E-Learning Lesson on

Village Social Accounting Matrix (SAM): An Impact Assessment Tool to Study the Effect of Programme/ Policy Interventions on Village Economy Dynamics

ICAR-Agricultural Technology Application Research Institute, Zone-VII Umiam-793103, Meghalaya

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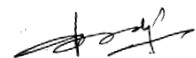***Corresponding author:** amrutha.t@icar.gov.in (Amrutha T., Scientist)

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PREFACE

In the tapestry of economic intricacies, Social Accounting Matrices (SAMs) emerge as powerful lenses, providing a comprehensive view of the complex web of transactions and interactions within an economy. SAMs capture the essence of economic dynamics, encapsulating exchanges among production activities, factors of production, and economic institutions. This conceptual framework acts as a repository of organized information, paving the way for constructing economic models that delve into the nuances of policy interventions and offer predictive insights. However, SAMs are not one-size-fits-all; their efficacy hinges on certain assumptions. These matrices assume static economic conditions, elastic supply within a Keynesian demand-driven system, and linear technology in production. The distinctive characteristics of a SAM lie in its intricate network of accounts, maintaining equilibrium between inflows and outflows, offering a window into the operations of diverse economic agents. Zooming into village contexts, the concept of Village Social Accounting Matrices (Village SAMs) aims to unravel the intricate connections between production activities, local institutions, and the broader external environment within a village. They serve as invaluable tools for analyzing the economic landscape, depicting how inputs, outputs, and income flow between different sectors and households. The entries in a Village SAM encompass intermediate input demands, income distribution, allocation of value added, household expenditure, and government accounts. Creating a Village SAM involves a meticulous process of identifying key elements, incorporating exogenous factors, ensuring a holistic understanding of the village context, and aligning with research goals. These matrices offer a comprehensive means to comprehend and study the economic dynamics of a village, providing valuable insights into the relationships between production, consumption, institutions, and external influences. This document delves deeper into the structure, objectives, and key assumptions of SAMs, shedding light on their role as impact assessment tools. It also outlines the application of Village SAMs, emphasizing their utility in assessing the effects of interventions on village economies and identifying key economic sectors. Additionally, a detailed description of Village SAM accounts, such as Activity, Commodity, Factor, Household, Savings-Investment, and Rest of the World accounts, unveils the intricate financial flows and interactions within a village. The breakdown of each account, from agriculture to transport services, offers a nuanced understanding of the economic dynamics at play. In essence, this preface sets the stage for an exploration into the world of Village SAMs, inviting researchers, policymakers, and enthusiasts to delve into the detailed analysis of village economies, where every account tells a story of economic interdependence and resilience.

Place: Umiam, Meghalaya

(A.K. Mohanty)
Director

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Social Accounting Matrices (SAMs) : Structure, Objectives, and Key Assumptions

Social Accounting Matrices (SAMs) serve as crucial tools in comprehending the intricate web of transactions and interactions within an economy. As elegantly described by Saluja and Bhupesh in 2006, SAMs encapsulate the entire spectrum of exchanges among production activities, factors of production, and various economic institutions like households, corporations, and governments, both domestically and internationally.

At its core, SAM can be envisioned as an advanced accounting framework for economic analysis and policy evaluation, that deals with the flows of goods, services, and payments between different sectors and agents in an economy over a specific period of time. This configuration facilitates a single-entry accounting system, which becomes instrumental in unravelling the economic intricacies of a specific country, region, or village during a given year. The overarching objectives of SAMs are two fold:

Firstly, they act as a repository of organized information that paints a comprehensive picture of the economic and social landscape. This wealth of data forms the bedrock upon which economic models can be constructed. These models, in turn, facilitate in-depth analyses of economic dynamics and offer predictive insights into the ramifications of policy interventions.

However, the efficacy of SAMs is contingent upon certain underlying assumptions:

1. **Static Economic Conditions:** SAMs are designed under the assumption that fundamental economic parameters like prices, population, employment, and technological states remain unaltered throughout the considered year.

2. **Elastic Supply:** They function within a Keynesian demand-driven system, assuming a perfectly elastic supply and disregarding resource constraints.

3. **Linear Technology:** SAMs postulate linear, fixed-proportion technologies in production, and assume parity between average and marginal expenditure propensities.

The distinctive characteristics of a SAM are emblematic of its significance:

- A SAM is an intricate network of accounts, where each account rigorously maintains the equilibrium between inflows and outflows, thereby embodying a meticulous balance.

- It's an architectural marvel, intended to capture both the microcosmic and macrocosmic dimensions of an economy. The design of a SAM elucidates the cyclic flow of income and expenditure, typically delineating the economic tapestry of a specific year.

- This framework offers a window into the operations of diverse economic agents, elucidating the interplay between enterprises, farms, households, investors, and the external sector.

- The extent and composition of accounts within a SAM hinge on the available data and the specific motives driving its construction.

In essence, SAMs stand as powerful instruments that provide a comprehensive view of economic interactions, enabling both detailed scrutiny and holistic understanding of economic systems at various scales.

Village Social Accounting Matrix

The concept of Village Social Accounting Matrices (SAMs) aims to capture the intricate connections between various production activities, local institutions, and the broader external environment within a village context. These matrices serve as valuable tools for analyzing the economic landscape of a village, providing a concise representation of how inputs, outputs, and income flow between different sectors within the village. They also depict the movement of income between production endeavours and village households, the allocation of household income toward consumption and investments, and the trade of goods and resources between the village and the Rest of the World.

Within a village SAM, the entries encompass several essential aspects:

1. **Intermediate Input Demands:** These outline the requirements for inputs among different production sectors.

2. **Income Distribution:** The income generated by production sectors is delineated, specifying the compensation to various types of labor (such as male or female, hired, or permanent labor), and attributing income to land or capital.

3. **Allocation of Value Added:** Distribution of value added from labor, land, and capital across different household groups.

4. **Household Expenditure:** Illustrates how different household groups allocate their expenditures across domestically produced goods and services, savings, and imports.

5. **Government Account:** This section records taxes collected from commodities and households, which may be used for various purposes such as internal investments, savings, or payments to foreign entities.

Application of Village SAMs

❖ It can be employed to assess the impact of interventions like NICRA, TSP, MGNREGP etc. on entire village economy.

❖ It can be used to identify the key economic activities that can be majorly contributing to the village economy.

❖ We could assess the exogenous effect on the village economy.

Creating a Village Social Accounting Matrix involves a meticulous process:

✓ Identifying Key Elements: This includes recognizing significant production activities, factors of production, and institutions related to production, consumption, and marketing within the village.

✓ Incorporating Exogenous Factors: Apart from internal village dynamics, external elements such as capital accounts and institutions must be considered.

- ✓ Holistic Understanding: Before collecting data for the SAM, researchers need to immerse themselves in the village context to grasp its economic and social intricacies accurately. This helps prevent errors or omissions in the final analysis.

