Indian Journal of Agricultural Economics
Volume 76, Number 3, July-September 2021

SUBJECT III
AGRICULTURE AND ALLIED SECTORS IN NUTRITIONAL SECURITY

Household Food Insecurity and the Nutritional Status of Children Aged 6–59 Months: Insights from Rural Indigenous *Garo* Tribes of Meghalaya, India

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ABSTRACT

Child under-nutrition continues to be a significant public health problem among the rural indigenous hill tribes of Meghalaya, India requiring urgent attention and immediate action. The study assesses the magnitude of household food insecurity and its consequences on the nutritional status of children of 6–59 months among indigenous *Garo* tribe of Meghalaya, India dwelling under mountain specificities. An analytical cross-sectional study was conducted during December 2019 and September 2020 on 181 indigenous hill households, who reported having children in the age group of 6-59 months. Food access was measured as food consumption score (FCS). Majority of the sample indigenous hill households (76.24 per cent) are observed to be in borderline food security category (with average FCS of 31.60). Significant and positive correlation was observed between the household FCS and BMI of Children of 6–59 months. The households with higher FCS are having healthy children and children in food insecure households normally face malnutrition issues. Thus for improvement in the status of children, the focus should be on improvement of households FCS. For this effective policies and programmatic activities with focus on improvement of dietary diversity need to be initiated. Revitalising and strengthening the local food systems will increase local food production, improve the dietary diversity, and decrease the reliance on food supplies from outside the region.

Keywords: Hill tribes, Food insecurity, Malnutrition, children

JEL: J13, P36, Q18

I

INTRODUCTION

Globally around 50 million people currently live in remote rural mountain areas where their ability to access essential health, education, water, and supply services are limited; their trading capacity is constrained, and around 17 million of these people are vulnerable to food insecurity (FAO and UNCCD, 2019). Hunger and malnutrition are also widespread in the Hindu Kush Himalayan countries (Rasul *et al*., 2019); as of the 795 million people undernourished globally, 52 per cent (415 million) are from Himalayan parts of Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal

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This paper is part of research conducted under ICSSR-IMPRESS project entitled "Mapping the Vulnerability of Indigenous Hill People of Meghalaya to Food Insecurity" funded by Indian Council of Social Science Research (ICSSR), New Delhi (Grant Number: IMPRESS/P1021/10/18-19/ICSSR). All the help received from them is highly acknowledged.

The author would like to acknowledge the participants and the Nokmas (village heads) of the indigenous tribal villages of Garo hills, Meghalaya, India.

and Pakistan (FAO, IFAD and WFP, 2015). Overall, more than 30 per cent of people face food insecurity in Hindu Kush Himalayan countries (Mohanty *et al.*, 2018). The average calorie intake in the mountain States of India also tends to be lower than the national average, particularly in Manipur, Meghalaya, and Nagaland (Rasul *et al*., 2019). In north- east India, though the maximum share of household income is contributed by cultivation activities, the farm households of NER was found to be more food insecure in the country with 64.28 per cent during visit- I and 67.02 per cent during visit- II as per 68th NSS reports (Singh and Datta, 2016).

The mountain, hills, and forested tracts of India are by and large the dwelling places of tribal groups (Behera and Nayak, 2013), and the tribal inhabiting these poorly resource-endowed areas are under-nourished or food insecure (Swaminathan, 2006). The tribal communities of northeast India also live with relative isolation in the distant hills and spatially remote areas (Datta, 2011). They are chronically food deficient and produce roughly half of their food requirement (Hussain, 2004, Mohapatra, 2006). Meghalaya, one of the north-eastern States is known for its hills and indigenous tribal communities. Child under-nutrition continues to be a significant public health problem among the rural indigenous hill communities of Meghalaya (IIPS and ICF, 2017), requiring urgent attention and immediate action. High rates of childhood under-nutrition with 29.9 per cent underweight, 45 per cent stunting, 15.6 per cent wasting, and 48.8 per cent of children under 5 with anaemia are reported in Meghalaya (IIPS and ICF, 2017). Meghalaya is the only hill State where the prevalence of stunting, wasting, and underweight in children is significantly higher than the national average.

