# Tourism and Agricultural intersectoral linkages in Suriname 1980-2010

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## Abstract

The study focuses on the development of the tourism sector and looks at the nature of the inter-sectoral linkages between the tourism sector and the agricultural sector in Suriname over the past thirty years (1980-2010). The choice for these particular sectors is based on similar distinct characteristics such as labor intensity, geographic and economic dispersion, large number of private entrepreneurs and firms. The paper examines the question to what extent will variations in tourism output trigger a change in agricultural output? First a VECM is deployed to illustrate and describe the inter-sectoral linkages through multiple cointegration equation. With a Engle-Granger Error Correcting Mechanism (EG-ECM) we then explain the short- and long run interaction between the two sectors in a single equation. The results suggest that a change in both tourism output and per capita income will affect agricultural output in the short and long run. Moreover, it takes the agricultural sector approximately 3 years to recover from a shock (e.g. sharp drop in tourist arrivals) and return to long-run equilibrium.

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## 1. Introduction

The Surinamese economy has experienced structural changes in its sectoral composition over the past years. From a primary agro-based economy in the early twentieth century, the economy has been transformed into one with a predominant mining sector since the early 1900's. Currently, the share of mining (alumina, gold and oil) in total exports of goods amounts to more than 90%. Nevertheless, tourism and other forms of agriculture have emerged over the years and with the potential to become important contributors to economic activity. Diversification of the economy along these lines may reduce the dependence on mining. Suriname gradually became a favorite holiday destination, offering a variety of tourism products different from the islands in the Caribbean. The products range from cultural to nature tourism capturing culinary specialties, bird watching, white-water kayaking and tours to historical sites.

According to the World Travel &Tourism Council (WTTC), the direct contribution of travel and tourism to GDP was estimated at 2 percent, while the direct employment was expected to rise to 3000 jobs in 2011. Visitors' spending on travel and tourism was expected to generate USD 62 million and is on the rise. In this regard, eco-tourism needs to be emphasized as a significant driver of growth of the tourism sector in the interior of the country with its vast rainforest.

The development of the tourism sector could be important to the development of other sectors in Suriname's economy. Demand from the tourism sector stimulates growth for sectors such as agriculture, transportation, retailing and manufacturing. Therefore, it is believed that increasing activity in this sector will contribute to the expansion of the domestic economy that is growth in employment, national income as well as in the improvement of the balance of payments (BOP).

This paper focuses on the development of the tourism sector and looks at the nature of the inter-sectoral linkages between the tourism sector and the agricultural sector in Suriname over the past thirty years (1980-2010). The paper examines interactions which are intersectoral dependencies that exist between the tourism and the agricultural sector and makes an attempt to show how tourism GDP and average domestic income may stimulate agricultural output in the short and long run.
A thorough understanding of the inter-sectoral linkages may provide policymakers with the necessary insight to set up an institutional framework to foster the sector. Conventional wisdom learns that tourists consume products produced or imported and served in the country from which they acquire tourist services from. A logical inference is that tourists' demand for local food adds up

to domestic demand and subsequently triggers an increase of agricultural output. The question that needs to be addressed is: ***To what extent will variations in tourism output encourage a change in agricultural output?*** To answer this question, quantitative analysis is conducted first deploying a Vector Error Correcting Model (VECM), to identify cointegrating equations that would be plausible representations for intersectoral linkage. Then, an Engle-Granger Error Correcting Mechanism (E-G ECM) is used in a single equation situation, illustrating the short- and long run relationship between the tourism and the agricultural sector in Suriname.

The introduction precedes an overview of the evolution of the tourism and agricultural sector in Suriname. In section three the literature and some theories on intersectoral linkages are reviewed. Thereafter, the corresponding data is analyzed and the sources described. This is followed in section five with a description of the econometric methodology together with the identification of the variables and estimation of the model. The empirical results are presented in this section. The paper concludes with some findings and policy recommendations.

Due to its dispersed character and weak institutional framework, this sector has developed a significant informal dimension of which data is not available. As such, in this paper data from formal sources is used.

## 2. Sectoral overview

### 2.1 Tourism

In 1951, Suriname accepted the membership of the Caribbean Tourism Development Association (CTDA). In addition to the membership of the CTDA, Suriname's government cooperates with several other organizations at the regional and international level and has been part of a number of bilateral partnerships. Within the Latin America and Caribbean sub- region, Suriname participates in several organizations and partnerships such as the Combined Amazon Tourism Product (CATP) and the Amazon Cooperation Treaty Organization (ACTO), hereby focusing on the development of a unique tourism product. Following this, the tourism industry became more organized. Institutions were setup, while others were strengthened especially in the organization, identification and designation of areas with tourism potential. Suriname successfully offered rainforest tourism to visiting guests in the 1970's. More than two-third of the country consists of Amazonian rainforest with an immeasurable wealth of flora and fauna providing eco-tourism with a significant comparative advantage edge. Eco-tourism in Suriname includes trips to the unspoiled forest and

nature reserves. This market derives its great potential for same-day visitors and stay-over visitors from the alternative types of tourism available, especially from French Guyana (France) and the Netherlands.

In the 1980's, Suriname's economy went through some periodic setbacks with adverse impact on several emerging industries including tourism. Activity in the tourism sector slowed down and the average tourist arrivals fell from 50,000 over the period 1981-1985 to 21,000 visitors during the 1986-1990 period before rising to 51,000 during the next five years. Strong growth was achieved through investments and government's increasing efforts to accommodate this growth. The table below presents the key economic indicators regarding tourism and agriculture.

