RESEARCH PAPER

An inquiry into intersectoral linkages of agriculture through social accounting matrix

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Abstract : As India followed a mixed economy model after its independence, both public and private sectors coexisted. In the agricultural sector, production decisions were highly taken by private producers with government's role limited to infrastructure development such as irrigation, extension services and trade in some major commodities. In the manufacturing and service sectors, state played a commanding role by owning and operating many industries. The post-reform period had witnessed significant decline in capital formation in the agriculture sector, especially in the public sector. The trade liberalization had led to shifts in cropping patterns towards cash crops such as cotton, oilseeds, sugarcane, fruits and vegetables for increasing the volatility of agricultural incomes. Besides, as a part of the structural change within the industrial sector, the importance of agro-based industries had come down in the post-reform period. Despite various development planning efforts, poverty, unemployment, and inequality still exist to a greater extent in Indian economy. An important factor responsible for this is the strategy of extension of macro level plan methodology to the development of micro regions (regional level). Initially sector's relationship with the rest of the economy through its direct and indirect intermediate purchases and sales should be known. The sectors with the highest linkages are likely to stimulate rapid growth of production, income and employment. In the present study linkage between agriculture and other industry was studied by constructing Social Accounting Matrix (SAM) and for that the study was undertaken in Krishnagiri District of Tamil Nadu.

Key Words : Inquiry, Intersectoral linkages, Social accounting matrix

INTRODUCTION

The Indian economy had been undergoing a structural change in its sectoral composition over the years. From a primary agro-based economy during the 1970s, the economy had been emerging as predominant in the service sector since 1990s. This structural change and the uneven pattern of sectoral growth is likely to cause substantial changes in the production and demand linkages among various sectors, which in turn, could had significant implication for the overall growth of the economy. At the same time the changes in the policy environment as a result of the economic reforms process,

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and growing integration with the world economy in the post-reform (post 1991) period also likely to have significant impact on the linkages between different sectors of the economy. It was widely recognized that the burden of structural adjustment and fiscal stabilization had been registered in its most virulent form in the agriculture sector (Radhakrishna and Manoj, 2006).

The post-reform period had witnessed significant decline in capital formation in the agriculture sector, especially in the public sector. The trade liberalization had led to shifts in cropping patterns towards cash crops such as cotton, oilseeds, sugarcane, fruits and vegetables. It also increased the volatility of agricultural incomes. Besides, as a part of the structural change within the industrial sector, the importance of agro-based industries had come down in the post-reform period. Also the 'jobless' growth of the organized manufacturing sector and the decline in employment elasticity of the service sector in the post-reform period had put intense pressure in the farming sector, which ultimately end up with vast numbers of workers moved out of the farm sector into self-employment for mere subsistence(Jha and Rajiv, 2010).

In order to understand the socio-economic status of the country, the basic phenomenon like poverty, income distribution and employment were considered for the study as cited in the many regional level study (Chinnadurai, 1996).

Because of the mutual interdependence and symbiotic relationship between agriculture and industry, the contribution of agriculture to industry is well known, especially in developing countries. The relationship between agriculture and industry had been seen from different channels. Whereas some of the channels emphasized on the supply side or production side, others stress the linkages through the demand side. The production linkages basically arised from the interdependence of the sectors for meeting the needs of their productive inputs, whereas the demand linkage arised from the interdependence of the sectors for meeting final consumption.

The present study was undertaken in the region of North-Western zone of Tamil Nadu to provide development framework under which different sectors including markets and institutions can play a more useful and efficient role in order to achieve a faster economic growth. This forms basis to develop a regional planning model which will be used to assess the likely impact of different policy instruments on regional income, employment, distribution of benefits, trade and exports. Subsequently, a set of policies will be identified to accelerate economic growth in the region.

A Social Accounting Matrix (SAM) can be defined as an organized matrix representation of all transactions and transfers between different production activities, factors of production andinstitutions (like households, corporate sector and government) within the economy and with respect to the rest of the world (ROW). A SAM is thus a comprehensive accounting framework within which the full circular flow of income from production to factor incomes, household income to household consumption and back to production is captured. In a SAM all the transactions in the economy are presented in the form of a matrix.

A social accounting matrix is simply defined as a double entry accounting system whereby each macroeconomic account is represented by a column for outgoings (payments/ expenditure) and a row for incomings" (receipts) (Round, 1980 and Chinnadurai, 1997). It is represented in the form of a square matrix with rows and columns, which brings together data on production and income generation as generated by different institutional groups and classes, on the one hand, and data about expenditure of these incomes by them on the other hand. In a SAM, incomings are indicated as receipts for the row accounts in which they are located and outgoings are indicated as expenditure for their column accounts. Since all incomings must be, in a SAM, accounted for by total outgoings, the total of rows and columns must be equal for a given account. According to Taylor (1980), the SAM as a tabular presentation of the accounting identities, stating that incomings must be equal to outgoings for all sectors of the economy.

