An Input-Output Analysis with an Environmentally Adjusted Agricultural and Forestry Sector in Bangladesh

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Abstract

Traditional national income accounting methods does not make an allowance for the environmental damages incurred while producing the current output. Agriculture is no longer considered to be an environmentally friendly activity. In Bangladesh, efforts to feed an ever-increasing population have meant unsustainable farming practices and a steady depletion of the resource base. The quality of the environment has been degraded and ability of the future generations compromised. This calls for "greening" of GDP by deducting negative changes in environmental quality in national income calculation. This paper begins by developing an environmental account for Bangladesh's agricultural sector. This is done by collecting physical data on depletion and degradation of environmental resources and then estimating their costs by appropriate valuation techniques. The environmentally adjusted agricultural sector is then integrated with a Social Accounting Matrix. Finally, sectoral products for agriculture and forestry are estimated net of environmental cost.

Keywords: Social accounting matrix, Input-output table, GDP, Sustainability

1. Introduction

The effect of the "green revolution" in Bangladesh has been mixed. Introduction of high yielding varieties (HYV) of rice and associated technology is credited with feeding an ever-expanding population of Bangladesh. The environmental damages done in the process has been formidable, and will probably carry in to the future. Alauddin and Tisdell (1989) noted a 50 to 200 per cent higher return on capital compared to labor encouraged an inappropriate choice of inputs like chemical fertilizers and modern irrigation methods over Bangladesh's much abundant labor. Higher doses of chemical fertilizers are responsible for creating conditions where the natural nutrients of the soil are fast depleting.

Very recently Goldar et al. (2011) used the input-output (I-O) methodology on 2003-04 data in order to take into account both direct and indirect emissions from the foreign trade sector of India. Certain categories of traditional export items such as cotton textiles were found to be far more damaging to the environment in this I-O framework than what their direct emission coefficient would suggest. Their recommendation to policymakers was to emphasize or de-emphasize the export of certain categories of exports in line with national environmental goals.

Our research presented in this paper forms one of the early attempts to integrating environmental accounts into national accounts. We used the economic I-O matrix to develop a social accounting matrix (SAM) for the Bangladesh economy. We then extended the analysis in the satellite account to determine the depletion and degradation impact on Gross Domestic Product (GDP). Being an early attempt, this research is confined only to the study for agriculture and forestry sector (contributed about 16.03% of the total GDP in 2008-09) to illustrate

that a sustainable income growth would mean a choice between sectors. If a sector has a higher degradation and depletion effect compared to other sector, then income growth using this particular sector may not be the right choice of an economy. Unlike Goldar et al. (2011) study that considered only foreign trade sector of India, our study concentrates only on two of the environmentally sensitive sectors within the domestic economy of Bangladesh.

The research is conducted in three stages: (i) to start from a suitable I-O table for the Bangladesh economy, (ii) to extend the I-O table into a Social Accounting Matrix (SAM), and finally (iii) to determine the depletion and degradation impact from agriculture and forestry activities on GDP. The SAM is a matrix presentation of the System of National Accounts (SNA) elaborating the linkages between the supply and use table, commonly known as the input-output (I-O table) and institutional sector accounts.

An adjustment to GDP from environmental damage is done by deducting environmental costs caused by economic activities including environmental degradation cost and ecological damage cost. The resultant product is an Environmentally Adjusted Domestic Product (EDP), known popularly also as "green GDP". The idea of green GDP has gained in popularity ever since the Rio Earth Summit in 1992. It is a measure of how a country is prepared for sustainable economic development. It should be noted here that the estimates presented in this research is not quantitatively at par with the green GDP accounting rules as we only include agriculture and forestry sectors for illustrative purposes. Nevertheless one can appreciate the enormity of the issues involved and a clearly defined methodology presented here to tackle a complex problem that need to be resolved.

2. Framework for National and Input-Output Accounts

2.1 System of National Accounts

In its efforts to increase comparability of economic statistics, the United Nations (1953) first published the System of National Accounts (SNA) in 1953. Initially, the SNA was comprised of six standard accounts, based on an underlying structure of production, appropriation, capital reconciliation, external transactions, and government. By now, the SNA describes a coherent, consistent and integrated set of macroeconomic accounts in the context of a set of internationally agreed concepts, definitions, classifications and accounting rules. In addition, the SNA provides an overview of economic processes, recording how production is distributed among consumers, businesses, government and foreign nations. In 1993, in response to United Nations (UN) Rio Summit, the SNA included system for integrated environmental and Economic Accounting (SEEA) to deal with the environmental issues (United Nations, 1993). In subsequent publication (United Nations, 2003) the UN conceded that methodological problems about green GDP remained unresolved and questioned even usefulness of such measure. At present the SEEA remains a satellite system, not integrated into SNA. Besides information about economic activities, the SNA now shows the levels of an economy's productive assets and the wealth of its inhabitants at particular points in time.

