

**Developing a Social Accounting Matrix to Examine Tourism in the
Área de Proteção Ambiental de Guaraqueçaba, Brazil**

John E. Wagner

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About the Author(s)

John E. Wagner is an Assistant Professor of Forest Resource Economics, SUNY College of Environmental Science and Forestry, 304 Bray Hall, 1 Forestry Drive, Syracuse NY 13210 USA. E-mail: jwagner@syr.edu Phone: (315) 470-6971 Fax: (315) 470-6535.

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ABSTRACT

Ecotourism emphasizes the central role of the ecosystem as the basis for tourism. It is seen as a means to sustainably use the natural resources by providing income and economic security for a region. Therefore, an important component in assessing the merits of ecotourism is determining its ability to do this. This study uses a Social Accounting Matrix (SAM) to examine the economic effects of ecotourism in the *Área de Proteção Ambiental (APA) de Guaraqueçaba*, Brazil. A SAM provides a systematic framework for synthesizing and displaying the data on a region's economy and estimating regional economic multipliers. Most of the inputs, commodities, and capital used in the region are imported. Therefore, monies' tourists spend are used to pay for these imports and will generate only a small economic impact. Consequently, there is little incentive to stop current economic activities that are probably counter to ecosystem-based tourism.

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Developing a Social Accounting Matrix to Examine Tourism in the Área de Proteção Ambiental de Guaraqueçaba, Brazil

INTRODUCTION

Ecotourism emphasizes the central role of the ecosystem as the basis for tourism. Theophile (1994) identifies it as one of the fastest growing segments of the tourism industry. In addition, she describes ecotourism as ranging from “ornithologists collecting data on arduous Himalayan treks to retirees enjoying inner tube rides in a New Hampshire [USA] river.” Ecotourism is seen as a means to sustainably use natural resources and to provide income and economic security. Therefore, an important component in assessing the merits of ecotourism is determining its ability to do this. In areas with only a slightly developed economy, measuring the impacts of ecotourism or most other activities is extremely difficult. Areas with a primarily subsistence economy, such as the Guaraqueçaba region of Brazil, prevent precise measurement of economic activities and impacts. Nevertheless, if one is to estimate whether ecotourism could benefit the region and the amount of those benefits, a descriptive and predictive model of economic activity is necessary.

The measures of economic benefits depend on the focus and scope of the analysis. Some basic economic questions will examine the changes in production, employee compensation, value added, income distribution, household expenditures and employment within the region as a result of an increase in ecotourism.¹ From a regional economic perspective, the structure of a regional economy can be described by its production activities, income distribution, consumption of goods/services, savings and investment, and external trade. One technique for estimating the regional economic impacts of tourism is by using Input-Output (I/O) models (Loomis 1995, English et al. 1995, Bergstrom et al. 1990, Heng et al. 1990, Khan et al. 1990, Fletcher 1989 Alward 1986, Propst 1985, and Alward et al. 1984). Hommerding (1993) developed a *Matriz de Insumo-Produto* or an Input-Output (I/O) model to examine the economic impacts of tourism on Brazil and the state of Paraná. He developed the model using the national Brazilian National I/O Model (IBGE 1989). However, I/O has concentrated historically on the production activities to estimate regional economic impacts (Miller and Blair 1985).

An alternate approach would be to use a Social Accounting Matrix (SAM) (Pyatt and Round 1985a and Bulmer-Thomas 1982). A SAM has three advantages. First, a SAM describes the structure of an economy; the links among production activities,

¹The definitions of terms (e.g., value added) are contained in Appendix - A and also will appear later in the manuscript.

income distribution, consumption of goods/services, savings and investment, and external trade (Thorbecke 1985). A SAM, therefore, describes the links between demand, production, and income within a region's economy. This allows for estimating the impacts of ecotourism on production, employee compensation, value added, and income distribution. Second, regional economic data are often gathered by different governmental agencies and stored in different formats. A SAM provides a concise framework for synthesizing and displaying the data on a region's economy (Thorbecke 1985). Finally, it allows for calculating regional economic multipliers for estimating the impacts of ecotourism on production, income distribution, and demand given the existing structure of the economy. While an I/O model can do similar analyses as a SAM, a SAM is a more complete methodology. In fact, as will be shown later, an I/O model is a subset of a SAM.

A SAM has been used traditionally to examine the structures of large regions and national economies (Pyatt and Round 1985a). Subramanian and Sadoulet (1990) and Adelman et al. (1988) described how SAMs were developed for village economies characterized by relatively simple production accounts. Our ultimate goal was to develop economic multipliers which can be used to examine the economic impacts of ecotourism.

STUDY AREA

The Atlantic Coastal Forest of Brazil is a unique and threatened ecosystem. This area consists of estuaries, bays, islands, mangroves and salt marshes, coastal lowlands, and a coastal mountain range and plateau. The specific area is located in northeastern Paraná State and contains the municipality of Guaraqueçaba, and parts of the municipalities of Atonina, Campina Grande do Sul, and Paranaguá. The United Nations' Man and the Biosphere Program have recognized the area as an Internal Biosphere Reserve.

The Brazilian government has created conservation units in the Guaraqueçaba region which contain national parks, environmental protection areas, ecological stations, and state parks. The regulation of the conservation units at the federal level is under the authority of *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis* (IBAMA). The largest conservation unit is the *Área de Proteção Ambiental (APA) de Guaraqueçaba* or the environmental protection area of Guaraqueçaba. The APA designation allows private landowners, within the APA, regulated use of natural resources.

An objective of this study is to describe the regional economy of the APA de Guaraqueçaba. There are roughly 313,400 hectares in the APA, approximately 61% is within the municipality of Guaraqueçaba. Included within the municipality's boundaries are Superagui and Ilha dos Peças, two areas of interest for further research. Although

there are many small villages within the municipality, Guaraqueçaba is the largest town.

A broad overview of Guaraqueçaba's regional economy activity is summarized in three reports (SPVS 1992a and 1992b and IPARDES 1982). Table 1 defines the distribution of value added among the four main economic sectors for 1989. The agricultural crops are rice (*arroz*), pineapple (*abacaxi*), banana, coffee (*café*), sugar cane (*cana-de-açúcar*), beans (*feijão*), oranges (*laranga*), manioc (*mandioca*), corn (*milho*), ginger (*gengibre*), and tangerine (*tangerina*). In terms of total hectares and number of farmers, bananas are the principal agriculture activity followed by manioc, corn, coffee, and sugar cane (SPVS 1994). Recently, ginger has become an important agricultural crop. However, ginger cultivation requires intensive farming techniques and therefore a high capital investment (SPVS 1994). Finally, there are buffalo ranches interspersed within the municipality of Guaraqueçaba.

The predominate industry in the manufacturing sector is food production (*Produtos Alimentares*) (SEFA 1989). The principal industry is the processing of *palmito*, the hearts of palm trees. The commercial and service sectors are small and serve the basic needs of the local population (SPVS 1992b). The economy has been changing from agriculture to industry (IPARDES 1982). Some of the reasons for this change are discussed in the above reports.

THE SOCIAL ACCOUNTING MATRIX

The rows of a SAM define receipts, while the columns define expenditures. Figure 1 is an example of the proposed SAM for Guaraqueçaba. The rows and columns are grouped into four main account headings: 1) Activities - local enterprises and businesses, 2) Primary Factors of Production - wage payments and indirect business taxes, 3) Institutions - households and governments, and 4) Imports/Exports. As can be seen by Figure 1, each main account is further delineated into more descriptive sub-account headings.

