Current Journal of Applied Science and Technology

38(6): 1-8, 2019; Article no.CJAST.53260
ISSN: 2457-1024
(Past name: British Journal of Applied Science & Technology, Past ISSN: 2231-0843, NLM ID: 101664541)

Food Consumption Pattern and Dietary Diversity in Rural-urban Interface of Bangalore

B. C. Ashwini[1*], K. B. Umesh[1], M. G. Chandrakanth[2] and Veerabhadrappa Bellundagi[1]

[1]Department of Agricultural Economics, UAS, GKVK, Bangalore, India.
[2]ISEC, Nagarabhavi, Bangalore, India.

Authors' contributions

This work was carried out in collaboration among all authors. Author BCA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors KBU and MGC managed the analyses of the study. Author VB managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2019/v38i630435
Editor(s):
(1) Ahmed Mohamed El-Waziry, Department of Animal Production, Faculty of Agriculture, Alexandria University, El-Shatby, Alexandria, Egypt and Department of Animal Production, College of Food and Agricultural Sciences, King Saud University, P.O. Box 2460, Riyadh 11451, Kingdom of Saudi Arabia.
Reviewers:
(1) Jayath P. Kirthisinghe, University of Peradeniya, Sri Lanka.
(2) Nagwa Thabet Elsharawy, Jeddah University, Saudi Arabia and Assiut University, Egypt.
(3) Hussin Jose Hejase, Al Maaref University, Lebanon.
Complete Peer review History: http://www.sdiarticle4.com/review-history/53260

Original Research Article

Received 10 October 2019
Accepted 21 December 2019
Published 27 December 2019

ABSTRACT

The paper has examined the pattern of food consumption, dietary diversity and factors influencing dietary diversity across rural-urban interface of Bangalore. The study is based on the primary data of 510 households comprising of 189 rural, 211 transition and 110 urban households. Simpson Index of Dietary Diversity (SIDD) was employed to estimate the diversity in the consumption basket and to determine the factors influencing dietary diversity, the fractional probit model was used. The results showed that, higher cereal consumption was observed in rural area than in transition and urban areas and cereals were the prominent source of energy across all the gradients. The total calorie intake to the recommended calorie intake in urban, transition and rural area indicated that, the calorie intake in urban area was higher than the recommended intake (2100 Cal/CU/day) while, the scenario was opposite in transition and rural areas. This necessitates interventions to educate households to modify the existing purchasing behavior to reduce the gap between recommended

**Corresponding author: E-mail: ashwinismile813@gmail.com;*

and actual calorie intake. Further, the dietary diversity was analysed using SIDD, among the gradients, highest dietary diversity score was observed in urban (0.82) followed by transition (0.79) and rural gradients (0.77). Factors such as per capita income, access to irrigation and urban area had positive influence on dietary diversity. While, family size had negative influence on dietary diversity. Furthermore, among the different food items, cereals took major share in quantity consumption, calorie consumption and food consumption expenditure. On the other hand, diversity in consumption basket was marginally high in urban area.

Keywords: Food consumption pattern; calorie intake; dietary diversity; rural-urban interface.

1. INTRODUCTION

Economic growth of a developing country depends on its food production capacity, employment opportunities, food consumption pattern; and health and nutritional status of the country. For better health and nutritional outcomes, a diversified and balanced food consumption pattern is sine-qua-non. During the past few decades (1960 to 2010), India has made a substantial progress in food grain production (115.6 mt to 241.4 mt), especially in rice and wheat production with the growth in yield by 1.9 per cent and 2.75 per cent per annum, respectively [1]. In recent years market driven agriculture has made a significant impact on food consumption pattern of rural households and urbanization and rising income levels have changed consumption habits of urban households [2]. Change in consumption pattern resulted from rising population, economic growth, increasing urbanization, increase in demand for non-cereal based food crops, conscious towards nutrition and change in tastes and preferences. Hence, change in consumption pattern leads to diversity in the food consumption basket.

