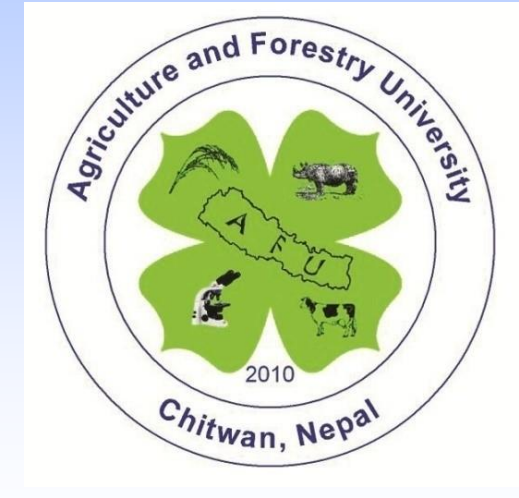


Cropping diversity and diversity of food of women influences the child malnutrition on flood affected region of Siraha district, Nepal

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Introduction

Climate change has impacted all aspect of the life (IPCC, 2017). Nepal is the 4th most climate-vulnerable country in the world (World Bank, 2005) and is highly exposed to a range of water-related hazards such as floods and droughts, changing weather patterns etc. (Danga, 2011) that influenced the major aspect of livelihood (IPCC, 2004). Climate projections predict increased climate variability {Ministry of Environment (MoE), 2010}.

Terai region is famous as the grain basket of Nepal, characterized as the high population density and increasing urbanization in the recent days. The flash flooding incurs great losses to the agriculture livelihood then influence the nutrition of the poor farm families. This problem is severe especially in the eastern Terai of Nepal due to fragile environment, high monsoon rain & low to socioeconomic adaptation capability against the climate change. Siraha district is high for human sensitivity (0.13-0.32), high to temperature and rainfall risk (0.44-0.58), high to flood risk/exposure, very high to drought risk/exposure (0.56-1.00), very high to multiple risk/exposure index (0.68-1.00) (MoE, 2010). Communities adjacent to Kamala river of Siraha district have high poverty level based on multidimensional poverty index, high population density, a large GINI coefficient, poverty, low food and nutrition intake, instability, and low economic opportunity. Recurrent flood severely affects crop production, food intake and the malnutrition especially of the children, which ultimately influenced the life, property, and livelihood of the community. The study identified the impact of the flood occurrence on the food diversity and diversity of women diet especially the mother that influenced the child malnutrition.

Methodology

A survey study was done with mixed methods using both qualitative and quantitative approaches, to assess knowledge, attitude, and practices on nutrition and agriculture-based livelihoods of Siraha, Kalyanpur and Karjanha municipalities of Siraha district, which are situated in the eastern bank of Kamala River. The sample size was obtained using the formula given by Daniel (1999) for the known population. The quantitative method included a purposive and random sampling of 496 households from each wards of these municipalities which are adjacent of Kamala River (5 wards from Siraha, 6 wards from Kalyanpur and 5 wards from Karjanha) and only five wards from the other remaining wards. In ward level, marginalized, disadvantaged and flood-affected communities were purposively selected. Within the communities, households were purposively (household with child of <5 years) and randomly selected. The household survey was conducted using the IT-based application with AKVO Flow software using Tab. For the study of the malnutrition status of child 1299 children were selected randomly from the all selected wards. While the qualitative survey included focus group discussion, key informant survey, in-depth study of some farmers & direct field observation with the help of checklists.