- ✓ Alignment with Research Goals: While the SAM design should mirror the village's reality, it should also align with the research objectives. For instance, if the focus is on a program's impact, like the MGNREGP, the SAM should include relevant accounts. Similarly, if regional development is under study, both urban and rural households might be included. The design should maintain a balance between research goals and the village's actual structure.

In essence, Village Social Accounting Matrices offer a comprehensive means to comprehend and study the economic dynamics of a village. By encapsulating the intricate web of interactions within a simplified framework, SAMs provide valuable insights into the relationships between production, consumption, institutions, and external influences within the village ecosystem.

Description of Village SAM accounts

A typical village SAM contains major accounts such as

A. Activity account

B. Commodity account

C. Factor account

D. Household (HH) account

E. Government account

F. Savings-Investment (S-I) account

G. Rest of the world

A: Activity account

The activity account for a village outlines the various production activities and their transactions that contribute to both expenditure and income. The account includes agriculture, livestock, village production (manufacturing), private services, public services, transport services, and more. Here's a detailed breakdown of each activity:

a. *Agriculture:* This includes rainfed and irrigated agriculture, as well as perennial crops. The values of the agriculture production output are calculated based on market price for the sale of the production and imputed value of the product which is not sold. Different vegetable crops grown together are combined as one. Farm inputs like seeds, manures, fertilizers, and pesticides are sourced locally and externally. Irrigation charges can be in kind or cash. Tractors and bullocks are hired, and land revenue is paid. The cost of the labour are calculated based on wages paid and imputed family labour.

b. Livestock production: The livestock production includes milk, milk products, livestock sales, and other products like meat, eggs, and manure. Livestock activities also earn from bullock services for farming. Input costs involve fodder, veterinary services, and labour. Fodder can be farm-produced or purchased. Veterinary expenses are outside the village. Labour cost is calculated per hour basis.

c. Agricultural Services: This involves hiring out tractors, threshers, and bullock-pair. Receipts come from payments and owner contributions. Expenses include fuel, maintenance, tax, and insurance. Profits are calculated residually.

d. Village Production or Manufacturing: It can be disaggregated into different activities based the village's. Receipts are from sales, by-products, service charges, and value of retained products. Costs involve raw materials, labour, and imputed family labour. Profits are residual.

e. Private Services: Includes local services like barbers, electricians, painters, etc. Receipts are from service charges, salaries, grants, etc. Expenditures cover within and outside the village.

f. Government Services: Includes anganwadi center, government school, and ration shop. Ration shop sells subsidized items. School employs teachers, gets grants, and provides scholarships. Aganwadi center implements nutrition programs.

g. Transport Services: Includes anganwadi center, government school, and ration shop. Ration shop sells subsidized items. School employs teachers, gets grants, and provides scholarships. Aganwadi center implements nutrition programs.

Each activity has specific income and expenditure components that contribute to the overall activity account of the village. This breakdown allows for a detailed understanding of the economic dynamics within the village and helps in analyzing the financial flows and interactions between different sectors.

B: Commodities account

The commodities account within the Social Accounting Matrix (SAM) is structured to accommodate various scenarios. Each activity is associated with its distinct commodity. Additionally, some activities yield multiple commodities, while in other instances, different activities generate the same commodity through different methods. In situations where a single activity results in multiple commodities, the SAM treats the production of by-products that serve multiple sectors as a distinct commodity. This approach ensures accurate representation while minimizing redundancy.

C: Factor account

The factor account within the Social Accounting Matrix (SAM) illustrates earnings originating from productive activities, encompassing wages, rent, and interest. These earnings compensate for factor services obtained, while disbursements are made to institutions like households and Rest of the World (ROW), which offer these services. These factors are typically categorized into hired labour, family labour, and capital, highlighting their diverse roles within the economy.

D: Institutions account

Households and the local government are the main components of the village institution. Further, to study the impact on different class of households, it can be classified into different groups based on the land holding criteria, religion criteria, caste criteria etc. These households generate income through various means, such as wages, profit, interest rent, remittances, savings, social transfers and spends on household expenditure.

Conversely, the village panchayat/ government is responsible for the development and welfare programme/ activities, including the construction of drainage canals and providing water supply through pipelines, among others. The village government also compensates its workers by paying them salaries. The major chunk of its fund comes from state and central authority and also the village panchayat collects taxes from its residents to fund its operations and services.

E: Savings and investment account

It depicts the village's capital account, where the accumulated savings of households are deposited. These savings obtained as the difference of the income or funds between the beginning and end of the year. The capital collected in this account is then utilized for investing in various products.

F: Rest of the world

This account documents the financial transactions involving the village's income and expenses. It includes land revenue generated from agricultural activities, taxes levied on various activities by external government bodies, road tax, and any type of insurance paid by village residents, taxes and rent paid by local residents and business shops, upfront payments for electrical connections, and other payments made to rest of the village.

The village's economic activities encompass the marketing/export and purchase of agricultural and providing agriculture and allied services like machineries, tractors, and auto

rickshaws. Additionally, the village provides various services, including those offered by barbers, tailors, electricians, and painters. The imports also consist of inputs purchased by the farmers, purchases made by local retail shops, and supplies obtained by the ration shop. The livestock industry imports animals, concentrates, and veterinary assistance, while agricultural service providers acquire various producer durables. Within the village, the transport sector imports producer durables, while households import a range of consumer goods. Some households even source insurance services from external providers. Moreover, both schools and anganwadi centers require stationery supplies, which are also imported. This account provides a comprehensive view of the village's financial activities, reflecting both its economic contributions and its reliance on external resources for various needs.

Village SAM Construction using Excel Spreadsheet

	Expenditure columns							
	Activities C1	Commodities C2	Factors C3	HH C4	Village Government C5	S-I C6	Rest of world C7	Total
Activities R1		Commodity supply						Activity income
Commodities R2	Intermediate Demand			Consumption demand	Recurrent spending	Investment	Export earnings	Total demand
Factors R3	Factor payment			Interest on consumption loan			Factor earnings	Total factor income
Households R4	Profit		Factor payment	Inter HH transfers	Social transfers		Remittances	Total household income
Village Government R5		Taxes(land revenue)		Taxes(water, electricity)			Grants &loan	Government expenditure
Saving and investment R6				Private savings	Public savings			Total savings
Rest of world R7	Import payment	Sales taxes &Import payments	Factor payment	transfers		Capital outflow		Foreign exchange outflow
Total	Gross output	Total supply	Total factor spending	Total household spending	Government expenditure	Total investment	Foreign exchange inflow	

(Income rows — label along left side)

Source: Gowda, 2015

An Excel spread sheet will suffice to construct SAM or Village SAM and compute multipliers for SAMs

Activity, commodity and factor account

In the social accounting matrix (SAM), the North-Western corner specifically encompasses the accounts related to village production activities, essentially constituting the village input-output sub-matrix modelled on Leontief principles. Distinguishing between "activities" and "commodities," the former denotes various entities such as crop production, livestock management, dairy operations, piggery, flour milling, provision stores, tailor shops, barber establishments, government schools, anganwadi centers, program interventions, and self-help group (SHG) activities.

