***Original Research Article***

# An economic analysis of cropping pattern, marketing chains and food security status of farm households in rural-urban interface of Bengaluru


## ABSTRACT

The study was taken in rural-urban interface of Bangalore to examine the participation of households in different marketing chains and production diversification on food insecurity status among selected households. Herfindahl-Hirschman (HH) index was used to estimate the crop diversification in both north and south transect. To analyze the household food security status, Food Security Index (FSI) was employed. The results indicated that, south transect was more crop diversified than north transect and the food security status was also high in south transect compared to north transect, hence crop diversity is having positive influence on household food security status in the study area. Among the different crops cultivated in the study area, percentage of area under ragi was the highest followed by maize in both the transects. In case of both maize and ragi, majority of the farm households sold their produce in the regulated markets. But ragi producers realized higher price (Rs. 2350/q) in farmers market (producer to consumers) and maize producers realized higher price (Rs. 1550/q) in regulated markets. Food security can be enhance through crop diversification and better price realization can be achieved by encouraging to adopt direct marketing or selling farmers produce through regulated markets.



***Keywords:****Food Security, Crop diversification, Rural-urban interface, Herfindahl-Hirschman (HH) index, Direct and regulated markets.*




## 1. INTRODUCTION

The global urbanization undeniably results in variety of consequences both positive and negative. Nevertheless, there exists a strong association between urbanization and economic growth. Urbanization puts pressure on food systems and urban poverty is now swelling worldwide, triggering food insecurity, alterations of livelihoods and agriculture production system[1]. Urbanization has a wide consequence in India as majority of the population depend on agriculture and allied activities for their

livelihood. Rural population migrate towards the urban areas in search of better employment opportunities, posing the consequences of transformation of agriculture land, food insecurity, development of slums and poverty in urban areas. The rate of urbanization in India is very high and the cities are becoming larger due to continuous migration of population to the urban areas (cities). Bengaluru is one among the fastest-growing Indian cities over the last 40 years[2].

Increase in urban population impact the environment much higher ensuing in loss of arable land[3] leading to significant change in land use pattern as well as cropping pattern. Cropping pattern is the proportion of area under various crops at a point of time as it changes over space and time. The change in cropping pattern in particular span of time clearly indicates the changes that have taken place in the agricultural development. Because of the changing cropping patterns brought about by the green revolution, the nation now has access to surplus food and has improved food security.Food security is a state of existence in which all people at all time have physical, social and economic access to sufficient, safe and nutritious food that meet their dietary needs and food preferences for an active and healthy life[4]. There are four dimensions of food security i.e. availability, accessibility, utilization and stability.

The present study is an attempt to assess the cropping pattern, participation of farm households in different marketing chains and food security status in rural-urban interface of Bengaluru.

## 2. METHODOLOGY

The study was taken up to investigate socio-economic transition processes in the rural–urban interface of Bengaluru, which was further divided into two transects; Northern transect (N-transect) is a rectangular stripe of 5 km width and 50 km length. The lower parts of this transect cuts into urban Bangalore, and the upper part contains rural villages. The Southern transect (S-transect) is a polygon covering a total area of 300 $km^2$, taking the reference point as Vidhana Soudha which is located in the center of the city. Each transect was further divided into three gradients namely rural, transition and urban gradients. The distinction of the areas into rural, transition and urban gradients was made based on thelogic of the Urban–Rural Index (URI), a simplified Survey Stratification Index (SSI) was developed, and the SSI refers to the linear distance between a village centre and the city centre[5].Both components, building density and

distance, were investigated separately before they were combined to calculate the SSI. The building of the state legislature, Vidhana Soudha, was used as reference point for the city centre. The distance to the centre and the built-up area are considered as a proxy for urbanisation. Since a high value of distance correlates to low urbanisation, whereas a high value of density indicates high urbanisation, the non-built-up area (100% minus percentage of built-up area) was used for constructing the SSI. This brings both variables to a common scale, in which low values correspond to urban character, and high values to rural character.