Table 1: Tourism and Agriculture key Indicators

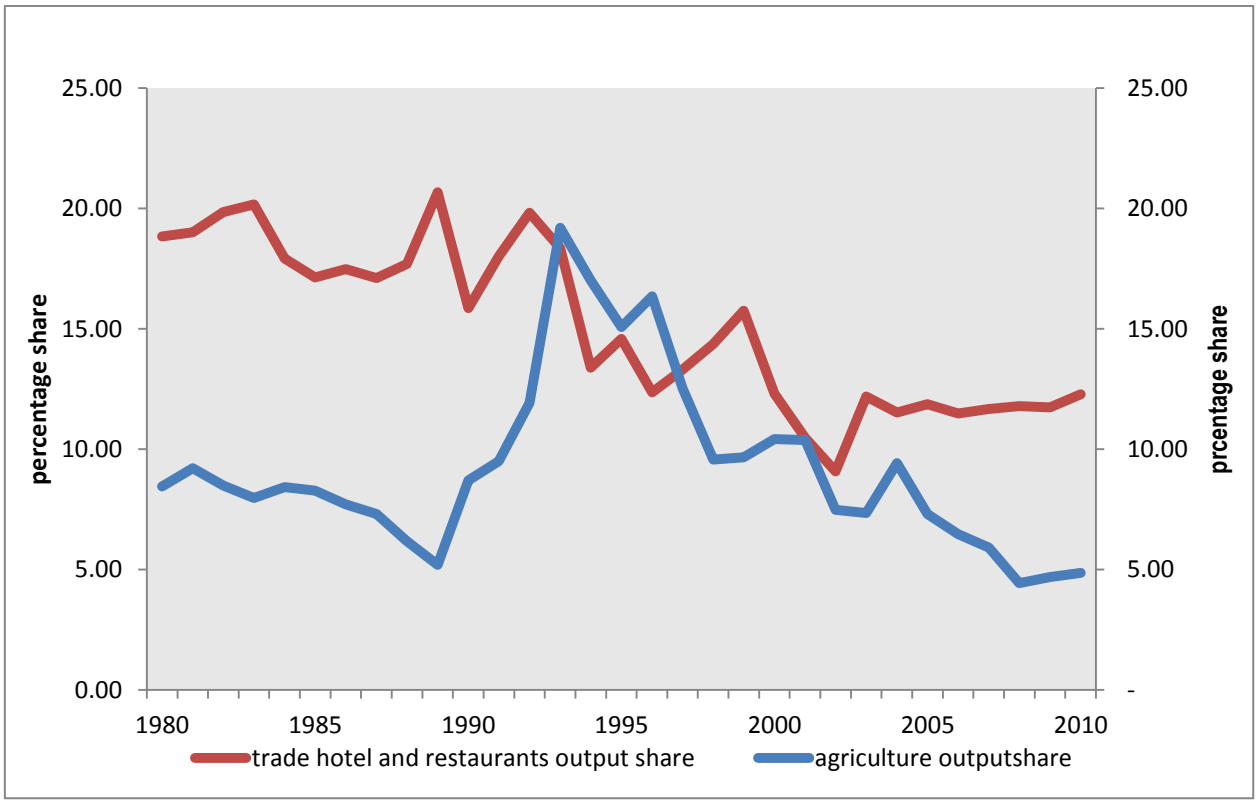
| | Visitors exports | | | Impact of tourism on GDP | | Impact of Agricultureon GDP | |
|---|---|---|---|---|---|---|---|
| Period | Average. tot tourist arrivals x1000 | Average tot tourist expenditure est xmln USD | Average annual exchange rate USD/SRD | average value added xmln SRD | *Average Share GDPbp based ISIC % | Average value added x mln SRD | Average Share GDPbp % |
| 1981-1985 | 52 | 37,435 | 1.77 | 0.29 | 18.62 | 0.13 | 8.47 |
| 1986-1990 | 33 | 23,659 | 1.77 | 0.41 | 17.76 | 0.17 | 7.02 |
| 1991-1995 | 51 | 2,366 | 0.21 | 11.26 | 16.83 | 11.96 | 14.54 |
| 1996-2000 | 57 | 55,206 | 1.04 | 77.31 | 13.62 | 63.08 | 11.71 |
| 2001-2005 | 101 | 122,121 | 2.66 | 335.62 | 11.03 | 243.89 | 8.39 |
| 2006-2010 | 165 | 156,640 | 2.78 | 856.93 | 11.79 | 372.40 | 5.27 |

Source: Author based on GBS,CBVS

* this figures includes Trade Hotel & Restaurant shares

In the four year bracket between 2006 – 2010, Suriname experienced an increase in the number of visitor arrivals with a average of 135 thousand tourists and approximately US$ 125 million of tourism revenues. Tourism accommodation facilities like leisure resorts increased during this period. The average contribution of tourism to $GDP_{bp}$ was estimated at 12 percent per year in the period 2006 – 2010, compared to 11percent in the previous period. During that same period an average value added at constant prices of both hotels and restaurant was estimated at SRD 213 million as a result of a 0.16 percent average growth. Due to an increasing demand, new capital investments and a diversification in the range of products occurred. Many new hotels and eco-lodges were constructed.

## Figure 1: Evolution of Agricultural and Tourism Output Shares 1980-2010




Source: authors based on GBS figures

### 2.2 Agriculture sector

The agricultural sector was the most important economic activity during the entire colonial period until the rise of mining in the early 1990's. Agricultural output in that period consists of several crops such as sugarcane, cotton, wood, cacao, coffee. Since 1993 crops like cotton, cacao and coffee were no longer produced and the agriculture sector in Suriname has been dominated since by rice and banana. Rice, accounts for about 90 percent of agricultural land use, followed by banana. In 2004, agriculture accounted for 9 percent of Suriname's GDP, and cultivated land covered about 58,000 hectares across the northern plains. The output share of agriculture to GDP declined over past periods (2001-2005) with an annual average of 8.4 percent from an average of 11.7 percent from the period 1996-2000. This may reflect the precarious situation and volatility of rice production and a collapse of the banana sector in 2003. Agricultural output rebounded in 2004 due to an increase in

particular the banana production. In recent years, the average output share to GDP declined further to 5.3 percent during 2006-2010.

