

Perennial Plants in Vietnam's Economy

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Abstract

Vietnam has strengths in perennial crop production due to its diverse soil, climate and crop ecosystems. Developing perennial crops is strength of our Vietnam's agriculture to serve the requirements of raw materials for the processing industry and for export. During the 36 years of renovation (1995 - 2021), perennial crop production has continuously developed comprehensively, growing rapidly both in terms of area expansion and intensive farming to increase productivity and output. In recent years, the output of most perennial crops has increased sharply, especially those associated with export such as coffee, rubber, tea, cashew, and pepper. Policymakers and many researchers in Vietnam seem to be "crazy" for the GDP index, so everything seems to be compared with GDP; if an industry's share in GDP is low, it doesn't seem these sectors important enough! This study used input-output analysis method to show the importance of perennial crops to the Vietnamese economy through the multiplier links between industries (inter-industrial) and the economy's supply-demand relationship.

Keywords: analysis, economy, input, output, perennial crop

JET classification: C10, C50, C7

1. Introduction

Vietnam has strengths in perennial crop production due to its diverse soil, climate and crop ecosystems. Developing perennial crops is strength of our Vietnam's agriculture to serve the requirements of raw materials for the processing industry and for export. During the 36 years of renovation (1995 - 2021), perennial crop production has continuously developed comprehensively, growing rapidly both in terms of area expansion and intensive farming to increase productivity and output. In recent years, the output of most perennial crops has increased sharply, especially those associated with export such as coffee, rubber, tea, cashew, and pepper.

In 2010, the area of crops reached 14.06 million hectares, perennial crops reached 2.85 million hectares, accounting for 20.2%; after 10 years, in 2020, the area of crops will reach 14.49 million hectares, perennial crops will reach 3.62 million hectares, accounting for 25.3% of the total area of all kinds of crops. In 2010, the area of perennial industrial plants reached 2.01 million hectares, accounting for 70.6% of the area of perennial plants, fruit trees reaching 779.7 thousand hectares, accounting for 27.7%; but by 2020, the area of perennial industrial plants will reach 2.18 million hectares, accounting for 60.4%; fruit trees reached 1.14 million ha, accounting for 31.4%. Perennial tree area has always increased for a long time, not stopping increasing in 2012, increasing the most by 5.3% per year, increasing by at least 1.5%, mainly in the group of fruit trees. In the period 2010-2020, the average growth rate of perennial crops is 2%. In which, in the period of 2010-2015, the average annual growth rate of perennial industrial crops and fruit trees is 1%; in the 2016-2020 period, the average growth rate of perennial crops will increase. 2%, of which the area of perennial industrial crops decreased by 1%, the area of fruit trees increased dramatically by 5%.

In the period 2010-2020, a number of perennial crops are assessed as key commodities with export potential for the agricultural sector, including: coffee, rubber, pepper, and some flowers fruits such as dragon fruit, mango, pineapple,... Coffee accounts for 12.5% of the total export turnover of agricultural products, rubber accounts for 7.7%, pepper accounts for 4.3% and vegetables accounts for 7.8%. During this period, the products such as coffee; rubber, pepper have export volume are steadily increasing, the average export price tends to decrease relatively sharply: the average price of coffee decreased from 2.1 thousand USD/ton in 2010 to 1.9 thousand USD/ton in 2020; the average price of rubber products decreased from 2.3 thousand USD/ton in 2010 to 1.3 thousand USD/ton

in 2020; the average price of pepper decreased from 6.7 thousand USD/ton in 2010 to 3.3 thousand USD/ton in 2020. The average export price of the above-mentioned commodities decreased significantly affecting the growth of pepper. Export turnover reduces the average annual growth rate during this period. Specifically: coffee exports increased by an average of 1.3% per year in volume, but the average annual turnover decreased by 0.6%; the average annual rubber export increased by 7.3% in volume but the turnover decreased by 5.1%; The average pepper export per year increased by 12.2% in volume but decreased by 0.7% in turnover.

Regarding on fruit trees, before the outbreak of the Covid 19 epidemic, that is, from 2019 and earlier, the fruit consumption market had many advantages, the number, types, and annual export turnover increased. Vietnam's fruit products are exported to over 60 countries and territories, of which the 10 main export markets are China, Japan, the United States, Russia, Taiwan, South Korea, Indonesia, the Netherlands, Thailand and Singapore. In 2010, export turnover reached 451 million USD; 2016 reached 2,457.2 million USD; in 2019 is 3,574.2 million USD; The average growth rate in the period 2010 - 2019 reached 26.0%/year.