One of the possible determinants of child malnutrition in developing countries is food insecurity (Saaka and Osman, 2013). Though in Meghalaya, there are literatures reporting cases of household food insecurity (Roy *et al*., 2015), its contribution to child malnutrition remains unclear, necessitating research on primary data to draw any conclusions about whether household food insecurity is independently associated with child malnutrition among the indigenous hill tribes. Under this backdrop, the study attempted to investigate the access component of food insecurity among the indigenous rural hill households of Garo tribal communities of Meghalaya. The household Food Consumption Score (FCS), one of the access indicators of food insecurity, was compared with nutritional indicators of children aged 6- 59 months to conclude whether any significant relationship exists between the two. The findings shall help the policy makers to formulate effective policies and programmatic activities to answer the malnutrition issues faced by children of rural indigenous hill communities.

II

MATERIAL AND METHODS

Study Area and Sampling

This analytical cross-sectional study was conducted in the Garo Hills of Meghalaya, purposively selected for the following three reasons- geographic and

demographic context, and existing food shortage scenario. The sampling procedure was based on *Comprehensive Food Security and Vulnerability Analysis (CFSVA) Guidelines* designed by World Food Programme of United Nations (WFP, 2009). A list of Community & Rural Development (C & RD) blocks having more than 95 per cent of ST households was prepared and then five C & RD blocks were selected by following the method of simple random sampling. Since the focus of the study was on indigenous hill tribal households, on the basis of Census, 2011 data (District Census Handbook, Village and Town Wise, Primary Census Abstract, Census, 2011 Series-19, Part- XII-B) the villages with only tribal population were short-listed for the purpose of inclusion in the sample.

Cluster/village population figures are used to select the clusters with a probability proportional to size (PPS), meaning that larger clusters have a higher probability of selection. In the next stage from each cluster/village 30 households are selected (based on CFSVA Guidelines). The sampling frame of all the households in the selected clusters, i.e., villages were constructed with the help of electoral roll and in consultation with the village headman. Once the sampling frame was constructed, following the procedure of random sampling the households were selected for inclusion in the study. Thus a total of 300 sample households were selected for the study. The present study was initiated on 1st of April, 2019. Pilot survey was carried out in the month of August, 2019 to November, 2019 and actual data collection was started from 1st Week of December, 2019 and completed in the last week of September, 2020.

Data Collection – Tools/Techniques and Measurements

Based on concepts given in Comprehensive Food Security & Vulnerability Analysis Guidelines (WFP, 2009), the data collection/measurement was carried out. Food consumption score (FCS), a proxy indicator of household access to food, has been a reliable indicator of food insecurity in all CFSVAs (WFP, 2007), thus, selected to estimate the household food security. The household was asked about the number of times (in days) a given food item was consumed over a recall period of the past seven days. Items had been grouped into eight standard food groups (each group has a maximum value of seven days/week). The consumption frequency of each food group is multiplied by an assigned weight based on the nutrient content of a portion. Those values are then summed to obtain the FCS.

Composite FCS= Cereals, tubers, and root crops × 2 × days eaten in past 7 days + Pulses × 3 × days eaten in past 7 days + Vegetables × 1× days eaten in past 7 days + Fruit × 1 × days eaten in past 7 days + Meat and fish × 4 × days eaten in past 7 days + Milk × 4 × days eaten in past 7 days + Sugar × 0.5 × days eaten in past 7 days + Oil × 0.5 × days eaten in past 7 days

The household score is compared with pre-established thresholds that indicate the status of the household's food consumption. WFP finds the following thresholds to be applicable in a wide range of situations:

- Poor food consumption, i.e., poor food security: 0 to 21
- Borderline food consumption i.e. borderline food security: 21.5 to 35
- Acceptable food consumption i.e. acceptable food security: > 35

The FCS has a theoretical range from 0 to 112 (WFP, 2007). In brief, the FCS is a composite score that includes information on three aspects: household dietary diversity using information on food group consumption in the past 7 days, frequency of food group consumption (number of days in the past week), and nutritional value using weights. It is thus meant to reflect the quality and quantity of food access at the household level. There are positive and statistically significant associations with calorie consumption per capita and FCS (WFP, 2009).