At a country level, China was the first country to publish its green GDP data for the year 2004, in 2006 (SEPA 2006). It showed that the financial loss caused by pollution was 511.8 billion yuan ($66.3 billion), or 3.05 percent of the nation's economy. It was considered a very promising development in the adoption of green GDP that proposes to discount GDP for the environmental costs lost to growing that GDP (He, 2009; Li & Lang, 2010). In the face of mounting evidence that environmental damage and resource depletion was far more costly than anticipated, the Chinese government subsequently withdrew its support for the green GDP methodology and suppressed the 2005 report that was due to be released in 2007. Instead, the government plans to release green GDP data from 2015 in its bid to bring environmental concerns into mainstream growth accounting.

2.2 Input-Output (I-O) Accounts

An input-output model reflects the precise quantitative sectoral relations in an economy. Originally developed by Wassily Leontief (1936) to depict inter-industry relations of an economy, the input-output table has become an indispensable tool in any quantitative exercise. It shows how the output of one industry is an input to each other industry. It also provides a detailed analysis of the process of production and the use of goods and services (products) and the income generated from the production process. Transactions of goods and services are broken down by intermediate and final use. A complete I-O table also shows the cost structure of production activities: intermediate inputs, compensation to labour and capital, taxes on production. Later, Leontief modified the input-output model to study environmental issues relating to pollution (Leontief, 1970) (Note 1).

An I-O table is normally displayed in the form of a matrix. A given input is typically enumerated in the column of an industry and its outputs are enumerated in its corresponding row. This format, therefore, shows how dependent each industry is on all others in the economy both as customer of their outputs and as supplier of their

inputs. Each column of the input-output matrix reports the monetary value of an industry's inputs and each row represents the value of an industry's outputs.

Table 1 illustrates a general structure of an I-O table, according to the European System of Integrated Economic Accounts (EUROSTAT, 1986).

In the standard EUROSTAT framework, Matrix A represents an intermediate demand. Rows in the matrix A describe production sector outputs. Columns represent sectors that use outputs of production as intermediate inputs. A breakdown of a final demand on private consumption, government consumption, investment, and export is shown in Matrix B. Matrix C gives the information on total domestic production. Matrices D, E and F give the corresponding information on imported goods and services. Payments to labour and capital, depreciation, and indirect taxes are presented in Matrix G. Matrix H is normally empty, and summation over rows in Matrix I gives information on value-added. If an I-O table is balanced, then columns of Matrix J should be the same as the rows of Matrix C because total input equals total output for production sectors.

For Bangladesh, a condensed I-O table corresponding only to intermediate demands (Matrix A as per Table 1) for the economy is shown in Table 2. The Bangladesh Institute of Development Studies (BIDS, 1998) constructed a 1993-94 I-O table (Note 2). The current I-O table is an up-dated version of the BIDS (1998) estimate using 1998-99 national accounts data. The BIDS (1998) I-O Table was constructed with 79 sectors. A complete listing of these component sectors is provided in Appendix 1, which shows a relatively well-documented, I-O data in as far as for the agricultural sector is concerned.

Admittedly the data used in this research are dated, but release of new I-O data can take up to a decade and are usually comes incomplete initially. For Bangladesh, a newer I-O table was constructed by researchers at Dhaka University and the Bangladesh Institute of Development Studies (BIDS) in 2006-07. There were number of gaps reported in this newer I-O table. For example, a high number of cells across the rows and columns were empty (GHK, 2010). An operational version of the original table was constructed by merging a number of sectors while splitting other sectors that was less than robust. The I-O table used in this study does not have similar shortcomings and represents a better choice in our judgment.

The base year used for the I-O Table 2 is 1998-99, the latest period in which complete national accounts data was available from Bangladesh Bureau of Statistics. The 17x17 use matrix reported forms the core of the I-O table. The I-O coefficients have been used to split out the production value of the various commodities as found in the national statistics. The sectoral GDP column describes the value of outputs by sectors. The total sum of the cells in the column matrix equals the total domestic production of the Bangladesh economy.

The I-O table shows only the relationship between production accounts. Thus, an entry in a cell a_{ij} tells the proportion of sector i's output used in the production of a sector j. The use matrix also contains a large number of cells with zero entries. This is because many activities take inputs only from some sectors and not from all sectors. Agriculture and forestry, for example, cannot be expected to use hotels and restaurants as an intermediary input. The crop sector has been aggregated over 15 major crops (paddy, wheat, sugarcane, etc.), while livestock, forestry and fishing (including shrimp farming) has been kept separate (refer to Appendix 1).