Suriname is a member of the African Caribbean and Pacific states (ACP). This has allowed it to export rice and bananas to the European Union on preferential terms within the Cotonou partnerschip agreement of 2000 with the European Union. This agreement has since 2008 been superseded by the European Partnership Agreement (EPA). Several similarities in nature, determined the choice of agriculture and tourism in this study. Both sectors are dispersed of nature, meaning that their activities span a large geographical area. With many local entrepreneurs operating on different levels and employing many, the sectors are considered to be labor-intensive,. The implication is that agriculture and tourism have a significant developmental potential. Besides the strong backward linkages between tourism and agriculture, possible evidence on consumption linkages also exists. Wages paid in these sectors demand goods and services from other sectors. This implies great spin off effects to the rest of the economy.

## 3. Literature review of inter-sectoral linkages

In general, inter-linkages among sectors in an economy can be examined in different ways. First, it may be done through the input–output (I-O) framework illustrating broad trends in structural shifts and the interdependence among sectors; second, by statistical analysis, involving an investigation of causality among the sectors; and third, through the use of econometric models such as co-integration analysis and Vector Autoregression (VAR) analysis (Gunjeet, Sanjib, & Raj, 2009).

The development literature describes a variety of models, which hypothesize several possible interactions between sectors such as agriculture, manufacturing and services during the development process (Gemmell, Lloyd, & Mathew, 1998). Many studies depart from the two-sector model, also known as the dualism model (Lewis, 1954) in the investigation of linkages among sectors. This model, a closed economy model, explains the growth of a developing economy in terms of labor transition between two sectors usually a traditional (agricultural) and a modern (industrial) sector. According to Lewis (1954), the development in the traditional sector assists the expansion of the modern sector. Thus, a surplus of labor and capital in the agricultural sector is transferred to the manufacturing sector, the growth of which over time absorbs these surpluses, thus promoting industrialization and sustained development.

In the dualistic case of agriculture and manufacturing the relationship has been seen from various inter-sectoral linkages (Saikia, 2011) (Saikia, 2011). While, on the one hand, food grains and inputs like raw materials needed by agro-based industries are supplied by the agricultural sector, on the other hand, industries supply industrial inputs, such as fertilizers and machines needed in that sector. In this model agriculture also provide scarce foreign exchange to the manufacturing sector for the import of key intermediate or investment goods. Thus, the different dimensions of the agriculture-manufacturing and vice-versa linkages can be summarized as both demand and supply-side (backwards and forward) linkages (Gemmell, Lloyd, & Mathew, 1998). According to Gemmell et al. a logical inference is then that a faster growing agricultural sector will trigger a faster growth in the manufacturing sector, ceteris paribus.

However, the theory of dualism proved to be inappropriate for some economies. Hiranya (1997) shows with a study done for Assam in India that substantial investment in the modern sector failed to trigger a process of sustained growth in the traditional sector. According to Hiranya, these investments were not able to establish the crucial linkages of capital, labor, goods and services, between the modern and the traditional sectors. Instead of manoeuvering the economy on to a path of long run growth, the missing links gradually transformed the modern sector into an economic enclave. This implies that the type and direction of investments may be determinant for the emergence of linkages. Simultaneous investments in both the traditional and modern sectors might create simultaneous demand and supply conditions between the two sectors, creating intersectoral linkages. Large and comprehensive investments in several sectors at a time also called the Balance Growth Approach (Nurske, 1953) or Big Push Theory (Rosenstein-Rodan, 1943; Murphy, Vishny and Schleiffer, 1989) are often made by governments. These investments need to be meticulously planned and coordinated in order to succeed. Eco-tourism, like in the case of Suriname, would not be a likely candidate for this approach because of the dispersed nature of that activity.

The tourism sector is an industry of not one particular product but many heterogeneous products, brought forth by many entrepreneurs (Rogerson, 2012). According to Rogerson the tourism sector has the dynamics to diversify an economy since all kinds of beginner entrepreneurs are given the opportunity to link up with large firms in the sector. This heterogeneity causes the entrepreneurs in this sector to interact with entrepreneurs in other sectors for both inputs and outputs. As such, the tourism sector develops many inter-sectoral linkages with significant spin off effects to the rest of the economy. It therefore demonstrates its developmental potential. The linkage analysis examines the strengths of the inter-sectoral forward and backward linkages between the tourism sector and the

other non-tourism industries (Junning, PingSun, & James, 2005). In order to investigate linkages in a dispersed situation, Junning et al. propose the application of an Input-Output (I-O) model. The inter-sectoral linkage in the economy begins with the primary sector (agriculture, agribusiness and fishery), and goes through the secondary (manufacturing, construction and telecommunication) and ends with the tertiary sectors (services including Tourism) (Meyer, 2006).

Bowen et al. (1991) presented a conceptual model of linkages between the agricultural and the tourism sectors in the case of Hawaii. They argued that there is potential for both the tourism and agricultural sectors to benefit from the linkages. But there is also a possibility that both sectors may compete against one another for resources, such as human capital, natural and entrepreneurial resources. They also highlighted the shift of resources particularly land and labor from agriculture to tourism (Bowen, Cox, & Fox, 1991). Rogerson (2012) argues against this by claiming that strengthening tourism-agro linkages tends to promote stronger inter-linkages instead triggering crowding-out effects. Crowding-out might be the case in a situation of mass-tourism, where large amounts of resources are needed to accommodate large groups of tourists. With respect to eco-tourism the environment is exploited in such a way that the bio-diversity and pristine nature of the country are preserved and as such resource shifts away from agriculture might be unidirectional. Another argument is that in the case of eco-tourism, activities and accommodations are usually located in rural and relatively poor areas where agriculture is one of the main means of existence. A growing demand for these agricultural products may enhance the earning capacity of the local economy and may even provide a basis for poverty alleviation.

