Nutrition Attitude Level

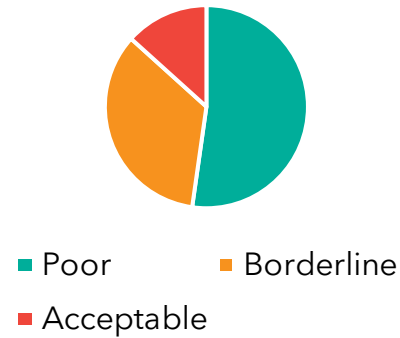


	(N = 90)	Mean	SD	t value
Telangana	Model villages	19.656	6.76	3.77**
	Non-model villages	16.089	5.88	(p < 0.01)
Uttar Pradesh	Model villages	19.72	7.31	5.14**
	Non-model villages	14.26	6.92	(p < 0.01)

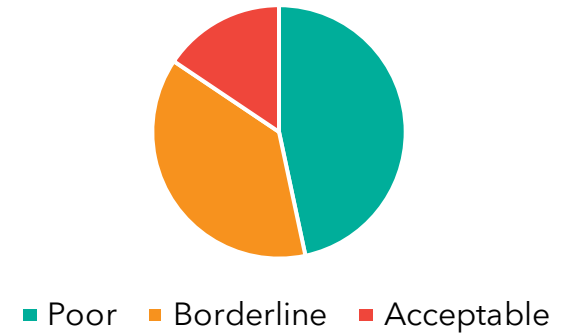
Household Dietary Diversity Scores



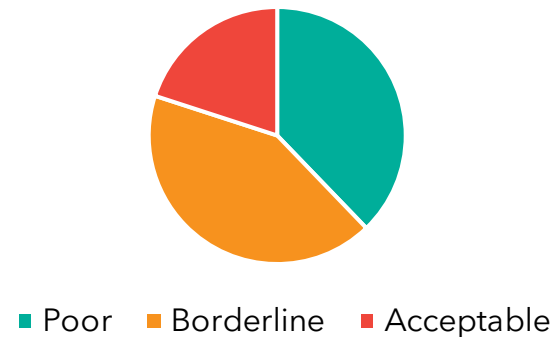
TG Model (n=90)



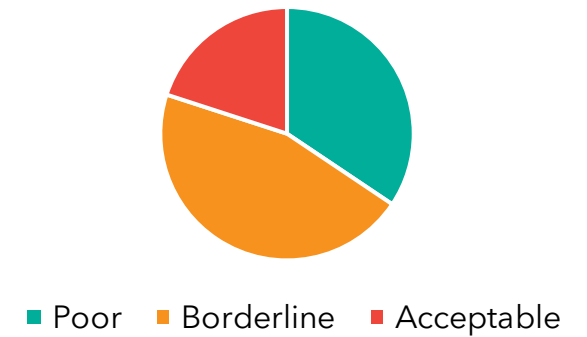
UP Model (n=90)



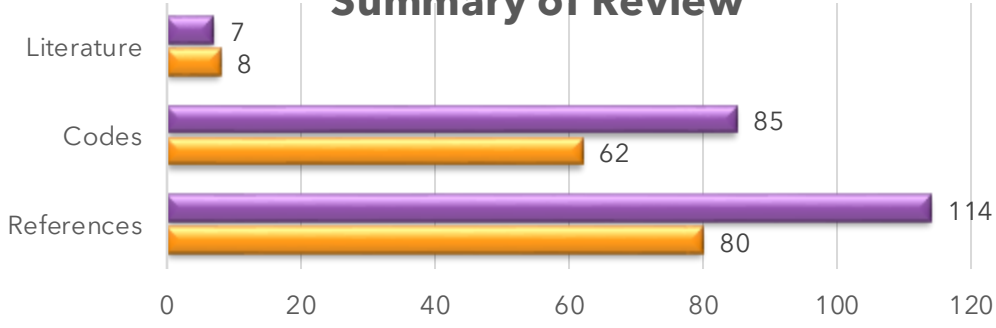
TG Non-model (n=90)