3. Social Accounting Matrix (SAM)

A SAM is an expanded version of an I-O table that is designed to capture specific details of various economic flows in a matrix format. Traditionally applied to analyze causes and consequences of various aspects of inequality among household groups, an extended SAM is currently used as a conceptual and modular framework for policy and planning purposes. A detailed SAM integrates the four existing economic frameworks in the country: (i) System of National Accounts, (ii) Balance of Payments, (iii) Flow-of-Funds, and (iv) Input-Output Table. The SAM, therefore, provides a comprehensive quantified description of the macro-economic and financial interrelationships in the country. A more detailed discussion on the construction and uses of SAM can be found in Pyatt and Round (1985). For our purposes, SAM can provide useful information about intersectoral linkages, including the one's that exist between agriculture and environment, the focus of this research. Table 3 shows the SAM matrix for Bangladesh for the year 1998-99. The SAM is based on the 1998-99 I-O Table as reported in Table 2.

For compactness, we have aggregated 79 sectors from BIDS (1998) 1993-94 I-O table to form a 17x17 SAM. The 79 sectors were originally chosen in BIDS (1998) project on the basis of the importance of the sectors and commodities (paddy, jute, livestock, forestry, RMG, etc.) to reflect, as best as possible, the structure of the Bangladesh economy. 18 agricultural products have been aggregated as “crop” sector while 38 industrial outputs have been aggregated as “manufacturing” sector. Other aggregations done are shown in Appendix 1 (Note 3).

Like the I-O Table 2, The SAM, as calculated here, incorporates only the production side, (the input-output table), while the distribution and transfers among various institutions (households, enterprises and government) are ignored. Flexibility of SAM allows division of the sectors into different sub-sectors and in taking account of the transactions among them (i.e. among different sectors and within the sub-sectors). The primary sector, for example, has been disaggregated into crop, livestock, forest, fishing and mining, and the table could be used to trace the environmental effect of a specific production shift among various sub-sectors.

Let us take a closer look at Table 3 to see its correspondence with I-O table (Table 2). Rows in table 3 represent production sector outputs, which are used as intermediate inputs for other sectors. Columns in Table 3 represent intermediate consumers (production sectors which use an output of production sectors as intermediate inputs). Looking along a particular column of Table 3, one can see how inputs are used for production in a certain sector. Take for example row 2, livestock. We can see, from column 1, that the crop sector has consumed a livestock output in the value of 16,144, while the third column shows that the forest sector as an insignificant consumer of livestock. Finally, there is a relationship between an I-O table and Gross Domestic Product (GDP). Sectoral GDP can be calculated as sum of the columns corresponding to a sector. This is reported in the last column of Table 3. By summing up the entries in this column, we can obtain the GDP figures. GDP is defined as the value of final goods and services produced in a given year. Hence, alternatively, we can extract information on GDP from an I-O table by eliminating intermediate production - goods that are used up to produce other goods.

4. Discussion of Results

For Bangladesh, SAM has been developed using the input-output (I-O) table (Table 2) for the economy and this is shown in Table 3. Based on these I-O and SAM tables and by incorporating in them the information on forestry acreage, deforestation rate, cultivable land under rice cultivation, we calculated the depletion and degradation impact on the national economy.

Using the SAM matrix, Table 4 then shows the division of agricultural output for use as intermediate goods and as final demand. A negative entry in this table would mean this sector has a net import.

Forestry and agricultural activities generate methane and ammonia emission - both are greenhouse gases. In addition, water and land emissions from agriculture include run-off pesticides and soil nutrients. Due to lack of information on valuation, we did not include these in our environmentally adjusted GDP calculations. However, agricultural and forestry activities also causes soil erosion and loss of opportunities for the communities to use forest products. These two impacts are estimated during period 1998-99 using secondary information and reported in Table 5.

Finally, based on the above, we have estimated the gross and net (of environmental cost) sectoral product for agriculture and forestry. These are presented in Figure 1 and Figure 2. Figure 1 shows that due to erosion, agricultural sector lost a sizeable output. This is nearly 2 percent of the sectoral product (see Table 5). Figure 2 then shows the product of the forestry sector and the adjusted product. It is evident that deforestation (a type of depletion) has reduced the forestry sector output by nearly 50 percent. The losses are calculated in terms of depletion of forest product and soil erosion due to deforestation. The last diagram, Figure 3, shows the percent loss in GDP if we adjust it for degradation and depletion.

5. Concluding Observations

From the results obtained in this research, it is clear that had there been a choice, utilization of renewable resources without causing depletion is a better choice. Estimates of rather large deforestation impact in this research suggest that attempts to raise GDP using forestry sector is not environmentally sustainable.

The presentation above has shown that to make an optimum decision for the society, traditional gross domestic product (GDP) does not provide a long-term perspective. Consideration of net losses of natural resources and environmental assets would imply Bangladesh's GDP need to be reduced significantly, especially if manufacturing and service sectors are considered. The current research was restricted to a narrow set of damages from agricultural and forestry sectors and it is only logical to extend the analysis to all sectors. This suggests that it is the (environmentally adjusted) ecological domestic product (EDP) that needs to be used to ensure a sustainable development.