Within these activities, the production of commodities involves the utilization of raw materials sourced from the village market, serving as intermediate inputs. These materials include seeds from the previous year (in agriculture), manures, fertilizers, and other inputs relevant to agricultural practices. The quantitative aspects of labour and land utilization are documented in the factor account, representing payments from activities to factors. Consequently, the value-added entry in the SAM is reflected in the activity column and the factor row, spanning from cell C1 to R3. Moreover, the concept of intermediate demand denotes payments made by activities of commodities for goods and services procured in the domestic market and subsequently used in the production process. This transaction is captured in the SAM from cell C1 to R2. The cumulative sum of intermediate inputs (from cell C1 to R2) and factor incomes (from cell C1 to R3) culminates in the gross output, providing a comprehensive picture of the economic interactions within the village economy.

The commodities account serves as a comprehensive representation of the combined domestic (village) and imported reservoirs of goods and services. Within the domestic supply (commodity supply) [C2 to R1], the progression of domestic production from commodity to activity accounts is encapsulated, its value ideally aligning with gross output, denoted by the summation in column C1. The cell labeled "imports" [from cell C2 to R7] delineates the monetary value associated with the acquisition of goods and services from external sources beyond the village. In addition to intermediate inputs for production [from cell C1 to R2], the total demand for commodities encompasses household consumption spending [from cell C4 to R2], government spending [C5 to R2], investment demand [from cell C6 to R2], and export

demand [from cell C7 to R2]. These diverse sources of demand collectively constitute the commodity row [C2], embodying the financial transactions initiated by various entities for the acquisition of commodities. Termed as the Supply-Use Table, both the commodity row and column accounts offer a comprehensive overview of the total supply of commodities and their myriad uses or demands. It serves as a pivotal tool for understanding the intricate interplay between the production and consumption dynamics within the village economy.

The factor payment cell from C3 to R4 represents the income received by factor owners (households) within the village, encompassing wages, rent, and profits. Conversely, the factor payment cell from C3 to R7 denotes payments made from the factor account to individuals working outside the village. This includes wages for external labour contributing within the village.

Institutions account (Households and Government)

Households, positioned as the ultimate managers of factors of production, receive income from factors engaged in the production process. This income manifests in diverse forms such as wages, rent, and profits [from cell C3 to R4]. Additionally, households benefit from transfer payments initiated by the government, encompassing elements like pensions and social security [from cell C5 to R4], as well as transfers from the global arena [from cell C7 to R4], involving remittances and gifts. The allocation of these incomes is channelled towards the acquisition of commodities [from cell C4 to R2], and the settlement of direct taxes with the government [from cell C4 to R5]. Subsequently, the residual income undergoes saving or, conversely, dissaving if expenditures surpass incomes [from cell C4 to R6]. The inter-household transfers cell [C4 to R4] encapsulates transactions occurring among households within the village. The government's fiscal landscape primarily revolves around revenues generated from taxes [from cell C2 to R5], [from cell C4 to R5], and transfer payments received from other sectors of the village government, inclusive of grants and development assistance [from cell C7 to R5]. These revenues are then directed towards recurrent expenditures on commodities [from cell C5 to R2] and social transfers to households [from cell C5 to R4]. The disparity between total revenues and expenditures delineates the government's savings, or conversely, a deficit if expenditures exceed revenues [from cell C5 to R6]. This intricate interplay of financial transactions and allocations within the SAM framework encapsulates the dynamic economic relationships within the village.

Savings & Investments and RoW Account

The savings and investment account serves as a comprehensive framework for delineating the origins of savings utilized to fund domestic investments within the village economy. Savings within the economic context are categorized into private and public savings. Private savings encompass the savings generated by households (from cell C4 to R6), while government savings are encapsulated within the range from cell C5 to R6. The amalgamation of private and public savings, in conjunction with investments made within the village economy (from cell C6 to R2) and capital outflows outside the village economy (from cell C6 to R7), collectively constitutes the expenditure of the Savings-Investment (S-I) account.

According to the ex-post accounting identity, it is imperative that investment, or gross capital formation, including alterations in stocks or inventories, precisely equals the aggregate of total savings.

The residual section of the village account, often denoted as the "rest of the world" account in Social Accounting Matrices (SAM), provides a consolidated overview of economic transactions between the village and other economies in the region. Trade dynamics are encapsulated through the interaction between the commodities account and this account. This involves the tracking of import payments (from cell C2 to R7) and export earnings (from cell C7 to R2). Additionally, the rest of the village account derives income through leakages from the village economy, including factor payments from the factor account (from cell C3 to R7), transfers from the household account (from cell C4 to R7), and capital outflows (from cell C6 to R7). This intricate web of economic interactions underscores the interconnectedness of the village economy with the broader regional context.

Snapshot of the Aggregate village SAM

Aggrigate SAM

#	Account	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
		ACTIVITY ACCOUNT							COMMODITY ACCOUNT							FACTOR ACCOUNT			HOUSEHOLD ACCOUNT							
1	agriculture	0	0	0	0	0	0	0	13272546	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	livestock	0	0	0	0	0	0	0	0	9E-06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	village production activities	0	0	0	0	0	0	0	0	0	12285550	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	private	0	0	0	0	0	0	0	0	0	0	7E-06	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	public	0	0	0	0	0	0	0	0	0	0	0	519799	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MGNREGA	0	0	0	0	0	0	0	0	0	0	0	0	119970	0	0	0	0	0	0	0	0	0	0	0	0
7	SHG	0	0	0	0	0	0	0	0	0	0	0	0	0	5E-06	0	0	0	0	0	0	0	0	0	0	0
8	agriculture	12897752.5	1E-06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	359598	260132	351636	222311	0	0	1E-07
9	livestock	1103563.9	0	0	5E-06	0	0	0	0	0	0	0	0	0	0	0	0	0	0	73899	53136	61568	25200	0	0	3E-06
10	village production activities	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1E-07
11	private	295265	1E-06	8005	9008800	0	0	0	0	0	0	0	0	0	0	0	0	0	169816	2E-06	713094	249777	218902	0	0	5E-06
12	public	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29917	232628	84177	56231	10860	0	0	519799
13	MGNREGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	231224	0	0
14	SHG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151930	3E-06	1E-06	686211	294091	0	350000	28000
15	Family Labour	10904485.7	2E-06	1369750	615000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	Hired Labour	1107247.5	0	2761200	60000	118560	119970	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	949500
17	capital	30510.47	0	0	0	0	0	569440	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Landless	0	0	258600	157737	37798	0	135652	0	0	0	0	0	0	0	235500	1E-06	2637.7	0	0	0	0	0	12058	0	40000
19	Marginal	1943176.7	1E-06	2718020	177185	206434	0	2E-06	0	0	0	0	0	0	0	2E-06	3E-06	14406	0	0	0	0	0	65855	0	120000
20	Small	854899.61	0	1409900	30394	84318	0	1E-06	0	0	0	0	0	0	0	1E-06	638465	5884.1	0	0	0	0	0	26899	0	64000
21	Medium	1525597.9	0	901110	123757	50882	0	612689	0	0	0	0	0	0	0	1E-06	465980	136372	0	0	0	0	0	16232	0	80000
22	Large	784239.93	449120	963350	30394	21806	0	262581	0	0	0	0	0	0	0	522315	289464	67932	0	0	0	0	0	6956.5	0	40000
23	Government	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2608.7	24696	10087	6087	4521.7	0	0	359224
24	capital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	876139	2E-06	2E-06	4E-06	1E-06	0	0	1E-07
25	ROW	2971700.6	333527	1895615	0	0	0	0	0	0	0	4E-06	413813	11254	350000	0	0	648719	809792	5E-06	2E-06	2E-06	1E-06	0	1E-07	0