This study used input-output analysis method to show the importance of perennial crops to the Vietnamese economy through the multiplier links between industries (inter-industrial) and the economy's supply-demand relationship

2. Literature Review

In the 1930s of the twentieth century, the general theory of Keynes.J.M was proposed to explain the phenomenon of crisis and economic recession of the world during these years. That changed the perception of economists at that time that they only used the concept of national income as the sole economic measure of a country (Keynes, 1931). Based on the general theory of Keynes and the economic schema of Francois Quesnay in 1936, 1941 Wassily Leontief introduced the Input-Output model. The input - output model reflects the overall picture of production activities of the economy. It reflects industry/regional relationships in the production and use of products for final consumption, gross capital formation and the export of goods and services throughout the economy.

Since then, the analysis of the input - output of the economy has been expanded and used quite flexibly as the input - output table was extended to the social accounting matrix (SAM) by Stone, R. and Brown, A., 1961, 1962, Miyazawa's economic demographic model, Ken'ichi (1968), the inter-regional, inter-country input - output model by Isard. The input - output table is also used quite flexibly in the analysis of inter-sectoral relationships to analyze the interrelationships of an industry or industry group with the rest of the industries of the economy. In 1971, Miyazawa applied the I.O table to "An analysis of the interdependence between service and goods-producing sectors".

Rohanabt (2008) pointed out that the input-output model is widely used in the study of economic structural change because it shows the inter-sectoral in the economy and it also measures the relationship between demand side and supply side. Baumol and Gomory (1994) argue that input-output analysis becomes indispensable for rational policy formulation. Tanaka, 2011 shows that the input-output table helps policy makers and researchers to see how the production technology of the economy changes; the quality of economic growth of each period in promoting the development of industries through forward and backward linkages. Henderson Et al. (2008) had study evaluates the importance of the forest products industry to the state's economy Mississippi.

Recently, there have been studies related to this issue such as Duong; Bui (2019) about the forestry sector in the Vietnamese economy, Bui et al (2021) researched on the use electricity in the Vietnamese economy through the model. Input - output, Le et al (2022) use the input-output model to study the agricultural sector in the Vietnamese economy. In this type of analysis, not only is the calculation of the backward and forward linkages, but also such relationships are analyzed into different types of effects of one industry group on other industries such as: direct effects, indirect effects, induced effects, spillover effects by other industries. The sum of all these effects is the backward linkage. Thus, researchers and policymakers can relatively determine which industry's final demand increase will have a positive effect on itself and the economy as a whole.

3. Data Sources

This study uses the IO table in 2019 updated by the research team of the agriculture department - General Statistics Office based on the official national input-output table 2012 and 2019 data from the enterprise survey and the population living standard survey. . The RAS method with a random fixed point is used for balancing. This input-output table has 29 sectors in Appendix 1. Perennial crops in research include: fruit tree products, cashew nuts, pepper, rubber latex, coffee beans, fresh tea buds and tree products other years.

4. Approach

The basic equation of W. Leontief has the form:

$$X = (I - A)^{-1} \cdot Y \tag{1}$$

Or

$$X = (I - A^d)^{-1} \cdot Y^d \tag{2}$$

Where: $(I - A^d)^{-1}$ Leontief matrix inverse, Y^d is a matrix of domestic final demand, X is an output matrix that induced by factor of domestic final deman. In the case of studying a group of industries (perennial crops) in the economy, Matrix A is divided into sub-matrices for the group of perennial crops (r) and the rest of the economy (s) as follows:

$$A = \begin{bmatrix} A^d_{rr} & A^d_{rs} \\ A^d_{sr} & A^d_{ss} \end{bmatrix} \tag{3}$$

And call:

$$B = (I - A^d)^{-1} = \begin{bmatrix} B^d_{rr} & B^d_{rs} \\ B^d_{sr} & B^d_{ss} \end{bmatrix} \tag{4}$$

B_{ij}^d is sib-matrix of Leontief matrix B that presents relationship inter-sectoral of economt.