Both the variables were normalised to a scale of 0–1 using the formula.

$$Z_i = (X_i \min(X))/(\max(X) - \min(\mathrm{X})) \quad \text{.....(1)}$$

Where, $z_i$ is the normalised variable, x is the distance or non-built-up area, min(x) is the minimum value in the transect, max(x) is the maximum value in the transect. The two measures (non-built-up area and distance) were then aggregated with equal weights to form the SSI, by calculating the geometric mean

$$SSI = \sqrt{\{(Zi_{distance})(Zi_{non\ built\ up\ area})\}} \quad \text{.....(2)}$$

Further with the help of SSI, each transects were divided into six strata based on the SSI score which varies from 0-1 (0= high urbanization; 1= less urbanization). Then, in the SSI, low value (close to zero) corresponds to high degree of urbanization then village stratification and random sampling in Northern and Southern transect is shown in the table 1.

**Table 1: Village stratification and random sampling followed in northern and southern transect of Bengaluru**

| Stratum | SSI Score | North transect | | South transect | |
|---|---|---|---|---|---|
| | | Village per stratum | | Village per stratum | |
| | | Total | Randomly Selected | Total | Randomly selected |
| **1 (Urban)** | <0.167 | 5 | 2 | 14 | 4 |
| **2** | 0.333 | 9 | 3 | 10 | 3 |
| **3** | 0.5 | 9 | 3 | 13 | 4 |
| **4** | 0.667 | 18 | 6 | 26 | 8 |
| **5** | 0.833 | 30 | 10 | 23 | 7 |

| | | | | | |
|---|---|---|---|---|---|
| **6 (Rural)** | >0.833 | 22 | 7 | 12 | 4 |
| **Total** | | 93 | 31 | 98 | 30 |

**Source: Ellen*et al.*, 2017**

The lottery method without replacement was used to randomly select the villages in each stratum. The final list consists of approximately 30 per cent settlements per stratum[6]. The baseline lists of households were collected from anganawadi centers of selected village. The stratified purposive random sampling method was used to select the households. The sample frame consisted of 1275 households, 616 each from north (87 from urban, 171 from transitionand 358 from rural households) and 659 from south transects (125 from urban, 260 from transition and 274 from rural households) of Bengaluru.

### 2.1 Data

In order to address the objectives of the study, both primary and secondary data were collected. The data were collected through personal interview using a well-structured and pre-tested interview schedule. The data collection included two sets of interview schedules, one for the household head and the other for the eligible woman, who is typically the wife of the household head. The questions related to household income, expenditure, access to irrigation, employment, cropping pattern, marketingchain etc., were collectedfrom the household head. While, data pertaining to menu and quantity of the food prepared, quantity of food consumed by each individual, education, health and some other social indicators were collected from wife of household head.

### 2.2 Analytical tools

#### 2.2.1 Tabular presentation

Tabular method was employed to compile the socio-economic status, quantity of different food items consumed, household income, cropping pattern, marketing chains and marketed surplus, etc. In order to facilitate interpretation of findings, statistical measures like percentages and averages were also worked out.

#### 2.2.2 Herfindahl-Hirschman Index (HHI):

The Herfindahl index, also known as Herfindahl-Hirschman index was developed by economists Orris C. Herfindahl and Albert O. Hirschman.

It is the sum of square of the proportion of acreage under each crop to the total cropped area and is given by the equation:

$$\mathbf{HHI} = \sum_{\mathbf{i=1}}^{\mathbf{N}} \mathbf{P_i^2} \text{.....(3)}$$

Where, Pi represents acreage proportion of the $i^{th}$crop in total cropped area.

The Herfindahl index takes the value of one when there is specialization and approaches zero when there is diversification.

### 2.2.3 Food Security Index [FSI]

The Food Security Index (FSI) was used to assess the food security status of the households. A food security line was determined and used to classify households into either being food secure or food insecure depending on which side of the line they fall. The household caloric acquisition method according to Hodinnott[7] is the number of calories or nutrients available for consumption by household members over a defined period of time. The household calorie intake was obtained from the household per day consumption. The quantity of every food item consumed by the household in a day was converted into its calorie content. This was achieved by multiplying all respective food items (weight in kilograms) by the corresponding food energy content. This was further converted into per capita calorie by dividing the estimated total household calorie intake by the adjusted household size in adult equivalent (consumption unit).

