Linkages Between Urban Consumption and Rural Non-Farm Employment and Agricultural Income: A New Perspective

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I

INTRODUCTION

Development economics literature during 1950s accorded primacy to manufacturing sector for economic growth and progress. This view was based on the premise that demand for industrial goods is more elastic than demand for food products and therefore increase in per capita income involves much higher increase in industrial goods than in food commodities. This was reflected in the famous two sector model developed by Lewis (1954) which presumed that labour productivity of agriculture is zero and it involves low cost to transfer resources out of agriculture to high productivity industrial enterprises. This was further supported by Hirschman (1958) who claimed that agriculture does not provide direct stimulus to new activities through linkage effect whereas manufacturing has a strong edge over agriculture in this respect. This strong belief led Hirschman to conclude that agriculture has very weak production linkage with the rest of the economy whereas industries were found to have strong spill-over effect throughout the economy. This led policy makers throughout the developing world to focus on shift of surplus labour and supply of investment and foreign exchange by agriculture sector to fuel industrial growth. In short, this doctrine assigned purely passive role to agriculture and central role to manufacturing sector for growth and development. This industrialisation-led growth across the developing world failed to trickle down to the rural poor and warranted an urgent need for restructuring the development strategy of 1950s (Eapen, 2009).

The conventional wisdom of industry as a locomotive of growth and passive role for agriculture was first challenged by Johnston and Mellor (1961) who emphasised that agriculture also deserves recognition as a producer of food and as a potential market for industrial goods. Green revolution technology during late 1960s brought agriculture to the centre stage of debate on economic growth. Rising concern about rural poverty, equity and gains from agricultural productivity from green revolution technology in Asia in the early 1970s motivated agricultural economists to advance agriculture's claims as a departure from industrial-led growth to the notion that agriculture itself could serve as the engine of growth (Haggblade, 2007, p.33). This

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transformed the conventional views of the contribution of agriculture to economic development and led to a new view that agriculture could drive economic growth (Mellor and Lele, 1971; Mellor, 1976). Johnson and Killby (1975) countered Hirchman and documented considerable production linkages generated by new agricultural technology. These linkages included backward linkages in terms of agricultural inputs and services and forward production linkages through agro processing and distribution of produce. Further, increase in farm income brought by new technology in agriculture created consumption linkages via increased consumer demand for non-agricultural goods and services (Mellor and Lele, 1973). In a seminal work in the South Korean economy Adelman (1984) completely reversed the " Industry first" paradigm of the 1950s as it was found that agriculture demand-led industrialisation can generate superior growth and equity in contrast to industrialisation strategies. Thus, growth linkages brought agriculture to assume role as engine of economic growth in developing countries.

As rural poverty became a major concern in the 1970s and superiority of agricultural growth linkage was established by several studies, the development focus in developing countries entailed emphasis on the role of rural non-farm employment and its linkage with agriculture sector. The literature on these aspects concluded that there are a significant rural non-farm spin-offs from agriculture growth and agriculture plays a pre-dominant role in influencing rural non-farm employment and income in the early stages. At the later stages of economic growth, forces other than agriculture acquire more important role (Haggblade *et al.,* 2007).

In the Indian context agriculture-industry relationship and linkages between agriculture and rural non-farm economy have remained the subject of great interest. According to agriculture centric view, rise in industrial growth without any increase in agriculture growth can be merely transitory and in the long run industrial growth will slow down through backward and forward linkages between agriculture and industry. The second view is that with diminishing share of agriculture in the economy, industry can grow on its own (Rangarajan, 1982) and the linkage between agriculture and industry is weak (Bhattacharya and Rao, 1986). Similarly, while a strong association has been found between earning per worker in agriculture and in rural non-farm activities (Chadha, 1986; Papola, 1987) several scholars remain skeptical about the nature of agriculture growth linkage to generate rapid growth in rural non-farm employment (RNFE) (Vyas and Mathai, 1978; Harriss, 1987 and Eapen, 2009).