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Notes

Note 1. Wassily Leontief received the 1973 Nobel Prize in Economics for his pioneering work in input- output method and its application to important economic problems that includes environmental issues.

Note 2. Bangladesh Planning Commission and Bangladesh Institute of Development Studies. 1998. An Input-Output Table for Bangladesh Economy, 1993-94. Dhaka, Bangladesh.

Note 3. Same aggregation also done in constructing an aggregated I-O table, which is presented in Table 2.

Table 1. General structure of an input-output table

		INTERMEDIATE USE				FINAL USE				
		By Production Sectors				Private	Gov't			Output
		1	2	...j...	n	Consump.	Consump.	Invest.	Export	
	1									
Domestic	2									
Production	:									
	i			A			B			C
	:									
	n									
	1									
	2									
Imports	:									
	i			D			E			F
	.									
	n									
Value added:										
-labor										
-capital				G			H			I
-indirect										
taxes										
INPUT				J						

Source: EUROSTAT, 1986

Table 2. A condensed input-output table of Bangladesh

Sector	I. AGRICULTURE	II. LIVESTOCK	III. FORESTRY	IV. FISHING	V. MINING & QUARRYING	VI. MANUFACTURING	VII. ELECTRICITY & WATER SUPPLY	VIII. CONTRUCTION	IX. WHOLESALE & RETAIL TRADE	X. HOTEL & RESTAURANTS	XI. TRANSPORT & COMMUNICATION	XII. FINANCIAL INTERMEDIATIONS	XIII. REALESTATE, & BUSINESS ACTIVITIES	XIV. PUBLIC ADMN & DEFENCE	XV. EDUCATION	XVI. HEALTH & SOCIAL WORK	XVII. COMMUNITY & PERSONAL SERVICES
I. AGRICULTURE	0.08488845	0.177166143	0	0	0	0.277046805	0	0	0	0.096783813	0	0	0.00058064	0	0	0.00018066	0.001869459
II. LIVESTOCK	0.083322115	0.017693436	5.25539E-06	0.00313 2601	0	0.01338598	0	0	0	0.18086 6957	0	0	0	0	0	0.00079 8958	0
III. FORESTRY	0.00270 6653	0	6.3191E-09	0.00122 8501	0	0.00718 0095	0	0.01328 0206	0	0	0	0	0.12366 5283	0	0	0	0
IV. FISHING	0	0.00118 3526	0	0.04430 0715	0	0.01319 5834	0	0	0	0.07555 4117	0	0	0	0	0	0.00012 4671	0
V. MINING & QUARRYING	0	0	0	0	0	0.00624 6768	0	0.08263 7309	0	0	0	0	0.01078 8164	0	0	0	0
VI. MANUFACTURING	0.09733 9263	0.178708261	0.00168 1733	0.178708261	0.01258 1913	0.309122219	0.098323019	0.467387849	0.100257428	0.213893459	0.163178769	0.035451707	0.239586035	0.093795111	0.088792185	0.016357333	0.096040566
VII. ELECTRICITY & WATER SUPPLY	0.00198 0006	0.00199 5425	0	0	0.00024 8518	0.028754305	0.099148411	0.00091 1414	0.011730 63	0.037369171	0.000902863	0.008082897	0.000370361	0.010353909	0.018714529	0.001299629	0.005097207
VIII. CONTRUCTION	0.00155 4773	0	1.73207E-05	0	9.05492E-05	9.09671E-06	0.004728821	0.00308 2681	0	0	0.000259535	0	0	0	0	0	0
IX. WHOLESALE & RETAIL TRADE	0.137556849	0.055006827	0.068251756	0.371350981	0.307302401	0.053247865	0.051793437	0.042640066	0	0.048075482	0.093521 48	0.225358392	0.055617825	0	0.127081166	0.161258 39	0.077313286
X. HOTEL & RESTAURANTS	0	0	0	0	0	1.49729E-05	0	0	0	0	0.001642 09	0.014787472	0	0.003869912	0.002777086	0	0
XI. TRANSPORT & COMMUNICATION	0.038292859	0.045579901	0.010022747	0.011154897	0.172777755	0.026840 64	0.003808588	0.042984022	0.028404746	0.008725949	0.040467204	0.034241897	0.038489847	0.071499513	0.014570821	0.001043841	0.083050215
XII. FINANCIAL INTERMEDIATIONS	0.00052 2028	0.00015 9303	3.4924E-06	0.00038 7192	8.61202E-05	0.012928375	0.000417866	0	0.024175 04	0	0.000815003	0.002336275	4.36549E-05	0	0	0.016794998	0
XIII. REALESTATE & BUSINESS ACTIVITIES	0	0	0	0	0	0.025278262	0	0	0.002681463	0	0.000114984	0.007638311	0	0.098979358	0.013668776	0.076085004	0
XIV. PUBLIC ADMN & DEFENCE	0.00063 4874	0.00027 302	0.00015 0936	0.00029 7017	0.00012 05683	0.001458439	0.002543054	0.018681898	0.016010387	0.008373438	0.013262705	0.000160 42	0	0.025635209	0.021665941	0.000798994	0.001178427
XV. EDUCATION	0	0	0	0	0	6.56427E-05	0	0	0	0	0	0	0	0	0	0	0
XVI. HEALTH & SOCIAL WORK	0	0.013554841	0	0.00143 7187	0	0.000188008	0	0	0.046434866	0.019645 39	0.003139023	0	0	0.000376603	0.000572894	0.004485954	0.035037394
XVII. COMMUNITY & PERSONAL SERVICES	0.00311 9177	0.00089 9318	6.24117E-06	0.00206 0979	0	0.000494437	0.003064722	0.021877943	0.011800047	0.000837387	0.013747 93	0.016385596	4.36549E-05	0.020846867	0.009262 06	0.001326809	0.012338428

