Extent and Determinants of Livelihood Diversification in North and South Bengaluru : An Interspatial Analysis

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Abstract

The study attempts to quantify the magnitude of livelihood diversification in north and south transects of Bengaluru across rural-urban. Across all the gradient of both transects, majority of the households have one major source of livelihood option (47.08 per cent in south transition to 75.00 per cent in south of urban). North of Bengaluru is more diversified (SID=0.42) than south of Bengaluru (SID=0.37). Simpson Diversification Index (SID) didn't show any significant difference in livelihood diversification over the rural-urban gradient in north of Bengaluru, but differences were significant in south of Bengaluru. The major determinants of livelihood diversification are annual income of the household, age of the household head, distance to the market, land man ratio, extension contact and organizational membership of the household head.

Keywords: Livelihood diversification, Urban-rural transition, Simpson diversity index (SID)

KARNATAKA, like many other states in India, is also a victim of continuous droughts from 2011 to 2014 in majority of its districts. The Government of Karnataka declared 28 out of 30 districts as drought hit (Anon., 2014). The changes in precipitation, climate, seasons being delayed has led to accumulation of distress among the farming community and farmers being economic agents are trying to find the options to mitigate these challenges by resorting to off-farm and non-farm income generating activities (Gecho, 2017). The importance of livelihood diversification can be better understood in terms of addressing constraints to income generating capacity (Birthal, *et al*., 2014). In continuance to this, India is witnessing the phenomena of urbanization at a much faster rate than before, it was 27.80 per cent in 2001 which went up to 31.20 per cent in 2011 and is likely to reach more than 50 per cent by 2050 (Roopa, 2015). Urbanization helps in speedy growth of nation. As the density of people increases, amenities like schools, hospitals and other infrastructure facilities should become enhanced quickly. Transportation is another critical area which attains importance because good transportation facility can lead to rapid economic development of the nation. Enormous investment to increase employment, healthcare, education and food security comes with urbanization (Tripathi, 2013).

Over the years, farming has been showing falling income levels and the need for diversification to other activities to sustain the rural livelihoods has caught the attention of policy-based research (Barrett *et al*., 2001). It has been observed that the rural people just do not take up agriculture and allied activities to meet the ends; they also construct a diverse portfolio of activities (Ellis, 2000). In fact, 'livelihood diversification is a process by which rural households construct a diverse portfolio of activities and social support capabilities in their struggle for survival and improvement in their standards of living'. Livelihood diversification is the most important source of poverty reduction for small farmers in South and South-East Asia (Anon., 2001).

In India, rural livelihoods are increasingly becoming unsustainable, owing to inability of the one or two livelihoods they were practicing are no longer able to fulfil the complete requirements of rural mass (Hiremath, 2007). Consequently, rural households look towards alternative sources of employment and income to achieve a minimum level of standard of living. The ground situation in rural areas is much serious and needs immediate policy intervention as NSSO survey has revealed that about 27 per cent of the farmers consider farming as unviable and given a

chance, about 40 per cent farmers would quit farming to take up other livelihood activities (Kumar *et al.*, 2006).

Bengaluru is one of the fastest urbanizing locales. Rural areas around Bengaluru are experiencing the influence of urbanization with greater magnitude in recent days than before; similar phenomenon is noticed in most of the developing countries. The present study is aimed at examining the impact of urbanization on rural and transition areas in terms of livelihood options and factors leading to diversification of livelihood activities with the following objectives :

1) To quantify the magnitude of livelihood diversification in north and south transects of Bengaluru across rural-urban interface

2) To determine the major factors determining livelihood diversification in north and south transects of Bengaluru across rural-urban interface

