Impact of agriculture growth on poverty reduction- A case of Karnataka

ABSTRACT

Karnataka is one of the progressive states in the country even though it experiences the challenges of poverty and it has wide variation, depending on rural-urban disparities, region, caste, and religion. Agriculture as primary sector contribute notably to the country's Gross Domestic Product(GDP) and being main occupation for majority population acts as largest source of livelihood for the rural poor by creating enormous employment opportunities thusby increasing the income levels, agricultureplay a key role in reducing poverty. The present study was conducted to analyse the impact of agriculture growth on poverty reduction in Karnataka state by using secondary data. The relationship between poverty, agriculture GDP per worker and non-agriculture GDP per worker was analysed using pooled panel regression analysis. The results of the study shows that contribution of agriculture sector was far more in decreasing poverty than the non-agricultural sector, as every one per cent increase in agriculture GDP per worker reduced poverty by 1.36 per cent as against 0.80 per cent in non-agriculture GDP per worker. As majority of people depends on agriculture for their livelihood, it is evident that the agriculture sector has a greater impact on alleviating poverty among rural population. However, it suggested that the balanced growth across all three sectors of the economy will help to reduce the poverty rates by increasing income level of the population.

Key words: Reduction in poverty, Agriculture, Non- Agriculture, GDP per worker, Karnataka

Introduction :

Agriculture has substantial growth linkage impacts on the rest of the economy in addition to its direct effects on reducing poverty and for long, agriculture has been considered as an important instrument in reducing poverty levels (Janvry and Sadoulet, 2021).The majority of poor households were financially supported in rural areas, which made them engage in agricultural activities, which subsequently increased the income of 40 per cent of the poorest people. However, massive global challenges such as climate change, tenacious conflict, and the pandemic Covid-19 were again pushed more people into poverty, and it is not possible to achieve one of the agenda of Sustainable Development Goals (SDG) to end poverty by 2030 (Fan *et al*.,2021).

Karnataka is one of the progressive states in the country and also experiences the challenges of poverty where, 13.10 per cent population are poor. The poverty status in Karnataka has wide variation, depending on rural-urban disparities, region, caste, and religion. The National Multidimensional Poverty Index (NMPI), released by the NITI Aayog points to an increased poverty gap between districts in the south and north Karnataka regions where Yadgiri district surrenders to a highest poverty rate with 41.67 per cent of the poor(NMPI, 2021).To reduce poverty, the world requires the agriculture sector

to grow considerably faster and more inclusively in the future and it is a key means of reducing poverty, particularly in rural areas. In India, about 54.60 per cent of the workforce directly depends on agriculture for their livelihood and 57.80 per cent of the rural household population professionally engages in agriculture (Agriculture Statistics at a glance, 2020). The study conducted by Bathla *et al.* (2020) studied on agricultural growth and rural poverty reduction in India revealed that marginal returns per rupee spent was highest from well irrigation followed by public investment in agriculture, education, health and energy at the national level.

In Karnataka about 68 per cent of the population depends on agriculture for their livelihood. The state's estimated GDP growth for the year 2021-22 was 9.5 per cent and the state has shown consistent economic performance above the national average (Karnataka at a glance, 2021).

Thus, continued agriculture growth is defensible owing to its strategic position in poverty reduction, sizable economic contribution, and growing employment opportunities. In these thrives, poverty reduction through agriculture becomes a noticeable concept to the government, academia, and national and international development organizations. Therefore, organizations like Food and Agricultural Organisation (FAO) and World Bank are predominantly emphasizing the significance of agricultural interventions towards poverty reduction (World Development Report, 2021). Hence, the present study was taken up to analyse the impact of agriculture growth on poverty reduction with special reference to Karnataka state.

Material and methods

The study was based on secondary data. Secondary data pertaining to poverty rates, sectorial GDP and total available workers were collected from published sources and official websites like *indiastat.com*, District at a Glance Reports, Economic Survey Reports and Population Census and Agriculture Census etc. In addition to published government reports, reports of Directorate of Economics and Statistics and also other unpublished sources were compiled for tabulation.