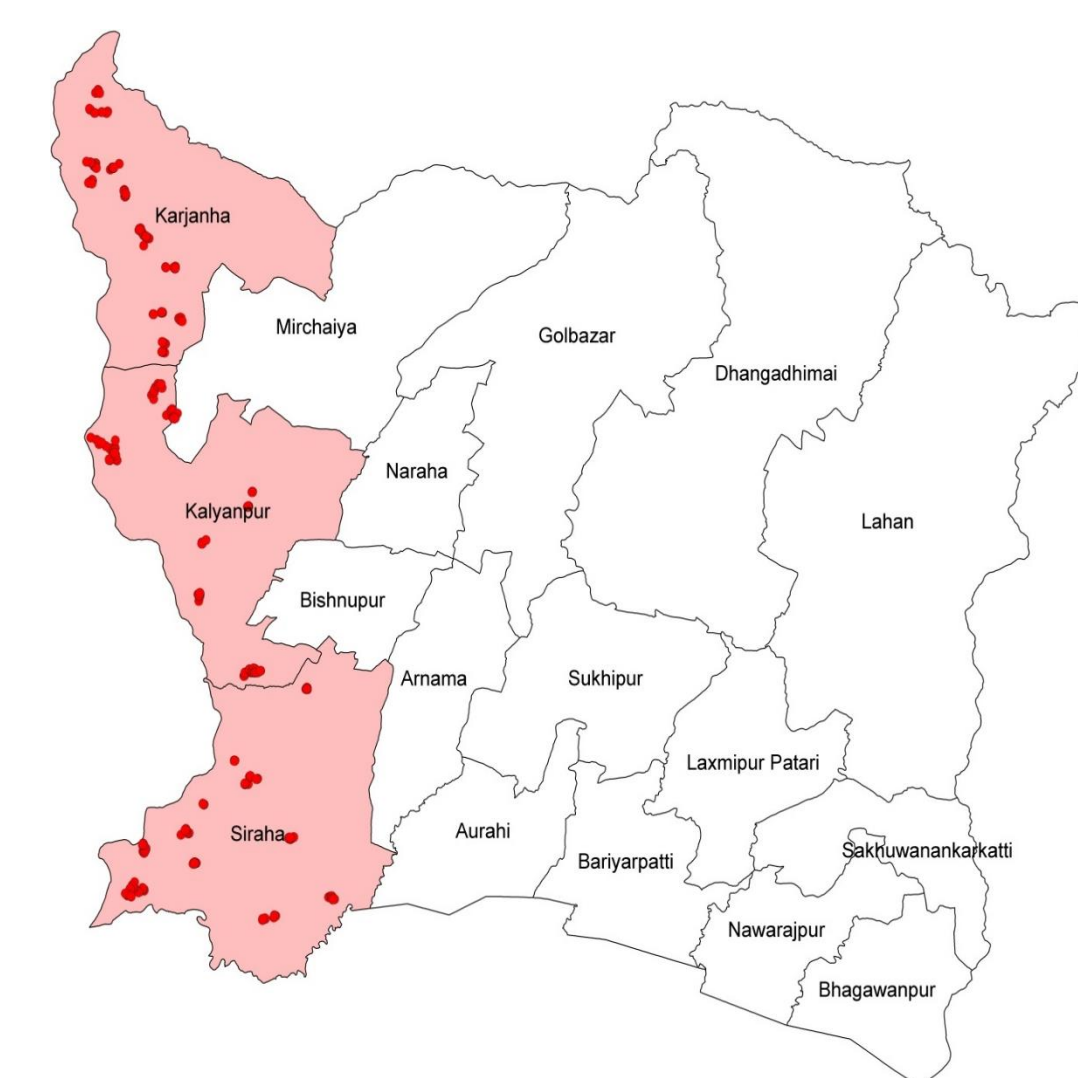


Figure 1: Distribution of the sample households (HH) of the survey

Sample size estimation

$$n = \frac{N \times X}{(X + N - 1)}$$

Where,

N = the population size

$$X = \frac{Z_{\alpha/2}^2 \times p \times (1 - p)}{MOE^2}$$

$Z_{\alpha/2}$ is the critical value of the Normal distribution (i.e. 1.96 at 5%),

MOE is the margin of error, p is the sample proportion (= 0.5 for max. sample size)