The row and column intersections describe specific economic interactions. Each sub-matrix has a specific economic interpretation. However, some of the sub-matrices are zero filled denoting no economic transactions. Due to the general equilibrium assumption of either SAMs or I/O models, total expenditures (a column sum) **must** equal total receipts (a row sum) for each sub-account (Briassoulis 1991; Pyatt and Round 1985a; Miller and Blair 1985; and Bulmer-Thomas 1982). All the sub-matrices are defined excluding imports, except those matrices dealing with imports explicitly.

The economic impacts estimated using regional economic multipliers developed from a SAM or I/O model are subject to a number of assumptions and criticisms. Briassoulis (1991), Miller and Blair (1985), and Bulmer-Thomas (1982) provide an in-depth discussion of the assumptions. Briassoulis (1991) provides a critique of using

I/O models to examine the economic impacts of tourism. The same criticisms concerning I/O models would also hold for using SAMs to examine the economic impacts of tourism. In addition, Bulmer-Thomas (1982) discusses some criticisms of using SAM methodology.

INTERINDUSTRY TRANSACTIONS SUB-MATRIX

The interindustry transactions matrix describes the expenditures and receipts between activities within the region. The columns define the expenditures by an activity on inputs purchased from the activities named at the left (Figure 1). Conversely, the rows define the receipts of an activity selling inputs to those activities named at the top (Figure 1).

The Activity account was divided into eight sub-accounts: 1) rudimentary rural farms (*produtores simples*), 2) rural entrepreneurs (*empresários rurais*), 3) construction, 4) manufacturing, 5) commercial, 6) services, 7) transportation, and 8) government enterprises. The rudimentary rural farm and rural entrepreneurial sub-accounts described the production process associated with farming, fishing, forestry, and ranching. The rudimentary rural farm sub-account was used to describe the agricultural based informal economy, while the rural entrepreneurial sub-account was used to describe the agricultural based formal economy. SPVS (1994) identified three classifications that characterize the types of agricultural production systems in the Guaraqueçaba region. The characterizations included economic factors such as: 1) the composition of capital (including the quality and quantity of natural resources), 2) the availability of labor, and 3) the purpose for the production. Rudimentary rural farming described the principal agricultural production system within Guaraqueçaba (SPVS 1994). The rural entrepreneurial sub-account was a combination of two different categories: rural entrepreneurs (*empresários rurais*) and family entrepreneurs (*empresários familiares*). The principal component was rural entrepreneurs.

The construction sub-account described all forms of civil construction. The manufacturing sub-account described the processing of *palmito*. The commercial sub-account described the transactions associated with wholesale and retail trade. The service sub-account described the transactions associated with restaurants and lodging, personal services, health, insurance, and finance. The Secretary of Finance (*Secretaria da Fazenda do Paraná*) included transportation and communications in this sub-account for summary purposes. However, we disaggregated transportation into an individual sub-account. Communications remained part of the service sub-account. The transportation sub-account described the movement of goods and people by highway, rail, metro, water, and air. The government enterprise sub-account was an accounting tool for wage expenditures by the municipal government and for the legal sale of palm trees used in processing *palmito*. Government expenditures on the intermediate factors of production were recorded as final demand purchases by governments.

CONSUMPTION OR FINAL DEMAND SUB -MATRIX

This matrix defines the purchases of goods and services by institutions for final consumption because the items purchased were not used in any further production process.

The Institutional account was divided into four sub-accounts: 1) households, 2) capital investment, 3) enterprises and corporations, and 4) governments. Households were defined by income level: 1) subsistence, 2) low, 3) medium and 4) high. The capital investment sub-account defined savings by households, and surpluses or deficits by governments as well as changes in inventory. The enterprise and corporation sub-account defined the distribution of profits earned. Finally, governments were defined by different geographic levels: 1) municipal, 2) state, and 3) federal.

ACTIVITY EXPORTS SUB-MATRIX

The export region was defined as the rest of Brazil. This matrix defines goods and services produced within Guaraqueçaba and exported to the rest of Brazil.

VALUE ADDED SUB-MATRIX

This matrix defined payments to the Primary Factors of Production. The Primary Factors of Production account was defined into three sub-accounts: 1) capital rent, 2) indirect business taxes, and 3) labor. Capital rent was defined as dividends, interest, and rental income and other nonwage payments for the use of capital plus profits of partnerships and sole proprietorships. Indirect business taxes were defined as sales, excise, and value added taxes, as well as customs duties. In addition, social and welfare taxes were included in indirect business taxes. Labor was divided into two categories: salaried and household. The salaried category denoted wages, salaries, and any other benefits paid to employees with formal wage contracts (*com vinculo empregatício*). The household category denoted the imputed values of benefits of subsistence type activities (e.g., the household labor associated with rudimentary rural farming and/or fishing) and wages, salaries, and any other benefits paid to employees without formal wage contracts (*sem vinculo empregatício*). The sum of value added from each Activity sub-account defined gross regional product, an index of overall economic activity.

FACTOR EXPORTS SUB-MATRIX

This matrix defined payments to local capital or labor from foreign (outside the region) activities or institutions. This matrix could be used to capture monies sent back to households in Guaraqueçaba from family members working outside the municipality of Guaraqueçaba.

SALES AND TAX SUB-MATRIX

This matrix defined payments by activities to the various institutions. For example, an activity might pay a fee or royalty to a government to be able to use an input. This type of tax is different from an indirect business tax or a tax on income. Expenditures by activities to households would be payments for inputs (other than labor) used in the production process.

DISTRIBUTION SUB-MATRIX

This matrix defined the distribution of factor income to institutions. A row defined the amount of a household's income comprising salaries and interest payments. A column defined the distribution of salaries between households and governments (e.g., taxes paid on salary income).

TRANSFERS SUB-MATRIX

This matrix defined the movement of funds between institutions. For example, the federal government transfers money to the state and municipal governments or to households directly.

INSTITUTIONAL EXPORTS SUB-MATRIX

This matrix defined the export of mainly governmental goods and services. The import account also defines the capital accounts with respect to the region. For example, if the state government receives more (less) in taxes than it transfers to the region, this is a surplus (deficit) of capital and would be recorded in the import account as a positive (negative) number.

IMPORTS AND TRANSSHIPMENT SUB-MATRICES

The activity import matrix defined the import of inputs used by each activity in producing its output. The factor import matrix defined expenditures on exogenous primary factor requirements. The institutional imports matrix defined the expenditures on imported goods/services used in final consumption.² The transshipment matrix defined the cross hauling of goods (e.g., goods imported to meet export demand).

²Expenditures on imports leave the region and generate no local economic benefit.

METHODS

The smallest geopolitical area for which economic data were gathered was the municipality. In addition, the majority of the APA de Guaraqueçaba's area lies within the municipality of Guaraqueçaba. Therefore, the geographic boundary for the SAM was defined to be the municipality of Guaraqueçaba.

The base period for the SAM is defined to be 1989 to 1994. Generally, a SAM or I/O model is built for a specific year. However, given the nature of the municipality of Guaraqueçaba's economy and of the available economic data, a five-year range is tenable. Finally, due to the instability of the Brazilian currency during the 1980's and 1990's, the monetary unit is defined in United States dollars (\$).

