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A NOTE ON CONSTRUCTION OF REGIONAL SOCIAL ACCOUNTING MATRIX WITH NATURAL RESOURCE ACCOUNTS: LINKING VILLAGE/INDUSTRY LEVEL DATA TO REGIONAL LEVEL STUDIES

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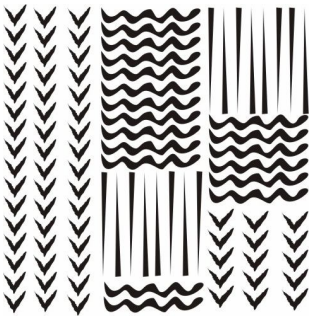

A NOTE ON CONSTRUCTION OF REGIONAL SOCIAL ACCOUNTING MATRIX WITH NATURAL RESOURCE ACCOUNTS: LINKING VILLAGE/INDUSTRY LEVEL DATA TO REGIONAL LEVEL STUDIES

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This research note aims at expanding a study area from a village or industry level to a regional level and proposing to construct a regional social accounting matrix (SAM). A SAM is a matrix presentation of transactions taken place between various economic agents in an economy. It shows production, generation and distribution of incomes, consumption expenditure and capital accumulation by various institutions, and transactions with outside the region. The SAM enables us to analyze not only direct effect but indirect and induced effects of the exogenous impacts, policy intervention or globalization, for example. The regional SAM thus will be a supplementary to the village studies.

The idea for proposing regional SAM construction has two distinct aims. One is to analyze the impacts of globalization on rural economy. Globalization is a complicate phenomenon with far-reaching influence not only on national economy but also on remote rural areas. One aspect of impact would be amplified or mitigated by another impact. In addition, inter-industry interactions in a region, inter-region interactions through trade in commodities, labor migrations, and financial flow, the impacts of globalization reaches to various groups of households. The induced effect through expenditure links and financial flow seems leaked out the village to a local market town and then to the rest of Inda, or even further. There could be a feedback links to the village as well. It is of great importance to study not only direct and indirect effects, but also induced effects through expenditures. Regrettably, this aspect is not within the scope of village and industry level studies, because village or industry level studies so far have focused on direct and indirect effects. More comprehensive studies rather than the specific industry level with a scope of wider region rather than a village are needed.

The other aim is concerned with environmental problems. Some of the most serious local and global environmental problems that India is facing are depletion of natural resources, water in particular, and change in land use patterns leading to degradation of cultivated and forest land. While the government of India envisaged the ambitious river link projects from the northern water surplus regions to the southern water shortage regions, equally important is effective utilization of local water and land resources. Soil degradation caused by over-use of chemical fertilizers and pesticides, and shortage of organic matters has caused concerns for future growth of crop production. The analysis of interactions between economic activities and natural resources is keenly needed.

With the two aims in mind, this paper proposes a construction of regional social accounting matrix with natural resource accounts. Since the study has just started, only a rough sketch of framework of regional SAM will be presented. The following section introduces my recent study on silk industry to illustrate shortcomings of the industry level studies. Section two briefly explains social accounting matrix and village SAMs constructed at two different times are compared to show that interactions between a village and to outside economy expanded and deepened. The village SAM, regrettably, is not able to analyze the expanding interrelations with outside the village. Section three proposes construction of R-SAM with natural resource accounts incorporating water, forest and land use accounts to Regional SAM. The last section concludes the discussion.

(1) Globalization and Industry level Studies—A Case Study on Silk Industry in India—

There are quite a few studies on globalization of Indian Economy. Most of them analyze the impacts of globalization either at the national economy as a whole, at industry level or at village level. These studies, industry level studies in particular, focus on direct effects or at most indirect effects of globalization, so that economy-wide interactions through indirect and induced effects are kept outside the scope of the study.

For an illustrative purpose, let me introduce my recent studies on silk industry in India. Indian silk industry was benefited from the revision of the Rules of Origin of the US in 1996 which significantly affected Chinese silk export to the US and EU during the late 1990s. Indian silk fabric export to the US increased from $120 million in 1995 to $320 million in 2003. As a result, the demand for raw silk increased, but domestic production and supply of raw silk could not respond. The Gap was filled with import of raw silk from china and India became the largest raw silk importer (Usami and Urade, 2006).

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With a large scale import of raw silk, Indian domestic markets of raw silk and cocoon were integrated to international market (Fujimori,). The domestic price of raw silk thus declined along with the fall of international prices from 2001 to 2003, though Indian silk export rapidly expanded during the same period. The fall of prices of raw silk and cocoon hit silk reeling industry as well as sericulture farms. To ameliorate the adverse effects, the Government of India implemented the Anti-Dumping duty against Chinese raw silk in 2003. It was, however, not successful in a sense that Chinese silk industry started exporting spun silk and silk fabrics (Usami and Urade, 2008).

Inferior quality of Indian raw silk is supposed as one of the reasons for large import of Chinese raw silk. It is reported that multivoltine raw silk, which accounts for about 90 percent of Indian silk production, is short in filament whereas Chinese bivoltine raw silk is suitable for warp. With the assistance of JICA, bivoltine silk worm rearing technology was transferred and bivoltine raw silk production has growing gradually. It is recently reported that one or two automatic reeling plants were installed for improving labor productivity.