Researchers have attempted to investigate inter-sectoral linkages using sectoral GDP. Many of the studies that have been reviewed use multivariate vector autoregressions (VAR) to investigate the nature and magnitude of intersectoral linkages. A VAR investigates related concepts like exogeneity and Granger- causality (Gemmell, Lloyd, & Mathew, 1998). In sum, it offers a natural framework for the study of structural change, allowing previously untested aspects of the process to be addressed systematically. The table below provides an overview of the findings and techniques used in several studies.

Table 2: Some Key Studies on Inter-sectoral Linkages

| Study | Findings | Methods used |
|---|---|---|
| **Bowen, Richard et al (1991)** | ➢ Presents a conceptual model of important market linkages between the tourism and agricultural sectors<br>➢ Both agriculture and tourism sectors benefit from the linkages in the case of Hawaii. | |
| **Gemmel, Norman et al (1998)** | ➢ Services GDP growth seems to be harmful to growth in agricultural GDP in both short and long run<br>➢ Manufacturing and Services GDP are both weakly exogenous: they Granger cause changes in agricultural GDP but not vice versa.<br>➢ Sectoral productivity analysis indicates that increases in manufacturing and services GDP both have a positive impact on agricultural productivity in the long run. This is consistent with the neo-classical arguments: higher manufacturing productivity tends to spill over to agriculture. | Vector auto regressive Model (Multivariate VAR) |
| **Graigwell, Roland et al (2008)** | ➢ The results of this paper suggested that an expansion of manufacturing GDP, is associated with a reduced agricultural output in the short run and an agricultural expansion in the long run<br>➢ In this paper sectoral real output was analyzed in two sub-periods, to investigate the structural transformation from an economy dominated by agriculture to one that is predominantly Service oriented.<br>➢ One co-integration relationship was found in both sub-periods.<br>➢ The results of this paper suggest that for the earlier period, increase in industrial output were associated with lower agricultural GDP over the long run<br>➢ In the short run of the earlier periods, changes in industrial output promoted growth in agricultural output.<br>➢ In the latter period an expansion in services output was found to be the only determinant of industrial output in both the long and short run<br>➢ agricultural output was not part of the co-integrating system and had no statistically significant impact on either the industrial and services sectors the time frame considered | Multivariate-co-integration analysis |
| **Gunjeet, Kaur et al (2009)** | ➢ The results of the study shows that there is a strong long run equilibrium relationship among the primary, secondary and tertiary sectors<br>➢ There is also a strong long run equilibrium | Input-output framework Co-integration |

| | | |
|---|---|---|
| | relationship with one another in a bivariate framework.<br>➢ At sub- sectoral level an existence of long run equilibrium relationship between trade, hotels, transport & communication and manufacturing sectors was observed.<br>➢ The financial sector (the banking and insurance sector) manufacturing sector and the primary sectors were co-integrated | analysis |
| **Saikia, Dilip (2011)** | ➢ The results of this papers shows that inter-sectoral linkages have been undergoing structural changes during pre- and post-reform periods.<br>➢ The agriculture-industry linkage has been deteriorating over the years and went through some directional changes in both demand and production linkage from industry to agriculture in pre period, while this changed in the past period from agriculture to industry<br>➢ There is no interdependence between agriculture and services but there is a strong interdependence between industry and services sectors | Input-output(I-O) framework |
| **Rogerson, Christian (2012)** | ➢ The results of this paper suggest that the macro-economic relationship between tourism and agriculture is multi-faceted, complex and variable.<br>➢ There is a symbiotic relationship between agriculture and tourism instead of a competition of resources where tourism crowd outs agriculture<br>➢ Tourism offers a potential backward linkages to the agriculture<br>➢ Strengthening of these linkage could lead to a decreased linkages (leakages) through imports<br>➢ Expanded linkages between agriculture and tourism can contribute to the ethos of sustainable tourism | |

Source: Authors

Insights from previous research (see table 2) may provide input for the study under consideration. At first, an evaluation of the techniques used shows a bias towards multivariate vector auto regression (VAR), co integration analysis and input-output (I-O) analysis. These techniques are used to detect uni- or bidirectional causality between sectors or sectoral interaction and interdependency, thus intersectoral linkages.

Notwithstanding the benefits of a VAR analysis, nevertheless, in the Surinamese case it is known that tourism output might affect agricultural demand, but not the other way around. The argument implies that application of a VAR analysis in the Surinamese case is superfluous. However, to substantiate and proof the alleged relationship, a VAR will be deployed.

Strong backward linkages, whereby agriculture is the upstream activity that caters to the demand of the tourism sector, are more evident. Input-Output (I-O) analyses are data intensive on both the micro and the macro level. The dispersed and informal nature of the tourism sector in Suriname impedes the gathering and availability of data.

There also exists a symbiotic relationship between both tourism and agricultural sector in the case of Suriname so that they don't crowd out each other. The broad thrust of this paper is to examine the nature of this relationship empirically.