A household whose daily per capita calorie intake was up to the recommended was regarded as food secure and if below as food insecure. In a similar way, as used by Ibrahim *et al.*[8], the food security index was calculated as follows:

$$Z = \frac{\text{Daily per capita calorie intake}}{\text{Recommended daily per capita calorie intake (kcal/capita/day)}} \text{.....(4)}$$

Where the Z value (Food Security Index) is less than 1, household was regarded as food insecure and where it was greater than or equal to 1, the household was regarded asfood secure.

## 3. RESULTS AND DISCUSSION

### 3.1 Cropping pattern in the study area

The details of cropping pattern of the study area are given in Table 2. In the study area, the overall gross cropped area (net cropped area) in south of Bengaluru [422.74 ha (347.65 ha)] was higher than the north of Bengaluru [415.35 ha (339.97 ha)]. Across the gradient, the gross cropped area and net cropped area was higher in rural area followed by transition and urban area in both the transects. In rural area of both the transect, the gross cropped area was 301.26 ha and 297.11 ha, respectively. In transition and urban area of south transect the gross cropped area was 117.34 ha and 4.79 ha respectively, while in north transect it was 88.94 ha and 7.36 ha, respectively. Among the different crops cultivated in the study area the percentage of area under ragi was the highest (24.94 % and 35.90 %) followed by maize (11.26 % and 12.75 %) in both south and north transect. In total, more than 30 different crops are grown in the research area, with ragi taking up the largest area (105.42 ha and 149.13 ha). This is because ragi is a significant staple food in the region, followed by maize, baby corn, mulberry, etc. The study conducted by Ravi *et al*. [9] showed similar results where ragi occupied higher share in gross cropped area among all crops grown in the study area followed by maize, coconut etc. It was observed that most of the vegetables were grown in transition areas of both the transect. In urban area a few numbers of farmers were cultivating fruit crops like grapes and sapota along with cultivation of ragi for their own consumption.The cropping intensity in south and north transect was 121.60 per cent and 122.17 per cent respectively, these resultsare similar to that of states average percentage of cropping intensity that is 127.10 per cent[10].