The labor productivity of reeling factories, of which the majority is out-dated cottage basin type, is supposedly quite low, and its improvement is an urgent need to compete with Chinese counterparts. It is, however, required to think over the employment situation as well. The automatic multi-end reeling machines surely replace a large number of workers who have been employed in cottage basin factories. This will have serious effects on the regional economy, depending on the performance of other non-farm sectors.

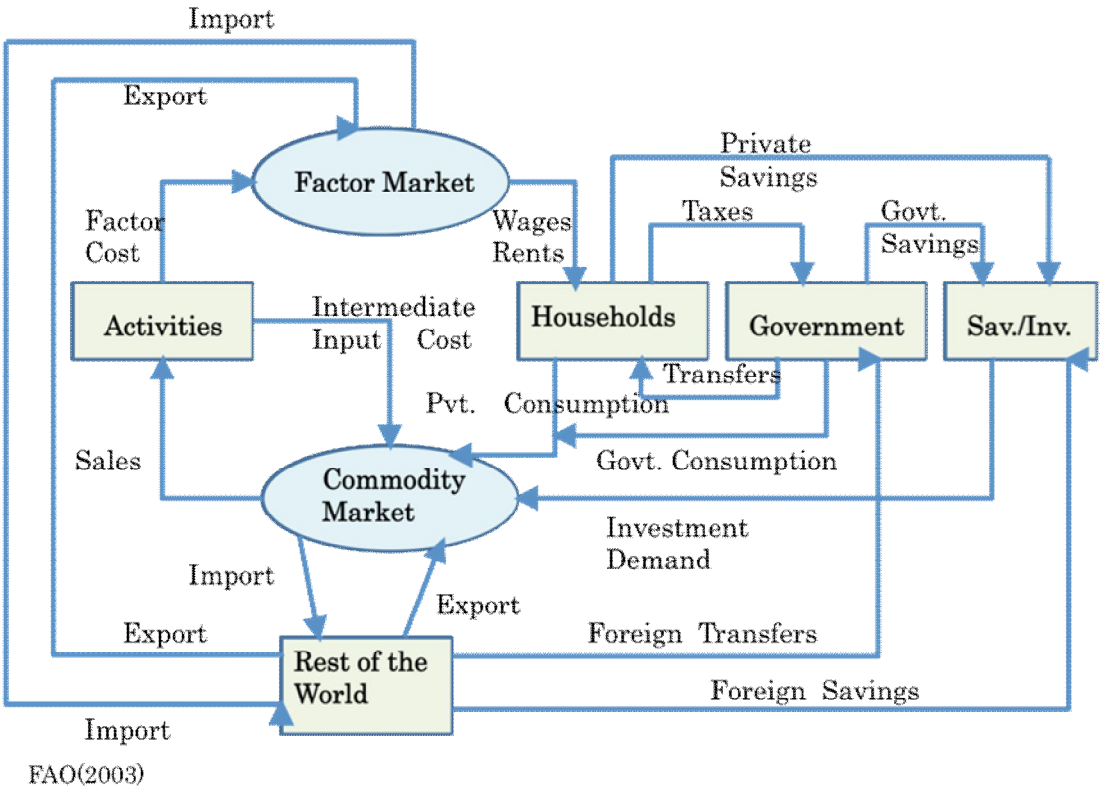
The study also noticed that while raw silk production in India as a whole remains at stagnant level, change in regional patterns of cocoon production has been taking place. Sericulture has declined in Karnataka, the largest cocoon and raw silk producer in India, whereas it has grown in Andhra Pradesh. There is a cobweb of factors, such as growth of urban sectors and government policy, for example, working behind the shift of cocoon production. This suggests that a regional economic structure has been changing rapidly.

Regrettably, because the industry level studies, like my own, tackle at direct effects or at most indirect effects, they are unable to analyze economy-wide effects on the regional society. Some other analytical tools are needed. The regional social accounting matrix, which is proposed here, is one of powerful tool for analyzing the economy-wide interactions in a region.

(2) Social Accounting Matrix (SAM)

According to SNA 1993 a social accounting matrix (SAM) is defined as the presentation of SNA accounts in a matrix which elaborates the linkages between a supply and use table and institutional sector accounts. The transactions which take place among various agents in an economy are schematically illustrated in Fig. 1. The production activities, for example, purchases intermediate inputs from the commodities market and services of factors from the factor market. The output is sold to either the domestic market or to foreign markets (export). The income thus generated is distributed to factors of production and then to the households in the form of labor earnings and others. The households earn factor income from the rest of the world (ROW) as well. Incomes received by households are spent on purchasing final goods and services, paying income taxes, transferring to other institutions and, then the balance is saved.

Figure-1 Structure of Payment Flow in an Economy



FAO(2003)

A SAM shows these comprehensive economic flows in a matrix format. The SAM thus incorporates the interactions among production activities, production factors, various institutions, capital accumulation and rest of the world in an accounting framework. Each row represents the receipts of the corresponding agent, and each column represents the expenditures.