The "anthropometric indicators of malnutrition" measurements serve as reasonably accurate indicators of chronic malnutrition reflecting past growth failure, and indicators of acute malnutrition reflecting current macronutrient nutritional well-being (WFP, 2009). A number of well-established anthropometric indicators exist for measuring physical status, growth, etc. These measures typically require collecting data on weight, height, or length; gender; and age of a sub-set selected from the population of interest. For children, the four main indicators of malnutrition are frequently used in CFSVAs (WFP, 2009) - Stunting (low height for age, "shortness for their age"), Wasting (low weight for height, "thinness"), Underweight (low weight for age) and Mid-upper arm circumference (MUAC). They are all measures of growth (i.e., stunting measures linear growth; wasting and MUAC measure thinness due to lack of growth or actual tissue loss, and underweight is a composite of both).

The children aged 0-59 months were then subjected to measurements of height and weight by standardized stadiometer (IndoSurgicals® Height Measuring Scale) and bathroom type weighing machine (Crown Classic® Analog Mechanical Weighing Scale), respectively, following standard protocol. Body mass index (BMI) was calculated as:

$$\text{BMI} = \frac{Weight\ (in\ Kg)}{Height\ in\ Square\ Meter}$$

The WHO adolescent BMI percentile chart was used to classify the nutritional status of the children. MUAC tape was used to measure child mid-upper arm circumference.

Statistical Analysis

For data analysis apart from descriptive analytical tools; Chi-Square and Pearson Correlation are used.

III

RESULTS

Demographics of Sample Indigenous Hill Households

The present study was conducted in Garo Hills of Meghalaya primarily inhabited by *Garo tribe*, commonly known as matrilineal society. The mean household size was observed to be of 4.65 members. The mean age of the household head was observed to be 32.79 years. The household heads were having on an average five years of formal education. In the sample households, half of the members belong to the dependent age category, which is on the higher side (Table 1). In contrary to the general belief, the sample indigenous Garo population was observed to be dominated by male headed households (98.33 per cent). From the 300 sample indigenous hill households of *Garo* tribe, 181 indigenous hill households reported having children aged 6-59 months, thus further study was conducted on these 181 households.

TABLE 1. DEMOGRAPHICS OF SAMPLE INDIGENOUS HILL HOUSEHOLDS

Sl. No. (1)	Demographic particulars (2)	Mean (3)	Standard deviation (4)	Coefficient of variation (per cent) (5)
1.	Family size	4.65	0.912	19.62
2.	Age of the household head	32.79	4.695	14.32
3.	Education of the household head	5.26	3.715	70.65
4.	Per cent of dependents in household	44.60	20.009	44.86

Food Consumption Score (FCS)

Table 2 presents food consumption score of 181 sample indigenous *Garo tribes* living in rural hilly areas of Meghalaya. Majority of the sample indigenous hill households (76.24 per cent) are observed to be in borderline food security category (with average FCS of 31.60) followed by 13.26 per cent of the sample indigenous hill households in poor food security category (with average FCS 19.21). Only 10.50 per

TABLE 2. FOOD CONSUMPTION SCORE OF INDIGENOUS HILL HOUSEHOLDS OF MEGHALAYA

Food Consumption Groups (1)	Households (in Numbers) (2)	FCS (Mean) (3)
Poor food consumption (FCS between 0 to 21)	24 (13.26)	19.21 (0.751)
Borderline food consumption (FCS between 21.5 to 35)	138 (76.24)	31.60 (3.518)
Acceptable food consumption (FCS > 35)	19 (10.50)	38.55 (1.554)
Total Households	181 (100.00)	30.69 (5.871)

Note: Figures in parentheses against different food consumption groups in household column indicate per cent to the total households and that in FCS column indicate standard deviation.

cent of sample *Garo tribe* (with average FCS 38.55), are in the acceptable food security category. Most of households who are in currently in acceptable food security level have FCS just marginally above the borderline level.