As reported in many research articles [3,4,5,6] consumption of cereals, particularly coarse cereals have been decreasing over the years. In contrast to this consumption of high value food items like fruits, vegetables, meat and animal-based products, milk and milk products, sugar, sweets, etc. have increased over time. This has resulted in diversification of food basket across all income groups both in rural and urban areas (Kumar, 2017). Despite increased dietary diversity score over the years, the estimated gap between recommended dietary allowances and actual intake of nutrients has widened. Over the years, due to expanding urbanization and sedentary lifestyle, there has been an increase in intake of fat and sugar rich food and there is reduction in intake of carbohydrates, dietary fibers and essential micro nutrients [7]. These changes in food consumption pattern in India are due to the demographic and socio-economic changes, which include a rise in income, changes in relative prices of commodities, dietary changes, expanding middle income class, increasing numbers of working women, change in lifestyles, fast urbanization, improvements in transportation and storage facilities, rise of super markets and rising importance of single person households [8]. In this context, an attempt has been made to examine the pattern of food consumption, dietary diversity and factors influencing dietary diversity across rural-urban interface of Bangalore, India.

2. METHODOLOGY

2.1 Primary Data

The study used stratified random sampling technique for the selection of households across rural, transition and urban gradients surrounding the rural-urban conglomerate of Bangalore. The study area was south transect of Bangalore and it was further divided into three gradients/areas (rural, transition and urban). The distinction of the areas into three gradients were made based on the survey stratification index [9] considering the percentage of built-up area and its linear distance from the city centre (Vidhana Soudha). The required data was collected through base line list of Households from anganawadi centers of every village and the total sample size consisting of 510 households out of which 189 households were from rural, 211 from transition and 110 households from urban gradient.

2.2 Analytical Techniques Employed

This study employed descriptive statistics, Simpson Index of Dietary Diversity (SIDD) and fractional probit model. According to Hejase and Hejase [10], descriptive statistics deals with describing a collection of data by condensing the amounts of data into simple representative

numerical quantities. Therefore this paper involved the use of frequency tables, percentages and means, for summarizing food consumption, calorie intake and consumption expenditure on food and non-food items. 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 calorie 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).

2.3 Simpson Index of Dietary Diversity (SIDD)

Diversity in the consumption basket of sample households was analyzed using the Simpson Index of Dietary Diversity (SIDD) as indicated in equation 1.

$$\mathrm{SIDD} = 1 - \sum_{i=1}^{N} P_i^2 \quad (1)$$

Where, P_i is the proportion of the i^{th} food item in total monthly consumption of all food commodities by the members of household. The monthly estimates were subsequently averaged to get the final SIDD estimate. The Simpson index ranges between 0 and 1, 0 indicates complete specialization and 1 indicate complete diversification.

2.4 Fractional Probit Model

Fractional probit model was used to model the correlates of dietary diversity with SIDD as dependent variable. SIDD is an index ranges between 0 and 1 and it does not meet the normality assumptions of the standard OLS. Hence, we estimated a fractional probit model to see the factors influencing dietary diversity.

Fractional probit regression can be written as: $E(y/x) = \phi(x\beta)$

The model specification for the fractional probit regression model is given as:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 D_1 + \beta_3 D_2 + \beta_4 X_2 + \beta_5 D_3 + \beta_6 D_4 + \mu \quad (2)$$

Where,

Y= SIDD score
X_1 = Per capita income (Rs./month)
D_1 = Irrigation (1 = access to irrigation, otherwise '0')
D_2 = Livestock (1 = households having livestock, otherwise '0')
X_2 = Family size (no.)
D_3 = Urban (1 = if place of residence is urban, otherwise '0')
D_4 = Transition (1 = if place of residence is transition, otherwise '0')
β_i (i = 1…6) = Regression coefficients
μ= Random disturbance term

2.5 Consumptive Unit (CU)

The energy consumption of an average male doing a sedentary work is taken as one consumptive unit and the other coefficients are worked out on the basis of calorie requirements relative to that of an adult sedentary man.