**Table 2: Cropping pattern in the study area (in hectares)**

| Crops | North transect | | | | South transect | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural | Transition | Urban | Total | Rural | Transition | Urban | Total |
| **CEREALS** | | | | | | | | |
| **Ragi** | 118.59 (39.91) | 29.61(33.29) | 0.92 (12.50) | 149.13 (35.90) | 57.75 (19.17) | 47.43 (40.42) | 0.93 (19.42) | 105.42 (24.94) |
| **Maize** | 39.62 (13.34) | 13.19 (14.83) | - | 52.82 (12.75) | 29.87 (9.92) | 17.72 (15.10) | - | 47.58 (11.26) |
| **Baby corn** | 1.84 (0.62) | 0.012 (0.01) | - | 1.85 (0.45) | 40.33 (13.39) | 7.07 (6.03) | - | 47.40 (11.21) |
| **Paddy** | 0.46 (0.15) | 0.23 (0.26) | - | 0.69 (0.17) | 5.81 (1.93) | 1.49 (1.27) | - | 7.31 (1.73) |
| **Jowar** | - | - | - | - | 2.74 (0.91) | - | - | 2.74 (0.65) |
| **PULSES** | | | | | | | | |
| **Tur** | 6.79 (2.29) | 2.3 (2.59) | - | 9.09 (2.19) | 6.76 (2.24) | 2.22 (1.89) | - | 8.98 (2.12) |
| **Field bean** | 5.93 (2.00) | 5.66 (6.36) | - | 11.60 (2.79) | 10.31 (3.42) | 13.57 (11.56) | - | 23.88 (5.65) |
| **Horse gram** | 0.63 (0.21) | 0.95 (1.07) | - | 0.73 (0.18) | 1.90 (0.63) | 1.38 (1.18) | - | 3.28 (0.78) |
| **VEGETABLES** | | | | | | | | |
| **Tomato** | 5.99 (2.02) | 2.17 (2.44) | - | 8.16 (1.96) | 2.00 (0.66) | 2.25 (1.92) | - | 4.25 (1.01) |
| **Beans** | 7.77 (2.62) | 0.48 (0.54) | - | 8.25 (1.99) | - | 0.828 (0.71) | - | 0.83 (0.20) |
| **Cucumber** | 4.18 (1.41) | 0.57 (0.64) | - | 4.76 (1.15) | - | - | - | - |
| **Coriander** | 0.86 (0.29) | - | - | 0.86 (0.21) | - | 1.12 (0.95) | - | 1.12 (0.26) |
| **Carrot** | 0.56 (0.19) | - | - | 0.56 (0.13) | - | - | - | - |
| **Cauliflower** | 1.72 (0.58) | - | - | 1.72 (0.41) | - | - | - | - |
| **Chilli** | 0.12 (0.04) | - | - | 0.12 (0.03) | - | 0.23 (0.20) | - | 0.23 (0.05) |
| **Fenugreek** | - | - | - | - | - | 0.17 (0.14) | - | 0.17 (0.04) |
| **Potato** | 6.41 (2.16) | 0.46 (0.52) | - | 6.87 (1.65) | - | - | - | - |
| **Radish** | - | 0.23 (0.26) | - | | - | - | - | - |
| **Spinach** | - | - | - | - | - | 0.97 (0.83) | - | 0.97 (0.23) |
| **Ridge gourd** | 3.34 (1.12) | 0.23 (0.26) | - | 3.527 (0.85) | 0.14 (0.05) | 0.86 (0.73) | - | 1.00 (0.24) |
| **FRUITS** | | | | | | | | |
| **Banana** | - | - | - | - | 11.22 | 4.32 (3.68) | - | 15.54 (3.68) |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | (3.72) | | | |
| **Mango** | 17.28 (5.82) | 0.92 (1.03) | - | 41.20 (9.92) | 2.00 (0.66) | 2.94 (2.51) | - | 4.94 (1.17) |
| **Grapes** | 36.22 (12.19) | 11.78 (13.24) | 4.60 (62.50) | 52.62 (12.67) | - | - | - | - |
| **Pomegranate** | 2.34 (0.79) | - | - | 2.34 (0.56) | - | - | - | - |
| **Sapota** | - | 0.92 (1.03) | 1.84 (25.00) | 2.76 (0.66) | - | 0.92 (0.78) | 3.86 (80.58) | 4.78 (1.13) |
| **PALM TREE** | | | | | | | | |
| **Coconut** | 1.88 (0.63) | 0.92 (1.03) | - | 2.8 (0.67) | 49.98 (16.59) | 1.28 (1.09) | - | 51.28 (12.13) |
| **TREES** | | | | | | | | |
| **Eucalyptus** | 14.7 4 (4.96) | 16.10 (18.10) | - | 30.84 (7.43) | - | - | - | - |
| **GRASS** | | | | | | | | |
| **Napier grass** | 12.46 (4.19) | 1.98 (2.23) | - | 14.44 (3.48) | 37.70 (12.51) | 9.30 (7.93) | - | 47.02 (11.12) |
| **COMMERCIAL CROPS** | | | | | | | | |
| **Mulberry** | 11.08 (1.86) | 0.46 (0.26) | - | 11.54 (1.39) | 85.50 (14.19) | 2.30 (0.98) | - | 87.80 (10.38) |
| **FLOWER CROPS** | | | | | | | | |
| **Marigold** | 1.84 (0.62) | - | - | 1.84 (0.44) | - | 0.12 (0.10) | - | 0.12 (0.03) |
| **Gross cropped area** | 297.11 | 88.942 | 7.36 | 415.35 | 301.26 | 117.338 | 4.79 | 422.74 |
| **Net cropped area** | 273.95 | 73.48 | 2.53 | 339.97 | 232.82 | 112.66 | 2.16 | 347.65 |
| **Cropping intensity** | **108.45** | **121.04** | **290.91** | **122.17** | **129.40** | **104.15** | **221.76** | **121.60** |

Note: figure in parentheses indicate the percentage to total

### 3.2 Crop diversification by farmers across rural-urban interface of Bengaluru

The crop diversification by the farmers across rural-urban interface of Bengaluru is presented in Table 3 using Herfindahl index (HI). Herfindahl index close to zero represents complete crop diversification. The index close to one represents complete specialization. In the study area across rural, transition and urban gradients, south transect is relatively more diversified than north transect. Within the gradients and the transect we could see more crop specialization. For India, the diversification index value was 0.44 for the eastern region, indicating that there was a high crop diversification in the study area and these results are in line with our present study [11].