A SAM is flexible in terms of size of an economy on which the SAM was constructed and the level of disaggregation of the account. It can be constructed at the national, state, region levels or at a village level depending on data availability and questions for which a research is undertaken.

It also allows subdivide accounts according to the purpose of study. The activities account, for example, can be disaggregated to the three or four digit classification of industries, or aggregated to fewer groups as well. In order to analyze problems of rural poverty households accounts can be disaggregated to several groups by income or by type of households in addition to rural and urban classification.

SAMs thus have been applied to various analyses of interrelationships between structural features of an economy and the distribution of income and expenditure among household groups. In India, B.K. Pradhan et.al. constructed the SAM for India (1994-95 and 2004-05). At the village level, there are a few studies such as Subramanian et.al.(1990), and Imai (2007). Bussolo, et.al., (2003) constructed a inter-regional SAM for India.

Here let us take the village SAM for Kanzara to understand the conceptual framework of a village SAM. The village SAM for Kanzara was constructed based on ICRISAT village survey data. Table-1 shows the village SAM for Kanzara, Maharashtra, which is in an aggregated form adding up all sub-accounts for each account of the original disaggregated SAM for Kanzara.

Table-1 Aggregate Village SAM for Kanzara (1984-85)

(Rs.1000)

1984-85	Activities	Commoditi	Factors	Household	Temple	Village Go	Capital	Maintenan	stock char	Rest of Ind	Total
Activities		2790.8									2790.8
Commoditi	1142.3	105.2		1620.7	5.0	0.4	203.0	15.9	135.0	1491.4	4719.0
Factors	542.6			11.3	0.7	2.0	17.8	2.2		489.9	1066.4
Household	1086.0		965.7	86.3						80.4	2218.4
Temple			6.5								6.5
Village Go	1.0		0.1	1.7						5.4	8.2
Capital				350.1	0.8	5.8					356.6
Maintenan	10.2			7.8							18.0
stock change		90.7		44.3							135.0
Rest of Ind	8.7	1732.3	94.1	96.1			135.9				2067.0
Total	2790.8	4719.0	1066.4	2218.4	6.5	8.2	356.6	18.0	135.0	2067.0	

Let us briefly look at the economic flows in the village. As mentioned previously, the rows in the SAM represent the source of income and the columns represent expenditure of income for each account. The Activities represent production in the village: the column shows purchasing intermediate inputs (Rs.1142.3 thousand) from the commodities account and the services of production factors (Rs.542.6) from the factors account. The residuals (supposedly profit) is distributed to the households account. The row indicates selling total products (Rs.2790.8 thousand) to the commodity accounts. The commodity row account represents the components of total receipts: intermediate use (Rs.1142.3 thousand) by production activities, consumption (Rs.1620.7 thousand) by households, investment and maintenance (Rs.203.0 thousand and Rs.15.9 thousand, respectively), change in stocks (Rs.135.0 thousand) and export (Rs.1491.4 thousand), while the column account shows the major portion of commodity's supply comes from production activity (Rs.2790.8 thousand), and imports (Rs.1732.3 thousand) from the rest of the country.

The row of factor account shows that factor incomes (Rs.542.6 thousand) are generated in production activities in the village, and earned from the rest of India (ROI, 489.9 thousand) and, the column indicates how the factor incomes distributed to households and other institutions. The households and other institutions accounts show the sources of each institution's income and the objects of expenditure, such as consumption, transfers, interest payments, savings and taxes. Thus, the incomes received by household (Rs.2218.4 thousand) are spent on purchasing consumer goods (Rs.1620.7 thousand), transferring to other households (Rs.86.3 thousand) and to the ROI (Rs.96.1 thousand), and saving (Rs.402.2). The row of saving and investment account (capital, maintenance and stock change, in the table) shows the source of savings and its column shows these savings are used for investment purposes

(Rs.373.9 thousand) and financial outflow from the village to the ROI (Rs.135.9 thousand). The ROI row account shows payments made by the village to the rest of India, such as transfers, taxes, factor payments, and payments for purchases from outside the village, and the column, receipt from the ROI.

Since the village is specialized in commercial crops (cotton) production, village economy deeply depended on the outside economy. Thus more than a half of total product in the village was exported to the rest of India while total import accounts for 57 percent of total domestic sale (total product + total import – total export). The trade deficit (Rs.240.9 thousand) was met by net factor income (Rs. 395.8 thousand). After spending for investment the balance leaked out as the financial outflow (Rs. 135.9 thousand).

It is well known that a SAM is a snapshot of the structure of an economy at a given time. However, if two SAMs are constructed with the same definition and methodology, they would be comparable. Table-2 shows the V-SAM for Kanzara in 2003-04. Since the aggregated SAM is only given and the method of construction is not mentioned in the paper, we can only assume that the economic structure in terms of shares could be roughly comparable. When compared with the previous one, it is clear a lot of change took place during the last two decades. Total product increased by 8.8 times in nominal terms. Income of rural households also increased, though the rate of growth is considerably lower.