## 4. Data analysis

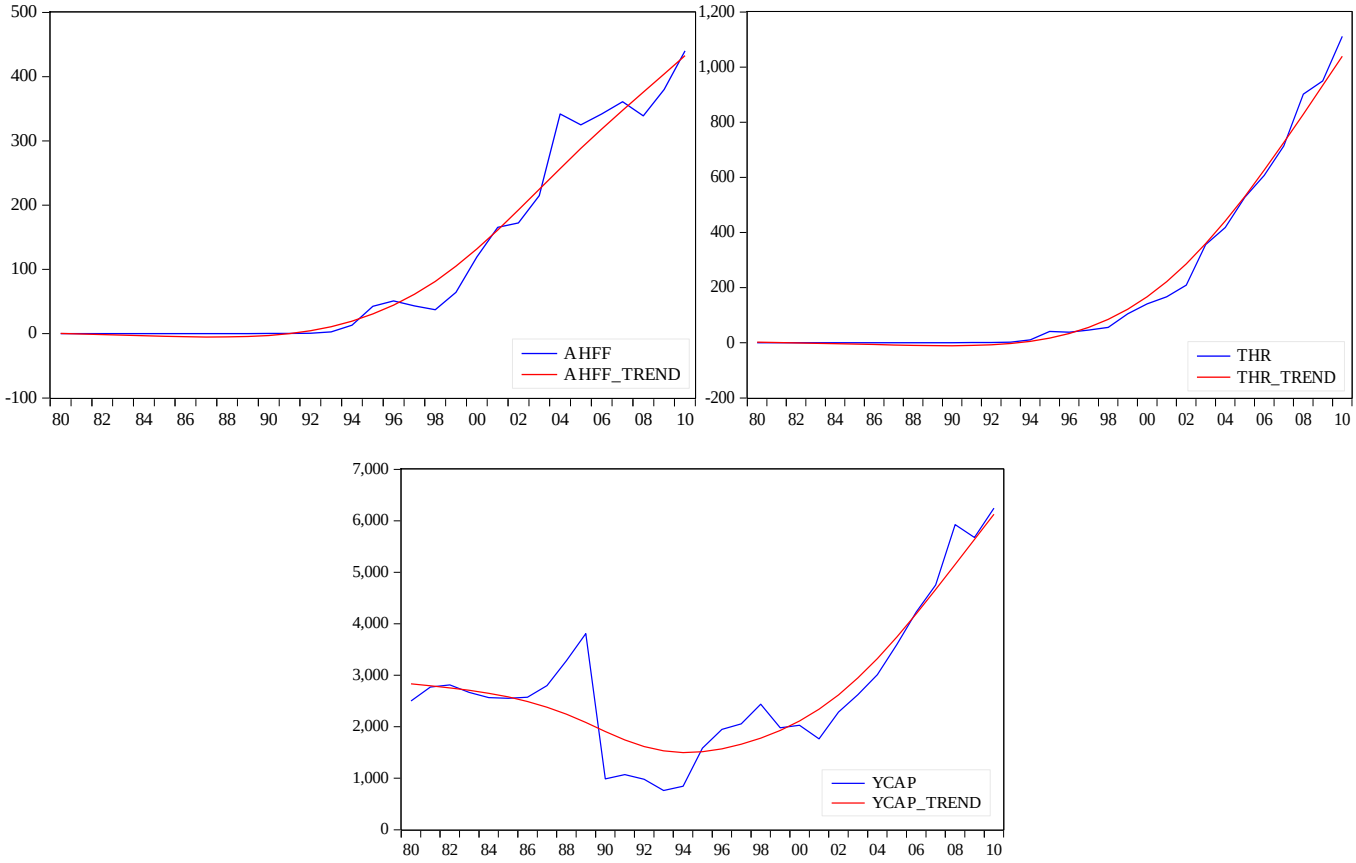
The data used in this paper are annual observations covering the sample period 1980-2010. The sectoral GDP data for this paper were collected from the data base of the General Bureau of Statistics (ABS). In general, value added of tourism services (according to ISIC classification) is measured as the sum of the value added of hotels, restaurants, construction, trade & wholesale, commercial and financial services. In the case of Suriname this measure is inappropriate, because the economy has no significant dependence on tourism. Indeed tourism services have little or no impact on construction, commercial and financial services. The variable for tourist services utilized in this paper therefore excludes these variables and consists of value added activities in hotel and restaurants as well as wholesale and retail trade *(thr).*

The sectoral GDP data in this paper are measured in millions of SRD. The logarithms of the variables are in this analysis. Therefore the variable capturing agricultural, husbandry, fishery and forestry[1] output is written in short as ***lahff,*** per capita income as ***lycap*** and trade, hotel and restaurants ***lthr***.

For trend analysis, the Hoddrick- Prescott filter is applied to the variables in their nominal form. This is a method used to estimate the long-term component of each series by separating the growth- and cyclical component. The series in this paper are decomposed into $\boldsymbol{y_t} = \boldsymbol{g_t} + \boldsymbol{c_t} + \boldsymbol{u_t}$, where $g_t$ is the growth or long-run component, $c_t$ the cyclical component and $u_t$ represents the irregular (noise) components of the series. A λ (lambda) equal to 100 is used to estimate the smoothed long run aspect. The value of 100is considered to be optimal for analyzing annual data (Hodrick & Prescott, 1997). The long-term developments of the abovementioned variables are presented in figure 1 and the cyclical components in figure 2. This shows that the long term component follows almost the same pattern as *thr*, *ahff* and *ycap* and is more sensitive to long term than to short term fluctuations. The short-term movement shows much volatility in its patterns (figure 3).

[1] The general bureau of statistics in Suriname added up agricultural data with fishery, forestry and husbandries during the period 1980-1989