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How to calculate SAM Multipliers

For a SAM multiplier analysis, the endogenous and exogenous accounts are first identified. Normally activities, commodities, factors and household accounts are endogenous and village government, savings and investment and rest of the world accounts as exogenous as expenditure from those accounts is all exogenous. Next, the village SAM transaction matrix is converted into a matrix of average expenditure propensities by dividing each element in a SAM by its respective column total called column co-efficient matrix.

Hirway et al. (2008) used following method for calculation of multipliers using a village SAM. Let the SAM model be written as

$$Y_j = \sum_i w_{ij} + \sum_i x_{ij}$$

Where,

$$Y_j = \begin{bmatrix} y_1 \\ \vdots \\ y_j \end{bmatrix}$$ And Y_j is a vector of column total of matrix Y, y_j is jth column total;

$$W = \begin{bmatrix} w_{11} & \cdots & w_{n1} \\ \vdots & \ddots & \vdots \\ w_{n1} & \cdots & w_{nn} \end{bmatrix}$$ and W is a matrix of endogenous accounts;

And $$X = \begin{bmatrix} x_{n+1,1} & \cdots & x_{n+1,n} \\ \vdots & \ddots & \vdots \\ x_{n+k,1} & \cdots & x_{n+k,n} \end{bmatrix}$$ and X is the vector of exogenous accounts.

Upon dividing each cell of SAM by its respective column total we get coefficient matrix 'A' whose elements are . Mathematically, it can be represented as

$$a_{ij} = W_{ij}/Y_{ij}$$

Where,

$$A = \begin{bmatrix} a_{11} & \cdots & a_{n1} \\ \vdots & \ddots & \vdots \\ a_{1n} & \cdots & a_{nn} \end{bmatrix}$$

The above equation can be written as

$$Y = AY + X$$

$$(I-A)Y = X$$

$$Y = (I-A)^{-1}X = MX$$

Where,

$$M = \begin{bmatrix} m_{11} & \cdots & m_{n1} \\ \vdots & \ddots & \vdots \\ m_{1n} & \cdots & m_{nn} \end{bmatrix}$$

The matrix M is called the village multiplier matrix because it contains estimated total, direct, indirect and induced effects of exogenous income injections on the endogenous accounts in the village SAM. Multiplier matrix contains coefficients mij, which represents the total impact on account i because of a unit shock/change in account j.

Obtaining Technical Coefficient Matrix (A)

- Divided each element in a SAM by its respective column total called column co-efficient matrix / Technical co-efficient matrixi

Formula bar: f_x =E11/E29

Technical coefficients matrix

		ACTIVITY ACCOUNT							COMMODITY ACCOUNT							FACTOR ACCOUNT			HOUSEHOLD ACCOUNT							
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
ACTIVITY ACCOUNT	1 agriculture	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2 livestock	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3 village production	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4 private services	0	0	0	0	0	0	0	0	0	0	0.6236	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5 public services	0	0	0	0	0	0	0	0	0	0	0	0.5568	0	0	0	0	0	0	0	0	0	0	0	0	0
	6 MGNREGA	0	0	0	0	0	0	0	0	0	0	0	0	0.5188	0	0	0	0	0	0	0	0	0	0	0	0
	7 SHG	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9356	0	0	0	0	0	0	0	0	0	0	0
COMMODITY ACCOUNT	8 agriculture	0.09717	0.1227	0.0006516	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0275	0.0408	0.0515	0.0647	0	0	0
	9 livestock	0.08315	0	0.2247518	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0056	0.0093	0.009	0.0073	0	0	0
	10 village production	0	0	0	0.693	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	11 private services	0.02225	0.142	0.1147608	0.132	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0832	0.1582	0.1118	0.0366	0.0637	0	0	0
	12 public services	0	0	0.0733471	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0147	0.0178	0.0132	0.0082	0.0032	0	0	0
	13 MGNREGA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5678	0	0
	14 SHG	0	0	0.0784133	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0745	0.2125	0.1782	0.1006	0.0855	0	0.0333	0
FACTOR ACCOUNT	15 Family Labour	0.08216	0.2458	0.1114928	0.0901	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0451	0.3364	0.2332	0.2854	0.1	0	0	0
	16 Hired Labour	0.08343	0	0	0.0088	0.2281	1	0	0	0	0	0	0	0	0	0	0	0	0.2268	0.5008	0.1248	0.0911	0.0556	0	0	0
	17 capital	0.02309	0	0	0	0	0	0.1121	0	0	0	0	0	0	0	0	0	0	0.003	0.0164	0.0067	0.1557	0.0776	0	0	0.7406
HOUSEHOLD ACCOUNT	18 Landless	0.14641	0.1197	0.0210431	0.0231	0.0727	0	0.0267	0	0	0	0	0	0	0	0.0451	0.2268	0.003	0	0	0	0	0	0.0296	0.0016	0
	19 Marginal	0	0	0.2212371	0.026	0.3971	0	0.4832	0	0	0	0	0	0	0	0.3364	0.5008	0.0164	0	0	0	0	0	0.1617	0.0038	0
	20 Small	0.06441	0.118	0.1147608	0.0045	0.1622	0	0.1998	0	0	0	0	0	0	0	0.2332	0.1248	0.0067	0	0	0	0	0	0.0661	0.002	0
	21 Medium	0.11494	0.1623	0.0733471	0.0081	0.0979	0	0.1206	0	0	0	0	0	0	0	0.2854	0.0911	0.1557	0	0	0	0	0	0.0399	0.0025	0
	22 Large	0.05909	0.0513	0.0784133	0.0045	0.042	0	0.0517	0	0	0	0	0	0	0	0.1	0.0556	0.0776	0	0	0	0	0	0.0171	0.0013	0
	23 Government	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0013	0.0019	0.0016	0.0009	0.0013	0	0	0.0112
	24 capital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4294	0.1595	0.3417	0.5657	0.4352	0	0	0
	25 ROW	0.2239	0.0381	0.1542963	0	0	0	0	0	0	0	0.3764	0.4432	0.4812	0.0644	0	0	0.7406	0.3969	0.4171	0.3035	0.2274	0.3391	0.1179	0.9667	0

