THE CONTRIBUTION OF AGRICULTURAL SUB-SECTOR TO INDONESIAN ECONOMY

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ABSTRAK

Studi bertujuan untuk menganalisis peranan pertaninan terhadap perekonomian mengingat pemerintah Indonesia menetapkan kebijakan revitalisasi pertanian dan perekonomian pedesaan untuk pengentasan kemiskinan. Metode yang digunakan adalah analisa Input-Output. Hasil penelitian membuktikan bahwa :1) Sub-sektor tanaman pangan memberikan kontribusi terbesar pada output dan nilai tambah; 2) Berdasarkan analisis keterkaitan, sub-sektor tanaman pangan mempunyai indeks keterkaitan ke depan tertinggi sedangkan sub-sektor peternakan memiliki indeks keterkaitan ke belakang tertinggi; dan 3) Berdasarkan analisis multiplier, sub-sektor peternakan memiliki nilai multiplier output dan pendapatan terbesar sedangkan sub-sektor kehutanan memiliki nilai multiplier tenaga kerja terbesar. Revitalisasi pertanian sebaiknya tidak dikosentrasikan pada sub-sektor pertanian saja, mengingat sub-sektor peternakan mempunyai efek multiplier yang lebih besar terhadap output, pendapatan,dan juga tenaga kerja.

Kata kunci: input-output, analisis keterkaitan, multiplier

ABSTRACT

The main objective of this paper is to analyze agricultural sub-sectors contribution to the Indonesian economy by using Input-Output analysis. The important finding of the study: 1) The food crops sub-sector has the highest contribution in output and value added; 2) In terms of link with the other sector, food crops sub-sector has the highest forward linkage. Meanwhile, the livestock and products sub-sector has the highest backward linkage; and 3) In terms of multiplier, livestock and product sector has the highest output and income multiplier, meanwhile for the employment multiplier second after the forestry sector. This result suggests that revitalization of agricultural sector in the future must not only concentrate in developing food crops sector. Development of the livestock and product sector needs further attention since it has higher potential to affect other sector of the economy compare to the other agricultural sub sector.

Keywords: input-output, linkage analysis, multiplier

INTRODUCTION

Background

Agriculture plays an important role in economy's of the developing countries. According to Gillis et.al (1992), there are several roles of agriculture in the economic development. First, agriculture provides food consumed by the people. Farmers must produce enough food to feed themselves as well as the urban population. Countries do not want to depend their food on other countries. Secondly, agriculture is an important source of labor for other industries. In the developing countries, most people live in rural area therefore increase employment means increase of labor demand which mostly come from the rural area. Third, agricultural sector can be a source of capital for modern economic growth especially in the early stage of development. Fourth, agriculture can be a source of foreign currency. Many developing countries depend on agricultural commodity export to obtain foreign currency needed for the country's economic development. Lastly, rural population is an important market for the output in the modern urban sectors.

The contribution of agricultural sector to Gross Domestic Product (GDP) in Indonesia has decreased significantly over the years, from 23.2 percent in 1985 to only 13.8 percent in 2007. The decreasing trend began in 1986, but during the crisis in 1997-1998 the contribution increased and it began to decrease again when the effect of the crisis began to vanish. In 2006-2007, the contribution experienced a slight increase mainly due to the increase of several agricultural prices which Indonesia export (Figure 1).

Although the contribution to GDP has decreased over the years but the people working in agricultural sector is still in huge number. In 2007, 42.6 million or 43.7 percent of the total labor force still depend on the agricultural sector. In addition, in terms of labor percentage it decrease from 54.7 percent but in term of

number, it increase from 34.1 million people in 1985 (Figure 1).

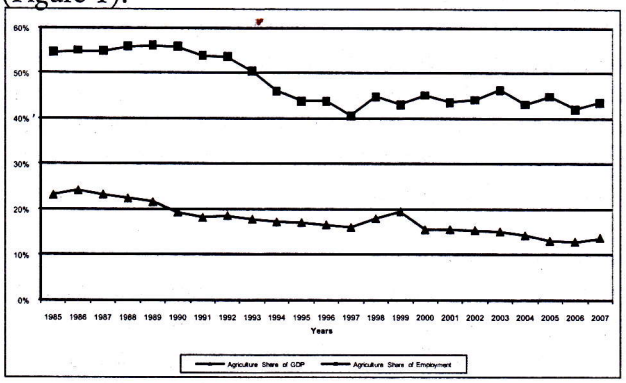

Figure 1. Agriculture share of GDP and employment

Source: Asian Development Bank (2008)

Aims of the Study

The main objective of this paper is to analyze the effect of the agricultural sub-sector on the Indonesian economy. In this study, the agricultural sub-sector consists of five sub-sectors, namely food crops, estate crops, livestock and its product, forestry and fishery. The effect on the economy consist the effect on output, income, employment, linkage between other industries and multiplier effect of the agricultural sub-sector.