UP Non-model (n=90)

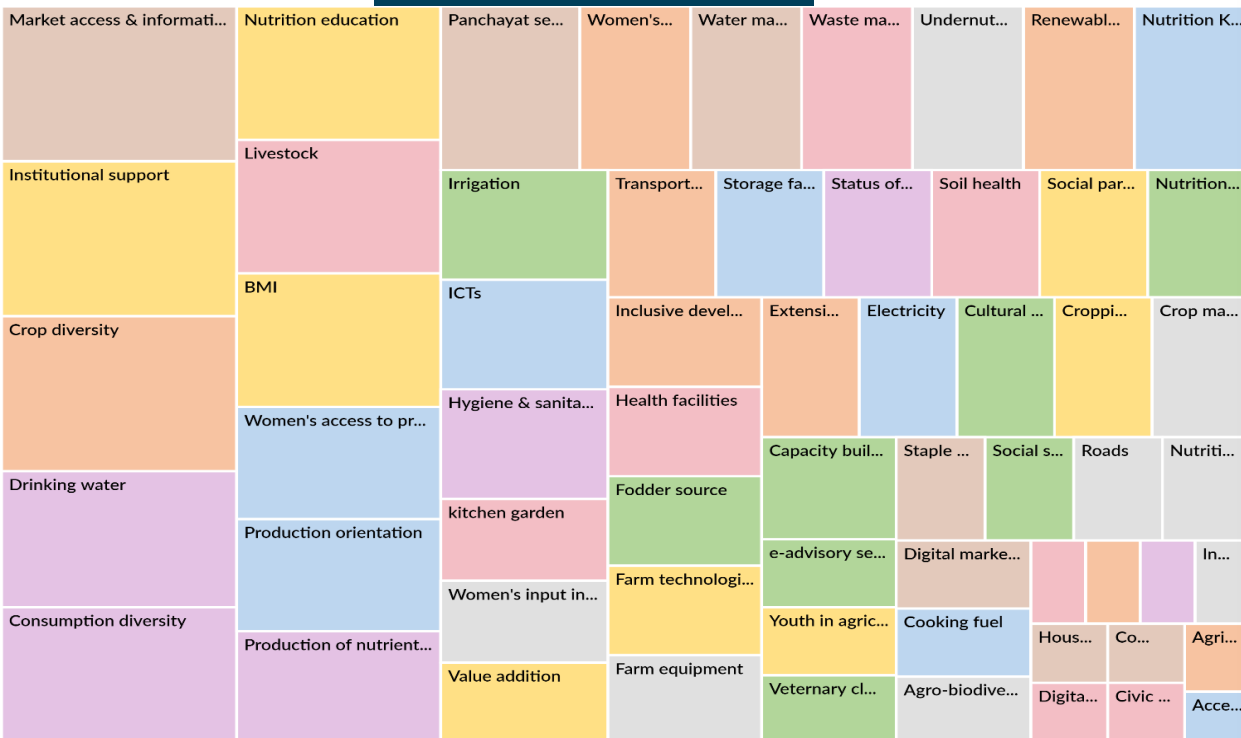


Summary of Review

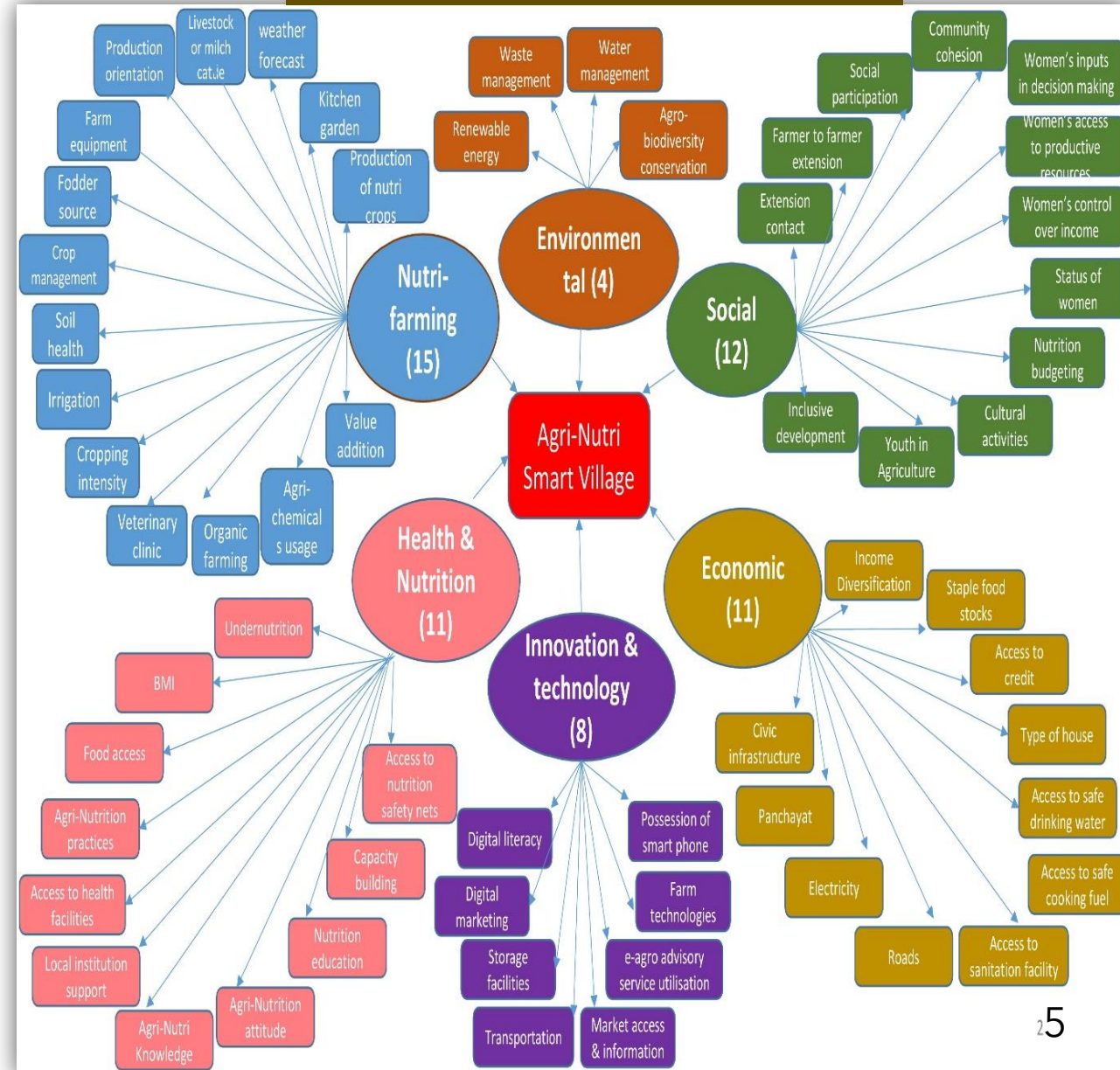


	References	Codes	Literature
Smart Village	114	85	7
Agri & Nutrition linkages	80	62	8

Tree map of codes



Thematic Map of Indicators



SNo	Indicators	Mean	Category
1	Production of nutrient-rich food crop varieties	8.73	Most important
2	Kitchen garden	8.47	
3	Agri-Nutrition Knowledge	8.07	
4	Livestock or milch cattle	8.00	Highly important
5	Drinking water	7.93	
6	Agro-biodiversity conservation	7.73	
7	Agri-Nutrition practices	7.73	
8	Soil health	7.20	Very important
9	Prevalence of undernutrition	7.20	
10	Crop diversity	7.20	
11	Farm equipment	7.07	
12	HDDS	7.07	Quite important
13	Fodder source	6.87	
14	Possession of a smart phone	6.87	
15	Production orientation	6.87	
16	Extension contact	6.27	
17	Access to health facilities	6.20	
18	Cooking fuel	6.20	
19	Nutrition education	6.13	
20	Market access & information	6.00	Least important
21	Crop management	5.93	
22	Farm technologies	5.93	
23	Local institutional support	5.87	
24	e-agro advisory utilization	5.80	