Objective :

The objective of the paper is to study the agriculture-industry linkages by assessing sectoral interdependence of the district economy by constructing Social Accounting Matrix (SAM).

MATERIAL AND METHODS

This explores the empirical methods and data used to estimate the inter-sectoral linkages between agricultural and industrial sectors in order to explore the possible development strategies. Agriculture sector helps the other sectors of the economy in the growth process

and contributes to the growth of GDP and employment of labour force. This study has been made to find the linkage by constructing a Social Accounting Matrix (SAM).

Sampling design :

Study area :

To study the intersectoral linkage of the economy, Krishnagiri district of Tamil Nadu was purposively selected. Major agricultural and horticultural crops are cultivated in this district. Similarly many manufacturing units and agro industries are located and arising here.

Social accounting matrix :

For constructing matrix, 10 major sectors were considered. It includes farming sectors (small and large) and livestock. Industries like food, wood, chemical, electricity, rubber, metal and non- metal were covered. Due to the time constraint only ten sectors were considered which may be increased in the future study.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Agriculture : Small farm sector :

In Table 1 from first row and column the incoming and outgoing of the small farming sectors has been studied. Looking towards first row, Rs. 12.87 croreswas received from small farming sector itself, it may be either by selling the raw materials to the other small farmers or else by using the retained agriculture stock of previous year. Only Rs.18 lakhs of income was received through

Table 1 : Abbreviations and their expansions		
Sr. No.	Abbrevation	Sectors name
1.	Smalfrmr =	Small farmer
2.	Lrgefrmr =	Large farmer
3.	Livstck =	Livestock
4.	Foodind =	Food industry
5.	Wood =	Wood
6.	Chemcl =	Chemical
7.	Elctrc =	Electricity
8.	Rubber =	Rubber
9.	Metal =	Metal
10.	Nmetal =	Non-metal

large farmers. Small farmers received Rs.335.91 crores from food industry alone. Nearly Rs. 5.48 crores are transacted from wood industry.

Coming down to the first column, it is understood that to meet the need of inputs for the farming, the purchase from trade sector is seemed to be in higher proportion (*i.e.,* Rs.153.10 crores). There is no farming without labours, hence by providing wages of Rs.144.74 crores to the rural agricultural labour the expenditure towards this sector holds second place. Even though the electricity supply is received at the free of cost from the government to the farmers still the amount spent towards this sector remains high Rs. 89.85 crores. This is because the water scarcity is one of the main reason for which it requires high power motor which works under diesel and engine oil for irrigation of the crops. To get higher yield and undamaged output the farmers spend Rs. 54.25 crores towards chemical sector by purchasing and applying fertilizer to the crops.

Small farm sector purchased Rs. 20.42 crores worth of inputs the dung and other inputs from livestock sector for increase the yield in agriculture.

Agriculture sector: Large farmer :

Second row and column of the SAM defines the income earned and expenditure made through different sectors. When seen across the row nearly Rs. 19.48 crores were earned from small farmers and Rs. 6.55 crores from large farmers itself. It could be noticed that as like small farmers even large farms earn more income from food industry (*i.e.,* Rs. 474.01 crores). The contribution made by wood manufacturing sectors to large farming group income was Rs. 16.88 crores.

When study the second column, about Rs.216.67 crores of expenditure was made from this sector. Large farms purchased input like seed from small farming sector was Rs. 0.18 crores, spent Rs. 6.55 crores from itself. It purchased manure directly from livestock sector for Rs. 9.63 crores. Nearly Rs. 74.77 crores was spent to buy chemical fertiliser for crop where as Rs. 105.75 crores at electrical appliances.

Agriculture sector: Livestock :

From third row and column of the Table 1, the contribution of livestock income to other sectors and also the earning of income from other sectors was studied. Livestock sector, it earned Rs. 20.42 crores from small farmers and Rs. 3 crores from livestock itself. Food

industry made direct purchase of chicken, goat and other livestock product worth of Rs. 9.57 crores.

Coming to the third column, the feed purchased for livestock from the farming sector was Rs. 5.55 crores. The amount spent on livestock itself was Rs. 3.00 crores. Nearly Rs. 8.00 crores worth of input was purchased from food industry. In total, Rs.17.71crores was spent for purchase of inputs for livestock sector.

Food industry :

The contribution of food industry in different sectors of the regional income was given in fourth row and column of the Table 1. The share of farming sector accounted for Rs. 4.91 crores to the income to this sector. This sector supplied Rs. 8.10 crores worth of products to livestock and Rs. 89.78 crores of products to other food industry for further processing.

The food industry procure Rs. 809.92 worth of raw materials directly from farming sectors, Rs.91.74 crores from importing, Rs. 89.78 crores from food industry itself. Nearly Rs.85.50 crores of income was spent on wood industry for purchasing wood logs.

Wood industry :

The inflow and outflow of wood industry is given in fifth row and column respectively. It could be interpreted from the SAM that Rs. 3.36 crores was earned from farming sectors by supplying wooden products. The food industry accounted Rs.85.50 crores to wood industry since the remaining wood log are used as firewood and also packing. Nearly Rs. 103.13 crores of amounts were retained by wood industry itself and other wood industry also purchased the furniture in order to polish and sell to the other sectors.