AGRICULTURAL SECTOR IN INDONESIA

According to the World Development Report 2008, Indonesia is considered to be a transforming country since agriculture is no longer a major source of economic growth but poverty remains serious problem in the rural area (World Bank, 2008). Over the years Indonesia has transformed from agricultural based country, which its main source economic growth came from agriculture sector, to a transforming country.

In 2005, the current government launched the revitalization of agriculture. The program is a part of so called triple track strategy which has a pro-growth, pro-employment and pro-poor spirit. The operationalization of the triple track strategy consist of (1) increasing the economic growth by more than 6.5 percent annually through investment and export, (2) real sector empowerment in order to absorb employment and create new jobs and (3) agriculture and rural sector revitalization in order to contribute to the eradication of poverty.

One of the roles of agricultural sector is source of foreign currency through agricultural product export. There are five important agricultural products export from Indonesia, namely palm oil, natural rubber, palm kernel oil, ply wood and crustaceans or shrimp (Figure 2). These five agricultural commodities in 2007 valued almost 16.5 billion US$ or 14.5 percent of the total Indonesia's export or 17.4 percent if oil and gas is excluded. Except for plywood, the other four products have positive trend over the years. Until 2001, plywood was the number one agricultural product export of Indonesia but beginning from 2002 the spot was taken by palm oil. This is caused by the declining of raw materials for the plywood industry causing many factories to shut down their operation.

Compared to 1989, palm oil and palm kernel oil export has increased by 32 times and 21 times in 2007. In terms of value, during the 1989-2007 period palm kernel oil export grew in average of 27.2 percent annually, palm oil by 26.6 percent, natural rubber by 12.4 percent, crustaceans by 4 percent and plywood decrease by 0.5 percent. For palm oil, natural rubber and palm kernel oil during the period of 2002-2007 these product grew by 42 percent, 36.7 percent and 42 percent respectively. The huge growth was mainly cause by the increase of the international price of these products.

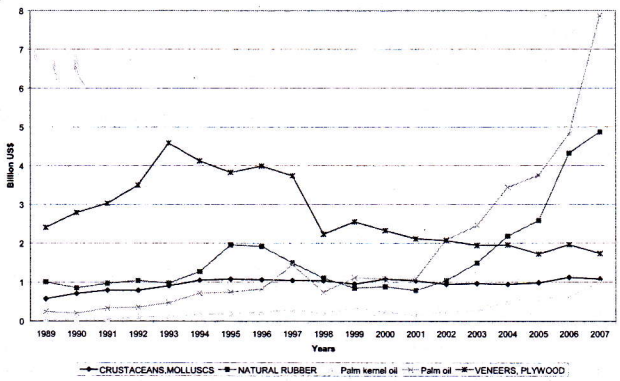

Figure 2. Indonesia's main agricultural product export, 1989-2007

Source: UN Comtrade, 2009

According to its export destination, 47 percent of palm oil export went to India, China and Netherlands; 57 percent of natural rubber export went to USA, Japan and China; 57 percent of plywood export went to Japan, USA and China; 61 percent of palm kernel oil export went to Netherlands, China and Malaysia and; 78 percent of crustaceans export went to USA, Japan and Belgium.

DATA AND METHODOLOGY

Data used for the research is the Input-output table of 2000 and 2005. The raw data consists of 175 sectors and for the purpose of this research the sectors are aggregated into 24 sectors (Appendix 1) with the focus on five sectors, namely food crops, estate crops, livestock and products, forestry and fishery.