Table-2 Aggregate Village SAM for Kanzara (2003-04)

(Rs.1000)

2003-04	Activities	Commoditi	Factors	Household	Temple	Village Go	Capital	Maintenan	stock char	Rest of Ind	Total
Activities		24541.2									24541.2
Commoditi	10629.4	32.2		8686.0	28.1	11.0	2316.5	385.6	1839.5	18035.2	41963.3
Factors	7863.4			395.9	19.3	14.3	365.7	252.3		1990.0	10900.8
Household	5311.5		6646.8	568.2		5.2				2411.3	14942.9
Temple			96.1	41.4						9.1	146.6
Village Go	4.9			22.9	4.7					12.6	45.1
Capital				2860.4	52.6	0.6					2913.6
Maintenan	99.3			489.0	36.8	12.8					637.9
stock change		1829.3		10.2							1839.5
Rest of Ind	632.8	15560.6	4157.9	1869.0	5.1	1.3	231.4				22458.1
Total	24541.2	41963.3	10900.8	14942.9	146.6	45.1	2913.6	637.9	1839.5	22458.1	

A marked change is seen in village's interdependence to the rest of India. Thus the share of export to total product rose to 74 percent, while total import accounts for 71% of the total sales in the village. Export increased and now trade surplus is recorded. Factor payment to the rest of India, on the other hand, becomes much more than factor income from outside the village in this paper. This suggests that loans for investment and material input increased and, as a result interest payment was swollen. The table clearly shows that during the last two decades interdependence of the village to outside economy was expanded and deepened in commodity market as well as in financial market.

This is why a regional SAM rather than a village SAM is proposed. When a village economy became much more open and interdependence between a village and a near-by market town strengthen, indirect and induced effects of exogenous impacts would not be confined within a village, but leak out the village and there might be feed-back effect from the outside the village. The major part of benefit of increase in Bt cotton cultivation would be leaked out in the form of financial outflow. On the other hand, if non-farm employment increased in the near-by urban area the impact would be feedback to the village through labor migration or induced effects of a change in consumption expenditure to more fruits and vegetables, and livestock products. The village SAM is not able to grasp the whole mechanism of interdependence between a village and market town.

By introducing additional rows and columns for financial assets and liabilities accounts, it is possible to incorporate financial flows into a SAM. This allows us analyze interdependence of a village economy with a market town through financial transactions in addition to factor income receipts and payments.

(3) Regional SAM with Natural Resource Accounts

Among the various local and global environmental problems, depletion of natural resources, water in particular, and change in land use patterns leading to degradation of cultivated and forest land are the most serious problems in rural India. While it is estimated that the utilizable water resources potential is 1123 billion tons, the total demand for water is anticipated to reach 1021 billion tons by 2025 (Min. of Water Resources, GOI,1999). It seems that water availability and demand are balanced in India as a whole, but the regional imbalance is serious. While the Ganga and Brahmaputra basin has surplus water, southern peninsular river basins are short in supply. Also depletion of groundwater resources is very acute in north-western and southern regions. Soil degradation caused by over-use of chemical fertilizers and pesticides, and shortage of organic matters has caused concerns for future growth of crop production. Indian government envisaged the ambitious river link projects from the northern water surplus region to the southern water deficient region, equally important is effective (efficient and equitable) utilization of local water and land resources. Analysis of interactions between economic activities and natural resources is called for.

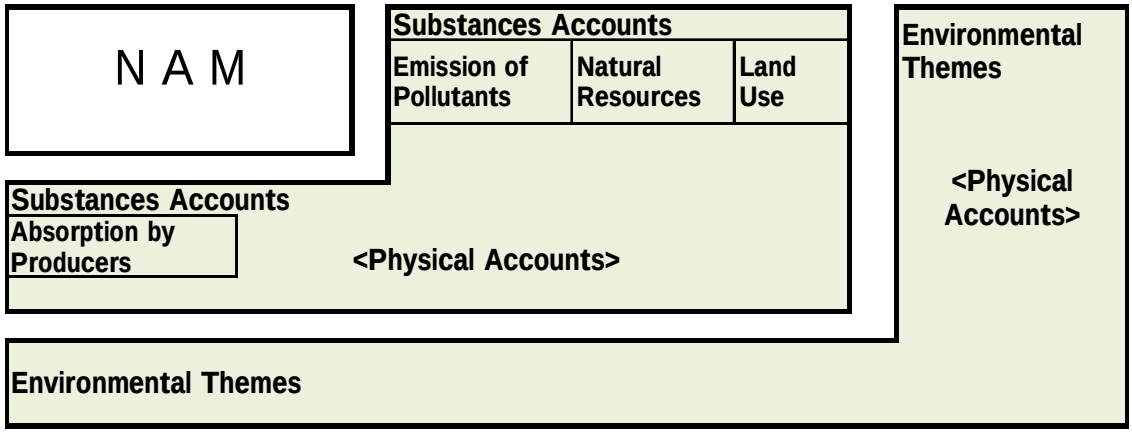
In this respect, the regional SAM has another advantage that it allows us to integrate the interactions between economic activities and the environment. While incorporating the natural resource use by economic activities, the regional SAM with natural resource accounts will be a powerful tool for analyzing the extent of depletion of natural resources due to production activities and households consumption, and its repercussions on economic activities.