METHODOLOGY

The study was conducted in the state of Karnataka during the period 2016-17. Primary data was collected through the pre-tested structured survey schedule through personal interview with the help of trained data enumerators under the Indo- German project '*The Rural Urban Interface of Bengaluru - A space of transition in Agriculture, Economics and Society* (I CO – 5)'. Bengaluru was referenced to identify two transects namely north and south of Bengaluru taking *Vidhana Soudha*, as the central point of the city. The distance of up to about 20 to 25 km away from the city centre, shows strong correlation of building density with distance (the closer to the city, the higher the percentage of built-up area). Beyond that, however, the two parameters were negatively correlated (Ellen *et al*, 2017). Each transect was further divided into three layers namely rural, transition (peri-urban) and urban areas. The distinction of the areas into rural, transition (peri-urban) and urban area was made based on the Survey Stratification Index (SSI) developed by considering percentage of built-up area and its linear distance from the city centre. Accordingly, primary data was collected from 60

households of urban, transition and rural area, forming 180 samples in north and south of Bengaluru and summing to 360 respondents for the study.

Bengaluru was purposively selected for the study as it represents one of the fastest growing urban centres of India. Stratification of the samples was done to represent two transects *viz.,* north and south of Bengaluru along with three layers in each transect *i.e.,* urban, transition and rural. Samples in each layer were drawn using simple random method.

The study uses descriptive statistics, Simpson Index of Diversity (SID) and linear regression analysis to explore the patterns of important socio-economic and demographic features of the sample respondents, magnitude of diversification and the factors influencing livelihood diversification of households in north and south of Bengaluru. The extent of diversification is measured using SID which is used as dependent variable. Paired t-test and one way ANOVA was carried out to check the statistical significance of the mean values of the SID. The predictor variables that were used in this model are presented in Table 1 (Khatun and Roy, 2012; Saha and Bahal, 2010).

Livelihood Diversification Index – Simpson index (SID) is used for its computational simplicity, robustness and wider applicability to measure livelihood diversification. Considering the share of income from various sources *viz.,* crop farming, dairying, off-farm wages, non-farm wages and other engagements like trading, services, migration etc., SID is computed (Khatun and Roy, 2016; Pavithra and Vatta, 2013). Simpson index is computed using the formulae given below (equation 1):

$$SID = 1 - \sum_{i=1}^{N} P_i^2 \qquad \text{-------------- (1)}$$

Where, N is the total number of income sources and P_i represents income proportion of the ith income source. In this study, SID worked out considering income share of the major livelihood activities. SID ranges from '0' perfect specialization (no diversi-fication) to '1' case of complete diversification.

TABLE 1

Description of the explanatory variables

Variable	Name	Definition	Type
AGE	Age of the head of the household	Years	Continuous
EDU	Education of the head of the household	Years of schooling	Continuous
GEN	Gender of the head of the household	Male:1 ; Female:0	Dichotomous
F-SZ	Family Size of the household	Numbers	Continuous
OWN	Ownership of land	Yes: 1; No:0	Dummy
L-SZ	Land Size of the household	Hectares	Continuous
MLR	Man-Land-Ratio	Ratio	Continuous
IRG	Irrigation	Yes: 1; No: 0	Dummy
ANY	Annual Income of household	Numbers	Continuous
LON	Access to loans	Yes: 1; No:0	Dummy
EXN	Access to extension	Yes: 1; No: 0	Dummy
DST	Distance to market	Kilometre	Continuous
ORG	Membership in organization	Yes:1; No:0	Dummy
WLT	Wealth Index	Ratio	Continuous
GDY	Gradient dummy	Rural: 1; Urban : 0	Continuous

Major Drivers of Livelihood Diversification can be identified using multiple regression analysis (Saha and Bahal, 2010) using equation (2) :

$$SID = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots\ldots + \beta_{15} X_{15} + \mu \quad \text{------ (2)}$$

SID = Simpson Livelihood Diversification Index

β_0 = Intercept

β_i^s = Parameters

μ = Stochastic error term

Age : Major decisions of the households are being undertaken by the household head. Hence, the age of the head of the household is considered. Further, it is expected that diversification of livelihood activities is more with younger head.

Education : The number of years of schooling of the head of the household is considered with an expectation of positive relationship with livelihood diversification.