- Create Identity matrix of the same order for the homogenous accounts

Identity marix to obtain SAM matrix inversion

			ACTIVITY ACCOUNT							COMMODITY ACCOUNT							FACTOR ACCOUNT			HOUSEHOLD ACCOUNT				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
ACTIVITY ACCOUNT	1	agriculture	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	livestock	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	village production act	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	4	private services	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	5	public services	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	6	MGNREGA	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	7	SHG	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
COMMODITY ACCOUNT	8	agriculture	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	9	livestock	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	10	village production act	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	11	private services	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	12	public services	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	13	MGNREGA	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	14	SHG	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
FACTOR ACCOUNT	15	Family Labour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	16	Hired Labour	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	17	capital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
HOUSEHOLD ACCOUNT	18	Landless	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	19	Marginal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
	20	Small	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
	21	Medium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	22	Large	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1

17

125   f_x =E69-E97

Obtained (I-A) Matrix

- Subtract each technical co-efficient matric (A) cell from respective identity matrix (I) cells

(I-A) matrix : step before obtaining SAM matrix inversion

			ACTIVITY ACCOUNT							COMMODITY ACCOUNT							FACTOR ACCOUNT			HOUSEHOLD ACCOUNT				
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
ACTIVITY ACCOUNT	1	agriculture	1	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2	livestock	0	1	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0	0
	3	village production act	0	0	1	0	0	0	0	0	0	-1	0	0	0	0	0	0	0	0	0	0	0	0
	4	private services	0	0	0	1	0	0	0	0	0	0	-0.62	0	0	0	0	0	0	0	0	0	0	0
	5	public services	0	0	0	0	1	0	0	0	0	0	0	-0.56	0	0	0	0	0	0	0	0	0	0
	6	MGNREGA	0	0	0	0	0	1	0	0	0	0	0	0	-0.519	0	0	0	0	0	0	0	0	0
	7	SHG	0	0	0	0	0	0	1	0	0	0	0	0	0	-0.94	0	0	0	0	0	0	0	0
COMMODITY ACCOUNT	8	agriculture	-0.097	-0.1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	-0.03	-0.04	-0.052	-0.065
	9	livestock	-0.083	0	0	-0.69	0	0	0	0	1	0	0	0	0	0	0	0	0	0	-0.01	-0.01	-0.009	-0.007
	10	village production act	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	-0.07	-0.21	-0.18	-0.101	-0.086
	11	private services	-0.022	-0.1	-7E-04	-0.13	0	0	0	0	0	0	1	0	0	0	0	0	0	-0.08	-0.16	-0.11	-0.037	-0.064
	12	public services	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	-0.01	-0.02	-0.01	-0.008	-0.003
	13	MGNREGA	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	14	SHG	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
FACTOR ACCOUNT	15	Family Labour	-0.082	-0.2	-0.111	-0.09	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	16	Hired Labour	-0.083	-0.1	-0.225	-0.01	-0.228	-1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	17	capital	-0.023	0	0	0	0	0	-0.1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
HOUSEHOLD ACCOUNT	18	Landless	0	0	-0.021	-0.02	-0.073	0	-0	0	0	0	0	0	0	0	-0.05	-0.227	-0.003	1	0	0	0	0
	19	Marginal	-0.146	-0.1	-0.221	-0.03	-0.397	0	-0.5	0	0	0	0	0	0	0	-0.34	-0.501	-0.016	0	1	0	0	0
	20	Small	-0.064	-0.1	-0.115	-0	-0.162	0	-0.2	0	0	0	0	0	0	0	-0.23	-0.125	-0.007	0	0	1	0	0
	21	Medium	-0.115	-0.2	-0.073	-0.02	-0.098	0	-0.1	0	0	0	0	0	0	0	-0.29	-0.091	-0.156	0	0	0	1	0
	22	Large	-0.059	-0.1	-0.078	-0	-0.042	0	-0.1	0	0	0	0	0	0	0	-0.1	-0.057	-0.078	0	0	0	0	1

Obtaining Matrix Multipliers: Output, Employment and Income Multipliers

- Take inverse of the matrix (I-A) by giving the following command
- {=MINVERSE(array)}. Press: Ctrl + Shift + Enter
- Example: for agriculture activity (read column wise), output multiplier is the sum of the multiplier values (0.66) indicated in the red coloured box. Employment multiplier value is the sum of the multiplier values (0.29) indicated in the orange coloured box. Income multiplier is the sum of the multiplier values (0.92) indicated in the blue coloured box. Therefore the total multiplier value for the agricultural activity is 1.87 (0.66+0.29+0.92). Similarly you can calculate multiplier value for all the activities from the activity account

SAM matrix inversion to get Matrix multipliers

		ACTIVITY ACCOUNT							COMMODITY ACCOUNT							FACTOR ACCOUNT			HOUSEHOLD ACCOUNT				
		agriculture	livestock	village produc	priva te	public servic	MGN REG	SHG	agricu lture	livesto ck	village produc	privat e	publi c	MGNR EGA	SHG	Famil y	Hired Labou	capita l	Landl ess	Margi nal	Small	Mediu m	Large
ACTIVITY ACCOUNT	agriculture	1.17	0.21	0.05	0.17	0.06	0.06	0.06	1.17	0.21	0.05	0.10	0.03	0.03	0.06	0.07	0.06	0.02	0.01	0.06	0.07	0.07	0.09
	livestock	0.17	1.16	0.08	0.89	0.09	0.09	0.09	0.17	1.16	0.08	0.55	0.05	0.05	0.08	0.08	0.09	0.02	0.05	0.12	0.10	0.05	0.06
	village production act	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	private services	0.10	0.19	0.09	1.25	0.12	0.11	0.11	0.10	0.19	0.09	0.78	0.06	0.06	0.10	0.10	0.11	0.02	0.07	0.15	0.11	0.05	0.07
	public services	0.01	0.01	0.01	0.01	1.01	0.01	0.01	0.01	0.01	0.01	0.00	0.56	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.00
	MGNREGA	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SHG	0.13	0.16	0.17	0.16	0.21	0.20	1.20	0.13	0.16	0.17	0.10	0.12	0.10	1.12	0.19	0.20	0.03	0.09	0.26	0.22	0.13	0.11
COMMODITY	agriculture	0.17	0.21	0.05	0.17	0.06	0.06	0.06	1.17	0.21	0.05	0.10	0.03	0.03	0.06	0.07	0.06	0.02	0.01	0.06	0.07	0.07	0.09
	livestock	0.17	0.16	0.08	0.89	0.09	0.09	0.09	0.17	1.16	0.08	0.55	0.05	0.05	0.08	0.08	0.09	0.02	0.05	0.12	0.10	0.05	0.06
	village production ac	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ITY ACCOUNT	private services	0.16	0.30	0.15	0.40	0.19	0.18	0.17	0.16	0.30	0.15	1.25	0.10	0.09	0.16	0.16	0.18	0.03	0.12	0.24	0.18	0.07	0.11
	public services	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.01	0.01	0.01	0.01	1.01	0.01	0.02	0.02	0.02	0.00	0.02	0.02	0.02	0.01	0.01
	MGNREGA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	SHG	0.14	0.17	0.18	0.17	0.22	0.21	0.21	0.14	0.17	0.18	0.10	0.12	0.11	1.20	0.20	0.21	0.04	0.10	0.28	0.23	0.13	0.12
FACTOR ACCOUNT	Family Labour	0.15	0.32	0.14	0.35	0.04	0.04	0.04	0.15	0.32	0.14	0.22	0.02	0.02	0.03	1.04	0.04	0.01	0.02	0.05	0.04	0.02	0.03
	Hired Labour	0.10	0.02	0.23	0.03	0.24	1.01	0.01	0.10	0.02	0.23	0.02	0.13	0.52	0.01	0.01	1.01	0.00	0.00	0.01	0.01	0.01	0.01
	capital	0.04	0.02	0.02	0.02	0.02	0.02	0.14	0.04	0.02	0.02	0.01	0.01	0.01	0.13	0.02	0.02	1.00	0.01	0.03	0.03	0.02	0.01
HOUSEHOLD	Landless	0.04	0.03	0.09	0.06	0.14	0.24	0.04	0.04	0.03	0.09	0.03	0.08	0.12	0.04	0.06	0.24	0.01	1.01	0.02	0.01	0.01	0.01
	Marginal	0.36	0.37	0.49	0.37	0.66	0.64	0.63	0.36	0.37	0.49	0.23	0.37	0.33	0.59	0.47	0.64	0.04	0.07	1.18	0.15	0.09	0.09
LD	Small	0.17	0.26	0.23	0.24	0.26	0.19	0.27	0.17	0.26	0.23	0.15	0.14	0.10	0.25	0.30	0.19	0.02	0.03	0.09	1.07	0.04	0.04
ACCOUNT	Medium	0.24	0.33	0.18	0.31	0.18	0.15	0.20	0.24	0.33	0.18	0.19	0.10	0.08	0.19	0.35	0.15	0.17	0.03	0.08	0.07	1.04	0.05
	Large	0.11	0.12	0.12	0.11	0.08	0.08	0.09	0.11	0.12	0.12	0.07	0.05	0.04	0.08	0.12	0.08	0.08	0.01	0.03	0.03	0.02	1.02
	column total	1.87	2.32	1.98	3.12	2.20	2.93	1.96	2.87	3.32	2.98	2.94	2.23	2.52	2.83	2.90	2.93	1.43	1.49	2.20	2.01	1.59	1.65