Schematically, the interactions between the two spheres are considered as abstraction of natural resources into economic activities, transactions among economic agents (production, sales / distribution,

and consumption), and return of residuals into the environment. It is the National Accounting Matrix including Environmental Accounts (NAMEA) that combined together the national account matrix in monetary terms and environmental accounts in physical terms (Haan and Kenung,1996). The SEEA 2003 adopted the similar matrix representation, called the hybrid flow accounts (UN et al.,2003). With the help of the NAMEA and SEEA 2003, the conceptual framework of our regional SAM with natural resource accounts will be formulated.

Let us have a brief look at the structure NAMEA. As shown in Figure-2, the NAMEA has in its core block the national account matrix (NAM) measured in monetary terms. This is the conventional national accounts in a matrix presentation. The structures of NAM and SAM are basically same with a difference that the latter focuses more on income distribution. The environmental accounts which measured in physical terms are shown in outside the core sub-matrix.

Figure-2 Structure of NAMEA



Source: Ariyoshi (2006)

The environmental accounts of original NAMEA consist of 1) substance accounts and 2) accounts for environmental themes showing pressures on local and global environment. The substance accounts are subdivided into the accounts of pollution emission and, that of natural resources and land use. The economic activities accounts, for example, indicate on the row the production of goods and services (the SAM block), and the related emissions of polluting substances. The column shows the intermediate consumption, consumption of fixed capital and net value added (the SAM block), as well as extraction of natural resources and waste and wastewater used in pollution abatement activities. The Dutch NAMEA has natural resource use accounts of coal and petroleum. The NAMEA of Japanese version made some adjustments to the original NAMEA (Ariyoshi, 2006). Among others, it added the forest and water resources accounts and land use accounts in the substance accounts of NAMEA.

Now let us discuss how to incorporate natural resources accounts into our regional SAM Since our main

purpose is to depict the natural resource use by economic activities in a region, the accounts for emission of pollutants and the pollution abatement activities, and the accounts for environmental themes are excluded. Of course, they would be easily incorporated in the regional SAM, if necessary. Also, it is not intended to construct the comprehensive environmental accounts, the environmental services provided by natural resources, such as ecosystem input of water, landscape amenity and biodiversity conservation of forest, are not taken into consideration here. With the Japanese NAMEA as a reference, a new set of accounts, water, forest and land use, measured in physical terms as well as in monetary terms are introduced to the conventional regional SAM. Since the study just started, the following discussion is a rough sketch of conceptual framework of regional SAM with natural resource accounts.

Water Resources

Water resource accounts comprise of stock and flow accounts in physical terms as well as in monetary terms. However, since the stock water for rivers is not well defined and information on stock water in groundwater, reservoirs, lakes and tanks is not easily available, the water asset account is not taken into account here. Further, the ecosystem inputs, or ecological requirements are not considered here, though the impacts of change in ecological services downstream would be important for people living there. If stock water data were available at the regional level, then depletion of water resources would be calculated while taking the ecological flow also into consideration.

The first step thus is to prepare the water flow accounts. The flow accounts show the water flow from the environment to the economy, flows within the economy and flows from the economy back to the environment. More specifically, the water flow accounts measure the supply and use of water by detailed economic activities and households so that these can be linked directly to the regional SAM. The water supply and use tables are disaggregated by the natural source of water, i.e., surface water and groundwater. Note that some economic sectors abstract water from nature for direct use in production and some abstract water for distribution to other sectors. Once water is abstracted from the environment and processed by an industry, it is considered as a product, irrigation and drinking water, for example. In order to show the difference between natural and produced water, we subdivide economic production into the water producing sector and other economic activities. The water producing sector could be further subdivided into irrigation sector and other water distribution sector.

In order to record the flow of water in the SAM block, the use of water as a product is measured not only in physical terms but also in monetary terms. Water supply in monetary units records the major economic output of water producing sectors, of drinking water, non-drinking water, and irrigation water. Water use in monetary terms records the use of water by other economic sectors and households. It is well known that valuing water is not easy. A market price, if any, covers only ordinary production cost

and is undervalued by economic subsidy provided by the government. Given that water is undervalued, yet measuring water in monetary terms would be useful to estimate water rent (economic rent as well as water services) which accrues to either water producing sectors or water user.

From the discussions above, it is clear that some adjustment and extensions are needed to the conventional SAM to integrate water resources, as shown in Figure-3. The adjustment is the subdivision of activities accounts in the SAM block to show explicitly water producing sector. The extension is introducing a new set of accounts below the SAM block to show water use by activities and institutions. One is surface water account and the other is groundwater account. Similarly, two columns are introduced to the right-side of SAM block to record the residuals returned to the environment.