Gender : Sex of the head of the household is an important factor with respect to decision making and risk taking. A positive relationship of livelihood diversification is associated with male headed households.

Family size of the household: Family size affects the ability of household to supply labour to the farm. In a household some of the members may take up off-farm and non-farm activities to augment the household income. Hence, affirmative relationship between livelihood diversification and family size is hypothesized.

Land-man ratio : This indicates per capita availability of land and a decrease in it value indicates disguised unemployment in the household. The surplus labour tries to find the suitable employment outside the agriculture and ventures into non-farming activities. Hence, it is hypothesised that it is negatively associated with livelihood diversification.

Wealth-index : Wealth index was formulated using physical capital, human capital (knowledge and skills; expertise in a vocation) and financial capital (savings, deposits and other investments).Therefore, positive association between livelihood diversification and wealth-index is hypothesized.

Irrigation : Water being the life-line of existence on the earth, it also opens up multiple opportunities of

vocation to be practiced particularly in agriculture and allied activities and other livelihood opportunities in general. It is therefore assumed that livelihood diversification will have a positive relationship with irrigation facility.

Distance to market : Proximity to market increases the prospects of non-farm employment. Thus if the distance is more to the city centre it is expected to be negatively associated with the livelihood options.

Loans : Loans have immense potential to make impossible a possibility and access to finance or credit has a positive relationship with the strategies of livelihood generation. In the study the access to the finance as one explanatory variable is considered.

Membership in organizations : A household head having membership in SHG / PMPCS (KMF) / NGO's / village committee etc., indicates an important social capital in determining livelihood diversification with a positive relationship.

Ownership of land : Land ownership is an indicator of resourcefulness of the household. This was coded as a dummy variable taking a value of one if the household owned land and zero otherwise. This variable is expected to be having positive relationship with livelihood diversification.

Land holding size : Farm size measured in hectares is expected to be positively associated with household choice of livelihood activities.

Annual income : Income refers to the earnings from all the sources in a year. It was hypothesised to be positively associated with diversification of livelihood options.

Extension : Exposure to model farms, training and visit, demonstrations to livelihood options including agriculture related activities. Training increases the skill and competency level of the households and therefore it is assumed to be having positive relation with livelihood diversification.

Rural-urban gradient : Urban and transition were grouped as urban for the purpose of the analysis and rural was used as control. With urbanization livelihood diversification should attain value nearer to one, *i.e.,* a positive relationship was anticipated.

RESULTS AND DISCUSSION

Table 2 provides the important features of the sample households across north and south transects and rural-urban gradients of Bengaluru. The household heads in the north part had relatively grater literacy rate (67 to 79 %) compared to south part (58 to 72 %). Average household size in rural areas in both transects are equivalent to the urban family size. This clearly indicates decreasing family size in rural areas as well and the emergence of nuclear families even in rural areas. The younger household heads have certain management potentials like decision making and risk taking as was noted in north of Bengaluru, where as in south of Bengaluru household heads were more experienced and elderly indicating some amount of risk aversion and non-enterprising attitude.

Table 3 shows that in all the gradients of both transect majority of the households have one major source of

TABLE 2

Important features of the sample households in north and south of Bengaluru across rural-urban gradient

Characteristics	North of Bengaluru			South of Bengaluru		
	Urban	Transition	Rural	Urban	Transition	Rural
Avg household size (number)	5.00	5.00	5.00	4.00	5.00	4.00
Literacy rate of head of households (%)	79.00	74.00	67.00	72.00	63.00	58.00
Avg age of head of the household (years)	43.00	47.00	47.00	72.00	63.00	58.00

TABLE 3

Number of income sources among households in north and south of Bengaluru across rural-urban gradient