How to Interpret SAM multipliers

The calculation of multipliers in an economic context involves three main types: output, household income, and employment multipliers. These are derived from the M matrix, wherein the activity column for which multipliers are sought is selected, and the cumulative values for commodity accounts, labour accounts, and household accounts are aggregated. The interconnections between production, factors, and households shape the repercussions of external shifts in the village economy.

To illustrate, consider an exogenous surge in demand triggered by village exports. Initially, the direct impact manifests on the production side of the village Social Accounting Matrix (SAM), affecting the relevant sector and leveraging Leontief-type production linkages to augment village production activities. A Leontief village multiplier analysis would conclude here. Yet, the amplified village production generates increased value added, leading to augmented incomes for village entities. A portion of this income is spent on locally-produced goods and services, while some leaks out through village "imports." This heightened demand for production initiates a new cycle of income changes in the village. The village multiplier unfolds through multiple rounds of feedback within SAM sub-accounts. Each injection of income into a sub-account ripples through local subsystems and extends into other SAM subsystems. This process persists as long as new income stimulates a derived demand for goods and services or triggers a redistribution of income flows within the village, with some income or savings leaking out.

The output multiplier gauges the total output demand change in the economy resulting from a unit change in output or investment in a specific sector. The employment multiplier quantifies the surge in labour demand from a unit increase in output or investment in a given sector. Meanwhile, the household income multiplier assesses the alteration in the income of all households due to a unit change in output or investment in a specific sector.

For instance, an output multiplier of 0.66 for agriculture implies that a one-rupee increase in final demand for agriculture activity leads to a Rs. 0.66 increase in the activity sector of the entire economy. This encompasses direct, indirect, and induced changes in the coefficients matrix. Similarly, an employment multiplier of 0.29 for agriculture suggests that a one-rupee increase in final demand results in a Re. 0.29 increase in labor demand in the economy. A household income multiplier of 0.92 for agriculture indicates that a one-rupee increase in final demand for agriculture elevates household income by Re. 0.92 above the existing income level in the economy.

It is crucial to note that all changes in output or labour demand are interpreted as real increases, independent of alterations in the price level. SAM analysis assumes constant and exogenous prices.

Economic impact of MGNREGP on rural livelihood security in Tumkur district, Karnataka – a SAM analysis (C. Gowda, H. R. 2015)

During 2012-13, a 65x65 sector Social Accounting Matrix (SAM) was constructed to analyze the key sectors contributing significantly to the economy of Belladamadugu village and evaluate the impact of the Mahatma Gandhi National Rural Employment Guarantee Programme (MGNREGP) on livelihood security in Tumkur district, Karnataka. A comprehensive field survey was conducted, gathering primary data from various demographic groups including 26 households, 21 farmers, 10 leaf plate makers, four luggage auto transport operators, 10 service-oriented households, 22 MGNREGP participants, and 35 non-participants. The sampling process was meticulously designed to adequately represent all sectors of the rural economy, employing a stratified sampling methodology for household data collection.

Snapshot of village economy

The comprehensive Village Social Accounting Matrix (SAM) for Belladamadugu reveals a total economic activity of Rs. 17.36 crores. Household income in the village is diversified, with labor (excluding MGNREGP wages) contributing Rs. 1.02 crores. Within this, 49 percent is earned through hired labor. Other significant contributors to household income include village production sectors (Rs. 62.51 lakhs), other sectors (Rs. 54.33 lakhs), which encompass transportation, flour mills, and provision stores, the agriculture sector (Rs. 51.08 lakhs), the livestock sector (Rs. 39.49 lakhs), remittances (Rs. 3.44 lakhs), and MGNREGP (Rs. 1.32 lakhs). Notably, MGNREGP income comprises only 0.08 percent of the village economy, indicating its minimal impact. Conversely, non-farm wages outside of agriculture play a significant role in influencing the village economy. Belladamadugu exhibits a trade surplus of Rs. 1.01 crores, constituting 5.79 percent of the overall village economy. Examining sector sizes within the SAM, the Rest of World sector holds the largest share, followed by the household sector, agriculture, village production sectors, livestock sectors, and other sectors. This intricate economic landscape underscores the village's reliance on various income sources and the nuanced interplay of sectors in shaping its economic dynamics.