There is a need to revisit this debate in the light of recent changes experienced in Indian agriculture particularly in the aftermath of economic reforms and new economic policy followed since the early 1990s. India has witnessed acceleration in growth of non-agricultural sectors whereas agriculture sector experienced deceleration in growth during last one and a half decade. This has changed the form and quickened the pace of structural transformation of Indian economy - a very sharp decline in the share of agriculture in GDP but only modest decline in share in

employment. Consequently, disparity in per worker income in agriculture and non-agriculture has widened (Chand, 2008) which is seen as a major factor for rise in agrarian distress during recent years (Rao, 2009). The last one and a half decade has also seen diversification in consumption patterns both in rural and urban areas, with more spectacular changes in urban areas (Rao *et al.,* 2007). All these changes, and weaknesses of hypothesis of linkage effect of agriculture, require fresh understanding of the linkages between agriculture income and other segments of the economy, and between agriculture sector and rural non-farm (RNF) sector. There is a growing recognition that large spread of RNF activity creates prospects for reversal of linkage from non-farm to farm. Further growth of RNF economy gets increasingly linked to urban income and urban demand for rural goods and services. Other factors which promote linkage between rural non-farm economy and urban economy are increase in cost of production and high population density in urban areas. It has been observed that in South Asia extremely high population densities and rise in urban incomes have made possible the beginning of a shift to an urban-led rural industrial growth around metropolitan centres and transport arteries (Haggblade *et al.,* 2007).

In the light of these new insights, an attempt is made in this paper to explore integration among urban economy, rural non-farm economy and agriculture sector by focusing on linkage between growth in urban consumption on the one hand and growth in rural non-farm economy and agriculture incomes on the other hand. Besides, reverse linkage between growth in rural non-farm employment and agriculture income, as pointed out in the recent literature cited above, is also examined. The specific objectives of the paper are: (1) To discuss changes in agriculture income, urban and rural consumption and rural non-farm employment after adoption of new economic policy in the early 1990s. (2) To explore linkages between urban consumption and agriculture income; urban consumption and rural non-farm employment (RNFE), and rural non-farm employment and agriculture income.

II

ANALYTICAL FRAMEWORK

This paper adopts a framework different from the usual and conventional approach that was based on agriculture linkage with the rest of the economy. The paper tests the hypothesis that Indian economy has reached a stage where urban growth and RNF employment derives agriculture income, and urban growth also derives rural non-farm employment. A similar framework was adopted in a recent U.N. study on India that quantifies the impact of growing urban consumption expenditure on rural employment and rural income (Purushothaman, 2008). This study uses NCAER household data on rural and urban income and NSSO data on consumer expenditure covering the period 1980-81 to 2005-06. The study did not

examine linkages between urban consumption and agricultural income, and, reverse linkage between RNF economy and agriculture income.

It is hypothesised that after some stage of economic growth, when the share of agriculture in GDP falls to low level, urban consumption becomes a major driving force for rural income (agriculture income and non-farm income) through demand for goods and services produced in the rural area. As we were particularly interested to see the linkage between urban consumption and agriculture income, and rural non-farm activity and agriculture income, we divided rural income in two parts, viz., agricultural income and RNF income. The second hypothesis put forward in this paper is that the linkage between agricultural growth and RNFE has reversed, and increase in non-farm employment raises agricultural income per worker as it involves shift of labour-force from agriculture to rural non-agricultural activities.

While data on agricultural income at national and state level is readily available the data on rural non-farm income is published by CSO only for selective years when the base level of price index for macro data is shifted. Last three points of time for which this data is available are years 1999-2000, 1993-94 and 1980-81. This did not permit extension of analysis to recent years after 1999-2000. Alternatively, the study uses data on non-farm rural employment in place of RNF income which is available from NSSO upto year 2004-05 (large sample). The paper uses data set consisting of cross section of 17 major states of India at two points of time, namely, 1993-94 and 2004-05.

The study has used the following econometric model to estimate the effect of (a) urban consumption on RNFE and (b) urban consumption and RNFE on agricultural income:

$$\text{Log (PWNSDPAG)}_{st} = C_1 + C_2 + \text{Log (PCCU)}_{st} + C_3 \text{Log(RNFE)}_{st} +$$
$$C_4 \text{Log (LANDPER WRKR)}_{st} + C_5 \text{Log (FERTPH)}_{st} +$$
$$C_6 \text{Log(IRRIPER)}_{st} + C_7 \text{(DUM)} \qquad \qquad \text{....(1)}$$

$$\text{Log (RNFE)}_{st} = C_{11} + C_{12} + \text{log (PCCU)}_{st} + C_{13} \text{Log(INFRA)}_{st} + C_{14} \text{DUM} \qquad \text{....(2)}$$