Malnutrition among Children of 6–59 Months

Table 3 presents the prevalence of malnutrition among children of 6–59 months among the *Garo* tribe of Meghalaya. As mentioned earlier, the initial 300 indigenous

TABLE 3. PREVALENCE OF MALNUTRITION AMONG CHILDREN OF 6–59 MONTHS IN GARO HILLS OF MEGHALAYA

		Anthropometric Indicators of Malnutrition				
Age (months)	Number of children	Height-for-Age (Stunted) below -2 standard deviations, based on the WHO standard (Z Score)	Weight-for-height (wasted) below -2 standard deviations, based on the WHO standard (Z Score)	Weight-for-Height (severely wasted): below -3 standard deviations, based on the WHO standard (Z Score)	Weight-for-age (underweight) below -2 standard deviations, based on the WHO standard (Z Score)	Mid-upper arm circumference (MUAC): below -2 standard deviations, based on the WHO standard (Z Score)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female Children						
6-11	0	00	00	00	00	00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
12-23	26	06	02	00	02	02
	(27.37)	(23.08)	(7.69)	(0.00)	(7.69)	(7.69)
24-35	25	08	04	01	07	07
	(26.32)	(32.00)	(16.00)	(4.00)	(28.00)	(28.00)
36-47	27	08	06	01	07	07
	(28.42)	(29.63)	(22.22)	(3.70)	(25.93)	(25.93)
48-59	17	05	04	01	05	05
	(17.89)	(29.41)	(23.53)	(5.88)	(29.41)	(29.41)
Total	95	27	16	03	21	21
	(52.49)	(28.42)	(16.84)	(3.16)	(22.11)	(22.11)
Male Children						
6-11	2	01	00	00	00	00
	(2.33)	(50.00)	(0.00)	(0.00)	(0.00)	(0.00)
12-23	19	05	02	01	03	03
	(22.09)	(26.32)	(10.53)	(5.26)	(15.79)	(15.79)
24-35	23	05	03	01	04	04
	(26.74)	(21.74)	(13.04)	(4.35)	(17.39)	(17.39)
36-47	23	08	05	00	05	05
	(26.74)	(34.78)	(21.74)	(0.00)	(21.74)	(21.74)
48-59	19	07	05	01	06	06
	(22.09)	(36.84)	(26.32)	(5.26)	(31.58)	(31.58)
Total	86	26	15	03	18	18
	(47.51)	(30.23)	(17.44)	(3.49)	(20.93)	(20.93)
TOTAL CHILDREN	181 (100.00)	53 (29.28)	31 (17.13)	6 (3.31)	39 (21.55)	39 (21.55)
Chi-Square Test		H_0: The anthropometric indicators of malnutrition and gender of children are independent.				
Chi-square Value		0.041	P value	0.999		
		As p>0.05, the null hypothesis cannot be rejected				

sample households reported 181 children in the age group of 6-59 months, which comprises 95 female children (52.49 per cent) and 86 male children (47.51 per cent). Among the female children of 6-59 months, 28.42 per cent of the children were observed to be 'stunted', 16.84 per cent were observed to be 'wasted', 3.16 per cent were observed to 'severely wasted' and 22.11 per cent were observed to be 'underweight'. On the mid-upper arm circumference parameter, 22.11 per cent of children were found to be below -2 standard deviations (Z score). Among the male children, 30.23 per cent of the children were observed to be 'stunted', 17.44 per cent 'wasted', 3.49 per cent 'severely wasted' and 20.93 per cent were 'underweight'. On the mid-upper arm circumference parameter, 20.93 per cent of children were found to be below -2 standard deviations (Z score). Overall, 29.28 per cent of the children were observed to be 'stunted', 17.13 per cent 'wasted', 3.31 per cent 'severely wasted' and 21.55 per cent were observed to be 'underweight'. On the MUAC parameter, 21.55 per cent of children were found to be below -2 standard deviations (Z score). The Chi square test shows that anthropometric indicators of malnutrition and gender of children are independent.

Table 4 presents the BMI percentile of children of 6–59 months among *Garo* tribe of Meghalaya. Around 22.11 per cent of female children were found to be underweight, 72.63 per cent were observed to be normal or healthy weight and 5.26 per cent were observed to be overweight. Regarding male children, 20.93 per cent were found to be underweight, 72.09 per cent were observed to be normal or healthy weight and 4.48 per cent were observed to be overweight. Overall, 32.65 per cent were found to be underweight, 63.26 per cent were observed to be normal or healthy weight and 6.98 per cent were observed to be overweight.