Table 1: Aggregated village SAM for Belladamadugu village economy, 2012-13. (₹ lakhs)

	Activity					Commodity					Factor		HH	V.	S&I	ROW	Total
	Agri	LS	VP	MGN REGP	OTH	Agri	LS	VP	MGNR EGP	OTH	L	C	HH	GOVT	S&I	ROW	Total
Agriculture	0	0	0	0	0	133	0	0	0	0	0	0	0	0	0	0	133
Live stock	0	0	0	0	0	0	93	0	0	0	0	0	0	0	0	0	93
Village Production	0	0	0	0	0	0	0	123	0	0	0	0	0	0	0	0	123
MGNREGP	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
Other sectors	0	0	0	0	0	0	0	0	0	76	0	0	0	0	0	0	76
Agriculture	13	11	0	0	0	0	0	0	0	0	0	0	12	0	0	97	133
Livestock	11	0	0	0	0	0	0	0	0	0	0	0	7	0	0	75	93
Village Production	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	123	123
MGNREGP	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Other sectors	3	0	0	0	9	0	0	0	0	0	0	0	84	0	4	8	109
Labour	22	22	41	0	7	0	0	0	0	0	0	0	0	0	0	10	102
Capital	3	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	9
Households	51	39	63	0	54	0	0	0	0	0	102	2	0	128	0	3	317
Village Government	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3
Savings & Investment	0	0	0	0	0	0	0	0	0	0	0	0	104	0	0	0	104
ROW	30	20	19	1	0	0	0	0	0	32	0	6	109	0	101	0	319
Total	133	93	123	1	76	133	93	123	1	108	102	9	317	3	104	319	

Note: Agri: Agriculture, LS: Livestock, VP: Village Production, MGNREGP: Mahatma Gandhi National Rural Employment Guarantee Act, OTH: Others (service providers including SHGs), L: Labour Services (including family labour), C: Capital Services, HH: Households, V.GOVT: Village Government (Panchayath), S & I: Savings and Investment, ROW: Rest of the World.

Identification of key sectors of the Belladamadugu village and Impact of MGNREGP on Livelihood Security

In the Belladamadugu village, economic activities are diverse, with various sectors contributing to the overall development. The highest contributing sector, with a substantial weighted multiplier value of Rs. 172.08 lakh, is milk production and the dairy cooperative. This sector plays a pivotal role in the local economy, representing 14% of the total weighted multiplier value. The significant contribution underscores the importance of dairy-related activities in sustaining the village's economic landscape. Following closely is tamarind harvesting and processing, contributing Rs. 158.27 lakh, showcasing the economic significance of this agricultural practice. The sector not only adds to the village's income but also provides opportunities for local employment and skill development. The Self-Help Groups (SHGs) sector follows suit, with a weighted multiplier value of Rs. 145.58 lakh. This sector, representing 12% of the total, reflects the collaborative efforts of the community to enhance economic empowerment and social well-being. Brick making, with a value of Rs. 131.70 lakh, holds a notable position in the economic structure, contributing to 11% of the total weighted multiplier value. This underscores the demand for construction materials, possibly driven by local infrastructure development or housing projects.

Rainfed groundnut cultivation, with a value of Rs. 130.64 lakh, is a significant agricultural pursuit in the village. It represents 11% of the total weighted multiplier value, emphasizing the importance of crop cultivation in the local economy. On the contrary, the Mahatma Gandhi National Rural Employment Guarantee Program (MGNREGP) exhibits the lowest weighted multiplier value at Rs. 1.92 lakhs. The minimal contribution suggests a weak integration of the program with the local economy, pointing towards potential areas for improvement and increased collaboration between the program and local industries. Livestock sectors, collectively contributing 21% to the weighted multiplier value, play a crucial role in the village's economy. Milk production and dairy cooperatives constitute the majority of this share at 14%, showcasing the significance of animal husbandry.

Village-based production activities, including tamarind harvesting and processing (13%), brick making (11%), and leaf plate making (5%), collectively contribute 28% to the aggregate weighted multiplier value. This indicates the importance of supporting and enhancing these local production activities for overall economic development. Agriculture-related endeavours represent 25% of the total weighted multiplier value. Rainfed groundnut

cultivation holds the highest share at 11%, followed by paddy cultivation (8%), irrigated groundnut cultivation (3%), and flower crop cultivation (3%). These activities highlight the diversity of agricultural practices in the village, contributing significantly to its economic output.

Belladamadugu village showcases a diverse economic landscape with a strong emphasis on dairy production, agriculture, and village-based production activities. The detailed analysis of each sector's weighted multiplier value provides insights into the key drivers of the local economy, helping policymakers and community leaders make informed decisions for sustainable development.

Estimation of Output, Employment and Household income Multipliers

The multiplier effects derived from the aggregated village Social Accounting Matrix (SAM) for Belladamadugu village in the agricultural year 2012-13 are presented in Table 2. The highest observed output multiplier emanated from village production activities, including brick making, tamarind harvest, leaf plate, and beedi making. Notably, the output multiplier for these activities was remarkably high, signifying their significant impact on the local economy. Labour incomes followed closely with a multiplier of 2.79, and livestock exhibited a multiplier of 2.75. In the scenario of a 1 rupee increase in final demand for agriculture, the agricultural sector's output experiences a noteworthy Rs. 1.46 rise. This increase is dissected into various components: Rs. 1 directly fulfills the final demand, Rs. 0.097 caters to the direct requirement, Rs. 0.063 addresses the indirect requirement, and Rs. 1.16 accounts for the total requirement. Concurrently, the livestock sector witnesses an increase of Rs. 0.12, and other services observe a rise of Rs. 0.29.

It is important to highlight that a one rupee augmentation in final demand for agriculture does not yield a discernible effect on village production activities and the MGNREGP sector. However, this increase significantly contributes to the income of village households, showing a boost of Rs. 0.89, and an increase in village employment by Rs. 0.24. To fulfill a one rupee increase in final demand in the agriculture sector, the entire economy requires a total of Rs. 2.73, considering the combined effects of direct, indirect, and induced impacts. This comprehensive figure is represented as the column multiplier, showcasing the interconnectedness and interdependence of various sectors within the village economy. The

multiplier effects elucidate the intricate web of relationships within Belladamadugu village's economy, emphasizing the importance of understanding the ripple effects across different sectors for informed economic planning and policy formulation.

In the scenario where the final demand for livestock experiences a one-rupee increase, the impact on the livestock sector's output is noteworthy. Specifically, the output expands by 1.03 rupees, with one rupee directly meeting the final demand and an additional 0.03 rupees addressing an indirect requirement. This indirect contribution is crucial, as there is no direct demand from one livestock to another. As this increase in livestock output ripples through the economy, the agricultural sector witnesses growth by 0.17 rupees, while other sectors experience a combined expansion of 0.28 rupees. Importantly, within this economic cascade, family labour income sees a notable uptick of Re. 0.21, and hired labour income increases by Re. 0.04.