THE STRUCTURED INTERVIEWS

Various data collected from governmental and nongovernmental organizations were used in estimating the SAM. However, most of these data were reported at some level other than a municipality. A possible simplifying assumption could be that expenditure patterns were the same for activities and institutions at the regional and national level.³ Expenditure patterns defined the percent of an activity's or institution's budget used to purchase various commodities and/or services (Wagner et al. 1992). However, these expenditure patterns did not always reflect accurately the limited economic data collected at the municipal level. Consequently, a technique was needed to incorporate additional municipal level data into the SAM additional to better reflect Guaraqueçaba's economy. Initially, a Delphi technique was proposed (Miller 1993, Harris et al. 1991 and Gordon and Helmer 1964). However, this technique was ineffective due to the large uncompensated time commitment required from the panel of experts to analyze the considerable amount of information contained within the SAM. Therefore, a set of structured interviews conducted by Ms. Lenita Marques and Ms. Vitória Müller with 13 experts were used. The experts ranged from municipal officials with specific knowledge of local enterprises and the labor force to state agencies and nongovernmental organizations that worked in the region on agricultural, economic development, and other projects. The education level for most of the experts was at least a Bachelors degree. The structured interviews were designed not to verify specific numbers within the SAM as much as the reasonableness of data blocks (e.g., the Value Added sub-matrix).

³In terms of the interindustry transactions sub-matrix, this is the same as an industry based technology assumption (Miller and Blair 1985). A partial expenditure pattern describing an activities' purchases of inputs from other activities is also defined as the matrix of technical or direct coefficients (*matriz de coeficientes técnicos*) or the Leontief production functions (Wagner et al. 1992).

ACTIVITY ACCOUNT

The Activity account was used to describe the production activity within the area and all expenses associated with production processes. The expenditure patterns for all but the rudimentary rural farm sub-account (i.e., interindustry transactions, value added, sales and taxes and import sub-matrices) were based on the 1980 Brazilian I/O Model (IBGE 1989). The expenditure pattern for the rudimentary rural farm sub-account was based on a 1975 Social Accounting Matrix for Brazil (Willumsen 1987). By using 1975 or 1980 expenditure patterns to describe purchases by these activities, we assumed that the production technologies did not change between these years. Given the nature of Guaraqueçaba's economy and the results of the structured interviews, this is a reasonable assumption. Total industry outlays, for all activities except rudimentary rural farmers and municipal government enterprise, were estimated using the 1989 report on value added by sector (SEFA 1989). Total outlay for the rudimentary rural farm sub-account was based on a 1991 United Nations study (United Nations 1991).

PRIMARY FACTORS OF PRODUCTION ACCOUNT

The Primary Factor of Production account distributed income earned through salaries and capital rent to households, enterprises and governments, and distributed indirect business taxes to governments. Indirect business taxes were distributed between the state and federal governments based on percent they spent in the region. Capital rent was distributed between households and enterprises. The distribution of capital rent to households was based on a family budget research study conducted by the Brazilian government (Table 5.1A, SNIPC 1992). Salary payments for work done without a formal employment contract were paid to subsistence households directly. We assumed that no wage taxes were paid by either subsistence or low income households. Salary payments for work done with a formal employment contract were distributed between low, medium, and high households income levels.

In 1992, the State of Paraná enacted a law for the purpose of preserving environmental areas important for improving the quality of life of the State's population. The law, entitled "*Lei Beraldin*", was named after its author Representative Neivo Beraldin. The principal beneficiaries were the municipalities which received an "ecological royalty" (*royalites ecológicos*) for protecting the environment. The source of the ecological royalties was a fund, called the "*Fundo do Participação dos Municípios*", created from the sales tax collected on merchandise and services (*Impostos sobre Circulação Mercadorias e Serviços - ICM/ICMS*).⁴ The monies were distributed to the various municipalities based on a complicated formula including variables such as population, value added, agriculture and ranching, protected environmental area, rural

⁴The sales tax ICM was used until 1988. In 1989 the sales tax changed to ICMS which included services.

area, and etc. The municipality of Guaraqueçaba's ecological royalties have increased dramatically since the law's inception. Between 1989 and 1994, the principal sectors affected by this sales tax were the commercial, the manufacturing, and the transportation sectors. These taxes were recorded as indirect business taxes (see Appendix A - Technical Definitions).

INSTITUTION ACCOUNT

The Institutional accounts described final demand purchases by households and governments and transfer payments between them. Expenditures by low, medium, and high income households were based on a family budget research study conducted by the Brazilian government (Tables 4.1 and 4.1A, SNIPC 1992). Subsistence household expenditure patterns were based on the study by Willumsen (1987) and the family budget research study (SNIPC 1992).⁵ Expenditures and receipts by the municipal government were taken from its published financial accounts (IPARDES 1989). All final demand expenditures were converted from consumer or purchaser prices to producer prices to be consistent with the values estimated in the activity accounts (e.g., the interindustry transactions matrix). The 1980 Brazilian I/O study provided margining tables (IBGE 1989).⁶

The import/export accounts described the trade flows into and out of the municipality. We had the least amount of information on these accounts. The principal exports from Guaraqueçaba were fish, ginger, buffalo, and processed *palmito*. As will be seen, the institutions and activities within the municipality of Guaraqueçaba imported most of their final demand commodities and inputs to the production process (e.g., fertilizers, gas and etc.). Therefore, given the nature of Guaraqueçaba's economy, we used these accounts to balance the SAM.

RESULTS

THE SUB-ACCOUNTS

The estimated SAM is given in Figure 2. The estimated numbers were net of imports. Therefore, it was important to distinguish between locally produced inputs purchased from local businesses and imported (nonlocally produced) inputs purchased

⁵Expenditures by the subsistence households are principally in the form of barter. The majority of this sector's expenditures are purchases of goods/services from other subsistence farmers or fisherman. The estimated expenditures in this column are the imputed values of the consumption part of the barter economy.

⁶Bulmer-Thomas (1982) provide a complete discussion on necessity of margining.

from local businesses. Finally, Figure 3 normalizes the SAM with respect to column totals or total expenditures and Figure 4 normalizes the SAM with respect to row totals or total receipts.

The Rudimentary Rural Farm Sub-Account

The rudimentary rural farm sub-account represents outputs principally from farming. We estimated that in 1989, approximately 79% of the total population was defined as rural. In addition, we estimated that approximately 85% of all the families in the municipality of Guaraqueçaba did not receive a formal paycheck and worked without a formal employment contract. These families constituted the principal component of the informal or barter economy. The rudimentary rural farm sub-account was used to estimate the production side of the informal or barter economy.⁷ Rudimentary rural farmers were defined as: 1) working small plots of land using family labor, 2) using rudimentary farming technology (no agricultural inputs such as fertilizers, insecticides, nor pesticides), 3) not adopting modern agricultural technology nor receiving technical assistance, and 4) not accumulating capital. Family members often worked part-time for other rural landowners.⁸ The principal revenue generating crops were banana and manioc, while the principal subsistence crops were rice, beans, and corn (SPVS 1994). Typically however, these families plant barely enough for their own needs. Therefore, there was little produce available for sale or barter to other business activities or households. The seed source used were gathered from either previous crops or local flora. This type of seed source usually resulted in a loss in the crop's quality and productivity. A majority of the rudimentary rural farmers owned their land, which had been passed down between generations.

The estimated expenditures and receipts represent combinations of actual currency exchanges plus the estimated value of barter exchanges. The expenditures represent the percent of total payments on inputs used by the rudimentary rural farm sub-account. For example, 35% of the total expenditures were used to purchase intermediate inputs from the rudimentary rural farm sub-account. This expenditure could be in the form of seed saved from previous crops - the opportunity cost (*custo de oportunidade*) of purchasing the seeds from themselves - or trade between other rudimentary rural farmers. Any inputs that were not produced by the rudimentary rural farmers were bought from local businesses. Rudimentary rural farmers were, for the most part, self-sufficient. The expenditures on capital rent represent the implied and actual rental payments for land used in farming and for livestock. The responses to the structured interviews indicated that between 40% and 80% of land used in rudimentary

⁷For accounting purposes we have recorded the earnings from harvesting *palmito* in a different business activity.