Table 3. A condensed Social Accounting Matrix (SAM) for Bangladesh, 1998-99

Sector	I. AGRICULTURE	II. LIVESTOCK	III. FORESTRY	IV. FISHING	V. MINING & QUARRYING	VI. MANUFACTURING	VII. ELECTRICITY & WATER SUPPLY	VIII. CONTRUCTION	IX. WHOLESALE & RETAIL TRADE	X. HOTEL & RESTAURANTS	XI. TRANSPORT & COMMUNICATI	XII. FINANCIAL INTERMEDIATIONS	XIII. REALESTATE, & BUSINESS	XIV. PUBLIC ADMN & DEFENCE	XV. EDUCATION	XVI. HEALTH & SOCIAL WORK	XVII. COMMUNITY & PERSONAL	Sum of Column = Sectoral GDP at Constant Prices:1998-99
I. AGRICULTURE	35,392.	73,865.	-	-	-	115,50	-	-	-	40,352.	-	-	242.08	-	-	75.322	779.43	266,216.00
II. LIVESTOCK	16,144.	3,428.3	1.018	606.98	-	2,593.7	-	-	-	35,045.	-	-	-	-	-	154.80	-	57,975.000
III. FORESTRY	644.52	-	0.002	292.53	-	1,709.7	-	3,162.3	-	-	-	-	29,447.	-	-	-	-	35,257.000
IV. FISHING	-	971.07	-	36,348.	-	10,827.	-	-	-	61,991.	-	-	-	-	-	102.29	-	110,240.00
V. MINING & QUARRYING	-	-	-	-	-	1,160.8	-	15,356.	-	-	-	-	2,004.7	-	-	-	-	18,522.000
VI. MANUFACTURING	11,800.	21,664.	203.87	21,664.	1,525.2	37,474.	11,919.	56,660.	12,154.	25,929.	19,781.	4,297.7	29,044.	11,370.	10,764.	1,982.9	11,642.	289,882.00
VII. ELECTRICITY & WATER SUPPLY	230.86	232.66	-	-	28.977	3,352.6	11,560.	106.26	1,367.7	4,357.1	105.27	942.45	43.183	1,207.2	2,182.0	151.53	594.32	26,463.000
VIII. CONTRUCTION	22,740.	-	253.34	-	1,324.4	133.05	69,166.	45,088.	-	-	3,796.0	-	-	-	-	-	-	142,503.00
IX. WHOLESALE & RETAIL TRADE	17,998.	7,197.1	8,930.1	48,588.	40,207.	6,967.0	6,776.7	5,579.0	-	6,290.2	12,236.	29,486.	7,277.1	-	16,627.	21,099.	10,115.	245,377.00
X. HOTEL & RESTAURANTS	-	-	-	-	-	7.563	-	-	-	-	829.45	7,469.4	-	1,954.7	1,402.7	-	-	11,664.000
XI. TRANSPORT & COMMUNICATION	9,745.8	11,600.	2,550.8	2,839.0	43,973.	6,831.1	969.32	10,939.	7,229.2	2,220.8	10,299.	8,714.8	9,796.0	18,197.	3,708.4	265.66	21,137.	171,019.00
XII. FINANCIAL INTERMEDIATION	261.28	79.734	1.748	193.79	43.105	6,470.8	209.14	-	12,100.	-	407.92	1,169.3	21.850	-	-	8,406.1	-	29,365.000
XIII. REALESTATE & BUSINESS	-	-	-	-	-	18,980.	-	-	2,013.4	-	86.337	5,735.3	-	74,319.	10,263.	57,129.	-	168,528.00
XIV. PUBLIC ADMN & DEFENCE	264.68	113.82	663.27	123.82	502.66	608.03	1,060.2	7,788.6	6,674.8	3,490.9	5,529.3	66.881	-	10,687.	9,032.7	333.10	491.29	47,432.000
XV. EDUCATION	-	-	-	-	-	40,304.	-	-	-	-	-	-	-	-	-	-	-	40,304.000
XVI. HEALTH & SOCIAL WORK	-	4,489.7	-	476.03	-	62.273	-	-	15,380.	6,507.0	1,039.7	-	-	124.74	189.75	1,485.8	11,605.	41,361.000
XVII. COMMUNITY & PERSONAL	4,108.5	1,184.5	8.221	2,714.6	-	651.26	4,036.8	28,817.	15,542.	1,102.9	18,108.	21,582.	57.502	27,459.	12,199.	1,747.6	16,252.	155,575.00