Q-sort distribution of indicators and their mean scores

- 15 experts sorted - Scientists; KVK SMS.
- Total - 9 categories; 61 indicators
- Mean range = 8.73 - 1.93
- 42 selected with mean \geq 4.5

S. No	Indicators	Mean	Category
25	Women's access	5.73	Slightly important
26	BMI	5.67	
27	Transportation	5.67	
28	Toilets	5.60	
29	Nutrition safety nets access	5.53	
30	A2N attitude	5.53	
31	Women's control	5.47	
32	Income Diversification	5.40	
33	F-F extension	5.33	
34	Irrigation	5.33	
35	Women's decision making	5.27	
36	Storage facilities	5.20	
37	Social participation	5.07	

S. No	Indicators	Mean	Category	
38	Waste management	5.00	Slightly important	
39	Access to credit	5.00		
40	Staple food stocks	5.00		
41	Water management	4.80		
42	Type of house	4.53		
43	Youth in agriculture	4.40		
44	Participation in capacity building activities	4.33		
45	Access to weather forecast	4.07		
46	Veterinary facilities	4.00		
48	Agri-chemicals usage	3.40		Little importance
49	Renewable energy	3.07		
50	Cropping intensity	3.00		
51	Digital marketing	2.93		
52	Status of women	2.87		
53	Cultural activities	2.67		
54	Roads	2.67		
55	Digital literacy	2.60	Very little importance	
56	Community cohesion	2.60		
57	Nutrition budgeting	2.53		
58	Electricity	2.47		
59	Inclusive development	2.27		Least important
60	Panchayat services	2.07		
61	Civic infrastructure	1.93		