Number of Sources of income	North of Bengaluru			South of Bengaluru		
	Urban	Transition	Rural	Urban	Transition	Rural
One source	59.72	58.22	58.06	75.00	47.08	64.67
Two Sources	33.33	31.51	32.90	20.54	24.90	28.80
Three sources	5.56	8.22	8.06	3.57	27.24	4.35
More than three	1.39	2.05	0.97	0.89	0.78	2.17

livelihood option (47.08 per cent in south transition to 75.00 per cent in urban gradient of south transect). A good percentage of households are having two sources of livelihood vocation (approximately 30 % in both transects of the study area). Only a few households (3 to 5 %) are having more than three economic activities to sustain their livelihoods. Similar results were obtained by Pavithra and Vatta, 2013 documenting the number of income sources across cross-sections. They have recorded that majority of the households had one major source of income and the diversification to other income generating activities is mainly distress driven.

A significant distinction in the degree of livelihood diversification across the north and south transect was observed as reflected by the Simpson Index of Diversification given in Table 4. North of Bengaluru

TABLE 4

Simpson Diversification Index values in north and south of Bengaluru across rural-urban gradient

Gradient	Simpson Diversification Index	
	North of Bengaluru	South of Bengaluru
Urban	0.42 [NS]	0.45 [*]
Transition	0.43 [NS]	0.37 [*]
Rural	0.41 [NS]	0.30 [*]
Overall	0.42 [**]	0.37 [**]

Note : ** Indicates statistical significance at five per cent level for inter transect difference (Paired t-test); NS: Non-significant for inter-gradient difference within north of Bengaluru (One way ANOVA test); * Indicates significance at one per cent for inter-gradient difference within south of Bengaluru (One way ANOVA)
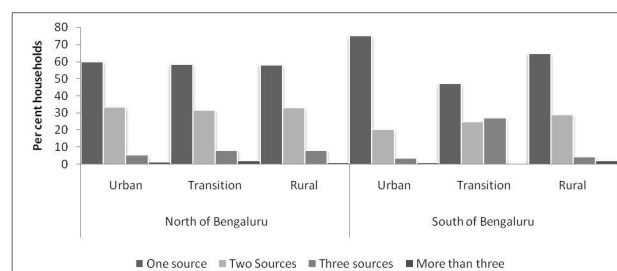
is more diversified (SID=0.42) than south of Bengaluru (SID=0.37). This disproves the hypothesis that the north and south are experiencing the same level of diversification. As noted by Khatun and Roy, 2016 the rural livelihoods being location specific there is a need to device policy and programmes as per the regional needs. However, interspatial SID didn't show any significant difference in livelihood diversification over the rural-urban gradient in north of Bengaluru, which concludes that the hypothesis of no difference is accepted. The results of extent of livelihood diversification across different strata of south transect indicated distinctness over rural (0.45), transition (0.37) and urban (0.30) layers (Fig. 1). Hence, there is ground to believe that the scope of livelihood diversification across the layers of south of Bengaluru is vivid and distinct.

Fig. 1: Distribution of households according to number of income generating acticvities

Table 5 enlists the percent households categorised as having relatively high, medium and low level of livelihood diversification across north and south transects of Bengaluru over the three layers of rural-urban gradient. A good majority of households in north transect were found in the category of medium (45.56 %), followed by 32.78 per cent under low and 21.66

TABLE 5

Distribution of households according to Simpson Diversification Index in north and south
of Bengaluru across rural-urban gradient

Diversification index class	North of Bengaluru			Total	South of Bengaluru			Total
	Urban	Transition	Rural		Urban	Transition	Rural	
Low	22.00	21.00	17.00	59.00	26.00	22.00	22.00	71.00
	(36.67)	(35.00)	(28.34)	(32.78)	(43.33)	(36.67)	(36.67)	(39.44)
Medium	23.00	27.00	32.00	82.00	14.00	23.00	28.00	66.00
	(38.34)	(45.00)	(53.34)	(45.56)	(23.33)	(38.33)	(46.67)	(36.67)
High	15.00	12.00	11.00	39.00	20.00	15.00	10.00	43.00
	(25.00)	(20.00)	(18.32)	(21.66)	(33.34)	(25.00)	(16.66)	(23.89)
Total	60.00	60.00	60.00	180.00	60.00	60.00	60.00	180.00
	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Note: Figures in parentheses are percentages to the total

per cent under high level of livelihood diversification. A similar pattern was observed in south of Bengaluru with 39.44, 36.67 and 23.89 per cent of the households under low, medium and higher scope of diversification in income generating activities. The survey conducted by Saha and Bahal, 2010, indicated that majority of the households had medium level of diversification, which is inconformity with the results. Further, they have opined that diversification can reduce both predictable and un-predictable fluctuations in income and assure smooth flow of income to the households.