The methodology employed in this paper is the input output analysis. The input output analysis was developed by Leontief in the late 1920's and early 1930 (Blair and Miller, 1985; Miller, 1997). In order to analyze using input output analysis, input output table or account is utilized. The input output table or account indicates the interconnection of the economy by recording, for a given period (usually one year), the economic transaction that happen in the economy (Miller, 1997). In the input output table or account the rows describe the distribution of producer's output in the economy;

meanwhile the columns describe the composition of inputs required by a particular industry to produce its output.

The input output table or account basically indicates the equilibrium between demand and supply in the following equation (Blair and Miller, 1985; Miller, 1997):

$X_i = A_i + F_i$ .....(1)

where:
X_i = production of sector i
A_i = intermediate demand of sector i
F_i = final demand of sector i

In matrix notation, equation (1) can be written as follows:

$AX + F = X$ .....(2)

where
A = intermediate input coefficient matrix
X = output vector of all sectors
F = final demand vector

Equation (2) can be transformed into the following equation:

$X = [1-A]^{-1} F$ .....(3)

where
[1-A]-1 = Leontief inverse matrix

The 2000 and 2005 input output table published by Statistics Indonesia is utilized to analyze the contribution of palm oil sector and palm oil processing to total output, value added and employment. Meanwhile, 2005 input output table is utilized to analyze the linkage and multiplier analysis. A 33 sector input output table is constructed for the analysis.

Linkage Analysis

In the input output analysis, production in a particular sector has two kinds of economic effects on the other sectors of the economy:

Backward Linkage

If sector j increases its output, it will increase the demand from sector j (as a purchaser) on the sector which products are used as inputs to production in sector j. A measure of the backward linkage is given by the sum of the elements in the j-th column of the technical coefficient matrix, A, it is also called the direct backward linkage (Miller, 1997) In order to include the indirect effect, the total backward linkage is calculated. The total backward linkage utilized the column sums of (I-A)-1 not just A (Miller, 1997).

In order to make comparison between sectors, a normalization procedure is carried out by dividing each backward linkage by the average backward linkage (Miller, 1997).

Forward Linkage

If sector j increases its output also means additional amounts of product j that are available to be used as inputs in other sectors for the sector's production. The direct forward linkage of sector i is defined as the sum of the elements in the i th row of the direct-output coefficient matrix, D. In order to include the indirect effect, the total forward linkage is calculated. In order to make comparison between sectors, a normalization procedure is carried out by dividing each forward linkage by the average forward linkage (Miller, 1997).

Multiplier Analysis

One of the major use of input output analysis is assessing the effect to the economy from the changes in exogenous elements The term impact analysis is used when the exogenous changes occur because of the actions of only one impacting agent and the change occurs during the short run period. The analysis is derived from the Leontief inverse which is also known as the multipliers. There are three most frequently used multipliers (Miller and Blair, 1985):

Output multiplier

An output multiplier for sector j is the total value of production in all sectors of the economy needed to satisfy the final demand for sector j's output.

Income multiplier

Income multiplier analyzes the impact of changes in final demand spending into changes in income received by households.

Employment multiplier

Employment multiplier calculate the impact if changes in final demand into changes in employment in each sector of the economy.

EMPIRICAL RESULT

The value of agriculture GDP from 2000 to 2005 has increased by 74 percent, but in terms of share decrease from 10 percent to only 8.5 percent (Table 1). This shows that the other sector in the economy has increase

Table 1. The Role of Agricultural Sub-Sector and other Sectors in Output Creation

Sector	2000			2005		
	Output (Bil Rp)	Share (%)		Output (Bil Rp)	Share (%)	
		Sector	Total		Sector	Total
Food Crops	127,145	46.31	4.71	227,825	47.20	4.01
Estate Crops	41,923	15.27	1.55	86,710	17.96	1.52
Livestock	46,546	16.95	1.72	68,308	14.15	1.20
Forestry	20,039	7.30	0.74	27,100	5.61	0.48
Fishery	38,881	14.16	1.44	72,761	15.07	1.28
Agriculture	274,534		10.16	482,704		8.49
Food Industry	329,325		12.19	548,333		9.64
Mining	196,815		7.29	387,251		6.81
Manufacturing	749,850		27.76	1,579,811		27.77
Construction & Infrastructure	258,315		9.56	667,335		11.73
Services	892,259		33.03	2,022,840		35.56
Total	2,701,010		100.00	5,688,274		100.00

Source: Statistics Indonesia 2002 and 2007

more than the agriculture sector.