Where,

PWNSDPAG = Per worker agricultural income (Rs.) at 1993-1994 prices,

PCCU = Per capita consumption expenditure in urban area (Rs.). The data for 2004-05 was deflated by ratio of index number of prices for industrial worker between 2004-05 and 1993-94 to bring it to 1993-94 price level,

RNFE = Share of rural non-agricultural workers in total rural workers (per cent),

LANDPERWRKR = Net cultivated area per agricultural worker (hectare),

FERTPH = Fertiliser use per hectare of net cultivated area (NPK   kilogram).

IRRIPER = Per cent of net cultivated area under irrigation,

DUM = Dummy variable to capture time effect. DUM = 0 for 1993-94 and DUM = 1 for 2004-05.

INFRA = Index of infrastructure. It includes three infrastructure variables (i) per capita electricity consumption, (ii) road length per 100 square kilometer of geographical area and (iii) number of scheduled commercial bank branches per 100 square kilometer geographical area. The following mini-max formula was used to construct the infrastructure indexes for the two periods 1993-94 and 2004-05:

Infrastructure Index = (Value of infrastructure variable in a state - Minimum value of the variable in the sample states)/(Maximum value for the infrastructure in states - Minimum value for the infrastructure in the states).

The composite infrastructure index (CII) for a state for the first period (1993-94) was derived using average of the infrastructure index of three variables. The CII for each state for 2004-05 was derived by multiplying the CII for 1993-94 with averages of growth rates in the three infrastructure variables in each state during 1993-94 to 2004-05.

st = 's' designates state (1 to 17) and 't' designates time (1993-94 and 2004-05).

Equation (1) in the above model include per capita consumption expenditure and share of non-agricultural workers in total rural workers as determiners of agricultural income per agriculture worker. Agriculture income is also affected by other variables. Use of fertiliser and irrigation increase agricultural income through increase in agricultural productivity while higher land to labour ratio directly contributes to more production per worker. RNFE in equation (2) was considered to depend upon per capita consumption expenditure in urban areas (PCCU) and level of infrastructure.

III

RESULTS AND DISCUSSION

Changes in Structure of Economy and Consumption

Indian economy and agricultural sector have witnessed profound structural changes after early 1980s. The most profound change is decline in share of agriculture and allied sectors in national GDP from 29 per cent during 1993-94 to 19 per cent during 2004-05. However, the decline in share of GDP has not been accompanied by a commensurate decline in the share of agriculture in workforce. As would be seen from Table 1, the share of agriculture in total GDP came down by 34 per cent while the share of agriculture in employment experienced a very small, about 12 per cent decline.

TABLE1. CHANGES IN STRUCTURE OF INDIAN ECONOMY AS REVEALED BY SHARE OF
AGRICULTURE IN OUTPUT AND EMPLOYMENT

			(*per cent*)
Aspects (1)	1993-94 (2)	2004-05 (3)	Change (4)
Agriculture share in total GDP	28.93	19.2	-33.6
Agriculture share in workforce	61.8	54.3	-12.1

*Source*s: *National Accounts Statistics*, CSO.
Employment and Unemployment in India, Report No. 315, 409 and 515, NSSO.