⁸The technical description of rudimentary rural farmers and farming (*produtores simples*) was taken from SPVS (1994).

rural farming was owned by the occupants. We used 60% as a mean value of owner occupied rudimentary rural farms. Therefore, 60% of the total capital rent expenditure was the value attributed for using the land in rudimentary rural farming. We estimated, using the structured interview responses, that these farmers earned approximately 1 minimum salary. Finally, the purchase of imports represents the percent of total payments on nonlocally produced inputs used by the rudimentary rural farmers. Due to the self-sufficient nature of rudimentary rural farmers, they imported no inputs directly.

The estimated receipts represent the percent of total sales of commodities produced by the rudimentary rural farms to businesses, households, governments, and exports. The total rudimentary rural farm receipts were based on a report by the United Nations (1991). Generally, subsistence households consumed all the outputs from the rudimentary rural farms. However, these farmers do market small quantities of bananas, manioc, and fish. For example, 65% of total sales of bartered goods were sold to subsistence household for final consumption. The rudimentary rural farm sub-account exported no outputs.

The Rural Entrepreneurial Sub-Account

The rural entrepreneurial sub-account represents the outputs from farming, fishing, forestry, and livestock traded in the formal economy. There were three fundamental characteristics of this sector: 1) a salaried labor force of permanent and temporary employees, 2) the agricultural technology employed varied from simple to intensive, and 3) the availability of capital. For example, buffalo ranching required large tracts of land and a large labor force, but used simple technology. Ginger cultivation used smaller tracts of land, smaller more specialized labor force, and more intensive agricultural technology (such as fertilizers, herbicides, fungicide, agricultural machinery, and irrigation, etc.) and capital investment.⁹ The responses to the structured interviews indicated that the rural entrepreneurial sub-account consisted of four ginger producers, five buffalo ranchers, and some cultured shrimp producers. In addition, the majority of these businesses' owners did not live in the region. Finally, all the ginger produced was exported to Japan and the majority of the buffalo was exported to cities within Brazil.

According to the structured interview responses, this sub-account employed between 15 and 30 laborers with formal employment contracts and paid them approximately 1.2 minimum salaries. This sub-account also employed approximately 600 laborers without formal employment contracts and paid them approximately 1 minimum salary. These subsistence wages could be in the form of cash payments or in the form of rice, livestock, and etc.

⁹The technical description of rural entrepreneurs (*empresários rurais*) was taken from SPVS (1994).

The estimated expenditures represent the percent of total payments on inputs used by the rural entrepreneurial sub-account. We estimated that 35% of total expenditures were for inputs other than the Primary Factors of Production. According to the structured interview responses, the rural entrepreneurs imported the majority of their intermediate inputs. Of the 35% spent on intermediate inputs, we estimated that 92% were imported. In addition, 49% of total expenditures were payments to the owners of the rural entrepreneurial business activities. This payment was specified as capital rent.

The estimated receipts represent the percent of total sales of commodities produced by this sub-account to businesses, households, governments, and exports. According to the structured interview responses, this sub-account exports between 50% and 100% of its output. We estimated that this sub-account exported 96% of its total output. The sales to local households represent the final consumption of the commodities produced by the rural entrepreneurs.

The Construction Sub-Account

This sub-account represents all forms of civil construction, for example, the building of new structures (houses and businesses) and their upkeep. According to the structured interview responses, in 1989 there were about 800 houses in the municipality of Guaraqueçaba, in 1994 there were about 1000 houses. This implies that approximately 33 houses were under construction every year. Roughly 50% of the houses were built solely from wood, 30% were built using both wood and masonry and 20% were built solely from masonry. Generally, houses were constructed using local labor and simple technology. The building was financed primarily through savings. When savings ran out construction stopped, even if the project was unfinished. Construction was restarted when savings permitted. The businesses and laborers used on construction projects that required more sophisticated technology were brought in from outside the municipality of Guaraqueçaba.

The estimated expenditures represent the percent of total payments on inputs used by the construction sub-account. The only building materials purchased locally were sand and gravel. The structured interview responses indicated that this sub-account hired between 80 and 100 temporary employees at an average wage of three minimum salaries. Receipts represent the percent of total sales of commodities produced by this sub-account to businesses, households, governments, and exports. The primary sources of receipts were from households.

The Manufacturing: Food Production Sub-Account

According to the Secretary of Finance for the State of Paraná, the predominate industry was food production (*Produtos Alimentares*) which accounted for 99.95% of the value added generated in the manufacturing sector (*Sector Secondary*). The

principal industry was the processing of the heart of palm or *palmito*. The palm species harvested was *Europe edulis*. The best time to cut the palm for palmito was just after they reach maturity, when the tree was between five and ten years old. The palm tree was felled and the meter long upper portion of the stalk near the crown or *cabeça* was cut from the tree. The *cabeça* was removed from the forest for further processing. The sawyer or *palmiteiro* harvested between one and eight bundles or *feixas* per week. A bundle consisted of between 30 and 80 *cabeças*. We assumed that a *palmiteiro* can harvest on average four *feixas* per week or 16 *feixas* per month. Each *feira* contained 55 *cabeças*. The *palmiteiro* carried each bundle, weighing approximately 60 kilograms, on his back from the forest to a central collection point.

The responses to the structured interviews indicated that between 100,000.00 and 600,000.00 palms were harvested per month. The reason for this wide variation was that roughly 80% of the total palms harvested monthly were felled without a license, making it hard to get an exact estimate. We assumed that approximately 500,000.00 palms were felled per month. This harvest produced approximately 1,000,000.00 jars of processed *palmito*. From this information, we estimated that there were approximately 568 *palmiteiros* who earned about two minimum salaries.¹⁰ In addition, the structure interview responses indicated that there were 12 employees working in the processing plants.

The imputed value of the legal palm harvest was defined as an expenditure by this sub-account and a receipt by the government enterprise sub-account. The illegal palm harvest was viewed as a loss of ecological-capital. The imputed value of the illegal palm harvest was defined as an expenditure by the manufacturing sub-account and a receipt by the capital for investment sub-account (Figure 2). The illegal palm harvest was a capital loss that was not replaced (e.g., by investments in planting palms).¹¹ The loss appeared as a negative number in the transfers sub-matrix (Figure 2) at the intersection of the capital for investment row and column. In order for the capital for investment sub-account to balance, the imputed value of the capital loss must were imported.

The estimated expenditures represent the percent of total payments on inputs purchased by the manufacturing sub-account. The main input was the purchase of locally harvested *palmito* and the wages paid to the *palmiteiros*. These expenditures account for 41% of total expenditures. Purchases of locally produced inputs, other

¹⁰We estimated a total rural population of 6,018 individuals or 1,505 families. 568 *palmiteiros* implies that one family member works about 4.5 (= 568*12/1,505) months per year felling palms. Given the physical nature of the work, this seemed reasonable.

¹¹We should note that IBDF reported the municipality of Guaraqueçaba reforested approximately 69,800 hectares of palms in the years 1987, 1988, 1991, and 1992.

than *palmito*, were estimated to be 2% of total expenditures. Purchases of imported inputs were estimated to be 33% of total expenditures.