Based on Miyazawa (1976) matrix B can be decomposed as follows:

$$B_{rr} = (I - A_{rr} - A_{rs} \cdot (I - A_{rr})^{-1} \cdot A_{sr})$$

$$B_{ss} = (I - A_{ss} - A_{sr} \cdot (I - A_{ss})^{-1} \cdot A_{rs})$$

$$B_{rs} = B_{ss} \cdot A_{rs} \cdot (I - A_{ss})^{-1}$$

$$B_{sr} = B_{ss} \cdot A_{sr} \cdot (I - A_{rr})^{-1}$$

For this reason, we can define three constituent elements in the above formula, including:

Multiplier effects: $(I - A_{rr})^{-1}$, the change in production caused by a unit of final demand in an industry is the effect of intrinsic demand on the industry itself.

Inter-sectoral feedback effects: $B_{rr} - (I - A_{rr})^{-1}$, This effect implies that when other sectors in the economy use products of perennial crops as input costs, it will spread, stimulating the output of perennial crops.

Spillover effects: B_{sr} and B_{rs} , This effect shows how spillover per unit of perennial crop final products are to other sectors of the economy.

Furthermore from (1) and (3) we have:

$$\Delta X^s = (I - A^{ss})^{-1} \cdot A^{sr} \cdot \Delta X^r \tag{5}$$

$$\Delta X^r = (I - A^{rr})^{-1} \cdot A^{rs} \cdot \Delta X^s \tag{6}$$

The relations (5), (6) indicate that the change of an industry or a group of industries will lead to the change of all sectors in the economy. When the output of industry group $r(s)$ increases, it will lead to a change of industry group $s(r)$ as $(I - A_{ss})^{-1} \cdot A_{sr}$ and $(I - A_{rr})^{-1} \cdot A_{rs}$

5. Some Findings

Table 1 describes the supply and demand of perennial crops from table I.O. In general, the export of perennial crops products accounted for the highest proportion (44.5%) in the elements of aggregate demand, followed by intermediate demand, accounting for 38.4% of total demand. Note that the accumulation of perennial crops assets is only 0.7% of total demand indicating that the yield of perennials is relatively impressive? On the supply side 81.7% is domestic production, only 18.3% comes from imports. This seems to be the opposite of the manufacturing industry group, which has a very large import rate

Table 1. Proportion from the supply side and the demand side of perennial crops (%)

	Demand side					Supply side		
	Total demand	Intermediate demand	Final demand	Gross capital formation	Export	Total supply	Domestic production	Import
Fruit tree products	100	28.5	52.8	0.21	18.4	100	73.0	27.0
Cashew	100	77.6	8.9	2.02	11.5	100	70.9	29.1
Pepper	100	6.2	3.7	1.52	88.6	100	88.9	11.1
Latex	100	6.5	0.0	0.48	93.0	100	88.6	11.4
Coffee beans	100	66.4	0.1	0.65	32.8	100	84.2	15.8
Fresh bud tea, fresh tea	100	81.4	17.3	1.30	0.0	100	91.7	8.3
Other perennial products remaining	100	90.2	0.0	8.07	1.7	100	81.9	18.1
Total	100	38.4	16.3	0.7	44.5	100	81.7	18.3

Source: Calculations by authors.

In Table 2 shows on power of dispersion and sensitivity of dispersion indexes, these indexes are understood as the average level of the economy. If we call the backlinkage $BL = (BL_i)_{(1 \times n)}$ and the forward linkage $FL = (FL_j)_{(n \times 1)}$, it is possible to determine the power of dispersion $= (n \cdot BL_i / \sum BL_i)$ and sensitivity index $= (n \cdot FL_j / \sum FL_j)$. Products with this index greater than 1 mean that the products are of relative importance to the economy in terms of stimulus to output.

Results shows that the power of dispersion indexes of perennial plant products is lower than the general average of the economy (<1). The industries with high power of dispersion index é are mostly manufacturing and processing industries. However, in terms of sensitivity, there are 2 products with higher sensitivities than the general average of the economy; it's fresh coffee beans and tea buds.

Table 2. Effects of final products to output of perennial crops (times)

	Backward linkage	Power of dispersion	Forward linkage	Sensitivity of dispersion
Fruit tree products	1.77	0.936	1.43	0.76
Cashew	1.36	0.716	1.37	0.73
Pepper	1.51	0.799	1.01	0.53
Latex	1.56	0.827	1.06	0.56
Coffee beans	1.76	0.928	1.92	1.01
Fresh bud tea, fresh tea	1.74	0.919	1.93	1.02
Other perennial products remaining	1.74	0.921	1.21	0.64

Source: Calculations by authors.