The food crop sector has the highest contribution to the agricultural GDP. In terms of growth, the estate sector grew more than 100 percent during 2000 and 2005 which is caused by the booming of several estate crops such as palm oil, coffee, cacao, rubber etc. Meanwhile the forestry sector has the lowest growth with only 35 percent mainly caused by the decrease of forest area in the country (Table 1).

During the period of 2000-2005, all sectors experience an increase in value added. On the other hand, only the secondary and tertiary sectors enjoyed an increase in value added share. Meanwhile all the primary sectors, agriculture and mining, and food industry suffer a decline in share (Table 2). In line with the agriculture sector, the value added share of all agricultural sub-sector decrease during 2000-2005 which indicates that the contribution of the agricultural sub-sector on the entire economy shrink during this period.

Table 2. The Role of Agricultural Sub-Sector in Value Added Creation

Sector	2000			2005		
	Value Added (Bil Rp)	Share (%)		Value Added (Bil Rp)	Share (%)	
		Sector	Total		Sector	Total
Food Crops	110,707	52.24	8.10	183,111	49.61	6.36
Estate Crops	31,106	14.68	2.28	60,276	16.33	2.10
Livestock	24,396	11.51	1.79	43,678	11.83	1.52
Forestry	15,983	7.54	1.17	22,545	6.11	0.78
Fishery	29,713	14.02	2.17	59,485	16.12	2.07
Agriculture	211,904		15.51	369,095		12.83
Food Industry	112,063		8.20	192,601		6.69
Mining	167,692		12.27	317,170		11.02
Manufacturing	273,535		20.02	603,080		20.96
Construction & Infrastructure	84,967		6.22	233,773		8.13
Services	516,339		37.79	1,161,173		40.36
Total	1,366,500		100.00	2,876,892		100.00

Source: Statistics Indonesia 2002 and 2007

Looking at the agriculture sub-sector, all sub-sector experienced an increase in value with the highest increase in fishery sector with the increase more than 100 percent. Meanwhile the lowest increase in the forestry sector with the increase only 41 percent.

Linkage Analysis

The agricultural sub-sector generally has low direct and total backward linkage compare to the other sectors of the economy (Appendix 2). Meanwhile, comparing among the agricultural sub-sector the livestock and products sector has the highest direct and total backward linkage. This shows that the increase in output in this sector has the biggest direct and indirect effect on the other sectors especially which provides input to the sector. The lowest sub-sector is the forestry sector, which indicates that the increase in output in this sector has the lowest benefit to the other sector which provides input to the forestry sector. This is understandable since the forestry sector is an extractive sector.

For the forward linkage, the food crops sector has the highest direct and total forward linkage among the agricultural sub-sector (Appendix 3). This indicates that the product from the food crops sector is more utilized in other sectors of the economy compare to the other agricultural sub-sector. Meanwhile, the forestry sector also has the lowest direct and total forward linkage which means that the output from this sector is mainly consumed directly by households or exported. Plywood is the main output of the forestry sector and the main export commodities of Indonesia over the years.

Multiplier Analysis

The multiplier analysis consist of three types; output, income and employment. In the output multiplier, livestock and products has the highest output multiplier with 1.7204 which means that an increase in Rp 1 million of final demand in the livestock and products sector will increase the output of all sectors by Rp 1.7204 million (Appendix 4) Meanwhile, the forestry sector has the lowest output multiplier compare to other agricultural sub-sector with 0.3199.

Looking at the effect on each sector, an increase in the sector final demand mostly was mainly cause by its own sector. The highest is the food crops sector with 79.17 percent increase was caused by its own sector. This shows that the increase in final demand of food crops mainly affect its own sector. Meanwhile the livestock and products sector has relatively more effect on the other sectors.

Besides its own sector, the output multiplier of the agricultural sub-sector also affects other sectors. The other manufacturing sector was affected by all the agricultural sub-sector which indicates that all of the agricultural product has link on the other manufacturing sectors which mainly consist of non-food manufacturing sector.

On the income multiplier, the livestock and products sector has the highest income multiplier with 0.3289 which means that an increase of Rp 1 million in final demand of the livestock and products sector will increase income in all sectors by Rp 0.3289 million, meanwhile the food crops has lowest with 0.1881 income multiplier (Appendix 4).