The study was conducted in Karnataka state for two time periods namely, Period - I (2011-12) and Period - II (2019-20) and the average annual reduction in poverty rates was calculated for all the thirty districts. The districts which showed the annual average reduction in poverty rates were only selected to analyse the impact of agriculture growth on poverty reduction and hence in total twenty six districts were considered.

To analyse the impact of agriculture growth on poverty reduction the pooled panel regression analysis was used, it estimates the relationship between poverty, agriculture GDP per worker and non-agriculture GDP per worker.

The agriculture GDP per worker and non-agriculture GDP per worker were computed using below mentioned calculation procedure.

The agriculture GDP per worker, as the name implies, the ratio of total GDP for the sector divided by the number of economically active workers claiming agriculture as their main source of income.

Non-agriculture GDP per worker was defined as the difference between total national and agricultural GDP divided by the difference between total national and agricultural employment.

The high correlation between the variables, agriculture GDP per worker and non-agriculture GDP per worker stimulated the problems of multicollinearity and heteroscedasticity. Hence, to test the presence of Multicollinearity and to verify the presence of heteroscedasticity, Variance Inflation Factor (VIF) and the Breusch Pagan test (Gujarati and Porter, 2009) were conducted.

Where, VIF was calculated using the formula,

$$\mathbf{VIF} = \sqrt{(1 - R^2)}$$

Where, R^2= Regression coefficient

The procedure of the Breusch Pagan test was indicated below;

Estimate the regression model,

$$y = \beta_0 + \beta_1 x + u$$

To obtain from this fitted model a set of values for u^, the residuals. Ordinary least squares (OLS) constrains these so that their mean was "0" and so, given the assumption that their variance does not depend on the independent variables, an estimate of this variance was obtained from the average of the squared values of the residuals. If the assumption was not held to true, a simple model might be that the variance was linearly related to independent variables. Such a model was examined by regressing the squared residuals on the independent variables, using an auxiliary regression equation of the form,

$$u^{\wedge 2} = \gamma_0 + \gamma_1 \mathbf{x+v}$$

This was the basis of the Breusch–Pagan test. It was a chi-squared test; the test statistic was distributed $n\chi^2$ with k degrees of freedom. If the test statistic had a p-value below an appropriate threshold ($p < 0.05$) then the null hypothesis of homoscedasticity was rejected and heteroscedasticity was assumed (Gujarati and Porter, 2009).

The study analyses the relationship between poverty, agriculture GDP per worker and non-agriculture GDP per worker by using pooled regression analysis for panel data as shown below,

The mathematical form of equation is,

$$\ln P_{it} = \beta_0 + \beta_1 \ln AgGDP/Wk_{it} + \beta_2 \ln NonAgGDP/Wk_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots(1)$$

where,

P = Poverty rate

lnAgGDP/Wk = Agriculture GDP per worker

lnNonAgGDP/Wk = Non-Agriculture GDP per worker

ε is the error term

i is the panels (districts)

t is the time (years).

Results and discussion

The results of the study shows the extent of contribution of agriculturesector and the non-agricultural sector in decreasing poverty rates in all the districts of Karnataka state.

Extent of poverty reduction

The extent of poverty reduction in Karnataka is indicated in Table 1. The highest poverty reduction in the overall district was observed in Mandya which was 1.52 per cent, followed by Ramanagara (-1.43 %) district which also topped among the Southern districts. Whereas Udupi district (0.17 %) registered on increase in the poverty rate. Among the northern districts, the poverty reduction was higher in Bidar district (-1.26 %) followed by Belagavi district (-1.22 %) while, poverty rates had increased in Yadgiri (0.41 %) and Raichur (0.19 %) districts. It was also observed that variability in poverty reduction from Period I to Period II had increased by 21.13 per cent, which was mainly due to lack of natural resources, water scarcity as a major problem, these districts were more susceptible to draught and the districts were also registered with low literacy rate which limit access to many socio-

economic opportunities. These results are in line with the studies conducted by Satapathy and Jaiswal (2018) revealed that reduced poverty rates over the years.