Figure-3 Regional SAM with Water Flow Accounts

				Commodities*		Activities*			Factors*		Institutions							Natural*		
				Others	Water	Agriculture	Others	Water distribution	Labor	Water	Household	Government	Capital (investment)	Financial*	ROIndia	SAM Total		Others	Water	Land Use*
				A	B	C	D	E	F	G	H	I	J	K	L	M		AA	AB	AC
Commodities*		Others	1																	
	Water	Irrigation	2			C2														
		Others	3				D3				H3	I3								
Activities*		Agriculture	4																AB4	
	Water	Irrigation	5		B5														AB5	
	Distribution	Others	6		B6														AB6	
	Others		7																	
Factors*		Others	8																	
	Water		9			C9	D9	E9												
Institutions																				
	Household		10																AB10	
	Government		11																AB11	
Capital (savings)			12																	
Financial*			13																	
ROIndia			14																	
SAM total			15																	
Natural resources*		Others	16																	
		River Canal	17			C17	D17	E17			H17	I17								
	Water	Tank	18			C18	D18	E18			H18	I18								
		Ground water	19			C19	D19	E19			H19	I19								
Land Use*			20																	

Note: The accounts with * are shown in aggregated format.

Water abstraction from the environment is shown by rows 17-19. For example, the direct water abstraction by agriculture in physical terms from river and aquifer is shown in the cells (C17 and C19), respectively. The water distributors such as irrigation and water distributors abstract water from river or aquifer, which are shown in the cells (E17 and E19). Similarly, the direct water abstraction by households is shown in the cells (H17-H19). The return of residual water is shown in physical terms by the column AB.

The economic transactions of water as a product are shown in SAM block in monetary terms. The water distributors sell water to agriculture (irrigation) (B5) and other purposes (B6). The economic activities use treated (or untreated) water as intermediate input (agriculture C2, and other sectors D3). The cells (H3 and I3) show final consumption of water by households and the government, respectively. Provided that water rent were calculated, water rent is recorded in the cells (C9 to E9), some part would be accrue

to the distributors and the remaining accrue to users. The balance between the direct abstraction and residual return is actual water consumption in the region. The water flow account in physical terms is used to calculate the sector wise actual water use.

Forest resources and Land Use

During the last decade or so forest accounts have been prepared in many countries to shed light on the problem of forest depletion and assessment of non-timber forest products (NTFP) and environmental services of forest. Let us take a look at the analytical framework underlying these forest accounts. According to SEEA 2003 land is classified according to the land cover and land use classifications. In practice, however, it is not possible to classify land by both ways because usually land use data is only available. For accounting purpose forest and NTFP are separated from forest land. Forest land is included in land use accounts which will be discussed later. Forest then is divided into cultivated forest and non-cultivated (natural) forest. Forest supplies variety of products and services: timer, non-timber forest products, forest services, such as carbon storage and recreation (Lange, 2004). Wood and non-wood products are supplied by other wooded land as well.

Forest accounts consist of asset account and flow accounts. Some of the accounts are described in both physical and monetary terms and some in physical terms only. The forest asset accounts record balance accounts for stocks of standing timbers. The timber asset account records opening stock, natural growth, felling, change in classification, revaluation of stock and closing stock. The forest flow accounts include supply and use tables for detailed forest products by economic activities. Forest products include timber, NTFP like wild plants, honey, etc., and forest services, like livestock grazing, recreation and tourism, and carbon storage. Assessing NTFP and forest services allows us to analyze how many non-forestry sectors benefit from forest ecosystems.

Land is regarded as a production factor and land use accounts shows the actual use of land in the production and consumption processes in physical terms. A land use by economic activities matrix allows us to link directly to the regional SAM.

When constructing the regional SAM, it is required to take into account the very close interrelationship among crop cultivation, livestock husbandry, forestry and households. The interrelationship is characterized as a substitution relationship among each intermediate input. One example is wood (fuel wood), fossil fuel and dung fuel, and another is cow dung as manure and chemical fertilizer. Cow dung, thus, is used as manure for crop production and as fuel for households. That shortage of organic matter due to fuel use of cow dung is a cause of lower land productivity was noticed since long (Howard, 1924). Among forest products timer is used for house construction and furnishing as well as making farm implements. In addition to fossil fuels, such as coal, kerosene and gas, fuel wood is used by rural and urban households.

Kawasaki (2003) is a pioneering work to incorporate this nexus of livestock, forestry, fertilizer and fuel sectors into the SAM framework and the SAM thus constructed was used for the Computable General Equilibrium model. To integrate explicitly the interrelationship, he introduced land accounts (cultivated land, grazing land and forest land) in factors account. He also introduced two accounts for dung fuel and dung manure in commodities accounts. Regrettably, Kawasaki did not subdivide forestry account into timber wood and fuel wood.

Figure-4 shows the framework of our regional SAM incorporating forest resources and land use accounts. In order to represent explicitly the nexus among livestock husbandry, forestry and agriculture, it is required to adjust the conventional SAM, and the activities, commodities, factors and institution accounts are subdivided. Forestry account is subdivided into two sub-accounts, timber wood and firewood. As for commodities, accounts for cow dung, timber, firewood, NTFP and fossil fuels are separately formed. In addition to labor and capital in the factors accounts, land rent accounts for cultivated land, grazing land, and forest land are introduced. Like water resources accounting, forest services are not taken into account here, but if estimation for forest service value were available it would be recorded as the forest land rent.