The estimated receipts represent the percent of total sales of commodities produced by this sub-account to businesses, households, governments, and exports. We estimated that approximately 99% of the process *palmito* was exported.

The Commercial Sub-Account

The commercial businesses served the basic needs of the local population. The main economic activities were the retailing of food (e.g., grocery stores), drink, and tobacco. The responses from the structured interviews indicated that the commercial businesses employed in between 20 and 30 employees with formal employment contracts. These employees were paid approximately 1 minimum salary. The majority of its inputs were imported. The only commodities bought locally were manioc flour (*farinha de mandioca*), fish, and meat. These businesses exported no outputs.

The estimated expenditures represent the percent of total payments on inputs purchased by these commercial businesses. The purchases of locally produced inputs were estimated to be 7% of total expenditures. The purchases of imported inputs were estimated to be 28% of total expenditures. The estimated receipts represent the percent of total sales of commodities produced by these businesses to other businesses, households, governments, and exports. Sales to local households comprised 70% of total receipts.

The Service Sub-Account

The service businesses included activities such as restaurants and lodging, personal services, health, insurance, communications, electric energy, and banking. It also included the services of non-governmental organizations (e.g., churches and other not-for-profit organizations) and rental payments (and estimated rental payments) for housing. The main economic activity was in communications, health, hotels, and restaurants. The responses to the structured interviews indicated that the majority of the people owned their homes. Therefore, the rental payments defined the implied housing costs. The service businesses served the basic needs of the local population and exported no outputs.

The estimated expenditures represent the percent of total payments on inputs purchased by these businesses. This sector employed on average 28 workers with formal employment contracts and paid them 1 minimum salary. The restaurants purchased shrimp and fish locally and imported most of the rest of its inputs. Purchases of locally produced inputs were estimated to be 3% of total expenditures. Purchases of imported inputs were estimated to be 59% of total expenditures. The estimated receipts represent the percent of total sales of commodities produced by

service businesses to other businesses, households, and governments. Sales to households comprised 91% of total receipts.

The Transportation Sub-Account

The principal means of transportation were by the road from Morretes and by boat from Paranagua. According to the structured interviews, approximately 12 people were employed with formal employment contracts in maritime transportation, approximately 25 people were employed with formal employment contracts in road transportation, and approximately 45 people were employed without formal employment contracts in maritime and road transportation. The Graciosa bus company employed approximately 8 people with formal employment contracts. The employees with formal employment contracts earned between 2 and 4 minimum salaries, while the employees without formal employment contracts earned approximately 2 minimum salaries. This sub-account imported virtually all its inputs and exported no outputs.

The estimated expenditures represent the percent of total payments on inputs purchased by the transportation businesses. Purchases of locally produced inputs were estimated to be less than 1% of total expenditures. Purchases of imported inputs were estimated to be 65% of total expenditures.

The estimated receipts represent the percent of total sales by transportation businesses to other businesses, households, and governments. The principal industrial user of transportation was the manufacturing sub-account. This accounted for 17% of total receipts. Local households accounted for 71% of transportation's total receipts.

The Government Enterprise Sub-Account

The government enterprise sub-account combines government industries and an accounting tool for reporting salary payments by the municipal government. A government industry is similar to a privately owned industry. For example, both the government and private industry own lands used for growing palm trees. In addition, both the government and private industry sell these palms for *palmito*. The legal sale of palms was recorded as a receipt by the government enterprise sub-account and an expenditure by the manufacturing sub-account.

The only estimated expenditure by the government enterprise sub-account was the salary payment by the municipal government. There were no expenses in growing the palms once reforested.

The Indirect Business Taxes Sub-Account

These taxes were a direct result of the production processes and were collected from businesses within the municipality of Guaraqueçaba. The estimated expenditures

represent the distribution of indirect business taxes between the state and federal government. The distribution of indirect business taxes between state and federal government were based on the municipality of Guaraqueçaba's 1989 budget (IPARDES 1989). The collection of these taxes defines the receipts. We estimated that manufacturing businesses paid the most taxes followed by the rural entrepreneurial and commercial businesses.

The Capital Rent Sub-Account

Capital rent was defined as dividends, interest, rental income, and other nonwage or salary payments for the use of capital. Capital rent also included profits of partnerships and sole proprietorships. We assumed the *palmito* processing plants, the construction, commercial and service businesses were owned by local sole proprietorships and/or partnerships. In addition, the responses from the structured interviews indicated that the owners of the rural entrepreneurial businesses did not live in the region nor did the owners of the transportation businesses. Actual and attributed rental payments for housing were included in the services sector's capital rent. The majority of the local population owned their homes. The value attributed to owning a home was also included in this sub-account.

The estimated expenditures defined the distribution of capital rent to households and enterprises. We estimated that 37% of capital rent was exported to the business owners who live outside the region. The accumulation of capital rent by each business defined the receipts. For example, manufacturing businesses accounted for 33% of the total capital earnings.

The Labor: Household Sub-Account

This sub-account estimated the wages paid to those workers without formal contracts and represents the income distribution part of the barter or informal economy. This constituted approximately 85% of the families within the municipality of Guaraqueçaba. The subsistence wages were the estimated value of currency and goods/services given as payment for work and were based on a report by the United Nations (1991). Receipts defined the percent of total subsistence income earned from the various businesses. For example, 24% of total subsistence wages were earned from rudimentary rural farming and 67% was earned from harvesting *palmito*. Expenditures defined the percent of total subsistence income distributed to households and governments. We assumed that no wage taxes were taken out of subsistence earnings. Therefore, all subsistence wages were paid to subsistence households directly.¹²

¹²The estimated annual wage income for subsistence households, assuming that 85% of total households were subsistence, was 0.82 minimum salaries.

The Labor: Salary Sub-Account

This sub-account estimated the wages paid to those workers with a formal employment contract. Wages were recorded as the total amount paid during the year as fixed salaries, bonuses, profit withheld, commissions, and tips, as well as paid vacations, without any deductions of the payments made to the retirement and social assistance institute. This account distributed wage income between households and governments.

Receipts defined the percent of total gross wages paid by each business. Expenditures defined the distribution of the gross wages between households and governments. The distribution of salary income between household income levels was based on the results of the structured interviews. Approximately 11% of the families within the municipality of Guaraqueçaba were identified as low income households, 3% were identified as medium income households, and 1% were identified as high income households. Persons receiving less than 7 to 10 minimum salaries paid no wage taxes.

The Household: Subsistence Sub-Account

The expenditures and receipts by subsistence households were based on a family budget research study conducted by the Brazilian government (SNIPC 1992) and a study by Willumsen (1987). Expenditures and receipts by the subsistence households were in the form of barter and cash. The expenditures estimated the consumption value of the barter or informal economy. Expenditures defined the percent of total income subsistence households spent or bartered at local businesses. For example, 38% of subsistence households' expenditures were purchases of goods/services from other rudimentary rural or fisherman for final consumption. These purchases were principally sales to themselves for food that they grew. However, they still needed to purchase other goods/services from local businesses. According to the structured interview responses, these families were living on the margin and often were indentured to local businesses. In addition, the SNIPC (1992) report showed that households earning less than 10 minimum salaries spent more than they earned. We estimated that subsistence households spent 68% more annually than they earned. This explains the difference between the annual income received via wages paid for working without a formal employment contract and total subsistence household expenditures. They had to borrow from local businesses to make up the difference. This was recorded as a receipt in the capital for investment account with no offsetting savings expenditures. The model accounts for imported goods purchased at local businesses. According to the structured interview responses, subsistence households did not pay any taxes on wages and income.