Table 3 measures the spillover of final demand to value added and imports. It is interesting that although final demand of the perennial crop product group induces impacts to low output, the spillover to value added is higher than the average level of the economy; the same is true for the 2 industries processing products from coffee and tea. The policy implication in the IO analysis of sustainable development is that industries with high spillovers to added value, spillovers to imports and low waste (air, water, solid waste, etc.) selected industry as the key industry. Unfortunately, there are no data on waste in this study, so only the spillover to value added and imports are studied.

Table 3. Value added and import multipliers (times)

	Code	Value added multipliers	Power of dispersion on value added	Import multipliers	Power of dispersion on import
Fruit tree products	1	0.561	0.890	0.439	0.820
Cashew	2	0.629	0.996	0.371	0.694
Pepper	3	0.770	1.220	0.230	0.430
Latex	4	0.748	1.185	0.252	0.471
Coffee beans	5	0.642	1.017	0.358	0.670
Fresh bud tea, fresh tea	6	0.746	1.183	0.254	0.474
Other perennial products remaining	7	0.668	1.058	0.332	0.621
Other agriculture	8	0.644	1.021	0.356	0.665
Forestry	9	0.699	1.107	0.301	0.563
Seafood	10	0.531	0.841	0.469	0.877
Extractive	11	0.606	0.960	0.394	0.737
Processed vegetables and fruits	12	0.422	0.669	0.578	1.081
Cocoa, chocolate and confectionery; bakery products from flour	13	0.584	0.925	0.416	0.778
Coffee	14	0.659	1.045	0.341	0.637
Tea (tea)	15	0.754	1.195	0.246	0.460
Wines of all kinds	16	0.627	0.993	0.373	0.697
Other food, beverage and tobacco processing	17	0.585	0.928	0.415	0.775
fertilizers, nitrogen compounds, pesticides and other chemical products used in agriculture	18	0.469	0.743	0.531	0.993
Products from rubber	19	0.398	0.631	0.602	1.125
Other processing and manufacturing	20	0.427	0.677	0.573	1.071
Other industry and construction	21	0.571	0.906	0.429	0.801
Commerce	22	0.761	1.207	0.239	0.446
Service of transportation	23	0.498	0.788	0.502	0.939
Warehousing and service services	24	0.700	1.109	0.300	0.561
Food Service	25	0.608	0.963	0.392	0.733
Financial intermediary services (except insurance and social insurance)	26	0.780	1.236	0.220	0.412
Real estate service business	27	0.836	1.325	0.164	0.306
Advertising services and market research	28	0.665	1.054	0.335	0.626
Other services remaining	29	0.713	1.130	0.287	0.537

Source: Calculations by authors.

Table 4 shows that a unit of final product of fruit trees has the strongest effect on the economy 1,771, of which the highest spillover to the output of other industries is 0.76; Next is the coffee beans. However, these two products do not spread as much to outputs of themselves as other perennial crops but are very useful in contributing to the economy in general; Cashew product have the lowest overall spillover index and spillover effects to other industries among the 7 industries surveyed in the model. But this industry spillovers to its own output is the highest of the 7 surveyed industries.

Table 4. Multiplier effects, induced effects and spillover effects (times)

	Output requirement	Multiplier effects	Inter-sectoral feed back effects	Spillover effects
Fruit tree products	1.771	1.009	0.0019	0.760
Cashew	1.355	1.163	0.0003	0.192
Pepper	1.511	1.003	0.0010	0.507
Latex	1.565	1.006	0.0014	0.557
Coffee beans	1.755	1.051	0.0014	0.703
Fresh bud tea, fresh tea	1.738	1.127	0.0014	0.610
Other perennial products remaining	1.743	1.191	0.0014	0.550

Source: Calculations by authors.

In the classical standard IO model, the Leontief function shows that the output X depends on the final demand, however, analyzing a group of industries in the economy shows that the output of the group of industries to be studied depends not only on the final products but also depends on the production of other sectors in the economy. Table 5 shows that the output of some industries such as dried cashew nuts, coffee beans, fresh tea and other perennial crops is mainly spread from the production of other industries; The output of dried pepper and rubber products is basically spread from the final demand (exports).