An increase in final demand in the fishery sector will increase income in its sector the highest compare to other agricultural sub-sector. An increase in Rp 1 million in final demand in fishery sector will increase the fishery sector income by Rp 0.1657 million or 80.07 percent of the whole income increased.

The sectors affected by the increase in final demand of the agricultural sub-sector besides its own sector is the wholesale and retail trade. The highest is in the livestock and products sector, an increase in Rp 1 million in the livestock and products sector will increase the wholesale and retail trade sector income by Rp 0.0161 million. This shows that the expansion of agricultural sector will also benefit the wholesale and retail trade sector income since the sector is involved in marketing the

agricultural products.

The livestock and product sector has the highest employment multiplier with 0.3289 which means that an increase in final demand in the livestock and product sector by Rp 1 billion will increase employment in all sectors by 329 people which 238 people is in the livestock and product sector. Meanwhile the food sector has the lowest effect on employment (Appendix 4).

CONCLUSIONS

The contribution of agricultural sector on the Indonesian economy has decline over the years. Looking at the agricultural sub-sector, the food crops sector has the highest contribution to output and value added. Food crops also has the highest forward linkage since it is the main crops which will be utilized in the other sector especially the food or manufacturing industry.

Meanwhile, the livestock and product sector has the highest backward linkage, output and income multiplier. The development of the livestock and product sector will benefit other sector of the economy compare to other agriculture sub-sector.

POLICY IMPLICATIONS

The government over the years has focused mainly on the food crops sector because it produces the staple food for Indonesian people. Result study shows food crops sector has the highest contribution to output and value added. Meanwhile, the livestock and product sector has the highest backward linkage, output and income multiplier. Therefore in the future the government revitalization agriculture program must not only concentrate in developing food crops sector. Development of the livestock and product sector need further attention since it has high potential to affect other sector of the economy compare to the other agriculture sub sector.

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Appendix 1. List of Sectors

No	Sectors
1	Food Crops
2	Estate Crops
3	Other Crops
4	Livestock and Products
5	Forestry
6	Fishery
7	Agriculture Services
8	Coal and Metal Ore Mining
9	Crude Oil and Natural Gas
10	Other Mining and Quarrying
11	Food, Beverage and Tobacco Manufacturing
12	Petroleum Refinery
13	Other Manufacturing
14	Electricity, Gas and Clean Water
15	Construction
16	Wholesale and Retail Trade
17	Hotel and Restaurant
18	Transportation
19	Communication
20	Financial Sector
21	Building Rent
22	Business Services
23	Public Administration
24	Private and Other Services

Appendix 2.Direct and Total Backward Linkage

Sectors	Direct Backward Linkage		Total Backward Linkage	
	Value	Index	Value	Index
Food Crops	0.1751	0.5522	1.2593	0.8402
Estate Crops	0.2890	0.9113	1.4607	0.9745
Other Crops	0.3355	1.0577	1.5870	1.0588
Livestock and Products	0.3307	1.0428	1.6014	1.0684
Forestry	0.1516	0.4779	1.2388	0.8265
Fishery	0.1687	0.5319	1.2656	0.8444
Agriculture Services	0.2017	0.6360	1.3077	0.8724
Coal and Metal Ore Mining	0.2286	0.7207	1.3519	0.9020
Crude Oil and Natural Gas	0.0833	0.2626	1.0947	0.7303
Other Mining and Quarrying	0.1917	0.6045	1.3073	0.8722
Food, Beverage and Tobacco Manufacturing	0.6067	1.9128	1.9343	1.2905
Petroleum Refinery	0.2123	0.6694	1.2399	0.8272
Other Manufacturing	0.4535	1.4298	1.7196	1.1473
Electricity, Gas and Clean Water	0.6155	1.9408	1.9035	1.2699
Construction	0.5231	1.6493	1.8205	1.2146
Wholesale and Retail Trade	0.3072	0.9687	1.4744	0.9837
Hotel and Restaurant	0.5329	1.6804	1.8973	1.2659
Transportation	0.4704	1.4831	1.7145	1.1439
Communication	0.1799	0.5674	1.2729	0.8493
Financial Sector	0.3051	0.9619	1.4624	0.9756
Building Rent	0.1548	0.4882	1.2648	0.8438
Business Services	0.3360	1.0596	1.5349	1.0241
Public Administration	0.3744	1.1804	1.6318	1.0887
Private and Other Services	0.3839	1.2106	1.6277	1.0860