Table 4. Distribution of agricultural and forestry sector output as intermediate goods and as final demand in the economy

Intermediate Use		
	Agriculture	Forestry
1993-94	76221.7016	14180.70038
1994-95	80032.6034	7272.961837
1995-96	83493.9782	3892.446557
1996-97	88024.803	19159.29465
1997-98	92685.9889	21429.46513
1998-99	96848.3506	17180.30255
	Available as Final Demand	
1993-94	167950.298	14800.29962
1994-95	155788.397	22531.03816
1995-96	156431.022	26943.55344
1996-97	167351.197	12919.70535
1997-98	165371.011	-214291.2987
1998-99	169367.649	-171799.4998

Table 5. Loss of product due to erosion and deforestation (secondary estimates)

	Loss from Agriculture	Loss from Deforestation	Total Loss	Percent of Sectoral Product
Soil Erosion				
1993-94	7325.16	110.547	7435.70689	0.01864749
1994-95	7074.63	114.970	7189.59971	0.018085
1995-96	7197.75	125.755	7323.50477	0.01786735
1996-97	7661.28	126.039	7787.31859	0.01792434
1997-98	7741.71	131.786	7873.49589	0.01756316
1998-99	7986.48	131.786	8118.26589	0.01728438
Traditional use of forest resources				
1993-94		403.3618318	403.361832	0.00101156
1994-95		419.499757	419.499757	0.00105523
1995-96		458.8521308	458.852131	0.00111947
1996-97		459.8877196	459.88772	0.00105854
1997-98		480.8583925	480.858393	0.00107264
1998-99		480.8583925	480.858393	0.00102378

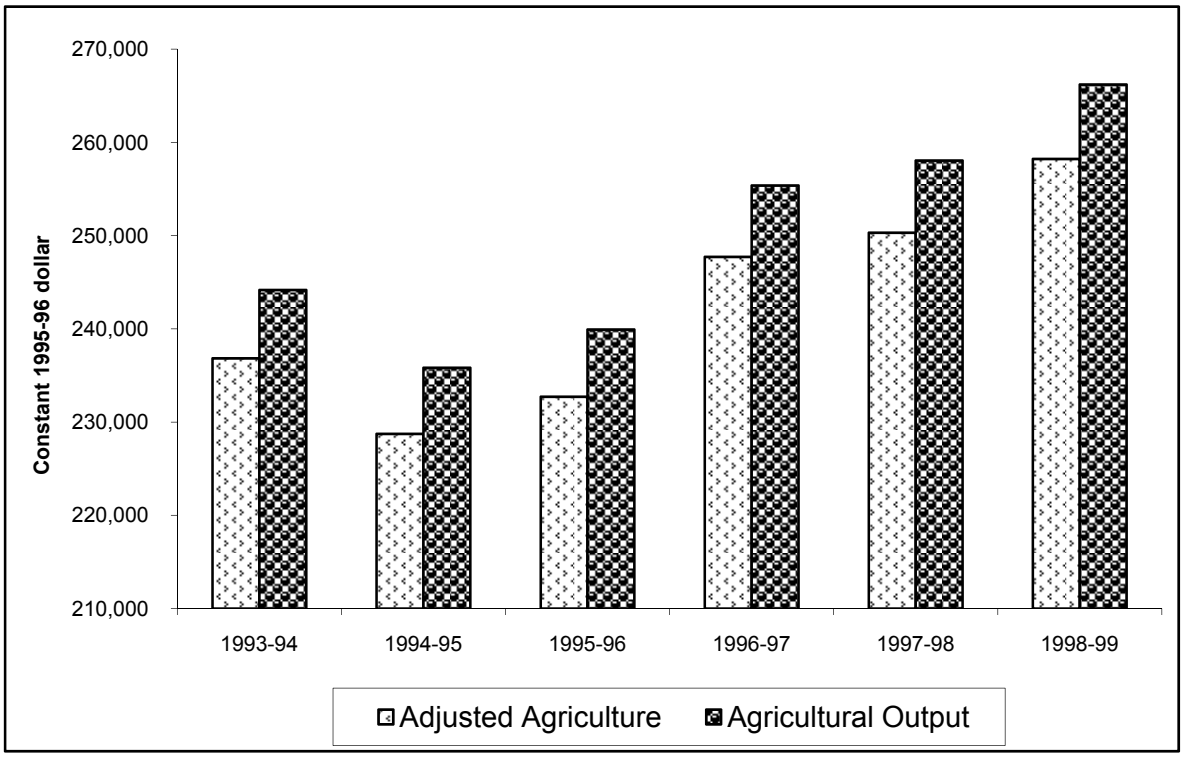

Figure 1. Agricultural product and environmentally adjusted agricultural product of Bangladesh