Similarly, crop diversification across gradients is influenced by access to irrigation in north and south of Bengaluru is presented in Table 4. Irrespective of intensity of agriculture across the gradients, the overall Herfindahl index value is relatively higher in rainfed area compared to irrigated area, which indicates high crop diversification in irrigated area than in rainfed area.

**Table 3: Crop diversification by farmers in southand north of Bengaluru**

| **Gradients** | **Herfindahl Index (HI)** | |
|---|---|---|
| | **South of Bengaluru** | **North of Bengaluru** |
| **Rural** | 0.45 | 0.47 |
| **Transition** | 0.46 | 0.51 |
| **Urban** | 0.62 | 0.64 |
| **Overall** | **0.46** | **0.49** |

**Note:** HI="0" total diversification, HI= "1" total specialization

**Table 4: Crop diversification among rainfed and irrigated farmers across rural-urban interface of Bengaluru**

| **Gradients** | **Herfindahl Index (HI)** | | | |
|---|---|---|---|---|
| | **South of Bengaluru** | | **North of Bengaluru** | |
| | **Rainfed** | **Irrigated** | **Rainfed** | **Irrigated** |
| **Rural** | **0.48** | **0.44** | **0.52** | **0.46** |
| **Transition** | **0.50** | **0.48** | 0.54 | 0.49 |
| **Urban** | **-** | **0.63** | - | 0.59 |

| | | | | |
|---|---|---|---|---|
| **Overall** | **0.49** | **0.46** | **0.53** | **0.47** |

**Note:** HI="0" total diversification, HI= "1" total specialization

### 3.3 Food security status of farm households

Farm household's food security status was presented in table 5. the results revealed that, households residing in south transect with relatively higher crop production diversity exhibited higher food security (62.8 %). Rural households had better food security status than the transition households in both the transects attributed that, majority of the rural households engaged in different farming activities.The hypothesis that, diversity in crop production has positively contributed to food security is accepted.

**Table 5. Food security status of farm households (%)**

| Gradients | North transect | South transect |
|---|---|---|
| Rural | 55.6 | 67.5 |
| Transition | 50.5 | 57.6 |
| **Overall** | **53.5** | **62.8** |

### 3.4 Marketed surplus of ragiand maize under rainfed and irrigated situations across rural-urban interface of Bengaluru

Since Ragi and maize were found to be the major crops in the study area, we have worked out marketed surplus and identified different marketing chains for these two crops. The results on marketed surplus and marketing chains are given below.

The details of marketed surplus of ragi under both rainfed and irrigated situations across rural-urban interface of Bengaluru are presented in Table 6. In north of Bengaluru, farmers in rural area were having the highest ragi production of about 387 quintals. In rural area, ragi produced by rainfed farmers was higher (345.21 quintals) than irrigated farmers (42.25 quinatls). Similarly, in south of Bengaluru, ragi production in rural area is more than transition area with maximum contribution from rainfed situations of both the gradients which is about 101.50 and 110.70 quintals, respectively. After deducting quantity used for family consumption and for kind payment, the marketed surplus is being obtained. In north of Bengaluru, the share of marketed surplus in total production is the highest in irrigated area of transition (25 %) followed by rainfed area of rural gradient. Correspondingly, in south of Bengaluru, the share of marketed surplus is

more in rainfed area (17.10 %) of rural gradient followed by rainfed area (15.40 %) of transition region.Veerabadrappa*et al*.[6] studied that marketed surplus of ragi was higher in irrigated (43.59 %) situation compared to rainfed (39.4 %) situation after meeting the family requirement of farmers.

The status of marketed surplus of maize under rainfed and irrigated situations across rural-urban interface of Bengaluru is given in table 7.In north of Bengaluru, maize is produced intensively in rainfed area of rural gradient with a highest production of 511.10 quintals. The contribution of rainfed areas of rural gradient in terms of marketed surplus is highest (96 per cent) to the total production followed by irrigated area (90.35 per cent) of rural gradient. Similarly, in south of Bengaluru the contribution of marketed surplus to the total production of maize is highest in rainfed (95.34 per cent) and irrigated areas(94.72 percent) of rural gradient, respectively.