TABLE 4. BMI OF CHILDREN OF 6–59 MONTHS IN GARO HILLS OF MEGHALAYA

Age (months)	Number of children	BMI Percentile Range										
		1st	3rd	5th	15th	25th	50th	75th	85th	95th	97th	99th
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Female Children												
6-11	0	00	00	00	00	00	00	00	00	00	00	00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
12-23	26	02	00	03	03	12	02	00	03	01	00	00
	(27.37)	(7.69)	(0.00)	(11.54)	(11.54)	(46.15)	(7.69)	(0.00)	(11.54)	(3.85)	(0.00)	(0.00)
24-35	25	05	02	00	03	14	00	00	01	00	00	00
	(26.32)	(20.00)	(8.00)	(0.00)	(12.00)	(56.00)	(0.00)	(0.00)	(4.00)	(0.00)	(0.00)	(0.00)
36-47	27	07	00	02	08	09	01	00	00	00	00	00
	(28.42)	(25.93)	(0.00)	(7.41)	(29.63)	(33.33)	(3.70)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
48-59	17	05	0	00	04	08	00	00	00	00	00	00
	(17.89)	(29.41)	(0.00)	(0.00)	(23.53)	(47.06)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Total	95	19	02	05	18	43	03	00	04	01	00	00
	(52.49)	(20.00	(2.11)	(5.26)	(18.95)	(45.26)	(3.16)	(0.00)	(4.21)	(1.05)	(0.00)	(0.00)
Male Children												
6-11	2	00	00	00	00	01	00	00	01	00	00	00
	(2.33)	(0.00)	(0.00)	(0.00)	(0.00)	(50.00)	(0.00)	(0.00)	(50.00)	(0.00)	(0.00)	(0.00)

Contd.

TABLE 4. CONCLD.

Age (months)	Number of children	BMI Percentile Range										
		1st	3rd	5th	15th	25th	50th	75th	85th	95th	97th	99th
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
12-23	19	03	00	00	01	05	08	00	02	00	00	00
	(22.09)	(15.79)	(0.00)	(0.00)	(5.26)	(26.32)	(42.11)	(0.00)	(10.53)	(0.00)	(0.00)	(0.00)
24-35	23	04	00	00	00	13	06	00	00	00	00	00
	(26.74)	(17.39)	(0.00)	(0.00)	(0.00)	(56.52)	(26.09)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
36-47	23	05	00	00	01	11	02	01	03	00	00	00
	(26.74)	(21.74)	(0.00)	(0.00)	(4.35)	(47.83)	(8.70)	(4.35)	(13.04)	(0.00)	(0.00)	(0.00)
48-59	19	06	00	00	01	11	01	00	00	00	00	00
	(22.09)	(31.58)	(0.00)	(0.00)	(5.26)	(57.89)	(5.26)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Total	86	18	00	00	3	41	17	01	06	00	00	00
	(47.51)	(20.93)	(0.00)	(0.00)	(3.49)	(47.67)	(19.77)	(1.16)	(6.98)	(0.00)	(0.00)	(0.00)
TOTAL	181	37	02	05	21	84	20	01	10	01	00	00
	(100.00)	(20.44)	(1.10)	(2.76)	(11.60)	(46.41)	(11.05)	(0.55)	(5.52)	(0.55)	(0.00)	(0.00)

Note: Less than the 5th percentile: Underweight; 5th percentile to less than the 85th percentile: Normal or Healthy Weight; 85th to less than the 95th percentile: Overweight; 95th percentile or greater:: Obese

The average FCS in households having girl child was observed to be 30.25 and average FCS in households having boy child was observed to be 31.18. The average BMI of girl child was observed to be 14.45. The average BMI of boy child was observed to be 15.12. Significant and positive correlation was observed between the household FCS and BMI of Children of 6–59 months, leading to conclude that households with higher FCS are having healthy child and children in food insecure households normally face malnutrition issues (Table 5). Thus for improvement in BMI the focus should be on improvement of households FCS. For this effective policies and programmatic activities with focus on improvement of dietary diversity need to be initiated.