2.6 Household Consumption Expenditure

The expenditure incurred by a household on domestic consumption during the reference period is the household's consumption expenditure. The household consumption expenditure is the sum total of the monetary values of consumption of various groups of items namely i) food (cereals, pulses, fruits, vegetables, sugar and jaggery, meat, egg and fish etc.) ii) non-food items (fuel and light, clothing, footwear, health service, education, miscellaneous goods and services, pan and supari, and durable articles etc.).

2.7 Monthly Per Capita Expenditure (MPCE)

For a household, this is the total household consumption expenditure during a period of 30 days subdivided by household size.

3. RESULTS AND DISCUSSION

3.1 Average Monthly per Capita Consumption of Different Food Items

The per capita consumption of various food items across sample households is depicted in Table 1. Among the gradients, rural households consumed the highest quantity of cereals (12.41 kg/CU/month) followed by transition (11.71 kg/CU/month) and urban gradient (10.78 kg/CU/month). The study conducted by Geetha [11] revealed that, per capita consumption of

cereals for 30 days in rural area was 12.40 kg and it was 10 kg in urban area. To the total quantity consumed by the households in rural area, cereals consumption constituted about 41.20 per cent followed by vegetables (21.08%), milk and milk products (16.63%), fruits (3.59%), sugar and sweets (3.42 %), pulses (3.39%), spices (2.92%), edible oil (2.79%) and remaining 4.99 per cent was constituted by dry fruits, meat and animal products and junk foods which constituted less to the total quantity of consumption. Across the transition households, cereals constituted the highest per capita consumption (36.23%) followed by vegetables (23.39%), milk and milk products (17.23%), fruits (5.31%), sugar and sweets (3.71%), pulses (3.13%), spices (3.06%) and remaining 5.27 per cent constituted by dry fruits and junk foods constituted less quantity to the total quantity of consumption. Similarly, in urban area, cereals constituted the highest per capita consumption (31.65%) followed by vegetables (25.54%) and others. Across all the gradients, cereals constituted the highest percentage of monthly per capita consumption among all other food groups but the percentage varied across the gradients, the percentage of cereals consumption was higher in rural gradient (41.20 %) followed by transition (36.23%) and urban gradient (31.65%). The 68th round of NSSO report reported that cereals consumption was higher in rural India than in urban India.

Table 1. Per capita consumption of food commodities by sample households in rural-urban interface of Bangalore

(kg/CU/month)

Food groups	Rural (n=189)	Transition (n=211)	Urban (n=110)	Overall(n=510)	RDA
Cereals	12.41 (41.20)	11.71 (36.23)	10.78 (31.65)	11.74 (35.12)	11.25
Pulses	1.02 (3.39)	1.01 (3.13)	1.35 (3.96)	1.15 (3.44)	1.35
Edible oil	0.84 (2.79)	0.83 (2.57)	0.91 (2.67)	0.89 (2.66)	0.75
Fruits	1.08 (3.59)	1.75 (5.41)	1.81 (5.31)	1.69 (5.06)	3
Vegetables	6.35 (21.08)	7.56 (23.39)	8.7 (25.54)	8.38 (25.07)	15
Dry fruits	0.29 (0.96)	0.35 (1.08)	0.36 (1.06)	0.35 (1.05)	-
Spices	0.88 (2.92)	0.99 (3.06)	0.88 (2.58)	0.94 (2.81)	-
Milk and milk products	5.01 (16.63)	5.57 (17.23)	6.29 (18.47)	5.61 (16.78)	9.00
Meat and animal products	0.84 (2.79)	0.91 (2.82)	1.12 (3.29)	0.99 (2.96)	1.50
Junk foods	0.37 (1.24)	0.44 (1.37)	0.53 (1.57)	0.48 (1.44)	-
Sugar and sweets	1.03 (3.42)	1.20 (3.71)	1.32 (3.88)	1.21 (3.62)	0.60
Total	30.12	32.32	34.06	33.43	-