The growth of agriculture and non-agriculture GDP per worker in Karnataka is depicted in Table 2. The annual and overall growth rate of agriculture GDP per worker was 22.56 and 203.05 per cent, respectively and for non- agriculture GDP per worker it was 83.97 and 755.75 per cent, respectively. The variation of Average Annual Growth rate (AAGR) and decadal growth for agriculture GDP per worker was 85.59 per cent, wherein non-agriculture GDP per worker (181.71 %) has registered the highest variability than that of agriculture GDP per worker. Chikkaballapura (87.98 %) district registered highest AAGR in agriculture GDP per worker and all the districts showed positive AAGR except for Chikkamagaluru district whose AAGR was estimated at -0.36 per cent. With respect to non- agriculture GDP per worker is concerned, all the districts exhibited positive AAGR and highest growth rate was registered in Mandya (763.17 %) district. The variation has been increased in agriculture GDP per worker (127.16 to 135.32 %) from Period I to Period II whereas it shows the decreasing trend in non-agriculture GDP per worker (209.27 to 181.71 %).With reference to annual and decadal growth of agriculture GDP per worker and non- agriculture GDP per worker in Karnataka, all the districts shows positive growth except Chikkamagaluru district (-0.36) which registered the negative growth for agriculture GDP per worker. The results are in consistent with the findings of Gulati *et al*. (2021), authors also quoted the same reasons for the positive and negative growth in agriculture and non- agriculture sectors.

Relationship between agriculture and poverty reduction

The impact of agriculture growth on poverty reduction in Karnataka is detailed in Table 3. The results revealed that there was negative and significant relationship exists between poverty and agriculture GDP per worker and non-agriculture GDP per worker.

The estimated coefficient of agriculture GDP per worker was found to be significantly higher than that of non-agriculture GDP per worker and determines that as every one per cent increase in agriculture GDP per worker, there found to be larger decline in poverty as compared to the non-agriculture GDP per worker.The slope coefficient (β1) value of about -1.36 explains that, as one per cent increase in agriculture GDP per worker on an average, leads to about 1.36 per cent decline in the poverty rate in Karnataka.On the other hand, as one per cent increase in non- agriculture GDP per worker there was a 0.80 per cent reduction in poverty.From the results it can also be found that 82 per cent of the variation in poverty was explained by agriculture GDP per worker as well as non- agriculture GDP per worker. Thus,

it can be noted that agriculture sector contributes significantly in reduction of poverty than that of non-agriculture sector.

The higher correlation between the variables like agriculture GDP per worker and non- agriculture GDP per worker awakened worries of multicollinearity problems exists, therefore Variance Inflation Factor (VIF) was computed. Generally, VIF values varies from one to infinity and the VIF value greater than ten normally indicates problem of multicollinearity. In the present study VIF value found to be 1.48, which indicates that there was no problem of multicollinearity. The study also tests for the Breusch Pagan test to recognize the presence of heteroscedasticity and fails to discern the presence of heteroscedasticity.

The Fig.1 shows annual growth of agriculture GDP per worker and non- agriculture GDP per worker in Karnataka. In both the cases AAGR was positive for all the districts but it was found to be negative for Chikkamagaluru district (-0.36) for agriculture GDP per worker. In overall, the agriculture GDP per worker shows the stationary variations than that of non - agriculture GDP per worker.