Results

Incidence, impact and vulnerability of hazards: People of the adjoin the Kamala river are well aware of the kinds of natural hazards to which they are exposed. Almost all the respondents observed at least one natural hazard/climate change related phenomenon trends occurring in their area. Flood and heat wave as the primary hazard, 71.08% of the respondents stated that flood severity was increasing and 61.67% respondent felt the increasing heat wave as time goes on. There is the case of highest (23 deaths) casualties because flood hazard in sample households in Siraha, and 1 and 2 for Karjanha and Kalyanpur respectively. More than half of the respondents from Kalyanpur (52.25%) and Siraha (55.67%) reported the loss of land in the last ten years. In terms of population categories, older people and children were felt to be most vulnerable (reported by 58% and 65% of respondents), followed by poorer people (47%).

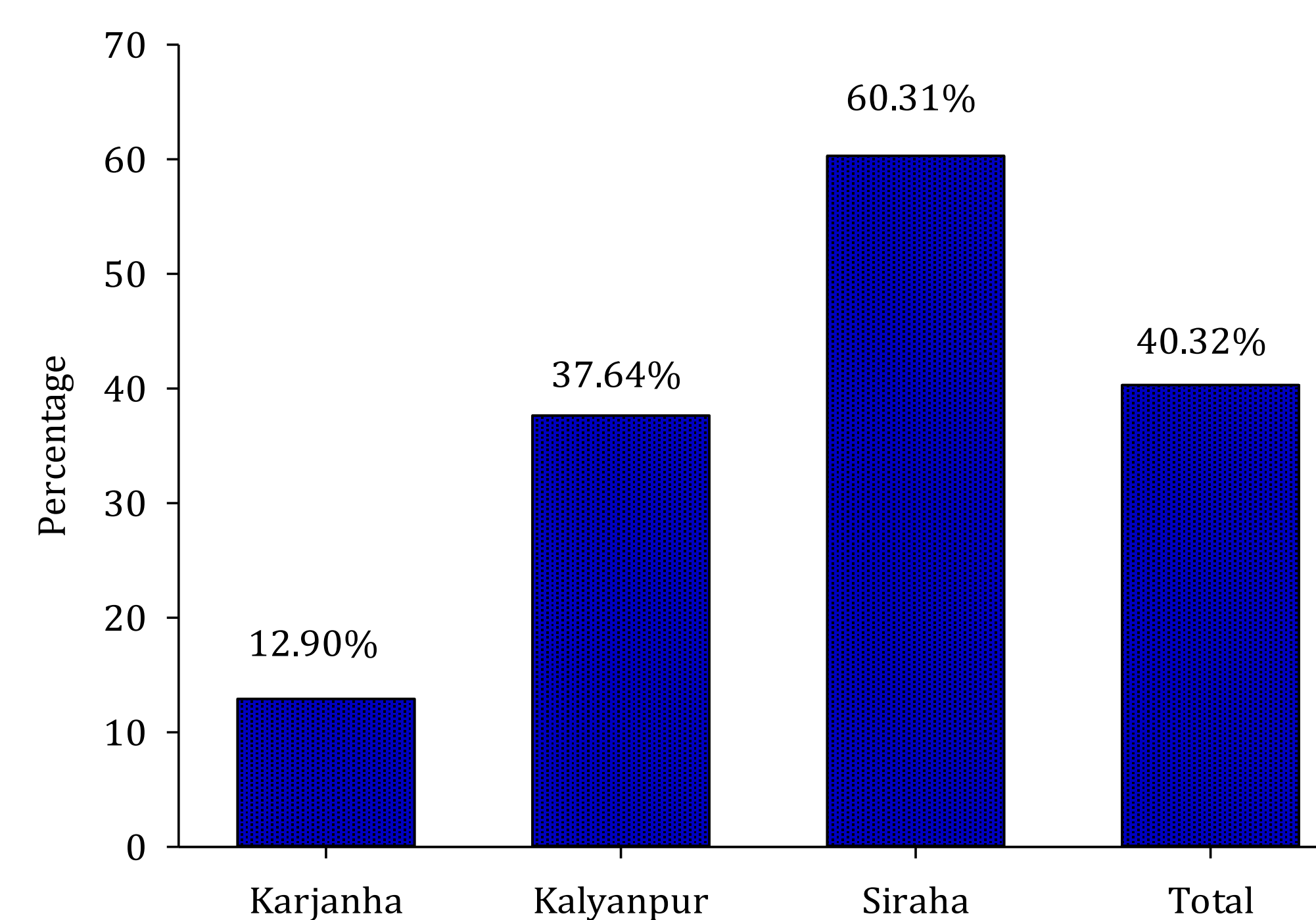


Figure 2: Population proportion felt to increase the risk due to flooding

Cropping diversity: Food insufficiency is one of the major problems in the area. Around one third (34.88%) of farmers in study area are food sufficient in food grains all round year. Only 62.29% of the households have their own land for agricultural production. Rice based cropping system is predominant in the study area (FGD and KII). Rice (48.79% studied HH), wheat (35.69%), maize (4.23%), and lentil (22.98%) are major field crops grown. Around one third of the households are engaged in vegetable production. Potato, onion, brinjal, tomato, cucurbits and garlic are major vegetables. Milk, yogurt and ghee are the major livestock product.

The crop grown, livestock they have and compulsory they used for their HHs are categorized in to five groups i.e. cereals, pulses, vegetables, oilseeds, eggs/meat.

Based on this indicator, 0.2% household grown/rare/used five food groups (cereals, pulses, vegetables, oilseeds, eggs/meat) on own household, 3.02% have four food group, 11.49% have three food group, 19.56% have two food group, 20.36% have only one food group (Table 1). Around 45% have not grown any type of the agriculture crops and livestock.