Note: RDA- Recommended Dietary Allowance values as per balanced diet of ICMR recommendation; CU: Consumption Unit, Figure in parentheses indicate the percentages

Table 2. Calorie intake through various food commodities in rural-urban interface of Bangalore

(kcal/capita/day)

Food groups	Rural (n=189)	Transition (n=211)	Urban (n=110)	Overall (n=510)
Cereals	1210 (54.78)	1132 (50.67)	1039 (45.95)	1126 (50.36)
Pulses	68 (3.08)	75 (3.36)	82 (3.63)	75. (3.35)
Edible oils	243 (11.00)	250 (11.19)	270 (11.94)	256 (11.45)
Fruits	39 (1.77)	42 (1.88)	52 (2.30)	45 (2.01)
Vegetables	153 (6.93)	168 (7.52)	173 (7.65)	166 (7.42)
Dry fruits	12 (0.54)	24 (1.07)	31 (1.37)	21 (0.94)
Spices	18 (0.81)	19 (0.85)	18 (0.80)	18 (0.81)
Milk and milk products	192 (8.69)	214 (9.58)	243 (10.75)	216 (9.66)
Meat and animal products	112 (5.07)	117 (5.24)	135 (5.97)	121 (5.41)
Junk foods	34 (1.54)	58 (2.60)	71 (3.14)	55 (2.46)
Sugar and sweets	128 (5.79)	135 (6.04)	147 (6.50)	137 (6.13)
Total	2209	2234	2261	2236

Note: The recommended calorie intake in rural and urban gradients are 2400 Cal/CU/day and 2100 Cal/CU/day, respectively; Figure in parentheses indicate the percentage to total

Table 3. Per capita monthly consumption expenditure on various food commodities across sample households in rural-urban interface of Bangalore

(Rs./capita/month)

Food groups	Rural (n=189)	Transition (n=211)	Urban (n=110)	Overall (n=510)
Cereals	522 (38.50)	463 (32.93)	421 (28.84)	468 (32.93)
Pulses	116 (8.55)	131 (9.32)	135 (9.25)	125 (8.80)
Edible oil	72 (5.31)	76 (5.41)	92 (6.30)	81 (5.70)
Fruits	136 (10.03)	140 (9.96)	160 (10.96)	147 (10.34)
Vegetables	110 (8.11)	122 (8.68)	130 (8.90)	124 (8.73)
Dry fruits	32 (2.36)	30 (2.13)	53 (3.63)	42 (2.96)
Spices	35 (2.58)	38 (2.70)	35 (2.40)	41 (2.89)
Milk and milk products	165 (12.17)	212 (15.08)	224 (15.34)	201 (14.14)
Meat and animal products	82 (6.05)	88 (6.26)	78 (5.34)	84 (5.91)
Junk foods	43 (3.17)	66 (4.70)	101 (6.92)	71 (3.00)
Sugar and sweets	43 (3.17)	40 (2.84)	31 (2.12)	37 (2.60)
Total	1356	1406	1460	1421

Note: Figure in parentheses indicate the percentage

Table 4. Simpson Index of Dietary Diversity (SIDD) across rural-urban interface of Bangalore

(n=510)

Gradients	Simpson Index of Dietary Diversity (SIDD)
Rural	0.77
Transition	0.79
Urban	0.82
Overall	0.79

Note: SIDD ="0"Complete specialization, SIDD = "1" Complete diversification

Table 5. Factors associated with dietary diversity across rural-urban interface of Bangalore [Dependent variable = Simpson Index of Dietary Diversity]

n=510

Variables	Coefficients	z value
Per capita income (Rs./month)	0.000032*	3.32
Irrigation (D_1)	0.077	1.08
Livestock (D_2)	0.035	0.53
Family size (no.)	-0.033**	-2.37
Urban (D_3)	0.172**	2.14
Transition (D_4)	0.161**	2.15
Constant	0.792	5.01
Log pseudolikelihood value	-75.09	