Outside the core SAM block, new accounts for cultivated forest and natural forest are introduced to record the timber flow in physical terms. Thus, the cells (B31-D32) record intermediate input use of timber wood and fuel wood by activities and the cell (G31-G32) shows final consumption of timber wood and fuel wood by households. The natural growth of timber stock is recorded in the cells (AA26). In addition, land use accounts are introduced to show land use by activities and households in physical terms. Land use is classified into cultivated land, fallow land, forest land, and other land.

Figure-4 Regional SAM with Forest and Land Use Accounts

				Commodities*	Activities*				Factors*	Institutions	Capital (investment)	Financial	ROIndia	SAM Total	Natural*		Land Use*
					Agriculture	Livestock husbandr	Forestry	Oters							Forest	Water	
				A	B	C	D	E	F	G	H	I	J	K	AA	AB	AC
Commodities*																	
	Ag. products	Others	1														
	Livestock products	Others	2														
		Dung manure	3														
		Dung fuel	4														
	Forest products	Log wood	5														
		Fuel wood	6														
		NTFP	7														
	Others	Others	8														
		Chem fertilizer	9														
		Fossil fuel	10														
Activities*																	
	Agriculture	***	11														
	Livestock husbandry	Cow buffalo	12														
		Drought animal	13														
		Sheep Goat	14														
		Poultry	15														
	Forestry	Log wood	16														
		Fuel wood	17														
	Others	***	18														
Factors																	
	Labor		19														
	Capital		20														
	Land cultivated		21														
	Land grazing		22														
	Land forestry		23														
Institutions																	
	Household		24														
	Government		25														
Capital (savings)			26												AA26		
Financial			27														
ROIndia			28														
SAM total			29														
Natural resources		Others	30														
	Forest	Cultivated forest	31		B31	C31	D31	D31		G31							
		Natural forest	32		B32	C32	D32	D32		G32							
Land Use		Agricultural land	33		B33	C33				G33							
		Forest land	34			C34	D34										
		Fallow	35			C35	D35										
		Other Land	36		B36			E36		G36							

Note: The accounts shaded are subdivided or newly added accounts..

Concluding Remarks

In order to study the change in economic structure in rural areas due to globalization or government policies and etc., both industry and village level studies are needed to expand the scope of research. Industry level studies are liable to be a partial, because effects of change in other sectors are not taken into accounts. Village level studies are not able to analyze full effects of exogenous shock because the relationship with local market towns is not treated as endogenous accounts. To expand the scope of the study, construction of regional social accounts is proposed. If the relationship with a local market town is explicitly incorporated, and if financial flow is incorporated in the regional SAM it will be a useful tool for analyzing the change in economic structure in the region.

Taking the recent concerns on environmental problems into consideration, this note further proposes to incorporate the interactions between economic activities and natural resources to the regional SAM. The

regional SAM with natural resource accounts will be a powerful analytical tool for depletion and degradation of natural resources, water and forest, due to economic activities within the region and the outside, and their repercussions on regional economy as well.

Data availability is a serious constraint as huge consistent data is required for construction of regional SAM. Since district level data is fragmentary it is not easy task to collect needed information for SAM construction at the district or NSS region level. In such a case, the mini-region SAM covering several villages and a local market town, like the study in Mexico undertaken by Yunez-Naude et.al.(2006) would be a substitute. This is just a starting point, showing a rough idea of regional SAM. Examination of the accounting framework of SAM and water and forest accounts in detail is remained for future studies.

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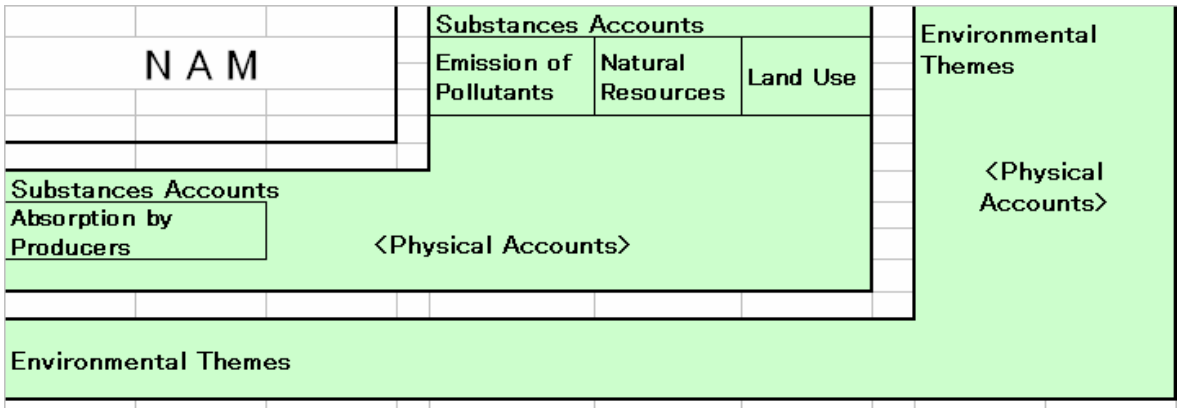
APPENDIX