Nearly 36.67 per cent and 25.00 per cent of the urban households of north part categorised as having low and high diversification in their livelihood activities, respectively. However, majority of the rural households (53.34 %) in the same north transect identified under medium level of SID value. The distribution of households in south of Bengaluru over the rural-urban layers followed the similar pattern of north part *i.e.,* 33.34 per cent of urban households, 46.67 per cent of rural households and 43.33 per cent of urban households categorised as having high, medium and low level of livelihood diversification.

The objective of the present study was to identify the major determinants of the livelihood diversification in the vicinity of Bengaluru. The empirical results of the

analysis are presented in the Table 6. The multiple linear regression functional form was employed for identifying the determinants of livelihood diversification as mentioned in the methodology. The results of the analysis show that annual income of the household, age of the household head, distance to the market and land man ratio were found to be negatively associated with the diversification of the livelihood. Increase in household income should have led to increased diversification, but the findings are contradicting the hypothesis. This may be because of the factors like enterprise risk and uncertainty. Younger household heads are more dynamic and capable of making quick and timely decisions compared to the older heads and it is reflected by significant and negative relation of the age of the head of the household with the dependent variable. As the distance to the market increases the chances of diversification decreases and the results have upheld the hypothesis. Land man ratio is hypothesised to be negative and the results are also negative this clearly means that surplus labour in the household will try to find jobs in other sectors. Other variables which had significant and positive impact on livelihood diversification were extension contact and organizational membership. Both of these variables are potential tapping, capacity building and skill enhancing in nature and hence they are positively influencing the dependent variable. The results

TABLE 6

Determinants of livelihood diversification in the vicinity of Bengaluru

Explanatory variables	Co-efficents		t-statistic	Prob. Value
Constant	0.4614		1.48	0.147
Annual income of the household (Rs.)	-7.2E-09	**	-1.86	0.071
Age of the head of the household (Years)	-0.0049	**	-1.81	0.079
Education (Years of schooling)	-0.0126		-1.5	0.143
Gender (Male:1, Female :0)	-0.1260		-0.71	0.482
Distance to market (km)	-0.0046	*	-2.34	0.025
Family size (Numbers)	0.0016		0.08	0.938
Ownership of land (Yes:1, No:0)	0.1697		1.46	0.152
Size of the holding (Ha)	0.0319		1.45	0.155
Access to irrigation (Yes: 1, No:0)	0.0297		0.41	0.687
Extension contact (Yes: 1, No:0)	0.2011	*	2.67	0.011
Organizational membership (Yes:1, No:0)	0.2451	*	2.27	0.029
Gradient dummy (Urban:0, Rural:1)	-0.0759		-0.96	0.341
Wealth index (ratio)	-0.0869		-0.7	0.489
Access to loan (Yes:1, No:0)	-0.0372		-0.35	0.732
Land_man ratio (Ratio)	-0.1368	*	-2.02	0.050

Dependent variable: Simpson Index of Diversification $R^2 = 0.65$

obtained by researchers Khatun and Roy, 2012, also enlisted some of these factors as the important determinants of livelihood diversification in West Bengal. This necessitates the urgency of evolving mechanisms to address the livelihood security through livelihood diversification. The prominence of factors like education, extension (skill development) and organizational participation among the households is reiterated.