The second important change experienced around early 1990s is that agricultural growth has ceased to determine the growth rate of non-agriculture sector. As can be seen from Figure 1, till around 1990, growth rate of overall economy moved up or down in tandem with the movement in growth rate of agricultural sector. After that growth rate in agriculture and non-agriculture sectors and economy moved on a disparate path – sharp deceleration in growth rate of agriculture sector but sharp acceleration in growth rate of non-agricultural sector and total economy. This is a clear indication of weakening of linkage effect of agriculture on non-agricultural sector and it is quite expected as the economy reaches a stage of high growth. This calls for a fresh look at linkages among various sectors of the Indian economy.
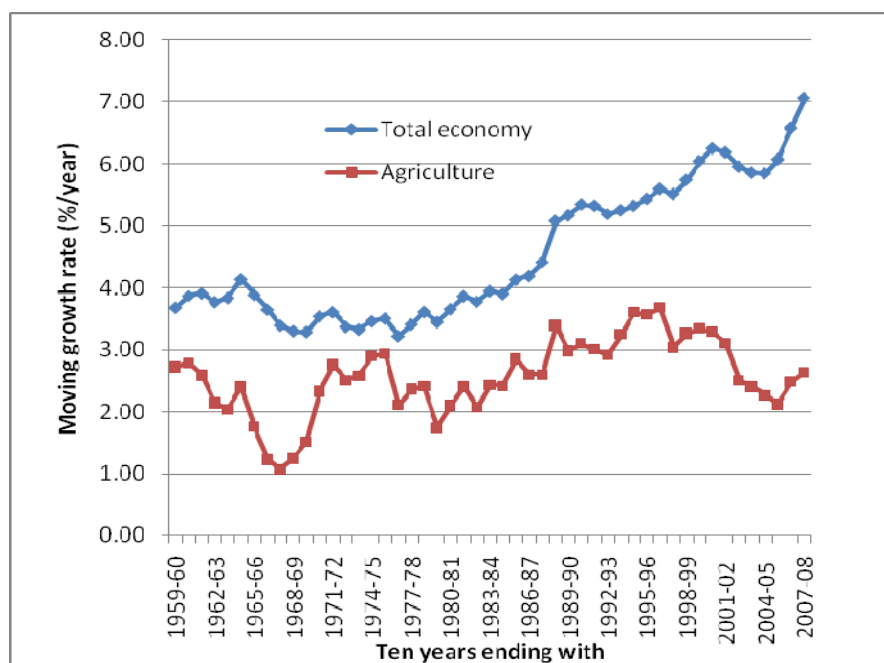

Figure 1. Growth Rate in GDP Agriculture and Total Economy Based on 10 years
Moving Trend Beginning with 1950-51 to 1959-60

Relatively high growth of non-agriculture sector and increase in its share in national income from about 70 per cent during early 1990s to more than 80 per cent in the next 15 years point to growing importance of urban demand in influencing growth of farm sector, as urban India is the major gainer of growth in non-agriculture sector. This is evident from faster growth in per capita consumption of food and non-food items in urban areas as compared to rural areas, and increase in share of urban areas in total consumption in the country (Table 2). The Table shows that urban consumption constituted one third of total food consumption in the country during 1993-94, and its share has grown by about one per cent since then. In fact urban consumption matters much more, in determining farm income, than what is revealed by its share in consumption, because of price effect. The share of urban consumption in marketed surplus of agri-food is much higher than its share in consumption expenditure of the country because a large part of farm produce consumed in rural areas is self produced. Due to these reasons urban consumption is considered to assume greater importance, with the passage of time, in determining agricultural income.

TABLE 2. CHANGES IN RURAL AND URBAN CONSUMPTION BETWEEN 1993-94 AND 2004-05

			(per cent per year)
Consumption/monthly (Rs.)	1993-94	2004-05	Growth rate
(1)	(2)	(3)	(4)
Per capita expenditure: Total			
Rural	281	559	6.43
Urban	458	1052	7.86
Per capita expenditure: Food			
Rural	178	308	5.11
Urban	250	447	5.42
Per capita expenditure: Non-food			
Rural	104	251	8.38
Urban	208	605	10.21
Share (per cent) of urban consumption in:			
Total	36.3	42.9	1.54
Food	33.0	36.7	0.98
Non-food	41.2	49.0	1.59

Source: Level and Pattern of Consumer Expenditure, Report No. 402 and 508. NSSO.

The correlation coefficient between per capita consumption expenditure in urban areas and agricultural income per worker across 17 major states of India during 1993-94 was 0.25 which was statistically non-significant upto 95 per cent level. The correlation during 2004-05 turned out to be 0.60, which was significant at 99 per cent level. This indicates growing importance of urban consumption in deriving farm income.

Rural Non-Farm Employment

A large number of studies during 1970s and 1980s demonstrated that agricultural growth induced growth in rural non-farm employment. The exact impact of growth in

agricultural production on RNFE was quantified by a World Bank study based on data around 1980 that showed that a sustained growth rate of 2.4 per cent in agriculture (historical growth rate) will lead to 2.8 per cent growth in non-farm employment (Hazell and Haggblade 1990), i.e., elasticity of RNFE with respect to agricultural output was around 1.166. Actual experience, shows that findings of this study were quite relevant during 1983 to 1993-94 (Table 3). GDP agriculture (including allied sectors) in this period increased on a trend growth rate of 3.12 per cent and employment in the same period showed compound growth rate of 3.43 per cent. However, after 1993-94, upto 2004-05, growth rate of agricultural output declined to 2.44 per cent as against acceleration in growth rate of RNFE to 3.69 per cent. This indicates strong possibility of a complete change in linkage from agriculture to rural non-farm sector after early 1990s.