Appendix 3. Direct and Total Forward Linkage

Sectors	Direct Forward Linkage		Total Forward Linkage	
	Value	Index	Value	Index
Food Crops	0.3379	1.0655	1.6137	1.0766
Estate Crops	0.1654	0.5216	1.3170	0.8787
Other Crops	0.0119	0.0374	1.0126	0.6756
Livestock and Products	0.1552	0.4894	1.2243	0.8168
Forestry	0.0477	0.1504	1.0777	0.7190
Fishery	0.0902	0.2846	1.1382	0.7594
Agriculture Services	0.0633	0.1997	1.0862	0.7247
Coal and Metal Ore Mining	0.1714	0.5404	1.2797	0.8538
Crude Oil and Natural Gas	0.3647	1.1498	1.6749	1.1175
Other Mining and Quarrying	0.0636	0.2004	1.0943	0.7301
Food, Beverage and Tobacco Manufacturing	0.8898	2.8057	2.2217	1.4823
Petroleum Refinery	0.5812	1.8327	1.8741	1.2503
Other Manufacturing	1.3654	4.3053	3.2987	2.2008
Electricity, Gas and Clean Water	0.2713	0.8554	1.4271	0.9521
Construction	0.3368	1.0619	1.4339	0.9567
Wholesale and Retail Trade	0.6533	2.0600	2.0131	1.3431
Hotel and Restaurant	0.1297	0.4088	1.1872	0.7921
Transportation	0.4280	1.3496	1.6635	1.1098
Communication	0.1733	0.5463	1.2631	0.8427
Financial Sector	0.5200	1.6395	1.8527	1.2360
Building Rent	0.1278	0.4029	1.2176	0.8124
Business Services	0.1866	0.5883	1.2973	0.8655
Public Administration	0.0337	0.1062	1.0480	0.6992
Private and Other Services	0.4434	1.3981	1.6562	1.1049

Appendix 4. Output, Income, and Employment Multiplier of Agricultural Sub-Sector

Sectors	Output	Income	Employment
Food Crops			
Food Crops	1.0615	0.1434	0.0708
Agriculture Services	0.0823	0.0089	0.0038
Livestock and Products	0.0312	0.0077	0.0018
Wholesale and Retail Trade	0.0292	0.0054	0.0008
Other Manufacturing	0.0195	0.0037	0.0005
Other Sectors	0.1170	0.0190	0.0017
Total	1.3407	0.1881	0.0793
Estate Crops			
Estate Crops	1.0791	0.2416	0.1192
Wholesale and Retail Trade	0.1662	0.0180	0.0012
Agriculture Services	0.0618	0.0118	0.0011
Other Manufacturing	0.0461	0.0085	0.0009
Food Crops	0.0370	0.0077	0.0007
Other Sectors	0.1932	0.0288	0.0033
Total	1.5834	0.3164	0.1266
Livestock and Products			
Livestock and Products	1.0148	0.2381	0.1175
Food Crops	0.3099	0.0268	0.0049
Estate Crops	0.0867	0.0161	0.0030
Wholesale and Retail Trade	0.0739	0.0100	0.0023
Food, Beverage and Tobacco Manufacturing	0.0496	0.0060	0.0014
Other Sectors	0.1855	0.0320	0.0034
Total	1.7204	0.3289	0.1325
Forestry			
Forestry	1.0144	0.1784	0.1271
Agriculture Services	0.0772	0.0083	0.0023
Wholesale and Retail Trade	0.0298	0.0064	0.0008
Food Crops	0.0296	0.0055	0.0005
Other Manufacturing	0.0254	0.0048	0.0004
Other Sectors	0.1435	0.0230	0.0023
Total	1.3199	0.2265	0.1335
Fishery			
Fishery	1.0375	0.1657	0.0817
Wholesale and Retail Trade	0.0696	0.0087	0.0013
Food Crops	0.0470	0.0060	0.0012
Estate Crops	0.0365	0.0040	0.0007
Livestock and Products	0.0272	0.0039	0.0005
Other Sectors	0.1120	0.0185	0.0019
Total	1.3298	0.2069	0.0873