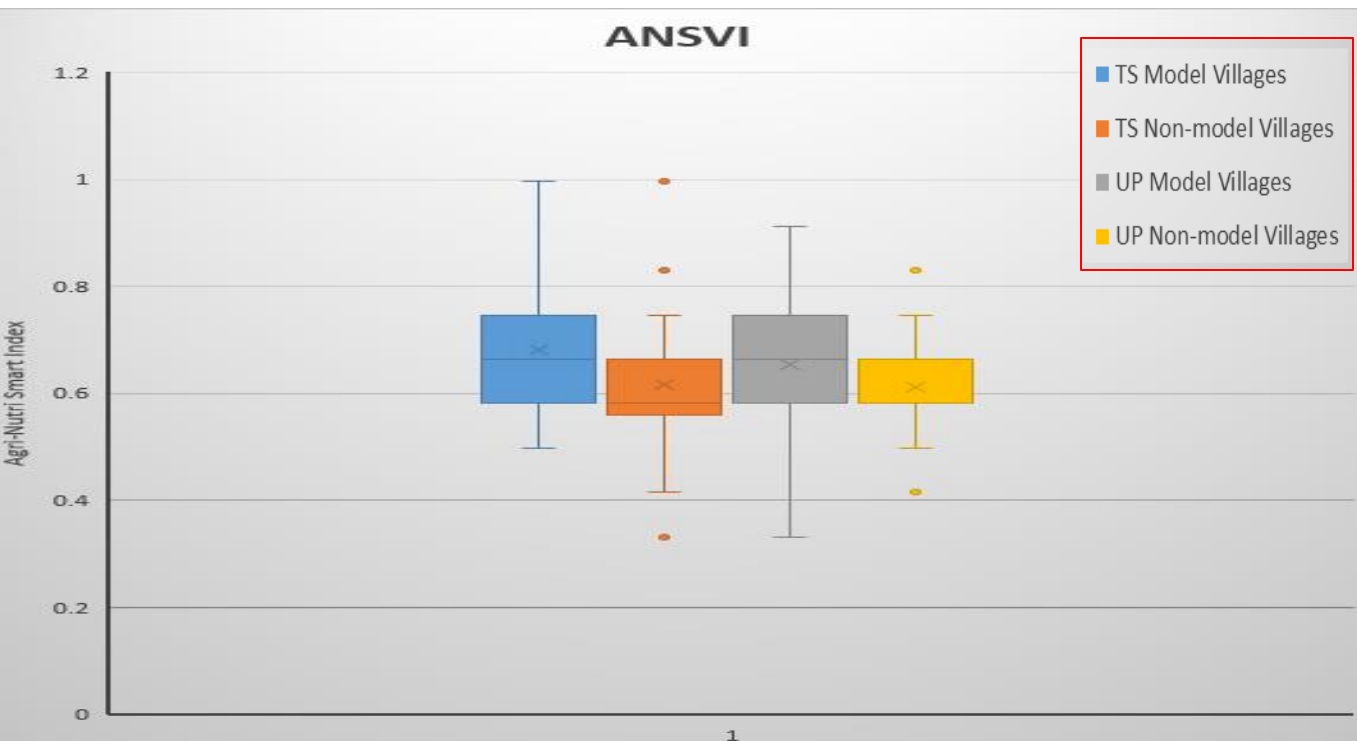
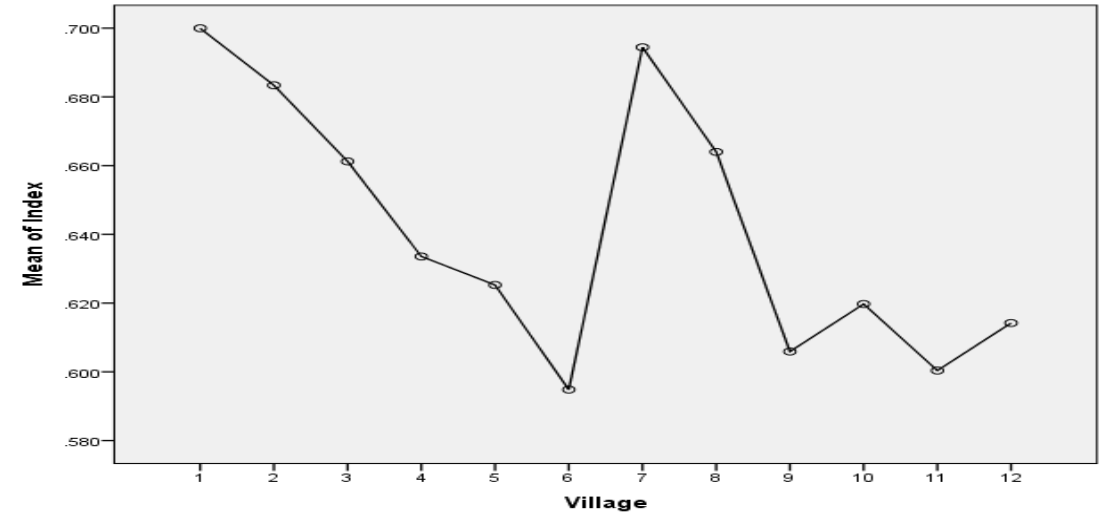
Component	Dimension	Description	Indicators	Factor Loadings
5	Production diversity	It quantifies the range and types of food produced, emphasizing the availability of diverse sources of nutrition from both plant and animal origin.	Production of nutrient rich food crop varieties	.742
			Crop diversity	.703
			Livestock or milch cattle	.693
			Kitchen garden	.739
6	Agri-inputs management	It gauges the effectiveness of resource allocation and practices to enhance agricultural productivity and sustainability.	Production orientation	.894
			Farm equipment	.907
			Fodder source	.644
11	Good farm practices	It evaluates the adoption of methods that promote sustainable and efficient farming, leading to improved crop yields and soil quality while optimizing water resources.	Crop management	.444
			Soil health	.772
			Irrigation	.544
7	Health and Nutrition practices	It measures the extent to which individuals have access to adequate food, engage in healthy dietary behaviors, and can obtain essential healthcare services, all contributing to improved health and nutrition outcomes.	Food access	.761
			Agri-Nutrition practices	.733
			Access to health facilities	.761
1	Nutrition and learning	It measures the capacity of a community to enhance nutrition outcomes through a combination of institutional, educational, and supportive factors, ultimately promoting learning and improved nutritional practices	Local institution support	.779
			Agri-Nutri Knowledge	.814
			Agri-Nutrition attitude	.832
			Nutrition education	.846
			Access to nutrition safety nets	.720
8	Financial resilience	It gauges the community's capacity to secure livelihoods, ensure food security, and manage financial risks in times of adversity.	Income diversification	.794
			Staple food stocks	.795
			Access to credit	.777