*Note:*Significant at 1 per cent, **significant at 5 percent*

Irrigation dummy	*D_1*	*Livestock dummy*	*D_2*	*Location dummy*	*D_3*	*D_4*
Access	*1*	*Possess*	*1*	*Urban*	*1*	*0*
No access	*0*	*Do not possess*	*0*	*Transition*	*0*	*1*
				Rural	*0*	*0*

The results indicated that, cereal consumption was higher in rural area, while the other important food items like pulses, edible oil, fruits, vegetables, dry fruits, milk and milk products, junk foods, sugar and sweets consumption was higher in urban area than in transition and rural area but lesser than the ICMR recommendation except for edible oils and sugar and sweets. The overall consumption was higher in urban area (34.06 kg/CU/month) compared to transition (32.32 kg/CU/month) and rural area (30.12 kg/CU/month).

The monthly consumption of cereals in rural and transition area was more than the RDA, while it was opposite in urban area. Similarly, in edible oil and sugar and sweets consumption the actual intake was more than the RDA. The important

food items like vegetables, fruits, milk and milk products, meat and animal products and pulses consumption were less than the recommended (RDA) across all the three gradients. These were the main source of nutrients in human diet; hence, educating the households to meet the recommended RDA is needed. According to the survey conducted by Lakshmi et al. [12] consumption of food items rich in protein such as milk and milk products, fruits, vegetables, pulses and legumes found to be negligible (less than the RDA) which leads to micronutrient deficiencies and affects the general wellbeing and health status of the households.

3.2 Calorie Intake of Households across Rural-urban Interface of Bangalore

Human body needs energy for maintaining body temperature and metabolic activity and for supporting physical work and growth. The energy allowances recommended are designed to provide enough energy to promote satisfactory growth in infants and children and to maintain constant appropriate body weight and good health in adults. The factors which influence energy needs are age, body size, physical activity and in to some extent, climate and altered physiological status such as pregnancy and lactation. To maintain energy balance, the input must equal the output, which corresponds to a steady state.

In rural area energy derived from consumption of cereals was highest (1210 Cal/CU/day) followed by edible oils (243 Cal/CU/day), milk and milk products (192 Cal/CU/day), vegetables (153 Cal/CU/day) and the lowest energy derived was from dry fruits in rural area (12 Cal/CU/day). Similarly, cereals provided the highest energy to the respondents of transition area (1132 Cal/CU/day) followed by edible oils (250 Cal/CU/day), milk and milk products (214 Cal/CU/day), vegetables (168 Cal/CU/day) and the lowest energy was derived from dry spices (19 Cal/CU/day) (Table 2).

Cereals provided the highest energy to the respondents of urban area (1039 Cal/CU/day) followed by edible oils (270 Cal/CU/day), milk and milk products (243 Cal/CU/day), vegetables (173 Cal/CU/day) and the lowest energy derived was from dry spices (18 Cal/CU/day). Across all the gradient the highest energy intake was derived from cereals (mainly rice and wheat) and cereals was the main source of calorie intake in India [13]. Deaton and Dreze [14] reported that, calorie intake from cereals over the years is declining but the calorie intake from consumption of pulses, milk and milk products, meat and animal products is increasing while consumption of vegetables is decreasing with slight increase in fruit consumption. In our study if we consider the calorie intake of food items other than the cereals over the space (rural, transition and urban), the calorie intake from these food items were marginally higher in urban gradient followed by transition and rural gradients, while the order was opposite in calorie intake from cereals.

The comparison of calorie intake and recommended calorie intake in urban, transition and rural area indicated that, the calorie intake in urban area was higher than the recommended calorie intake (2100 Cal/CU/day) while it was less than the recommended in transition and rural gradients. In urban area this was mainly due to consumption of fast food items, biscuits, cakes etc. which lead to higher calorie intake. The study conducted by Srivastava and Chand [15] stated that the gap in nutritional intake was 20 per cent in urban area and 30 per cent in rural area.