Source: Ariyoshi (2006)

Appendix Regional SAM with Natural Resource Accounts

				Commodities*							Activities*					Factors						Institutions			Capital (investment)	Financial		RO.India	SAM Total	Natural resources*		Land Use*
				***	Dung manure	Dung fuel	Forest products	Water	Chem fertilizers	Fossil fuel	Agriculture	Livestock husbandry	Forestry	Water distribution	Oters	Labor	Capital	Land agriculture	Land grazing	Land forestry	Water	Household	Corporations	Government		Financial assets	Liabilities			Forest	Water	
				A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
Commodities*																															
	Ag. products	***	1																												
	Livestock products	***	2																												
		Dung manure	3																												
		Dung fuel	4																												
	Forest products	Log wood	5																												
		Fuel wood																													
		NTFP	6																												
	Water	Irrigation	7																												
		Others	8																												
	Others	***	9																												
		Chem fertilizer	10																												
		Fossil fuel	11																												
Activities*																															
	Agriculture	***	12																												
	Livestock husbandry	Cow buffalo	13																												
		Drought animal	14																												
		Sheep Goat	15																												
		Poultry	16																												
	Forestry	Log wood	17																												
		Fuel wood	18																												
	Water	Irrigation	20																												
	Distribution	Others	21																												
	Others	***	22																												
Factors																															
	Labor		23																												
	Capital		24																												
	Land cultivated		25																												
	Land grazing		26																												
	Land forestry		27																												
	Water		28																												
Institutions																															
	Household		29																												
	Corporations		30																												
	Government		31																												
Capital (savings)			32																												
Financial																															
	Financial Assets		33																												
	Liabilities		34																												
RO.India			35																												
SAM total			36																												
Natural resources																															
	Forest	Cultivated forest	37																												
		Natural forest	38																												
	Water	River Canal	39																												
		Tank	40																												
		Ground water	41																												
Land Use		Agricultural land	42																												
		Forest land	43																												
		Fallow	44																												
		Other Land	45																												

Note: The accounts with * are shown in aggregated format.

				Commodities*		Activities*			Factors*		Institutions						Natural*		
				Others	Water	Agriculture	Others	Water distribution	Labor	Water	Household	Government	Capital (investment)	Financial*	ROIndia	SAM Total	Others	Water	Land Use*
				A	B	C	D	E	F	G	H	I	J	K	L	M	AA	AB	AC
Commodities*		Others	1																
	Water	Irrigation	2			C2													
		Others	3				D3				H3	I3							
Activities*		Agriculture	4															AB4	
	Water	Irrigation	5		B5													AB5	
	Distribution	Others	6		B6													AB6	
	Others		7																
Factors*		Others	8																
	Water		9			C9	D9	E9											
Institutions																			
	Household		10															AB10	
	Government		11															AB11	
Capital (savings)			12																
Financial*			13																
ROIndia			14																
SAM total			15																
Natural resources*		Others	16																
	Water	River Canal	17			C17	D17	E17			H17	I17							
		Tank	18			C18	D18	E18			H18	I18							
		Ground water	19			C19	D19	E19			H19	I19							
Land Use*			20																

Note: The accounts with * are shown in aggregated format.

				Commodities*	Activities*				Factors*	Institutions	Capital (investment)	Financial	ROIndia	SAM Total	Natural*		Land Use*
					Agriculture	Livestock husbandry	Forestry	Oters							Forest	Water	
				A	B	C	D	E	F	G	H	I	J	K	AA	AB	AC
Commodities*																	
	Ag. products	Others	1														
	Livestock products	Others	2														
		Dung manure	3														
		Dung fuel	4														
	Forest products	Log wood	5														
		Fuel wood	6														
		NTFP	7														
	Others	Others	8														
		Chem fertilizer	9														
		Fossil fuel	10														
Activities*																	
	Agriculture	***	11														
	Livestock husbandry	Cow buffalo	12														
		Drought animal	13														
		Sheep Goat	14														
		Poultry	15														
	Forestry	Log wood	16														
		Fuel wood	17														
	Others	***	18														
Factors																	
	Labor		19														
	Capital		20														
	Land cultivated		21														
	Land grazing		22														
	Land forestry		23														
Institutions																	
	Household		24														
	Government		25														
Capital (savings)			26												AA26		
Financial			27														
ROIndia			28														
SAM total			29														
Natural resources		Others	30														
	Forest	Cultivated forest	31		B31	C31	D31	D31		G31							
		Natural forest	32		B32	C32	D32	D32		G32							
Land Use		Agricultural land	33		B33	C33				G33							
		Forest land	34			C34	D34										
		Fallow	35			C35	D35										
		Other Land	36		B36			E36		G36							

Note: The accounts shaded are subdivided or newly added accounts..