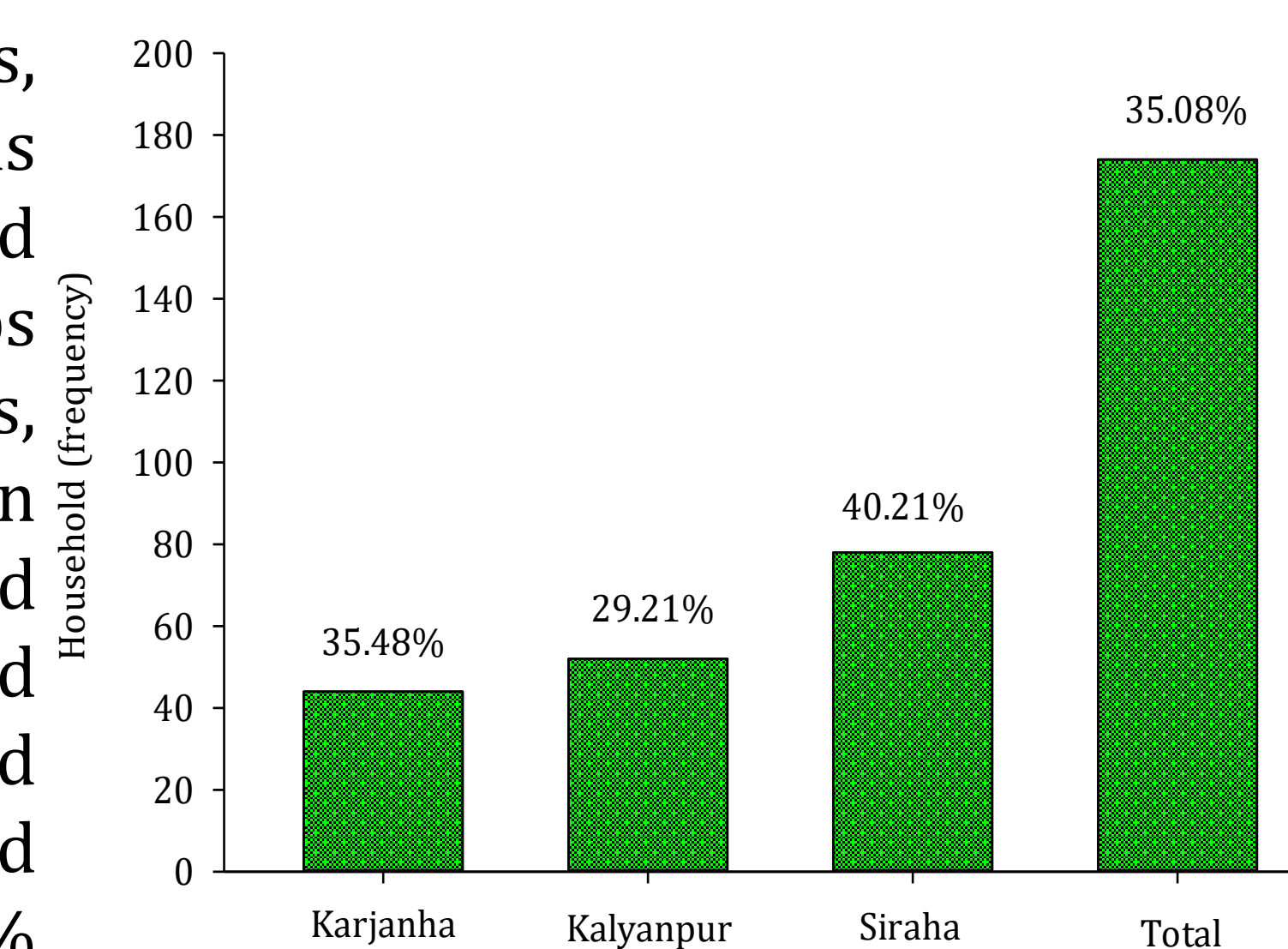


Figure 3: Vegetable cultivation status (HH involved)

Table 1: Agriculture Diversity of food groups

Municipality	Food groups					
	Zero	One	Two	Three	Four	Five
Karjanha	45 (36.29)	35 (28.23)	34 (27.42)	8 (6.45)	2 (1.61)	0.00
Kalyanpur	81 (45.51)	38 (21.35)	25 (14.04)	21 (11.80)	12 (6.74)	1 (0.56)
Siraha	99 (51.03)	28 (14.43)	38 (19.59)	28 (14.43)	1 (0.52)	0.00
Total	225 (45.36)	101 (20.36)	97 (19.56)	57 (11.49)	15 (3.02)	1 (0.20)

Figure in the parenthesis indicates the percentage

Food diversity of women: Based five food diversity (cereals, pulses, vegetables, oilseeds, and eggs/meat), 0.2% household grown/rare/used five food groups on own household, 3.02% have four food groups, 11.49% have three food group, 19.56% have two food group. Nearly 61 for women of reproductive age and around 79% for the mother of children aged 0-59 months fulfill the minimum diet diversity. More than half (56%) of the surveyed mothers were aware with examining the child nutrition status.

Child malnutrition: Around 50% of the children of the study area are suffering from the malnutrition (GAM of girl children 49.8%, boys 50.5%). The severe acute malnutrition (SAM) and moderately acute malnutrition (MAM) is 31.3% and 16.9% respectively.