3.3 Food Consumption Expenditure of the Households across Rural-urban Interface of Bangalore

The monthly per capita consumption expenditure on various food commodities across sample households in the study area is presented in Table 3. The monthly per capita food consumption expenditure was higher in urban households *i.e.* Rs. 1,460 followed by transition (Rs. 1,406) and rural households (Rs. 1,356). The study conducted by Pavithra [16] reported that the actual food consumption expenditure was higher in urban area (Rs. 446.57) than in rural area (Rs. 283.04). Among the 12 different food groups, cereals were the highest contributor to the total monthly consumption expenditure of the households across the gradients. Overall, the total food expenditure was Rs. 1421, of which cereals constituted 32.93 per cent (Rs.468) followed by milk and milk products (14.14%), fruits (10.34%), pulses (8.80%), vegetables (8.73%), meat and animal products (5.91%), edible oil (5.70%), dry fruits (2.96%) and the lowest food expenditure was on junk foods (2.04, %) Pavithra [16] estimated that the percentage of expenditure on cereals to the total expenditure was 36.84 per cent in rural area and in urban area the percentage was 25.72 percent. Results of this study are in line with the study conducted by Pavithra [16].

3.4 Household Dietary Diversity Score Across Rural-urban Interface of Bangalore

The SIDD (Simpson Index of Dietary Diversity) score across rural-urban interface was elucidated in Table 4. The SIDD score was relatively high in urban area than rural area indicating that, urban households' had access to variety of food items compared to rural households. This may be due to the market accessibility and also regular and higher income of the households. The SIDD score across gradients ranges from 0.77 to 0.82 with an average score of 0.79. Kumar et al. [17] assessed that, the dietary diversity score among different categories of farmers (marginal, small, medium and large farmers) in eastern India ranges from 0.70 to 0.72.

3.5 Factors Influencing Dietary Diversity

To study the influence of different factors on dietary diversity, the SIDD score was taken as dependent variable with per capita income, access to irrigation, livestock, urban, transition and family size are independent variables and the results were presented in Table 5. Fractional probit model was used to analyse the factors influencing dietary diversity.

The results revealed that per capita income, access to irrigation, location dummy for urban gradient had positive influence on dietary diversity, while family size was having negative relationship with the dietary diversity. Increase in per capita income increases the dietary diversity. In contrast to this, increase in family size decreases the dietary diversity vis-à-vis decreases the diversity in consumption basket. Large family size was a barrier for dietary diversity and also food security. Powell et al., [18] reported that, in large family size it was relatively difficult to get enough food because majority of the family size depends on his/her household head and there is less likely to have leftovers to eat at next meal.

4. CONCLUSION

Cereals were the prominent source of energy across the gradients. Higher cereal consumption was observed in rural area than in transition and urban areas. The dietary profile of sample households in terms of calorie intake varied across the gradients. The higher calorie intake was obtained from the consumption of cereals followed by edible oils and milk and milk products across all the gradients. Households in urban area consumed more than the recommended calorie intake (2100 Kcal/CU/day), while, households in rural areas consumed less than the recommended calorie intake (2400 Kcal/CU/day). Monthly per capita expenditure on food was high in urban area followed by transition and rural area. Cereals constituted a major share in food expenditure. However, expenditure on milk and milk products, pulses, fruits and vegetables were less and these are the rich sources of nutrients, vitamins and minerals. The total calorie intake to the recommended calorie intake in urban, transition and rural area indicated that the actual calorie intake in urban area was higher than the recommended calorie intake (2100 Cal/CU/day). While, the scenario was opposite in transition and rural area. This necessitates interventions to educate households to change/modify the existing purchasing behavior to reduce the gap between recommended and actual intake. The expenditure on non-food items was marginally higher than expenditure on food items in the study area.

Among the gradients the highest dietary diversity score was observed in urban gradient (0.82) followed by transition (0.79) and rural gradient (0.77). Factors such as per capita income, access to irrigation, location dummy for urban area had positive influence on dietary diversity, while family size was having negative relationship with the dietary diversity. Increase in per capita income increases the score of dietary diversity and in line with this diversity score was high in urban area. Since, presence of well-established income generating activities at the urban gradients compared to rural and transition areas. Hence, need of well-established income generating activities particularly at rural areas is very essential.