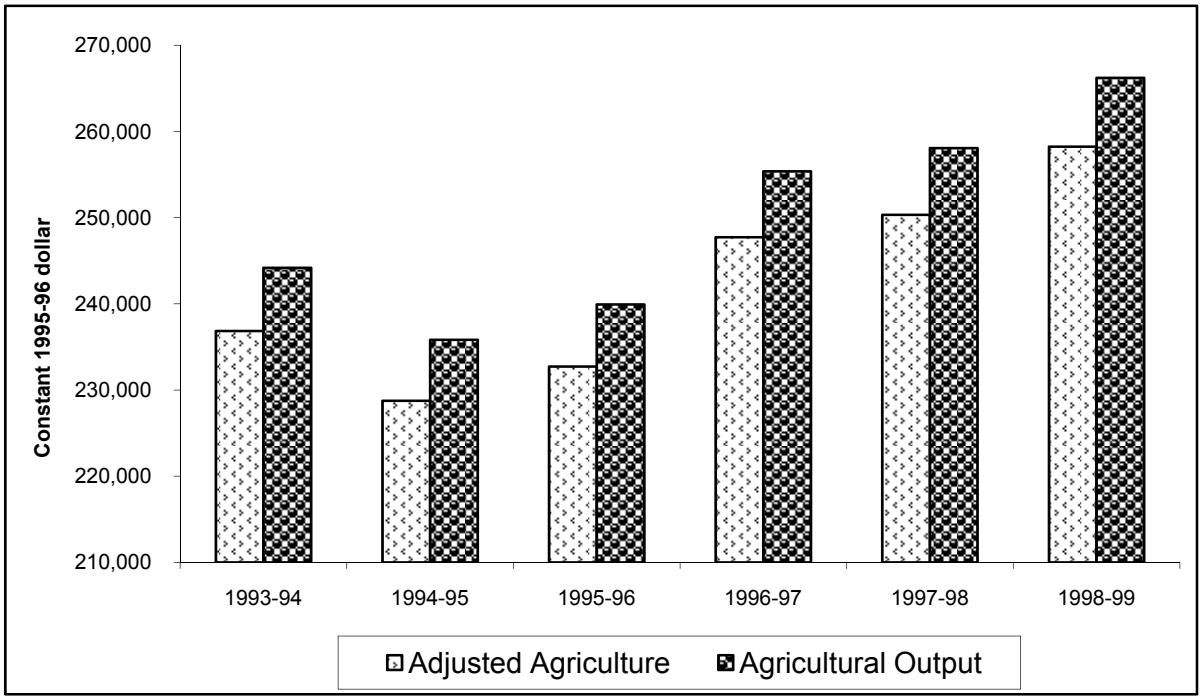

Figure 2. Forest product and environmentally adjusted forest product of Bangladesh