TABLE 5. CORRELATION BETWEEN HOUSEHOLD FCS AND BMI OF CHILDREN OF 6–59 MONTHS IN GARO HILLS OF MEGHALAYA

Category	FCS	BMI	Pearson Correlation
(1)	(2)	(3)	(4)
Girl	30.25 (5.633)	14.45 (1.230)	0.697**
Boy	31.18 (6.120)	15.12 (1.315)	0.679**
Total	30.69 (5.871)	14.77 (1.312)	0.683**

Note: ** Correlation Significant at the 0.01 level (2- tailed)

IV

DISCUSSION

Child under- nutrition continues to be a significant public health problem among the rural indigenous hill communities of Meghalaya (IIPS & ICF, 2017), requiring urgent attention and immediate action. The majority of the sample indigenous hill households are observed to be in borderline food security category. A significant and positive correlation was observed between the household FCS and BMI of Children of

6–59 months, leading to conclude that households with higher FCS have healthy child and children in food-insecure households usually face malnutrition issues. As FCS and calorie consumption per capita are positively and significantly correlated, the poor FCS may correspond with extreme undernourishment, and even some households belonging to the "acceptable food consumption group" may have consumption below 2,100 kcal per capita per day (WFP, 2007). In brief most of indigenous hill households in Garo Hills may be highly vulnerable to food insecurity.

Nutritionists have also long recognised dietary diversity as a critical element of high-quality diets. Dietary diversity is the sum of the number of different foods or food groups consumed by an individual or household over a specific time period. Increasing the variety of foods is thought to ensure adequate intake of essential nutrients and thus promote good health. However, the cereals, tubers, and root crops (maize, rice, sorghum, millet, bread, and other cereals; cassava, potatoes, and sweet potatoes), i.e., the starchy staples, were observed to be the main component of the diet of indigenous hill households in Garo Hills of Meghalaya. Lack of dietary diversity was observed from little intake of pulses, vegetables, fruits, milk, sugar, and oil by the indigenous hill tribes of Garo Hills, Meghalaya. Because their diets are based predominantly on starchy staples and often include little or no animal products and few fresh fruits or vegetables, nutrient inadequacy is an expected outcome. The lack of food alongside quality food not only contributes to malnutrition but also on a wider scale enhanced hunger, poverty and unemployment (Nongbri *et al.*, 2021) leading to a vicious cycle.

Dietary diversity also affects diet quality. A varied diet is more likely to ensure adequate micronutrient intake. Thus the above analysis not only shows poor dietary diversity among the indigenous hill households of Meghalaya but also poor diet quality among them. Thus for improvement in the nutritional status of the children, focus should be on the improvement of household's FCS. For this effective policies and programmatic activities need to be initiated. Studies have proved that the improvement in agricultural productivity has positive effect on reduction in rural poverty and economic disadvantage of a region (Chand and Srivastava, 2016). Studies have also established that increase in the per capita income of the households increases the intake of all nutrients by the households (Umanath *et al*.,2015). Thus improvement in agricultural productivity under mountain specificities of Garo Hills should be taken on priority basis. Though it is unlikely that complete food self-sufficiency in mountain specificities may be achieved because of low per capita availability of land along with other biophysical, environmental, and socio-economic constraints, but revitalising and strengthening the local food systems will increase local food production, improve the dietary diversity, and decrease the reliance on food supplies from outside the region.

V

CONCLUSION

The study assesses the magnitude of household food insecurity and its consequences on the nutritional status of children aged 6–59 months among indigenous

Garo tribe of Meghalaya, India. Significant and positive correlation was observed between the household FCS and BMI of children of 6–59 months. The households with higher FCS are having healthy child and children in food insecure households, i.e., households with low FCS, normally face malnutrition issues. Revitalising and strengthening the local food systems will increase local food production, improve the dietary diversity, and decrease the reliance on food supplies from outside the region. This will lead to improvement household FCS, which in turn will lead to improvement in nutritional status of children.

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