Table 2: Major economic sectors of Belladamadugu village as indicated by weighted value of multiplier

Sl No.	Key Sectors	Value of output in 2012-13 (Rs. lakhs)	Multiplier	Weighted value of multiplier (Rs.lakhs)
1	Milk Production and Dairy cooperative	65.66	2.62	172.08 (14)
2	Tamarind harvesting and processing	48.75	3.25	158.27 (13)
3	SHGs	54.31	2.68	145.58 (12)
4	Brick Making	52.00	2.53	131.70 (11)
5	Rainfed Groundnut cultivation	47.53	2.75	130.64 (11)
6	Paddy cultivation	37.08	2.60	96.25 (8)
7	Sheep & Goat rearing	26.96	2.91	78.37 (6)
8	Leaf plate making	20.49	2.68	55.00 (5)
9	Flower crops cultivation	14.18	2.77	39.24 (3)
10	Irrigated Groundnut cultivation	13.75	2.80	38.53 (3)
11	MGNREGP	1.33	1.45	1.92 (0.16)
12	Other sectors	75.74	2.28	172.42 (14)

Note: Figures in parentheses indicate percentage of respective column total.

Conversely, if the final demand for tamarind processing and harvesting sees a one-rupee increase, the impact on labour income is distinct. Family labour income rises by Rs. 0.22, and hired labour income experiences a more substantial increase of Rs. 0.33. This contributes to an overall generation of employment worth Rs. 0.55. Similarly, a one-rupee increase in the final demand for agriculture results in a significant positive impact. The income of poor farm households increases by Re. 0.58, and middle-income households see a higher rise of Rs. 0.67. Consequently, there is an aggregate increase in the income of village households by Rs. 1.25.

Contrastingly, the MGNREGP sector exhibits the least impact among various sectors in terms of output, employment, and household income. In response to a one-rupee increase in the final demand for MGNREGP, the direct, indirect, and induced increase in the output of all sectors in the village amounts to Rs. 1.45. This includes Rs. 1.00 from MGNREGP, Re. 0.05 from self-help groups, and Re. 0.02 from provision stores. The economic repercussions of changes in final demand vary across sectors, with livestock, tamarind processing, and agriculture showing distinct impacts. The detailed analysis underscores the intricate interplay of economic forces within the village setting, emphasizing the differential contributions of each sector to output, employment, and household income.

Table 3: Multiplier Values Derived from Aggregated Social Accounting Matrix for Belladamadugu Village for the Agricultural Year 2012-13.

	AGRI	LS	VP	MGNREGP	OTH	L	C	HH
AGRI	1.16	0.17	0.05	0.01	0.04	0.06	0.01	0.06
LS	0.12	1.03	0.03	0.02	0.02	0.03	0.01	0.03
VP	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
MGNREGP	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
OTH	0.29	0.28	0.31	0.05	1.33	0.37	0.10	0.37
L	0.24	0.29	0.37	0.16	0.10	1.04	0.01	0.04
C	0.04	0.02	0.02	0.00	0.07	0.02	1.01	0.02
HH	0.89	0.95	1.07	0.21	0.81	1.27	0.33	1.27
Total	2.73	2.75	2.85	1.45	2.36	2.79	1.46	1.79

Note: AGRI.: Agriculture, LS: Livestock, VP: Village Production, : OTH: Others (service providers including SHGs), L: Labour Services (including family labour), C: Capital Services, HH: Households.

Table 4: Output, Employment and Income multipliers of key sectors in Belladamadugu

Sl No.	Key Sectors	Output multiplier	Employment multiplier	Income multiplier
1	Milk Production and Dairy cooperative	1.50	0.25	0.87
2	Tamarind harvesting and processing	1.44	0.55	1.25
3	SHGs	1.42	0.16	1.10
4	Brick Making	1.34	0.27	0.91
5	Rainfed Groundnut cultivation	1.77	0.39	0.58
6	Paddy cultivation	1.45	0.19	0.96
7	Sheep & Goat rearing	1.37	0.41	1.12
8	Leaf plate making	1.38	0.29	1.02
9	Flower crops cultivation	1.47	0.27	1.03
10	Irrigated Groundnut cultivation	1.54	0.15	1.11

Impact of MGNREGP on overall economy of the Belladamadugu village

The technical coefficient of 0.1607 in MGNREGP sector highlights its substantial impact on employment generation. However, the study reveals that among the 35 sectors investigated; only hired labor exhibited a tangible interaction in the technical coefficient matrix. Surprisingly, other vital sectors, including irrigated crops, sheep and goat rearing, and various village production activities like tamarind harvesting, leaf plate making, brick making, and beedi making, displayed no discernible interaction with MGNREGP. Even government institutes like anganwadi centers, government schools, and PDS shops did not show any notable impact. This suggests a limited reach and effectiveness of MGNREGP in certain crucial areas of the village economy. Nevertheless, the SAM analysis, incorporating multiplier effects, provides a more comprehensive perspective. Despite the lack of direct interaction in many sectors, the indirect and induced impacts of MGNREGP were observed in 66 percent of the sectors. While these interactions were relatively weak, ranging from 0.00027 for rainfed groundnut cultivation to 0.16125 for hired labor, they signify some level of integration between MGNREGP and a majority of the village's economic activities. The sectors that demonstrated no interaction with MGNREGP may benefit from a more inclusive approach. To fully capture the SAM multiplier effects, it is imperative for MGNREGP to consider incorporating additional activities. This could involve the active involvement of Self Help Groups (SHGs) and the initiation of dairy-related endeavors within the village. By diversifying its scope, MGNREGP can extend its impact to sectors that have thus far remained untouched, fostering a more holistic economic development in Belladamadugu. In conclusion, while MGNREGP has made significant strides in the hired labor sector, there is a need for strategic expansion and diversification to ensure a broader and more profound impact on the overall economy of the village. This could be achieved through the incorporation of various economic activities and the

active engagement of local communities, ultimately contributing to sustainable and inclusive development in Belladamadugu.

Table 5 :Impact of MGNREGP on different sectors of the village economy

Sl. No.	Sectors	MGNREGP SAM matrix coefficients	MGNREGP technical coefficients
1	Rainfed groundnut cultivation	0.000265	0
2	Irrigated groundnut cultivation	0	0
3	Finger millet cultivation	0.001119	0
4	Paddy cultivation	0.004932	0
5	Flower crops cultivation	0	0
6	Redgram cultivation	0	0
7	Horsegram cultivation	0.000215	0
8	Fodder crops cultivation	0.000349	0
9	Other crops (onion, tomato, etc.,)	0	0
10	Dairy & Dairy cooperative	0.005635	0
11	Sheep and goat rearing	0	0
12	Tamarind harvesting & processing	0	0
13	Brick Making	0	0
14	Leaf plate making	0	0
15	Beedi making	0	0
16	Provision store	0.015415	0
17	Flourmill	0.000249	0
18	Barber	0.000407	0
19	Tailor	0.000784	0
20	Tv cable operator	0.000417	0
21	Pigmi collector	0.002262	0
22	Transportation	0.005177	0
23	Anganwadi centre	0	0
24	Govt. School	0	0
25	PDS Shop	0	0
26	MGNREGP	1	0
27	SHG	0.032759	0
28	Family Labour	0.00471	0
29	Hired Labour	0.161249	0.160689
30	Capital	0.003613	0
31	Landless households	0.038081	0
32	Marginal farm households	0.100569	0
33	Small farm households	0.028525	0
34	Medium farm households	0.022483	0
35	Large farm households	0.012632	0

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