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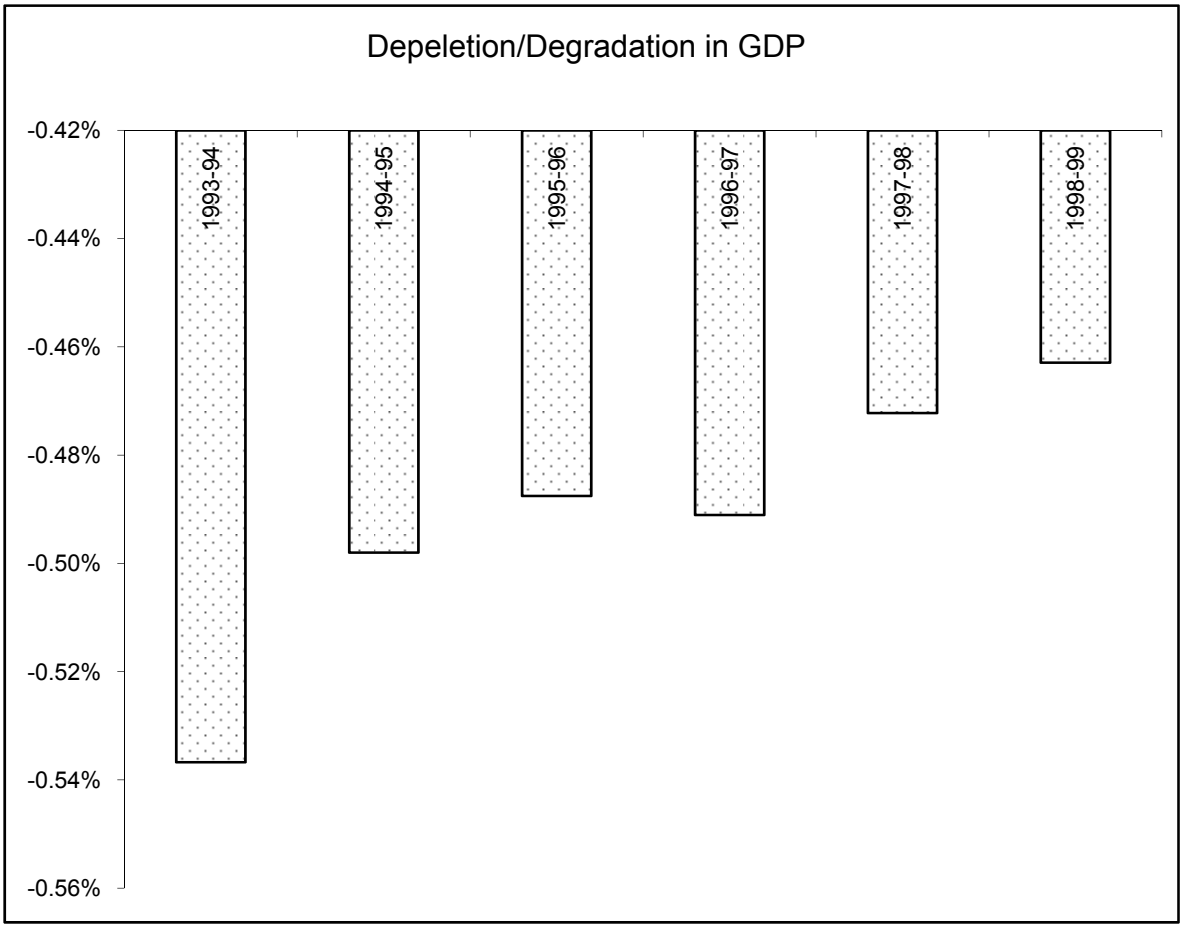

Figure 3. Adjustment to GDP from environmental damage

Appendix 1. Aggregation of the 79 I-O sectors into the 17 SAM sectors

Sector	**Sector**
01. Paddy	43. Wooden Furniture
02. Wheat	44. Pulp, Paper & Board
03. Other Grains	45. Printing and Publishing
04. Jute	46. Drugs & Pharmaceuticals
05. Sugarcane	47. Fertilizer
06. Potato	48. Other Chemicals
07. Vegetables	49. Petroleum Products
08. Pulses	50. Pottery & Earthenware
09. Oilseeds	51. China & Ceramic
10. Fruits	52. Glass & Glass Products
11. Cotton	53. Bricks, Tiles & Clay Products
12. Tobacco	54. Cement
13. Tea	55. Iron & Steel Basic Industry
14. Major Spices	56. Fabricated Metal Products
15. Other Crops	57. Machinery
I. AGRICULTURE	58. Transport Equipment
16. Livestock	59. Miscellaneous Industries
17. Poultry	VI. MANUFACTURING
II. LIVESTOCK	66. Electricity
20. Forestry	67. Gas
III. FORESTRY	VII. ELECTRICITY, GAS AND WATER SUPPLY
18. Shrimp	62. Construction: Electricity & Gas
19. Other Fish	63. Construction: Rural Road
IV. FISHING	64. Construction: Other Transport
68. Mining & Quarrying	65. Other Construction
V. MINING AND QUARRYING	VIII. CONTRUCTION
21. Rice Milling	69. Trade Service
22. Ata & Flour Milling	IX. WHOLESALE AND RETAIL TRADE
23. Fish & Seafood Processing	77. Hotels & Restaurants
24. Edible Oil	X. HOTEL AND RESTAURANTS
25. Sugar and Gur	70. Transport Service
26. Tea (Processing/Blending)	78. Communications
27. Salt	XI. TRANSPORT, STORAGE & COMMUNICATION
28. Other Food	75. Banking & Insurance
29. Tanning & Leather Finishing	XII. FINANCIAL INTERMEDIATIONS
30. Leather Products	60. Urban Building
31. Jute Baling	61. Rural Building
32. Jute Textile	XIII. REALESTATE & BUSINESS ACTIVITIES
33. Yarn	74. Public Administration & Defence
34. Mill Cloth	XIV. PUBLIC ADMINISTRATION AND DEFENCE
35. Handloom Cloth	73. Education Service
36. Dyeing & Bleaching	XV. EDUCATION
37. Readymade Garments	71. Housing Service
38. Knitting & Hosiery	72. Health Service
39. Other Textiles	XVI. HEALTH AND SOCIAL WORK
40. Cigarettes	76. Professional Services
41. Bidi	79. Other Services
42. Saw Mills	XVII. COMMUNITY AND PERSONAL SERVICES
	Total

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