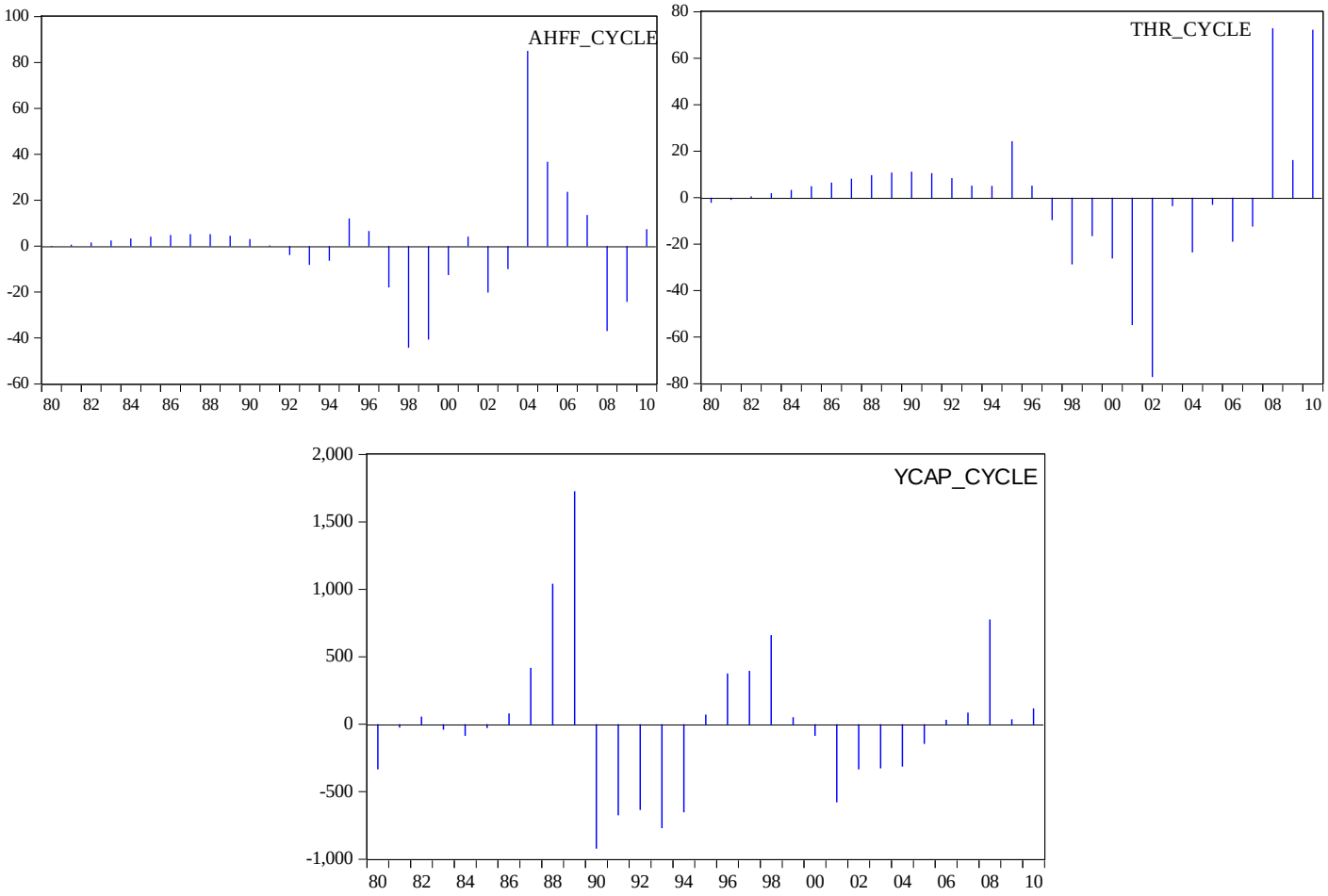
## Figure 2: HP-filter, Actual data and Long run trends of AHFF, THR, YCAP




Note: The variables trade, hotels and restaurants (thr), agriculture, husbandry, fishery and forestry (ahff) and per capita income (ycap)

Source: Authors estimation with Eviews 7.1

## Figure 3 : HP-filter, Cycle Component of the Variables AHFF, THR, and YCAP




Source: Authors estimation with Eviews 7.1

## Table 3: Summary Statistics of AHFF, THR, YCAP

| | Mean | Std. Dev. | Skewness | Kurtosis | Jarque-Bera | Probability |
|---|---|---|---|---|---|---|
| **AHFF** | 112 | 149.05 | 0.984 | 2.342 | 5.564 | 0.062 |
| **THR** | 207 | 326.41 | 1.539 | 4.078 | 13.742 | 0.001 |
| **YCAP** | 2746 | 1425.43 | 0.923 | 3.408 | 4.614 | 0.100 |

The summary statistics of the variables in their nominal form are presented in table 3. In this sample period 1980-2010, the sectoral output of agriculture, fishery & forestry **(ahff)** had a yearly average of SRD 112 million, while the sectoral output of trade, hotels and restaurants **(thr)** has an annual average of SRD 207 million. Per capita income **(ycap)** had an average of SRD 2746 million in the same sample period. As for the volatility measured by the standard deviation, we observe that the **ycap** cycle appears to be much more volatile than each of the other variables **(ahff, thr)**. The variable **thr** deviates from its mean and shows also a volatile pattern (see table 4). This reflects the uncertainty of the tourist arrivals. Based on the p-stats of the Jarque - Bera a percentage greater than 5 implies that the series are normally distributed, except for trade, hotels and restaurants.

The specification and estimation procedures are preceded by a stationarity test of all the included variables in their logarithms. This test is necessary to prevent from having spurious relationships presented as true relationships between variables. In table 4 the different stationarity tests are presented. All three test, namely ADF, PP and KPSS, show that all three variables, lahff, lthr and lycap, are stationary in their first difference on all (1 percent, 5 percent and 10 percent) levels. Hence, all the variables are integrated of the order one (I (1)).