In order to polish and make the product attractive, the industry spends Rs. 43.24 crores to the chemical industry. Rs.5.33 crores spent for functioning of machine. About Rs.6.62 crores was spent on rubber industry. Whereas Rs.2.24 crores are spent on metal and non-metal sectors. In total Rs.182.92 crores were paid by this sector to the other sector of the economy.

Chemical industry :

The transaction made by this sector was noticed from sixth row and column. This sector received Rs.129.03 crores from farming sector by selling fertilizers. From food industry about Rs.58.47 crores were earned. The contribution of wood industry to this sector was Rs.43.24 crores and from chemical industry itself was Rs.0.44 crores.

On the contrary the column of this sector shows the sources in which purchases were made. It paid Rs.17.16 crores to wood industry, Rs.0.44 crores to itself and Rs.8.22 crores to electrical sectors. It was also noticed that Rs.18.20 crores was paid to rubber industry and Rs.8.74 crores to metal industry. They allocated Rs.14.70 crores to machinery sectors.

Electrical industry :

The incoming and outgoing transactions in electrical sector is given in seventh row and column of the matrix. The consumption of electrical items in farming sector was Rs.195.60 crores. The food industry contributed Rs.9.86 crores. It earned Rs.5.33 crores from wood, Rs.8.22 crores from chemical and Rs.16.03 crores from other electrical industry itself. Reading down to column, it used Rs.16.03 crores of electrical appliances from itself and Rs.59.45 crores from rubber industry. It spent

Sr. No.	Sectors	Smalfarmer	Largefarmer	Livstck	Food ind	Wood	Chemcl	Elctrc	Rubber	Metal	Nmetal	Total
1.	Smalfrmr	12.87	0.18	1.11	335.91	5.48	0.17	0.37	0.17	0.18	0.19	356.63
2.	Lrgefrmr	19.48	6.55	4.44	474.01	16.88	0	0	0	0	0	521.36
3.	Livstck	20.42	9.63	3	9.57	0	0	0	0	0	0	42.62
4.	Food ind	2.5	2.41	8.1	89.78	0	0	0	0	0	0	102.79
5.	Wood	1.69	1.67	0	85.5	103.13	17.16	5.5	0.89	0.13	0.21	215.88
6.	Chemcl	54.26	74.77	0	58.47	43.24	0.44	0.08	0.01	0.04	0	231.31
7.	Elctrc	89.85	105.75	0.2	9.86	5.33	8.22	16.03	0.58	7.48	0.32	243.62
8.	Rubber	2.89	3.42	0.49	0.64	6.62	18.2	59.45	4.94	0.08	0.02	96.75
9.	Metal	8.67	2.79	0.37	4.83	1.19	8.74	17.05	0.48	0.26	1.84	46.22
10.	Nmetal	7.81	9.5	0	0.63	1.05	0.14	0.27	0	3.39	11.61	34.4
	Total	220.44	216.67	17.71	1069.2	182.92	53.07	98.75	7.07	11.56	14.19	1891.58

Table 2 : Social accounting matrix for Krishnagiri district 2016-17

Rs.17.05 crores to metal sectors.

Rubber industry :

Seventh row of the matrix represent the sources by which the rubber industry earned income. It was noticed that this industry received income through electrical sector by receiving Rs.59.45 crores followed by chemical sector Rs. 18.20 crores.

When noticed column wise, the rubber industry has no strong linkage in spending towards the given sectors. It spends only 7.07 crores towards these sectors.

Metal industry :

The transaction of metal industry with rest of the economy was furnished in row and column eight. For products sold to different sector, metallic industry received Rs.17.05 crores from electrical, Rs.11.83crores from farming sectors and Rs.8.74 crores from chemical industry. The metal industry products was purchased by farming sectors for agriculture. Almost all the sectors are depended on metal industry.

Coming to the column side, this sector spent on purchasing electric appliances (Rs. 7.48 crores) in order to produce the metal items. In total, Rs. 11.56 crores of income was spent.

Non – Metal industry :

Households make use of this sector for construction purpose. From row 9 in Table 1 it was observed that from the farming sector it earned Rs. 17.3 crores and Rs. 11.61 crores from non- metals industry itself.

By purchasing non-metal items Rs. 11.61 crores was spent. The total amount spent was Rs. 14.19 crores.

Conclusion :

In the present study, a Social Accounting Matrix was constructed to understand detailed or quantitative relationships among various sectors of the region. Construction was for the data related to 2016-17.

Overall, it could be concluded that from the sectors and activities like farming sectors food industry, wood industry, chemical industry and electric sectors were the major sources of income to the economy. While other sectors like non- metal and metal were the least contributors.

Similarly, majority of the amount was spent on the agriculture since it is one of the major contributor of the economy. It supplies food material to the population and feeds the livestock, supplies woods to the wood industry.

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