ACKNOWLEDGEMENT

The paper is the part of Indo-German Collaborative Research project titled" The Rural-Urban Interface of Bangalore - A Space of Transition in Agriculture, Economics and Society"- Sub project "Food Insecurity at Different Stages of Urbanization". The Department of Biotechnology (DBT), GOI, New Delhi (Sanction order: BT/IN/German/DFG/14/ BVCR/2016 dated 16th November 2016) is duly acknowledged for the financial support for this project.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Nanda KM, Grover DK. Estimation of Growth Trends and Impact Assessment of National Food Security Mission on Chickpea Production in India. Economic Affairs. 2018;63(4):941-951.
2. Venkatesh P, Sangeetha V, Singh P. Relationship between food production and consumption diversity in India – Empirical evidences from cross section analysis. Agricultural Economics Research Review. 2016;29:139-148.
3. Kumar P, Mathur VC. Structural changes in demand for food in India. Indian Journal of Agricultural Economics. 1996;51(4): 664-673.
4. Kumar P. Food demand and supply projections for India. Agricultural Economics Policy Paper. Indian Agricultural Research Institute, New Delhi. 1998;98-101.
5. Kumar P. Food and nutrition security in India: The way forward. Agricultural Economics Research Review. 2017;30(1): 1-21.
6. Kumar P, Mruthyunjaya, Dey MM. Long-term changes in Indian food basket and nutrition. Economic and Political Weekly. 2007;XLII(35).
7. Popkin BM. The world is fat: The fads, trends, policies and products that are fattening the human race. Avery Publisher, Penguin. 2009;1-240.
8. Umanath M, Chengappa PG, Vijayasarathy K. Consumption pattern and nutritional intake of pulses by segregated income groups in India. Agricultural Economics Research Review. 2016;29: 53-64.
9. Ellen MH, Monish J, Nils N, Thomas M. Construction and use of a simple index of urbanization in the rural–urban interface of Bangalore, India. Sustainability. 2017;1-21.
10. Hejase AJ, Hejase HJ. Research Methods: A practical approach for business students (2nd edition). Philadelphia, PA, USA: Masadir Inc; 2013.
11. Geetha KT. Consumption patterns among selected rural and urban households in Coimbatore city. International Journal of Multidisciplinary Research. 2011;1(2):46-61.
12. Lakshmi AJ, Khyrunnisa B, Saraswathi G, Jamuna P. Dietary adequacy of Indian rural preschool children–influencing factors. J. Trop Pediatr. 2005;51: 39-44.
13. Kolady D, Srivastava S, Singh J. Can agricultural growth explain the reversal of a declining trend in per capita calorie consumption in India? Paper presented at the Agricultural and applied Economics Association Annual Meeting, Boston, Massachusetts. 2016;1-29.
14. Deaton A, Drèze J. Food and nutrition in India: Facts and interpretations. Economic and Political Weekly. 2009;44 (7):42-65.
15. Srivastava SK, Chand R. Tracking transition in calorie-intake among Indian households: Insights and policy implications. Agricultural Economics Research Review. 2017;30(1):23-35.
16. Pavithra BS. An economic analysis of food consumption pattern in Karnataka with special reference to Mysore District, M.Sc (Agri) Thesis, University of Agricultural Science, Dharwad; 2008.
17. Kumar A, Saroja S, Singh RKP, Jee S. Agricultural diversity, dietary diversity and nutritional intake: An evidence on inter-linkages from village level studies in Eastern India. Agricultural Economics Research Review. 2016;29:15-29.
18. Powell B, Kerr RB, Young SL, Johns T. The determinants of dietary diversity and nutrition: Ethno nutrition knowledge of local people in the East Usambara mountains, Tanzania. Journal of Ethnobiology and Ethnomedicine. 2017;13:23.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/53260