TABLE 3. GROWTH RATE IN GDP AND EMPLOYMENT IN AGRICULTURE AND ALLIED
SECTORS AND RURAL NON-FARM SECTOR

(per cent per year)

Aspect	1982-83 to 1993-94	1993-94 to 2004-05
(1)	(2)	(3)
GDP agriculture and allied sectors	3.12	2.44
Rural non-farm workers	3.43	3.69
Agricultural workers	1.27	0.74

Source: Same as in Table 1.

Growing importance of rural non-farm activity in the country can be seen from the growth in employment in this sector relative to other sectors (Table 4). Employment in non-agricultural activities in rural areas show higher growth than urban areas. The share of rural non-farm employment in total rural employment had risen from 23.1 per cent to 29.2 per cent between 1993-94 and 2004-05. More than 47 per cent non-agricultural workers are engaged in rural areas. The share of RNFE in total workforce in the country increased from 17.9 per cent during 1993-94 to above 20 per cent in the next decade.

TABLE 4. GROWTH IN WORKFORCE IN DIFFERENT SECTORS AND SEGMENTS OF INDIAN ECONOMY

Worker type and share	Workers no.: crore		Annual growth rate (per cent)
	1993-94	2004-05	1993 94 to 2004-05
(1)	(2)	(3)	(4)
Rural agricultural workers	19.82	21.50	0.74
Rural non-farm workers	5.95	8.87	3.69
Urban agricultural workers	0.80	0.81	0.15
Urban non-agricultural workers	6.75	9.90	3.54
Total workers (R+U) : Crore	33.32	41.07	1.92
Share of RNFW in:			
Rural workforce	23.1	29.2	2.15
Total non-agricultural workers	46.9	47.3	0.08
All workers	17.9	21.6	1.74

Source: Same as in Table 1.

These changes in workforce raise several interesting issues. Why the slowdown in agricultural growth did not pull down growth in RNFE. What is the driving force for growth in RNFE? What are the implications of high growth in RNFE despite sluggish growth in agriculture for linkage between the two?

Among various possibilities, it is found that association between urban consumption and RNFE improved considerably during 2004-05 compared to 1993-94 (Table 5). The association between RNFE and per worker agricultural income continues to be very strong and show improvement over time, but, this association could be due to reversal of linkage from RNFE to agricultural growth rather than linkage effect of agriculture on RNFE.

TABLE 5. CORRELATION BETWEEN NSDP AG PER WORKER AND RURAL NON-FARM
EMPLOYMENT AND URBAN CONSUMPTION

Variables (1)	1993-94 (2)	2004-05 (3)
NSDPag/worker v/s per capita consumption expenditure in urban areas	0.25ns	0.60
NSDPag/worker v/s share of non-farm rural workers in total rural workers	0.57	0.68
Share of non farm rural workers in rural workers v/s per capita consumption expenditure in urban areas	0.30ns	0.51

Source of Basic Data: Same as in Table 1.
ns: Statistically non-significant at 95 per cent level.

Estimating Linkages

Two sets of linkages were estimated between urban economy, rural non-farm economy and agricultural economy using the econometric model presented in Section II. This includes (a) linkage effects of urban consumption and rural non-farm employment on per worker agricultural income, and, (b) linkage effect of urban consumption on RNFE. Equation (1) and (2) were estimated as a system by pooling two cross sections of 17 major states of India by using three stage least square method. Due to very high collinearity between irrigation and fertiliser, which turned out to be detrimental on other variables, one of these variables had to be dropped from the model. The estimates of the model finally selected are presented in Table 6 with other relevant information. The estimated effects of all the variables, except time effect on RNFE, were found statistically significant at 90 per cent or higher level.