Component	Dimension	Description	Indicators	Factor Loadings
4	Basic Infrastructure	It assesses the adequacy of these infrastructure components, which are essential for ensuring the health, safety, and well-being of community members.	Type of house	.856
			Access to drinking water	.608
			Access to safe cooking	.758
			Access to sanitary facility	.697
12	Smart technologies	It measures the community's readiness and capacity to leverage digital tools for enhanced agricultural productivity and access to information.	Possession of smart phone	.518
			Farm technologies	.561
			E-agro advisory service utilisation	.694
10	Market and logistics	It evaluates the community's ability to efficiently connect agricultural products to markets and manage logistical aspects of agricultural supply chains, which is essential for economic viability and sustainability.	Market access & information	.649
			Transportation	.758
			Storage facilities	.771
2	Social networking	It evaluates how well knowledge and practices are disseminated and adopted within the community through social interactions and outreach, fostering agricultural development and innovation	Extension contact	.926
			Farmer to farmer extension	.893
			Social participation	.926
3	Gender empowerment	It measures the extent to which gender equity and women's empowerment are integrated into the allocation and management of agricultural resources.	Women's inputs in decision making	.895
			Women's access to productive resources	.929
			Women's control over income	.916
9	Sustainability	It assesses the community's commitment to minimizing environmental impact and preserving resources for future generations.	Waste management	.607
			Water management	.771
			Agro-biodiversity conservation	.854

Agri-Nutri Smart Village Index (ANSVI)	Telangana		Uttar Pradesh	
	MV	NMV	MV	NMV
12D A2NS Score (1 - H*A)	0.78	0.67	0.72	0.65
Non A2NS Score (1-12D A2NS Score) (H*A)	0.22	0.33	0.27	0.34
Proportion of farmers reaching A2NS (1 - H)	0.43	0.22	0.32	0.18
Proportion of farmers not reaching A2NS (H)	0.57	0.78	0.68	0.82
Average inadequacy score (A) (%)	40.1	42.7	41.3	42.6
Average adequacy score (1 - A) (%)	59.9	57.3	58.7	57.4

Note: MV = Model Village; NMV = Non-Model Village

Cutoff – 25% (4 indicators)



State	Village	Inadequacy		ANSVI	Rank
		F	%		
Telangana	Pastapur	13	43.3	0.815	I
	Bidakanne	17	56.6	0.773	II
	Arjun Nayak Thanda	21	70.0	0.728	IV
	Jharsangam	23	76.7	0.687	V
	Shamshallapur	23	76.7	0.678	VI
	Jamgarbodi Thanda	24	80.0	0.637	X
Uttar Pradesh	Lachoda	18	60.0	0.773	II
	Bassi	19	63.3	0.742	III
	Sunehra	25	83.3	0.642	IX
	Kata	23	76.7	0.673	VII
	Sankroth	27	90.0	0.620	XI
	Mawikala	25	83.3	0.653	VIII