Table 5. Induced impacts from the final demand and from the production of other sectors in the economy to output of perennials ($B_{rr}Y_r + B_{rs}Y_s = X_r$)

Unit: %

	Total impacts	Induced by final products of perennials	Induced by production of other sectors
Fruit tree products	100	71.57	28.43
Cashew	100	26.12	73.88
Pepper	100	94.01	5.99
Latex	100	94.07	5.93
Coffee beans	100	35.47	64.53
Fresh bud tea, fresh tea	100	21.03	78.97
Other perennial products remaining	100	27.24	72.76

Source: Calculations by authors.

Table 6 describes the final demand of the remaining sectors of the economy and the production of perennial crops spillover to outputs of other sectors in the economy. The results show that the production of perennial crops has a spillover rate to the production value of fertilizers, nitrogen compounds, pesticides and other chemical products used in agriculture (13.74%). This may also mean that policy makers need to have appropriate policies (especially necessary policies) so that perennial crops are properly protected.

Table 6. Induced impacts from final demand of other sectors and the production of perennial crops to the output of other sectors of the economy ($B_{sr} \cdot Y_s + B_{ss} \cdot Y_s = X_s$)

	Total impact	Perennials plants	Final demand of other sectors
Other agriculture	100	1.57	98.43
Forestry	100	0.48	99.52
Seafood	100	0.13	99.87
Extractive	100	0.72	99.28
Processed vegetables and fruits	100	0.08	99.92
Cocoa, chocolate and confectionery; bakery products from flour	100	0.01	99.99
Coffee	100	0.01	99.99
Tea (tea)	100	0.05	99.95
Wines of all kinds	100	0.03	99.97
Other food, beverage and tobacco processing	100	0.18	99.82
fertilizers, nitrogen compounds, pesticides and other chemical products used in agriculture	100	13.74	86.26
Products from rubber	100	0.65	99.35
Other processing and manufacturing	100	0.55	99.45
Other industry and construction	100	0.35	99.65
Commerce	100	0.89	99.11
Service of transportation	100	0.78	99.22
Warehousing and service services	100	2.58	97.42
Food Service	100	0.19	99.81
Financial intermediary services (except insurance and social insurance)	100	2.00	98.00
Real estate service business	100	0.62	99.38
Advertising services and market research	100	2.00	98.00
Other services remaining	100	0.37	99.63

Source: Calculations by authors.

6. Conclusion

A number of studies on economic structure from the I.O model such as Trinh B et al (2012, 2014 and 2017) show that the spillover index of added value of the agricultural sector and the service sector is higher than the average level of the economy. This study, which delves into perennial crops in agriculture, shows that the spillover index of added value is higher than average (1,12) and the spillover index to imports is low. Among 7 perennial crops, there are 5

industries with high spillover index of added value and low import spillover index. In addition, there are three sectors such as coffee, pepper and fruit products that have a very good inter-industry influence.

But the irony is that although perennial crops have such good spillover indicators, it seems that the effective rate of protection (ERP) is decreasing (according to Bao H. D et al (2019)). If in 2012 this ratio of perennials was 0.27, in 2019 the ERP coefficient of perennials was negative (-0.06). This means that the industry is completely unprotected in terms of production. (-0.06). This means that the industry is completely unprotected in terms of production.

In summary: Industries with high spillover index to added value and low imports need appropriate incentive policies. The Vietnam economy needs to change its economic structure and approach substantive policy, especially, tax policies are no longer effective to protect industries with high spillover index to production value and value added.

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Appendix 1. Sectors in the Input-Output Table

Name of sectors	Code new
Fruit tree products	1
Cashew	2
Pepper	3
Latex	4
Coffee beans	5
Fresh bud tea, fresh tea	6
Other perennial products remaining	7
Other agriculture	8
Forestry	9
Seafood	10
Extractive	11
Processed vegetables and fruits	12
Cocoa, chocolate and confectionery; bakery products from flour	13
Coffee	14
Tea (tea)	15
Wines of all kinds	16
Other food, beverage and tobacco processing	17
fertilizers, nitrogen compounds, pesticides and other chemical products used in agriculture	18
Products from rubber	19
Other processing and manufacturing	20
Other industry and construction	21
Commerce	22
Service of transportation	23
Warehousing and service services	24
Food Service	25
Financial intermediary services (except insurance and social insurance)	26
Real estate service business	27
Advertising services and market research	28
Other services remaining	29

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