**Table 6: Status of marketed surplus of ragi under rainfed and irrigated situations across rural-urban interface of Bengaluru**

| Particulars | South | | | | North | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural | | Transition | | Rural | | Transition | |
| | Rainfed | Irrigated | Rainfed | Irrigated | Rainfed | Irrigated | Rainfed | Irrigated |
| **Total quantityproducedon farm per year (q)** | 118.40 (100.00) | 101.50 (100.00) | 110.70 (100.00) | 76.20 (100.00) | 345.21 (100.00) | 42.25 (100.00) | 71.95 (100.00) | 16.00 (100.00) |
| **Quantity used for familyconsumption (q)** | 96.50 (81.50) | 89.75 (88.42) | 80.90 (73.10) | 60.25 (79.06) | 280.17 (81.15) | 42.25 (100.00) | 64.75 (90.00) | 12.00 (75..00) |
| **Quantity used for kindpayment (q)** | 1.15 (1.00) | 3.00 (2.90) | 9.50 (8.58) | 11.00 (14.43) | 5.68 (1.64) | - | 3.00 (4.16) | - |
| **Quantity used for seed purpose (q)** | 2.50 (1.68) | 0.26 (0.25) | 3.10 (2.80) | 0.70 (0.91) | 2.26 (0.65) | - | 2.20 (3.05) | - |
| **Marketed Surplus(q)** | 20.25 (17.10) | 8.49 (8.37) | 17.20 (15.40) | 4.25 (5.58) | 56.70 (16.42) | - | 2.0 (2.78) | 4.0 (25.00) |

**Note:** Figures in parentheses indicates indicate percentage to total quantity produced

**Table 7: Status of marketed surplus of maize under rainfed and irrigated situations across rural-urban interface of Bengaluru (per farm)**

| Particulars | South | | | | North | | | |
|---|---|---|---|---|---|---|---|---|
| | Rural | | Transition | | Rural | | Transition | |
| | Rainfed | Irrigated | Rainfed | Irrigated | Rainfed | Irrigated | Rainfed | Irrigated |
| **Total quantityproduced(q)** | 685.00 (100.00) | 1361.00 (100.00) | 45.50 (100.00) | 137.60 (100.00) | 511.10 (100.00) | 100.00 (100.00) | 11.50 (100.00) | 72.50 (100.00) |
| **Quantity used as feed (q)** | 15.50 (2.26) | 35.80 (2.63) | 8.50 (18.68) | 7.80 (5.67) | 13.00 (2.54) | 5.20 (5.20) | 1.85 (16.09) | 4.60 (6.34) |
| **Quantity used for kindpayment (q)** | 10.60 (1.55) | 25.75 (1.89) | 4.60 (10.11) | 5.80 (4.22) | 5.00 (0.98) | 2.65 (2.65) | 1.20 (10.43) | 3.45 (4.76) |
| **Quantity used for seed purpose (q)** | 5.80 (0.85) | 10.25 (0.75) | 2.80 (6.15) | 3.65 (2.65) | 2.50 (0.49) | 1.80 (1.80) | 0.90 (7.83) | 2.80 (3.86) |
| **Marketed Surplus(q)** | 653.10 (95.34) | 1289.20 (94.72) | 29.60 (65.05) | 120.35 (87.46) | 490.60 (96.00) | 90.35 (90.35) | 7.55 (65.65) | 61.65 (85.03) |

**Note:** Figures in parenthesis indicts indicates percentages to total quantity produced

### 3.5 Participation of farm households in different marketing chains of ragi and maize

Participation of farm households in different marketing chains of ragi was presented in table 8. Producers sold their produce using six different marketing chains, out of these, producers realized higher price (Rs. 2350/q) in farmers market (producer to consumers) and the food security status(North-66.6 % and South-72.7 %) was also high in these households compare to others. Overall food security status of the households was relatively better for the households residing in south transect (64.8 %) compared to north transect (59.4 %). Next best marketing chain used by ragi producers was chain VI, since producers also realized good price in regulated markets (Rs. 2300/q). It was clearly evident from the table that, majority of the ragi producers sold their produce directly to consumers as this is one of important staple food crop in the southern Karnataka. The ragi market center (RMC) plays a major role in selling of farmer's ragi produce followed by the product was exchanged directly between producers and consumers [12].