It must note that the agriculturesector contributes considerable higher in decreasing poverty than that of non-agriculture sector, this is due to the fact of high productivity rates coupled with use of high yielding varieties, availability of improved technologies, high yielding in high valued crops and government support initiatives in uplifting the small and marginal farmers and increased financial support for the crop production and also the non-farm employment also play an important role reducing poverty particularly in urban areas still role of agriculture observed to be critically intervened. The same reasons were quoted by Gulati *et al.* (2021) in their study on linkages between agriculture, poverty reduction and malnutrition and concluded that poverty is often reduced faster by agriculture growth and improved nutritional status.The results are also in consistent with Anjum and Tarique (2017), they also opined the role of importance of agriculture sector in reducing poverty was higher than that of non- agriculture sector. Chritiaensen and Matin (2018) also concluded with same results as compared to growth outside of agriculture, growth in agriculture generally tends to reduce poverty to the greater extent.

Conclusion

Agriculture is a strategically important economic sector and a type of economic activity for every country. The agriculture growth determines food security and country independence, population well-being and health, demographic profile and economic development. Agriculture's contribution to poverty reduction is consistently greater. Most of the poor people in the developing world depends on agriculture for deriving their livelihood and in turn, the development of agriculture will play a greater role in eradicating the poverty. From the study it concluded that agriculturesector contributes substantially higher in decreasing poverty than the non-agriculture sector, as one per cent increase in agriculture GDP per worker on an average, leads to about 1.36 per cent decline in the poverty rate in Karnataka and as one per cent increase in non-agriculture GDP per worker there was a 0.80 per cent reduction in poverty level. Hence, agriculture sector play most important role in reducing poverty levels than any other sector.

Policy implications

Agriculture being a primary sector it takes significant role in reducing poverty levels but growth in agriculture sector alone cannot be possible, therefore a balanced growth across all the three sectors of the economy may contribute more towards poverty reduction by providing more employment opportunities and by increasing the income levels of poor population.

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Table 1. Extent of poverty reduction in Karnataka

Sl. No.	District	Poverty rates (%)		
		Period I (2011-2012)	Period II (2019-2020)	Annual Average Poverty Reduction Achieved
I Northern districts				
1	Bidar	30.8	19.42	-1.26
2	Belagavi	23.2	12.26	-1.22
3	Dharwad	19.4	9.65	-1.08
4	Haveri	24.8	15.61	-1.02
5	Bagalkot	29.1	20.23	-0.99
6	Kalaburgi	30.5	21.8	-0.97
7	Vijayapura	28.8	22.4	-0.71
8	Gadag	26.7	20.27	-0.71
9	Uttara Kannada	18	13.21	-0.53
10	Koppal	28.3	24.6	-0.41
11	Bellary	23.6	23.4	-0.02
12	Raichur	30.5	32.19	0.19
13	Yadgiri	38	41.67	0.41
II Southern districts				
14	Mandya	20.3	6.62	-1.52
15	Ramanagara	21.6	8.77	-1.43
16	Hassan	19.3	6.64	-1.41
17	Chitradurga	27.8	15.79	-1.33
18	Kolar	22.3	10.3	-1.33
19	Tumakuru	25.9	14	-1.32
20	Mysuru	19	7.79	-1.25
21	Chamarajanagara	30	18.91	-1.23
22	Davanagere	22.2	11.71	-1.17
23	Chikkaballapura	25.2	15.16	-1.12
24	Bengaluru urban	9.3	2.31	-0.78
25	Bengaluru rural	14.3	8.39	-0.66
26	Chikmagalur	15.7	11.19	-0.5
27	Shivamogga	15.8	12.72	-0.34
28	Dakshina Kannada	8.6	6.69	-0.21
29	Kodagu	7.8	8.74	0.1
30	Udupi	8.8	10.32	0.17
Mean		**22.19**	**15.09**	
S.D		**7.58**	**8.35**	
C.V (%)		**34.17**	**55.30**	