The receipts showed that the principal source of subsistence income was from labor: household wages. The sources of subsistence income included 14% from rudimentary rural farms (the sale of bananas and manioc), 4% from rural

entrepreneurs, 40% from food processing (the harvesting of *palmito*), and 40% in loans from local business to finance their deficit spending. Subsistence households did not receive any direct transfer payments from the municipal, state, or federal governments.

The Household: Low Sub-Account

The expenditures and receipts by low income households were based on a family budget research study conducted by the Brazilian government (SNIPC 1992). Expenditures defined the percent of total income these households spent at local businesses. According to the structured interview responses, these families were living on the margin and often were indentured to local businesses. In addition, the SNIPC (1992) report showed that households earning less than 10 minimum salaries spent more than they earned. We estimated that low income households spent 49% more annually than they earned. They had to borrow from local businesses to make up the difference. This was recorded as a receipt in the capital for investment account with no offsetting savings expenditures. The responses from the structured interviews indicated that low income households were exempt from taxes on wages and income. The model accounts for imported goods purchased at local businesses.

Receipts described all the sources of income. Approximately, 67% of low income households earnings were from wages. In addition, low income households received 33% in loans from local business to finance their deficit spending. They did not receive any direct transfer payments from the state or federal governments.

The Household: Medium Sub-Account

The expenditures and receipts by medium income households were based on a family budget research study conducted by the Brazilian government (SNIPC 1992). Expenditures defined the percent of total income these households spent at local businesses and institutions. The majority of these families were living on the margin. The SNIPC (1992) report showed that households earning less than 10 minimum salaries spent more than they earned. We estimated that medium income households that earned less than 10 minimum salaries spent 14% more annually than they earned. They had to borrow from local businesses to make up the difference. The borrowed amount was recorded a receipt in the capital for investment account with no offsetting savings expenditures. According to the responses from the structured interviews, medium income households earning below 7 to 10 minimum salaries were exempt from taxes on wages and income. The medium income households earning more than 10 minimum salaries paid income taxes to governments and also payments to retirement and social assistance. We estimated that less than 1% of the total income was paid in taxes to the municipal, state, and federal government. The model accounts for imported goods purchased at local businesses.

Receipts described all the sources of income. Wages accounted for 87% of the total income. In addition, medium income households received 12% in loans from local business to finance their deficit spending. Medium income households did not receive any direct transfer payments from the state or federal governments.

The Household: High Sub-Account

We assumed that the *palmito* processors and those involved in the construction, commercial and service businesses were designated as partnerships and/or sole proprietorships and the capital rent of these sectors defined their incomes. The average income for these households was more than 20 times the minimum salary. The expenditures by high income households were based on a family budget research study conducted by the Brazilian government (SNPIC 1992). Expenditures defined the percent of total income these households spent at local businesses. The model accounts for imported goods purchased at local businesses. We estimated that 35% of high income households expenditures were for purchases of imported goods sold at local businesses. Expenditures also included income taxes paid to governments and savings. We estimated that high income households paid approximately 29% in municipal, state, and federal taxes. High income households saved approximately 21% of their total income. Receipts defined the sources of income for these households. Profits from partnerships and sole proprietorships accounted for 97% of total income and bank loans accounted for the other 3%. In this case, borrowing was more than offset by savings. High income households received no direct transfer payments from state and federal governments.

The Capital for Investments Sub-Account

This sub-account defined savings or investment and dis-investments by households and surpluses or deficits by governments plus changes in inventory. Expenditures defined loans made to households and the purchase of capital assets by local business and institutions. The illegal harvest of *palmito* was viewed as a loss of ecological-capital and recorded as a negative expenditure. The loans to households were recorded as positive expenditures. The receipts of this account were the savings by high income households and the imputed value of the illegal harvested *palmito*. In this case, an import of capital would be necessary for the accounts to balance. This was not an actual flow of capital into the region, but the estimate of what would be needed for re-investment.

The Enterprises and Corporations Sub-Account

We assumed the *palmito* processing plants, the construction, commercial, and service businesses were owned by local sole proprietorships and/or partnerships and that the owners of the rural entrepreneurs and transportation businesses resided outside the municipality of Guaraqueçaba. Expenditures defined the distribution of

earnings to households and the tax payment to governments. The total net earnings of the locally owned enterprises were distributed to the entrepreneurs. Therefore, these enterprises did not make a profit nor paid state and federal taxes. We assumed there were no corporate holdings in the municipality of Guaraqueçaba. Receipts defined the sources of earnings for enterprises and corporations.

The Municipal Government Sub-Account

This account defined the expenditures and receipts by the municipal government. The receipts were the taxes levied by the municipal government and transfer payments from the state and federal governments. The expenditures were final demand purchases of commodities/services and transfer payments to households. The model accounted for imported goods purchased at local businesses. We estimated that 20% of municipal governments expenditures were for purchases on imported goods sold at local businesses. These values were taken from the municipality of Guaraqueçaba's published financial accounts (IPARDES 1989).

The State Government Sub-Account

This account defined the expenditures and receipts of the state government. The expenditures defined transfer payments to households, the municipal government and subsidies to local businesses. We estimated that in 1989 the state government collected more than it spent in the region. This surplus was due to the selling of licenses to cut *palmito*. This surplus in the state government capital account with respect to the municipality of Guaraqueçaba and was recorded as an import (see Appendix A - Technical Definitions). The receipts defined the tax income from the various businesses and institutions. For example, 26% of the total taxes collected by the state government were from nonsubsistence households and 74% were in the form of indirect business taxes.

The Federal Government Sub-Account

This account defined the expenditures and receipts of the federal government. The expenditures defined transfer payments to households, the municipal government, and subsidies to local corporations. We estimated that in 1989 the federal government collected less in tax receipts than it spent in the region. This was a deficit in the federal government capital account with respect to the municipality of Guaraqueçaba and was recorded as an import (see Appendix A - Technical Definitions). The receipts defined the tax income from the various activities, factors, and institutions. For example, 100% of the total taxes collected by the federal government were from nonsubsistence households.

THE STRUCTURE OF GUARAQUEÇABA'S ECONOMY

One reason for using a SAM was its ability to synthesize and display regional economic data, collected from various sources, in a concise framework. This framework displays the structure of an economy, namely the relationship between production, demand, and income. This relationship was described by the linkages between the sub-matrices. For example, payments to labor and other Primary Factors of Production were an expense required in the production of goods and services. These expenditures were recorded in the value added sub-matrix. These payments were allocated to the various households and governments in the distribution sub-matrix. This allocation was the principal component of household income. The spending of household income was split between purchases of goods and services (the final demand sub-matrix), and savings and taxes paid to governments (the transfers sub-matrix). In addition, the transfers sub-matrix showed additions to household income from loans, payments for the use of capital, and government subsidies. Finally, the relationship comes full circle in that the final demand for goods and services requires their production and the process begins again. Figures 2, 3, and 4 provided different views of these linkages.

Figures 3 and 4 can be used to describe how income generated from ecotourism would be distributed between the institutions. As can be seen by Figure 3, all the wages paid to employees without formal employment contracts are distributed to subsistence households. However, Figure 4 shows that these wages constituted 60% of the total subsistence household income. The other 40% was financed through loans with no offsetting savings. Ecotourism expenditures would affect primarily the commercial, service, and transportation activities. The wage payments associated with the commercial, service, and transportation activities constitute less than 1% of the total labor: household salary payments (Figure 4). If an ecotourist spends \$1.00 in each of these activities, this will generate approximately \$0.04 worth of direct labor: household wages (Figure 3). Therefore, the total expenditure of \$3.00 generated only \$0.04 in labor: household wages. Consequently, subsistence households will not benefit very much from ecotourism.