Sl. No	Indicators (TELANGANA)	Uncensored headcount ratio (%)		Censored headcount ratio (%)		Proportional contribution to Non A2NS	
		MV	NMV	MV	NMV	MV	NMV
1	Production diversity	08.9	11.1	06.7	11.1	0.95	1.38
2	Agri inputs management	15.6	50.0	14.4	45.6	1.67	6.21
3	Good farm practices	48.9	36.7	18.9	31.1	5.25	4.55
4	Health and nutrition practices	11.1	16.7	10.0	15.6	1.19	2.07
5	Nutrition and learning	83.3	81.1	54.4	68.9	8.95	10.1
6	Financial resilience	08.9	10.0	07.8	10.0	0.95	1.24
7	Basic infrastructure	25.6	28.9	18.9	26.7	2.74	3.59
8	Smart technologies	81.1	78.9	51.1	65.6	8.71	9.80
9	Market and logistics	28.9	21.1	22.2	18.9	3.10	2.62
10	Social networking	08.9	21.1	08.9	21.1	0.95	2.62
11	Gender empowerment	53.3	84.4	40.0	64.4	5.73	10.49
12	Sustainability	04.4	15.6	04.4	15.6	0.47	1.93

Sl. No	Indicators (UTTAR PRADESH)	Uncensored headcount ratio		Censored headcount ratio		Proportional contribution to Non A2NS	
		MV	NMV	MV	NMV	MV	NMV
1	Production diversity	13.3	10.0	11.1	08.8	1.53	1.27
2	Agri inputs management	33.3	42.2	17.8	36.7	3.82	5.36
3	Good farm practices	45.6	42.2	36.7	35.6	5.23	5.36
4	Health and nutrition practices	12.2	13.3	12.2	13.3	1.40	1.69
5	Nutrition and learning	81.1	82.2	58.9	74.4	9.31	10.4
6	Financial resilience	10.0	10.0	08.9	10.0	1.14	1.27
7	Basic infrastructure	27.8	35.6	26.7	34.4	3.19	4.52
8	Smart technologies	74.4	73.3	57.8	66.7	8.54	9.32
9	Market and logistics	26.7	21.1	22.2	21.1	3.06	2.68
10	Social networking	11.1	20.0	10.0	18.9	1.27	2.54
11	Gender empowerment	45.6	82.2	35.6	68.9	7.23	10.4
12	Sustainability	30.0	31.1	22.2	27.8	3.44	3.95

ANOVA

Distribution of respondents based on their ANSVI levels

Study area		High	Medium	Low
Telangana	Model villages (n=90)	25 (27.8)	54(60)	11(12.2)
	Non-model villages (n=90)	6 (06.7)	60(66.6)	24(26.6)
	Total (n=180)	31 (17.2)	114(63.3)	35(19.4)
Uttar Pradesh	Model villages (n=90)	23 (25.6)	56(62.2)	11(12.2)
	Non-model villages (n=90)	7 (07.8)	62(68.8)	21(23.3)
	Total (n=180)	30 (16.7)	118(65.5)	32(17.7)
Overall (n= 360)		61 (16.94)	232(64.4)	67(18.6)

ANOVA		Sum of Squares	df	Mean Square	F	Sig.
Telangana Villages	Between Groups	.182	1	.182	13.79	.000
	Within Groups	2.351	178	.013	8	
	Total	2.533	179			
Uttar Pradesh Villages	Between Groups	.085	1	.085	7.097	.008
	Within Groups	2.120	178	.012		
	Total	2.205	179			
Model Villages	Between Groups	.032	1	.032	2.433	.121
	Within Groups	2.355	178	.013		
	Total	2.387	179			
Non-Model Villages	Between Groups	.002	1	.002	.158	.692
	Within Groups	2.116	178	.012		
	Total	2.118	179			

Sensitivity Analysis of Indicators

		A-F	PCA
A-F	Pearson Correlation	1	.103*
	Sig. (2-tailed)		.050
	N	360	360
PCA	Pearson Correlation	.103*	1
	Sig. (2-tailed)	.050	
	N	360	360

Correlation signifies that indicators do not effect much to different weightage procedures.

*. Correlation is significant at the 0.05 level (2-tailed)

Implications of study

- Need for **tailored training programs and knowledge transfer** from model villages to non-model villages.
- The study identifies various indicators of model Agri-Nutri Smart Villages. These indicators can serve as benchmarks for evaluating and ranking villages in terms of their development in nutrition through agriculture. This is important **for tracking progress and targeting interventions** where they are needed the most.
- The study highlights the importance of **providing resources and incentives for adopting nutri farming practices.**