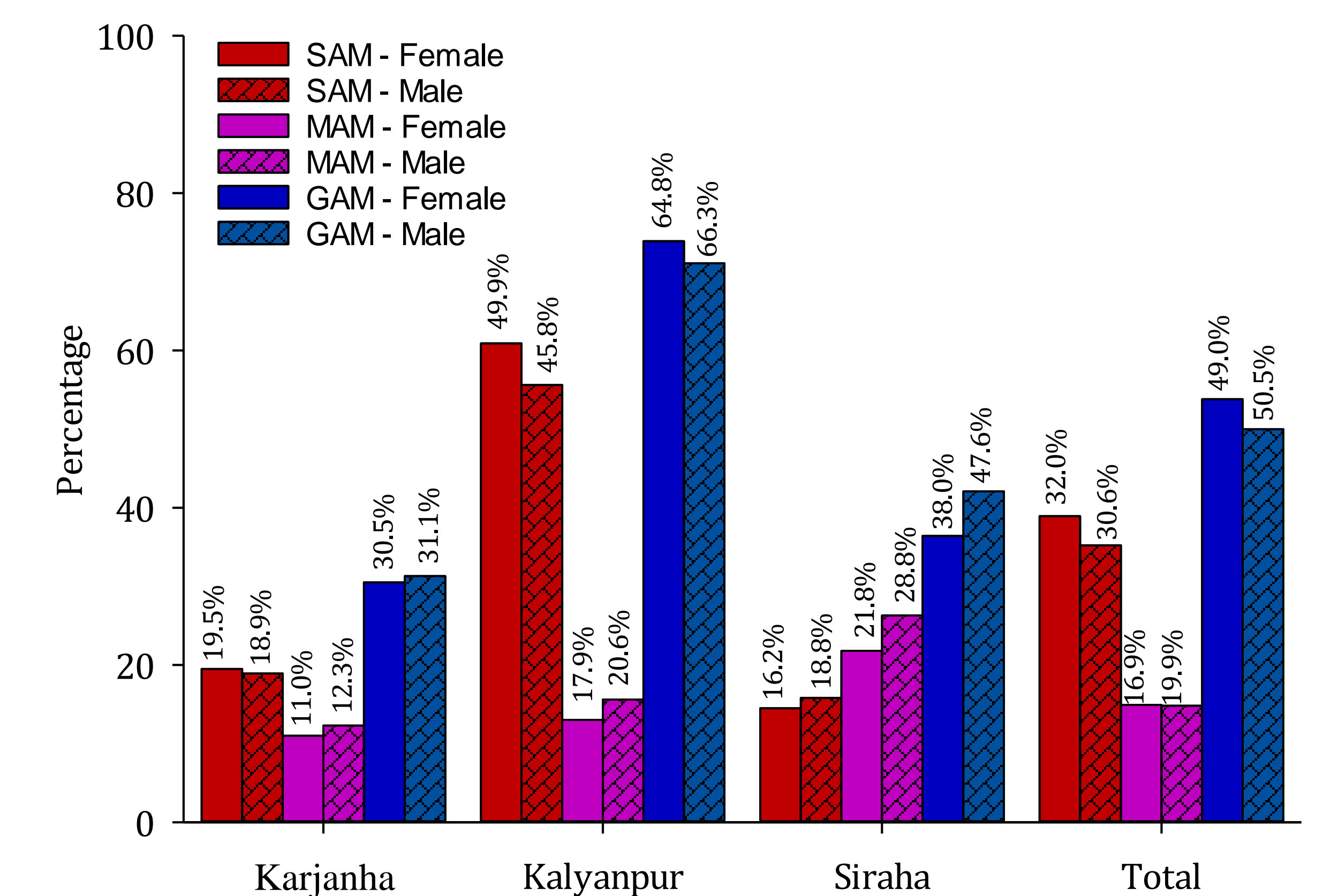


Figure 4: Malnutrition status of children on three municipality of Siraha district

Conclusions

Water related natural hazards are common on the communities near to the flash flood occurring rivers. These hazards basically impacted the agriculture sectors beside their settlement. Crop damage and limited choice of crops in these area influenced the dietary diversity of women who normally far from the access of the others dietary components. Low amount of diet and dietary diversity caused the child malnutrition. Thus intensification of land use and diversification of crops should be focused for improving the food and nutritional security.