Figure 4 shows the distribution of wage payments to laborers with formal employment contracts (value added sub-matrix). For example, 37% of the total labor: salary receipts were from the food processing sector. Figure 3 shows that 60% of these wage payments were distributed to low income households and 40% were distributed to medium income households (distribution sub-matrix). For low income households, labor: salary wage payments constituted 67% of total income and 32% was financed through loans (Figure 4). For medium income households, labor: salary wage payments constituted 87% and 12% was financed through loans. Again ecotourists will spend their monies in the commercial, service, and transportation activities and these activities constitute approximately 20% of the total labor: salary receipts (Figure 4). If an ecotourist spends \$1.00 in each of these activities, this will

generate approximately \$0.50 worth of direct labor: salary wages (Figure 3). Therefore, the total expenditure of \$3.00 generated only \$0.50 in labor: salary wages. Low income households will receive \$0.30 and medium income households will receive \$0.20 of this labor: salary payment. Consequentially, the low and medium income households will not benefit greatly from ecotourism.

Capital rent defines the payments to the owners of capital or the owners of the business activities. Figure 4 shows the distribution of capital rent between the business activities. For example, the commercial activities generate 7% of the total capital rent. Figure 3 shows that 42% of the total capital rent is distributed to high income households and 37% is used to pay absentee owners. If an ecotourist spends \$1.00 in each of the commercial, service, and transportation activities, this will generate approximately \$0.76 worth of direct capital rent, excluding implied rental payments (Figure 3). However, only \$0.40 will remain local.

In terms of total amounts, the income distributed to labor: salary employees was the greatest. However, this amount was dispersed among a large population, while the distribution of capital rent was among very few families. Therefore, the owners of capital or the high income households gained the most from ecotourism. In addition, of the total expenditure of \$3.00, over half or \$1.88 was used to pay for imports (Figure 3), while only \$0.94 was used for wages and capital rent. Currently, the groups that gained the most are those that live outside the municipality of Guaraqueçaba.

EMPLOYMENT AND POPULATION

Although employment was not directly part of the SAM, it was an important component of this regional economic analysis. The initial official employment figures for each sector were obtained from the *Município do Trabalho e da Administração*, *Instituto Paranaense de Desenvolvimento Econômico e Social* (IPARDES), and *Relação Anual de Informações Sociais*. These employment statistics only listed the number of laborers that worked with a formal employment contract and did not distinguish between full-time and part-time employment. Unfortunately, there were no official employment statistics on the number of laborers that worked without a formal employment. In addition, anecdotal evidence showed that laborers without formal employment contracts often worked 2 to 3 different part-time jobs in a year. Laborers without formal employment contracts constituted approximately 95% of the working age population or 85% of the families.

The structured interviews provided estimates of the number of laborers with and without formal employment contracts and their annual salary, in terms of the number of minimum salaries. For example, the rural entrepreneurial sector employed between 15 and 30 laborers with formal employment contracts and approximately 600 laborers without formal employment contracts. The laborers with formal employment contracts were paid approximately 1.2 minimum salaries annually and the laborers without formal

employment contracts were paid approximately 1 minimum salary. However, there was no distinction made between full-time and part-time employees. Table 2 summarizes the employment results of the structured interviews.

We estimated each activities' total salary payments by type of employment contract using the 1989 Brazilian I/O study (IBGE 1989) and the value added estimates obtained from the Secretary of Finance for the State of Paraná. To reconcile the disparity between the total salary payment by activity, the estimated full-time and part-time employment figures, and the estimated annual wages, we converted the employment figures to full-time equivalent (FTE) employment.¹³ This was done by dividing the total salary payments by the estimated annual wages per employee. For example, the rural entrepreneurial activities paid its employees, with formal employment contracts, 1.2 minimum salaries per year (or \$576.00 per year). The total salary payment was \$11,181 (see Figure 2). We estimated the rural entrepreneurial activities provided 19 FTE employees with formal employment contracts and 98 FTE jobs without formal employment contracts. Therefore, each of the estimated 600 laborers worked an average of 1.9 months or 57 days per year. Given the nature of employment within the area, this seems tenable. A similar procedure was done for each of the other sectors. Table 3 summarized the estimated FTE employment by Activity sub-account.

Detailed population information for 1970 and 1980 and an estimate of total population for 1991 was provided by the *Fundação Instituto Brasileiro de Geografia e Estatística* (IBGE). The total population was 7,648 in 1970, 7,647 in 1980, and 7,751 in 1991. The total population was stable from 1970 to 1980 and showed a growth in the late 1980's and early 1990's. The population data showed that in 1991 approximately 78% of the population was defined as rural and 22% defined as urban. Assuming the working age to be between 15 and 69, approximately 95% of the working age population did not receive a formal pay check and worked without a formal employment contract. Alternatively, if the average family consists of 4 persons, then 80% to 90% of these families worked without a formal employment contract.

REGIONAL ECONOMIC MULTIPLIERS

When ecotourists visit this region, they will spend money at various local business activities; e.g., the purchase of meals, hotel rooms, souvenirs, or guide services. These expenditures will cause additional economic activity as the monies are respent within the region's economy. For example, the monies spent by an ecotourist for a hotel room will be used to pay wages, purchase food for breakfast at the local

¹³A full-time equivalent standardizes the unit of work to a year. Therefore, two 6-month part-time jobs or twelve 1-month part-time jobs equals 1 full-time equivalent job.

market and etc. The monies spent at the local market will be used, in part, to pay wages. The wage payments to local employees will be spent at the local commercial and service businesses. Regional economic multipliers summarize these responding effects. The magnitude of the multipliers and therefore the benefits depend on leakages due to imports, taxes, and savings. The greater the leakages, the smaller the regional economic impacts due to ecotourism expenditures. The main leakage in the Guaraqueçaba region is due to imports. The business activities in this region import approximately 90% to 100% of their intermediate inputs.

The economic impacts estimated using regional economic multipliers developed from a SAM or I/O model are subject to a number of assumptions. The following are four notable assumptions:

1. There is no time component associated with when the economic impacts will occur. The multipliers are used to estimate the magnitude of the effect not how long it will take for this effect to happen.
2. The only spatial characteristics associated with the model are the definition of the geopolitical boundaries of the region. The municipality of Guaraqueçaba defined the geopolitical boundaries. This area contains a number of towns. One cannot state that the impacts will occur only in the town of Guaraqueçaba.
3. The regional multiplier is used to predict the change in output, income, or employment, etc. in a region which will result from an increase in some element of *autonomous expenditures* (an exogenously caused change in final demand due to expenditure by ecotourist).
4. In general the regional multipliers rely on the existence of unemployed resources which enable output to expand as demand rises.

We estimated three different varieties of regional economic multipliers: 1) Type I, 2) Type II, and 3) *SAM*.¹⁴ A Type I output multiplier is estimated using only the activity sub-accounts or the interindustry transactions matrix and is composed of two components:

Direct Effect - The immediate impacts associated with the change in demand for a particular good or service. For example, the direct effect of an

¹⁴For a complete theoretical development of Type I, Type II, and *AM* multipliers see Miller and Blair (1985), Pyatt and Round (1985), and Bulmer-Thomas (1982). However, Appendix B contains a summary of the mathematical development of Type I, Type II, and *SAM* multipliers.

ecotourist purchasing a hotel room or meal is the price of the hotel room or meal.