As all the variables in the model were expressed in log form, the estimated coefficients of explanatory variables are in the form of elasticities. Effect of per capita consumption and RNFE on agricultural income was very strong. A one per cent increase in per capita urban consumption leads to 0.46 per cent increase in per worker agricultural income. Similarly, one per cent increase in rural non-farm employment results in 0.83 per cent increase in the agricultural income. An improvement in land to labour ratio is capable of raising agricultural income by 0.5

per cent. Elasticity of agricultural income with respect to fertiliser use was 0.25. Effect of time or other factors on agricultural income was found negative. Growth in rural non-farm employment showed strongest effect on income of a worker in the agricultural sector.

TABLE 6. ESTIMATES OF ECONOMETRIC MODEL ON AGRICULTURE INCOME AND RNFE
INCLUDED OBSERVATIONS: 34
TOTAL SYSTEM (BALANCED) OBSERVATIONS: 68

(1)	Coefficient (2)	Std. Error (3)	t-Statistic (4)	Prob. (5)
Equation 1: Dep. Variable: Agriculture income per agriculture worker				
C(1) Constant	1.847	2.016	0.916	0.364
C(2) PCCUS	0.463	0.250	1.853	0.069
C(3) RNFE	0.830	0.160	5.183	0.000
C(4) LANDPERWRKR	0.493	0.079	6.220	0.000
C(5) FERTPH	0.251	0.064	3.911	0.000
C(6) DUMMY	-0.197	0.086	-2.289	0.026
Equation 2: Dep. Variable: Share of Rural Non Farm Workers in Rural Workers				
C(11) Constant	-2.127	2.767	-0.769	0.445
C(12) PCCUS	0.638	0.318	2.005	0.050
C(13) INFRA	0.174	0.089	1.951	0.056
C(16) DUMMY	0.193	0.109	1.769	0.082
Determinant residual covariance		0.005064		
Equation 1:				
R-squared	0.833	Mean dependent variable		9.482
Adjusted R-squared	0.803	S.D. dependent variable		0.531
S.E. of regression	0.236	Sum squared residual		1.555
Equation 2:				
R-squared	0.340	Mean dependent variable		3.324
Adjusted R-squared	0.274	S.D. dependent variable		0.373
S.E. of regression	0.318	Sum squared residual		3.027

Elasticity of RNFE with respect to per capita urban consumption was 0.64 and it was significant at 95 per cent level. Improvement in infrastructure like power, roads, and banking was found to make significant contribution in creating work opportunities in non-agricultural activities in the rural areas. The effect of time on RNFE was positive.

IV

CONCLUDING REMARKS

Linkages between different sectors and segments of an economy keep changing with the progress of economy. In the early stage of growth, agriculture was found to play central role in development of rural non-farm sector and non-agricultural sectors

in developing countries through supply of raw material, release of surplus labour and demand for industrial products as input in agriculture and as consumer goods by farming population. The linkage effect of agriculture on rural non-farm sectors and total non-agricultural sector in India diluted considerably after the early 1990s with sharp drop in agricultural share in GDP. This needs to be seen in the light of sharp acceleration in growth of non-agricultural sector and equally impressive growth in urban consumption. It looks as if these changes in the Indian economy have reversed the linkages between agriculture and other sectors during last 15 years. However, little empirical literature exists on the role of urban consumption in promoting agricultural output and income and non-farm employment. Similarly, while there is a lot of concern in India to shift workforce from agricultural sector, linkage effect of growth in RNFE on income of agricultural workers has not received much attention of researchers. This paper makes a simple attempt to explore how growth in urban consumption in India affects agricultural income and rural non-farm employment, and, how growth in RNFE affects per worker agricultural income. Growth in urban consumption is found to be an important determinant of growth in agriculture income and non-farm rural income measured by employment. Ten per cent growth in urban consumption was associated with 4.6 per cent growth in agriculture income and 4.9 per cent growth in rural non-farm employment. This result seems to be consistent with the sole study on similar lines by Purushothaman (2008) which reported that a 10 per cent increase in urban consumption is associated with a 3.8 per cent increase in rural household income. Further, a 10 per cent increase in RNFE was found to result in 8.3 per cent increase in income of an agriculture worker. Our conclusions, though indicative, underscore the need for further debate and elaboration of the impact of urban growth on rural agriculture and rural non farm sectors and impact of growth in rural non-farm sector on farm sector.

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