### 3.6 List of marketing chains

**Chain I**
Producer – Neighbors
**Chain II**
Producer – Middlemen
**Chain III**
Producer – Street vendor
**Chain IV**
Producer – Consumers (Farmers market)
**Chain V**
Producer – Wholesale market
**Chain VI**
Producer – APMC (Regulated markets)
**Chain VII**
Producer – Contract
**Chain VIII**
Producer – Cooperatives
**Chain IX**
Producer – Retailer

**Table 8: Participation of farm households in different marketing chains of ragi on food security across rural-urban interface of Bangalore (n=447)**

| Marketing chains | Net price realized (Rs./q) | Farmers (%) | | Food security (%) | |
|---|---|---|---|---|---|
| | | North | South | North | South |
| I | 2100 | 20.8 | 21.1 | 55.0 | 60.0 |
| II | 2000 | 17.7 | 16.9 | 58.82 | 66.7 |
| IV | 2350 | 15.6 | 15.5 | 66.6 | 72.7 |
| V | 1800 | 9.4 | 11.3 | 55.5 | 75.0 |
| VI | 2300 | 22.9 | 22.5 | 59.0 | 62.5 |
| IX | 2150 | 13.5 | 12.7 | 61.5 | 55.5 |
| **Total** | | **100.0** | **100.0** | **59.4** | **64.8** |

Participation of farm households in different marketing chains of maize and their food security status was presented in table 9. Maize producers sold their produce using eight different marketing chains.Maize producers residing in south transect realized higher food security (70.2 %) than the north transect households (68.7 %). Producers realized higher price in regulated markets and their food security status was also higher in both the transects. As maize was one of the important cash crops grown mainly for the profit, majority of the farmers sold their produce in the regulated markets as they realized higher price for their produce.

The hypothesis that, participation of farm households in marketing chains has a positive influence on the food security is accepted.

**Table 9: Participation of farm households in different marketing chains of maize on food security across rural-urban interface of Bangalore (n=167)**

| Marketing chains | Net rice realized (Rs./q) | Farmers (%) | | Food security (%) | |
|---|---|---|---|---|---|
| | | North | South | North | South |
| I | 1250 | 10.8 | 7.4 | 55.6 | 57.1 |
| II | 1200 | 19.3 | 19.1 | 68.8 | 72.2 |
| III | 1250 | 6.0 | 7.4 | 60.0 | 71.4 |
| IV | 1350 | 9.6 | 11.7 | 62.5 | 72.7 |
| V | 1400 | 9.6 | 9.6 | 75.0 | 55.5 |
| VI | 1550 | 25.3 | 25.5 | 76.2 | 75.0 |
| VII | 1250 | 8.4 | 7.4 | 71.4 | 71.4 |
| IX | 1200 | 10.8 | 11.7 | 66.7 | 72.7 |
| **Total** | | **100.0** | **100.0** | **68.7** | **70.2** |

## 4. CONCLUSION

The present study examines whether participation of households in different types of marketing chains and production diversification would result in minimizing the food insecurity among households. Among the different crops cultivated in the study area, percentage of area under ragi was the highest followed by maize in both the transects. With respect to crop production diversity, south transect with relatively higher crop production diversity exhibited

higher food security (63 %). Within the gradients and the transects we could see more crop specialization. Different marketing chains were observed for ragi and maize. In case of ragi, majorityof the farm households sold their produce directly to consumers(farmers market) realized better price (Rs. 2350/q) and their food security status was also higher in both the transects. Overall food security status of the households was relatively better for the households residing in south transect (64.8 %).In case of maize, producers sold their produce in eight different marketing chains. Maize producers residing in south transect realized higher food security (70.2 %) than the north transect households (68.7 %) and the producers realized higher price in regulated markets as well as their food security status was also higher in both the transects. Agricultural production diversity is positively influencing food security. From a policy perspective, the findings suggest that, efforts are to be made to promote crop diversification to enhance food security. For better price realization, producers needs to be encouraged to adopt direct marketing or selling their produce through regulated markets.

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