The study has indicated that the north part of the Bengaluru is definitely more diversified in its livelihood activities compared to the south transect of Bengaluru. There seems to be no significant difference in diversification of professions of household across rural-urban layer in north of Bengaluru. However, the situation in south of Bengaluru is indicative of clear differences in livelihood diversification across the rural-urban gradient. The major determinants of livelihood diversification are annual income of the household, age of the household head, distance to the market, land man ratio, extension contact and organizational membership of the household head

Exposure to entrepreneurship development programmes (EDP's) should be increased by augmenting extension machinery, organizational membership, study trips and such other transfer of technology methods to increase entrepreneurial opportunities. Such type of training will increase their livelihood options by manifolds. Households in the rural stratum are to diversify into market-oriented non-farm activities in addition to farm activities by enhancing their access to education, vocational training and rural credit. Government has been doing to improve rural infrastructure which develops capacity of the economic system to absorb increased capital and yield benefits to reduce poverty in the rural areas.

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REFERENCES

ANONYMOUS, 2001, *Farming Systems and Poverty - Improving farmers livelihoods in a changing world*, World Bank, Washington, DC.

ANONYMOUS, 2014, News segment: 28 of 30 districts in Karnataka get drought-affected tag from govt, In: News Daily- Times of India, dated 08th May, 2014.

BARRETT, C. B., REARDON, T. AND WEBB, P., 2001, Non-farm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics and policy implications, *Food Policy,* **26** (4) : 315 - 331.

BIRTHAL, P. S., NEGI, D. S., JHA, A. K. AND SINGH, D., 2014, Income sources of farm households in India: Determinants, distributional consequences and policy implications. *Agricultural Economics Research Review,* **27** (1) : 37 - 48.

ELLEN M. HOFFMANN, MONISH JOSE, NILS NÖLKE, AND THOMAS MÖCKEL, 2017, Construction and use of a simple index of urbanisation in the rural - urban interface of Bangalore, India. *Sustainability*, **9** (11), 2146 : 1 - 21.

ELLIS, F., 2000, *Rural Livelihoods and Diversity In Developing Countries*. Oxford University Press, Oxford, UK.

GECHO, Y., 2017, Rural farm households income diversification: The case of Wolatia Zone, Southern Ethiopia, *Social Sciences,* **6** (2) : 45 - 56.

HIREMATH, B. N., 2007, The changing faces of rural livelihood in India, Paper presented In: *National Civil Society Conference on What it Takes to Eradicate Poverty*, Institute of Rural Management, Anand, December 4 - 6.

KHATUN DILRUBA AND ROY, B. C., 2012, Rural livelihood diversification in West Bengal: Determinants and constraints. *Agricultural Economics Research Review*, **25** (1) : 115 - 124.

KHATUN DILRUBA AND ROY, B. C., 2016, Rural livelihood diversification in West Bengal: Nature and extent. *Agricultural Economics Research Review*, **29** (2) : 183 - 190.

KUMAR, P., SINGH, N. P. AND MATHUR, V. C., 2006, Sustainable agriculture and rural livelihoods: A synthesis. *Agricultural Economics Studies,* **32** (6) : 850 - 875.

PAVITHRA, S AND VATTA KAMAL, 2013, Role of non-farm sector in sustaining rural livelihoods in Punjab. *Agricultural Economics Research Review,* **26** (2) : 257 - 265.

ROOPA, H. S., 2015, Economic impact of urbanization on production systems and agro-ecosystem services in peri-urban and rural areas. *Ph.D. Thesis* (Unpub.), University of Agricultural Sciences, Bengaluru.

SAHA BISWARUP AND BAHAL RAM, 2010, Livelihood diversification pursued by farmers in West Bengal, *Indian Research Journal of Extension Education*, **10** (2) : 1 - 9.

TRIPATHI AND SABYASACHI, 2013, An overview of India's Urbanization, Urban Economic Growth and Urban Equity, Munich Personal RePEc Archive (MPRA) Paper No. 45537, Institute for Social and Economic Change, Bengaluru, pp. 1 - 21 .

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