Table 2. Growth of agriculture and non-agriculture GDP per worker in Karnataka

Districts	Agriculture GDP per Worker (in lakh)				Non-Agriculture GDP per Worker (in lakh)			
	Period I (2011-2012)	Period II (2019-2020)	AAGR (%)	Overall Change (%)	Period I (2011-2012)	Period II (2019-2020)	AAGR (%)	Overall Change (%)
I Northern districts								
Kalaburagi	0.29	1.16	34.03	306.25	0.7	2.61	30.57	275.09
Bidar	0.29	0.88	22.44	201.98	0.84	3.09	29.81	268.32
Gadag	0.26	0.78	22.2	199.79	0.6	3.38	50.98	458.78
Koppal	0.32	0.94	21.16	190.47	0.66	2.53	31.61	284.5
Haveri	0.43	1.11	17.87	160.83	0.52	3.09	55.21	496.9
Bellari	0.36	0.91	16.73	150.6	0.96	3.88	33.65	302.88
Bagalkot	0.49	1.17	15.25	137.29	0.85	4.38	46.51	418.6
Dharwad	0.4	0.82	11.44	102.91	1.16	4.14	28.51	256.54
Belagavi	0.71	1.29	8.95	80.52	0.61	2.54	34.83	313.51
Vijayapur	0.64	0.96	5.61	50.5	0.75	2.73	29.56	266.03
Uttara Kannada	1.64	2.03	2.67	24.01	0.73	3.24	38.49	346.43
II Southern districts								
Chikkaballapura	0.21	1.87	87.98	791.8	0.26	2.34	87.68	789.1
Bengaluru (Urban)	0.3	1.83	56.59	509.29	2.72	91.24	361.43	3252.88
Kolar	0.27	1.36	44.89	403.98	0.38	2.98	75.54	679.88
Bengaluru(Rural)	0.36	1.65	39.83	358.5	1.1	4.12	30.55	274.98
Ramanagara	0.36	1.6	38.57	347.14	0.59	3.48	54.98	494.81
Chitradurga	0.27	1.06	32.11	289.02	0.5	2.26	39.06	351.58
Chamarajanagara	0.28	0.84	21.61	194.52	0.74	3.8	45.68	411.1
Davanagere	0.72	1.99	19.46	175.18	0.74	3.01	34.04	306.34
Dakshina Kannada	4.87	13.4	19.43	174.84	4.68	24.17	46.31	416.81
Tumakuru	0.48	1.08	14.08	126.72	0.53	3.5	62.89	566.05
Mandya	0.61	1.31	12.8	115.2	0.56	39.34	763.17	6868.5
Shivamogga	0.66	1.41	12.69	114.2	0.91	4.58	45.19	406.74
Mysuru	0.78	1.34	7.91	71.21	1.02	3.17	23.28	209.51
Hassan	1.62	1.72	0.66	5.91	0.52	2.79	48.65	437.84
Chikkamagaluru	1.69	1.64	-0.36	-3.27	0.83	4.94	55.08	495.76
Mean	**0.74**	**1.77**	**22.56**	**203.05**	**0.94**	**8.90**	**83.97**	**755.75**
S.D.	**0.95**	**2.40**	**19.31**	**173.79**	**0.88**	**18.62**	**152.59**	**1373.29**
C.V. (%)	**127.16**	**135.32**	**85.59**	**85.59**	**94.00**	**209.27**	**181.71**	**181.71**

Note: Average Annual Growth Rate (AAGR)

Table 3. Impact of agriculture growth on poverty reduction in Karnataka

Variable	Coefficient	Standard error	t-Statistic	p-value
Constant	20.79	1.08	19.17	0.01*
Agri.GDP/worker	-1.36	0.56	-2.41	0.009***
Non- Agri.GDP/Worker	-0.80	0.078	-2.57	0.013**
No. of panel observations	52			
F Statistic (2,52)	11.92			
Prob. of F statistic	0.00			
R^2	0.82			
Adjusted R^2	0.79			
Tests conducted before pooled regression analysis				
Variance Inflation factors (VIF)	1.48			
Breusch-Pagan Test	χ^2	17.12		

*Note:*** ,** and * indicates one, five and ten per cent level of significance, respectively.

Fig.1Growth of agriculture and non-agriculture GDP per worker in Karnataka