**Table 4: Unit root Tests for lahff, lthr and lycap**

| | | ADF* | PP* | KPSS |
|---|---|---|---|---|
| **lahff** | Level | -0.211 | 0.267 | |
| | | (0.602) | (0.757) | |
| | Δ | -2.126 | -2.056 | 0.146 |
| | | (0.034) | (0.04) | |
| **lthr** | Level | 0.368 | 1.187 | 0.692 |
| | | (0.784) | (0.936) | |
| | Δ | -2.126 | -2.163 | 0.172 |
| | | (0.034) | (0.032) | |
| **lycap** | Level | 0.475 | 0.479 | 0.163 |
| | | 0.812 | 0.813 | |
| | Δ | -5.309 | -5.309 | 0.054 |
| | | (0.000) | (0.000) | |

**Note**: Figures within parentheses indicate one-sided MacKinnon (1996) p-values

* = no constant, no intercept

## 5. Model specification and estimation procedures

Both agricultural and tourism sector could benefit from the interlinkages by way of a symbiotic relationship. In the case of Suriname, there could be possible evidence for a unidirectional relationship. In other words, while an expansion of tourism output could potentially influence agricultural output, the reverse may not necessarily hold. Thus, there exists a well-developed backward linkage from tourism (trade, hotel and restaurant output) to agriculture (agricultural output), but not vice versa. To substantiate this assumption, first a VECM (restricted VAR) will be employed. Although a VAR was announced in previous sections, rules mandate that in the case of non-stationary variables a VECM is used. Engle and Granger (1987) claim, that a linear combination of two or more non-stationary series (I(1)) can be stationary (I(0)). This stationary combination is found in a cointegrating or equilibrium relationship. In the short -run, the VECM corrects the long-run deviation from equilibrium. The error correcting mechanism (ECM) must be stationary. Since, a VECM estimate may not perform robustly in a case with a small sample, an Engle-Granger ECM (EG-ECM) is ultimately used. The estimated model is described below.

**Estimated model:**

$$\Delta lahff_t = \alpha_0 + \alpha_1 * \Delta lthr_t + \alpha_2 * \Delta lycap_t + \varepsilon_t$$

*Where:*

*lahff is the log of value added in Agricultural, animal husbandry, forestry and fishery and*

*lthr the log of value added in Trade, Hotel and Restaurants*

*lycap represents the log of per capita income.*

The model stipulates that agricultural output in Suriname is determined by the value added of trade, hotels and restaurants representing tourism and per capita income.

The sequence of the proposed Engle-Granger two steps approach is as follows:

1. Use OLS to regress *lahff* against *lthr* and *lycap to obtain a cointegrating or long run equation*

$$lahff_t = \beta 0 + \beta 1 * lthr_t + \beta 2 * lycap_t$$

2. Test for cointegration.

Residuals of the long-run model can then be used in the dynamic, short-run error correction model or mechanism (ECM) as depicted below:

$$\Delta y_t = \delta_1(L)\Delta y_{t-1} + \omega_1(L)\Delta x_t + \gamma_1 [y_{t-1} - \beta_0 - \beta_1 x_{t-1}] + \mu_{1t}$$

The error correction mechanism is used to establish convergence, back to long-run equilibrium. The setup of this mechanism starts with the residuals from the long-run model obtained after an OLS regression. These residuals are then tested for unit roots to see if cointegration exists. If the residuals have no unit root, it is transformed into an ECM. With a general to specific stepwise procedure, insignificant variables are eliminated from the model with both short-run (dynamic) and long-run (static) dimensions. As the variables are presented in log-form, their coefficients are interpreted as elasticities.

## 6. Results

After running a VECM the results in Appendix 2 show the deployment of a Johansen Cointegration procedure that signals the presence of one cointegrating equation. The Mc Kinnon p-value of less than 0.05, that is p = 0.0001, implies that the rank value of r = 1 indicates the abovementioned results. The dependent variable in this equation is *Δlahff*.

This information confirms the assumption that in Suriname, agricultural output may be a function of tourism output and per capita GDP and not vice versa. Therefore, the EG-ECM was applied for this single equation.

The ECM was tested for unit roots, and the result suggested an ECM integrated of the order zero. This was later confirmed after incorporating the ECM in a reduced model that captured both **long-run** and **short-run** dynamics (see ECM t-statistic and p-value in table 5). This mean, that there exists a coïntegrated relationship between the variables in the model.

### Table 5: Engle-Granger Cointegration Approach: With "LAHFF" as the dependent variable

| | **Coefficients** | **t-statistic** | **p-value** |
|---|---|---|---|
| **Long-run multipliers** | | | |
| C | 4.178 | (6.852) | 0.000 |
| LYCAP | -0.632 | (-7.929) | 0.000 |
| LTHR | 1.082 | (81.129) | 0.000 |
| **Short-run dynamics** | | | |
| DLYCAP | -0.572 | (-5.195) | 0.000 |
| DLTHR | 0.856 | (7.174) | 0.000 |
| DLTHR(-1) | 0.361 | (5.248) | 0.000 |
| **ECM1(-1)** | **-0.293** | **(-2.452)** | **0.021** |

**Source: Authors with Eviews 7.1**

In the long-run, a one percent rise in per capita income would decrease agricultural output by 0.6 percent. This implies that an increase in income would establish a higher level of wealth which translates into a relatively lower demand of primary consumption goods (e.g. vegetables, rice) and a switch to savings or more imported food items. Growth of trade, hotels and restaurant of one percent will trigger a growth in agricultural output of almost 1.1 percent. This implies a more than proportional growth of agricultural output caused by an increase in demand from tourists and locals.

The coefficient of the ECM, or the speed of adjustment, indicates that a shock to agricultural output will take approximately 3 years to move production back to its long-run equilibrium. Thus, it will take the agricultural production 3 years to restore to its normal level after a sharp income shock, or a shock created by closures of tourist accommodation as a result of a persisting fall in tourist arrivals. It may be noted that developments in the trade, hotel and restaurant sectors from a previous period will also affect current agricultural production. It is argued, that foreign demand in the form of exports is kept constant due to rigid constraints on foreign agricultural markets.

## 7. Conclusions and Policy implications

Besides a description of the tourism sector, this paper provides insights into the possible interrelations and interdependencies between the tourism and the agriculture sector in Suriname during the period 1980 – 2010. Annual data of the sectoral output of agriculture husbandry, fishery and forestry (ahff), and trade (wholesale and retail trade), hotels and restaurants (thr) and per capita income (ycap) have been employed in this paper in order to do these investigations. The use of an Engle Granger error correcting mechanism (ECM) enabled the authors to examine the long- and short run effects between agricultural output (ahff), tourism output (thr) and per capita income (ycap).

The main finding of this paper is that both tourism output and per capita income stimulates movements in agricultural output in the short and long run. According to the empirical results, a change in tourism output leads to a more than proportional change in agricultural output in the long run, as a result of an increase in demand by both tourists and locals. On the other hand, an increase in per capita income in the long run leads to a decrease in agricultural output. As income increases people tend to save or spent their money on imported food items rather than on basic agricultural products.

An important policy implication of this study is that an expansion in tourism services in Suriname provides an important avenue for the development of the agricultural sector. It is therefore important for additional measures to improve and sustain the recent surge in tourism activity in the country. There is an urgent need for revamped legislation and regulations, in order to provide further impetus for the development and expansion of tourism sector output. The fact that the tourism sector is dispersed and therefore difficult to measure, poses a major challenge to analyze and quantify its role in the economy. To improve the scope and depth of analysis it is important to have a proper database in order to generate better statistics. This will not only help with the investigation of the interlinkages across sectors but also with developing sustainable tourism policy plans.

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# Appendix

## Appendix 1:

### Tourist arrivals, Agricultural Output, Trade Hotel & Restaurant GDP

### And per Capita Income

| | TA<br>Num. of visitors | YCAP<br>million USD | AHFF<br>million SRD | THR<br>million SRD |
|---|---|---|---|---|
| **1980** | 66336 | 2499.960 | 0.123 | 0.273 |
| **1981** | 64712 | 2772.490 | 0.139 | 0.287 |
| **1982** | 57235 | 2812.568 | 0.135 | 0.315 |
| **1983** | 49903 | 2668.683 | 0.123 | 0.311 |
| **1984** | 45353 | 2564.950 | 0.128 | 0.271 |
| **1985** | 30932 | 2552.712 | 0.129 | 0.268 |
| **1986** | 35030 | 2571.868 | 0.126 | 0.286 |
| **1987** | 23640 | 2798.464 | 0.133 | 0.311 |
| **1988** | 26976 | 3286.145 | 0.132 | 0.379 |
| **1989** | 34360 | 3809.235 | 0.129 | 0.514 |
| **1990** | 45616 | 986.576 | 0.314 | 0.572 |
| **1991** | 67167 | 1071.962 | 0.395 | 0.749 |
| **1992** | 62334 | 981.665 | 0.677 | 1.125 |
| **1993** | 38543 | 762.875 | 2.752 | 2.631 |
| **1994** | 42262 | 846.781 | 13.243 | 10.426 |
| **1995** | 43442 | 1584.822 | 42.754 | 41.364 |
| **1996** | 53228 | 1947.202 | 51.066 | 38.624 |
| **1997** | 61358 | 2055.581 | 43.363 | 46.016 |
| **1998** | 54585 | 2439.419 | 37.268 | 55.952 |
| **1999** | 57275 | 1980.141 | 64.381 | 104.995 |
| **2000** | 56843 | 2027.113 | 119.329 | 140.948 |
| **2001** | 54341 | 1763.375 | 165.411 | 167.059 |
| **2002** | 60223 | 2285.063 | 172.306 | 208.946 |
| **2003** | 90687 | 2621.739 | 214.749 | 356.166 |
| **2004** | 137809 | 3011.833 | 342.000 | 418.130 |
| **2005** | 160170 | 3597.997 | 325.000 | 527.807 |
| **2006** | 154060 | 4224.557 | 342.000 | 607.177 |
| **2007** | 166685 | 4752.286 | 361.000 | 713.647 |
| **2008** | 150711 | 5927.322 | 339.000 | 902.104 |
| **2009** | 150628 | 5675.548 | 380.000 | 950.080 |
| **2010** | 204519 | 6244.990 | 440.000 | 1111.649 |

Sources: General Bureau of Statistics, Central Bank and Suriname Tourism Foundation

**Appendix 2:**

**COINTEGRATION TEST FOR THE PERIOD 1980 - 2010**

| No. of CE(s) | Eigenvalue | Trace Statistic | Maximum Eigenvalue | P-value |
|---|---|---|---|---|
| r=1 | 0.730675 | 49.01407 | 29.79707 | 0.0001 |
| r=2 | 0.328543 | 12.28269 | 15.49471 | 0.1439 |
| r=3 | 0.039558 | 1.130136 | 3.841466 | 0.2877 |

Note: Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

# Appendix 3:
## VECM Cointegration Equation

| Variables | Cointegration Vector |
|---|---|
| LAHFF(-1) | 1.0000 |
| LTHR(-1) | -1.083586<br>[-145.801] |
| LYCAP(-1) | 1.03972<br>[ 14.0731] |
| C | -7.324002 |
| **Short-run Dynamics** | |
| **Error Correction:** | **D(LAHFF)** |
| CointEq1 | -1.75717<br>[-5.63918] |
| D(LAHFF(-1)) | 1.052698<br>[ 3.29749] |
| D(LAHFF(-2)) | -0.093441<br>[-0.38540] |
| D(LTHR(-1)) | -0.764089<br>[-2.00435] |
| D(LTHR(-2)) | -0.47031<br>[-1.46291] |
| D(LYCAP(-1)) | 1.477733<br>[ 4.11073] |
| D(LYCAP(-2)) | 0.698036<br>[ 2.53684] |
| C | 0.315849<br>[ 4.39799] |
| R-squared | 0.824434 |
| Adj. R-squared | 0.762985 |
| Sum sq. resids | 1.017992 |
| S.E. equation | 0.225609 |
| F-statistic | 13.41673 |