Indirect Effect - The secondary impacts caused by the changing input needs of the directly impacted activity. For example, the indirect effects would include the purchases of breakfast supplies from the local market as a result of the ecotourist purchasing a hotel room.

A Type I output multiplier is estimated using direct and indirect effects:

$$\text{Type I Output Multiplier} = (\text{Direct} + \text{Indirect})/\text{Direct}$$

As can be seen, the Type I output multiplier only accounts for the production side of a regional economy. However, household consumption through the spending of wage income may also generate a large economic impact not included in a Type I output multiplier (Miller and Blair 1985). This impact is captured by a Type II output multiplier.

Miller and Blair (1985) estimated a Type II output multiplier by closing the interindustry transactions matrix using the activity sub-accounts, both labor: household and labor: salary sub-accounts, and the four household sub-accounts. The detail provided by a SAM allows the interindustry transactions matrix to be closed with respect to other sub-accounts. Given the information contained within a SAM, the question of which other sub-accounts that might be defined as endogenous is important. Thorbecke (1985) states that the interindustry transactions sub-matrix should be closed so that it contains all the necessary behavioral and technical relationships of the economic system in a consistent way. Pyatt and Round (1985b) also state the multipliers should reflect the circular flow of income that characterizes the multiplier process of demand, production, and income distribution. Stone (1985) and Bulmer-Thomas (1982) defined a SAM output multiplier to also include the impacts due to payments to households for the use of capital. This is important if households receive a large portion of their total income from capital payments, as with this study. Therefore, a SAM output multiplier is estimated using the activity sub-accounts, the capital rent sub-account, both labor: household and labor: salary sub-accounts, the four household sub-accounts, and the enterprise sub-account.

Pyatt and Round (1985b), Stone (1985), and Bulmer-Thomas (1982) separate the economic impacts estimated using a Type II or SAM output multiplier into three components:

Intra-group Effects - This component estimates impacts within the account where the change is first introduced. For example, the intra-group effect of an ecotourist purchasing a hotel room (the Activity account) would be defined by the Type I output multipliers.

Inter-group Effects - This component estimates the impacts on the account where the change is first introduced after 'touring' through the other accounts or the 'closed-loop' impacts. For example, the inter-group effect of an ecotourist purchasing a hotel room would be the impacts on the Activity account resulting from increased household income (the Value Added account) causing an increase in households' purchases of goods and services (the Institution account).

Extra-group Effects - This component estimates the impacts of the initial change on the other accounts without returning to its starting account or the 'open-loop' impacts. For example, the extra-group effect of an ecotourist purchasing a hotel room would be the impacts of changes in household income (the Value Added account) and in consumption (the Institution account).

A potential problem with estimating Type II and SAM output multipliers is that wage payments by local enterprises and businesses are defined with respect to where these establishments are located while their employees might not live in this same region. Therefore, the local household income may not come from local establishments. Consequentially, changing the demand for products produced locally will have no effect on local household income. This is not a problem for our study.

Table 4 shows the Type I, Type II, and SAM output multipliers. The SAM output multipliers will be larger than either the Type I or Type II output multipliers and the Type II multipliers will be larger than the Type I multipliers for the business activities. A Type I multiplier is estimated using only the Activity sub-accounts; thus, it only captures intra-group effects associated with the production processes and ignores the inter- and extra-group effects. A Type II multiplier does capture the intra-, inter-, and extra-group effects; however, as defined by Miller and Blair (1985), it did not designate capital payments as a source of income distribution as endogenous. Since high income households' received most of their earnings through capital payments, it is important to include this circular flow of income (Pyatt and Round 1985b and Thorbecke 1985). The SAM multipliers are defined to include capital payments to households. Thus, the inter- and extra-group effects estimated by the SAM multipliers are greater than those estimated by the Type II multipliers. This is important in our study because high income households received 97% of their total income from capital payments (see the descriptions of the Capital Rent and Household: High sub-accounts). For example, \$1.00 change in final demand for commercial sector outputs would result in an increase of \$1.07 in total output using a Type I multiplier, an increase of \$1.64 in total output using a Type II multiplier, and an increase of \$2.76 in total output using a SAM multiplier.

The Type I output multipliers ranged from a high of 1.56 for rudimentary rural farmer activity to a low of 1.00 for the transportation and government enterprise

activities. The minimum value for any output multiplier was 1.00. This indicated that this activity imports 100% of its inputs and purchases nothing locally. The largest output multiplier, in the rudimentary rural farm activity, was due to the large purchases from itself in the form of seeds and other inputs. According to the Type I output multiplier analysis, the largest regional economic impact per dollar would occur in changing the final demand for the outputs of the rudimentary rural farm activity. However, the majority of the dollars spent by ecotourists will be in the commerce, service, and transportation activities, that have small Type I output multipliers.

The Type II output multipliers for the activity sub-accounts ranged from a high of 3.39 for the government enterprise activity to a low of 1.22 for the service activity. The influence of including the link between wage income and household consumption is apparent from examining the government enterprise activity. Table 3 shows that the only government enterprise activity expenditure are wage payments to employees with formal employment contracts. This generated an inter- and extra-group effect of \$2.39 per \$1.00 change in wage payments. The next largest inter- and extra-group effect was \$1.14 per \$1.00 change in demand for rudimentary rural farm output. The impact of the inter- and extra-group effect is correlated to the wage payments (the labor: household and labor: salary sub-account) and total expenditures (Figure 3). The Type II output multipliers for the Primary Factors of Production and the Institution accounts are interpreted in a similar manner as those for the Activity sub-account. For example, an increase of \$1.00 in wages paid to employees without formal employment contracts will increase total output by \$2.97.

The SAM output multipliers for the activity sub-accounts ranged from a high of 4.48 for the rudimentary rural farm activity to a low of 1.90 for the transportation activity. The largest difference between a SAM and Type I output multiplier was 2.92 for the rudimentary rural farm activity. The large difference was due to the link between the rudimentary rural farm activity and subsistence households, and the link between subsistence households and the rest of the economy. The government enterprise, manufacturing, and rural entrepreneurial activities had the next largest differences, respectively. The difference, as stated earlier, was due to the additional inter- and extra-group effects of capital on household income. The SAM output multipliers for the Primary Factors of Production and Institution accounts were interpreted in a similar manner as those for the Activity accounts. For example, if the subsistence households were to receive an additional \$1.00 this would cause an increase in total output of

\$2.66.¹⁵ As with the Type I output multipliers, the larger the amount of imports purchased by each activity the smaller the SAM output multiplier.

Miller and Blair (1985) described the technique for developing Type I and Type II employment and household income multipliers. For example, a Type I employment multiplier would estimate the direct plus indirect employment changes due to an initial employment change in an activity sub-account. An alternate method described by Miller and Blair (1985) was to develop *per dollar* Type I and Type II employment and household income multipliers. For example, a *per dollar* Type I employment multiplier would estimate the direct plus indirect employment changes due to a per dollar change in the output of an activity sub-account. We used these techniques to develop both Type I, Type II, and SAM multipliers and *per dollar* Type I, Type II, and SAM multipliers for FTE employment, indirect business taxes, and wage payments to employees with and without formal employment contracts.

Table 5 shows the Type I, Type II, and SAM and the *per dollar* Type I, Type II, and SAM FTE employment multipliers. For example, the Type II FTE employment multiplier for the commercial activity was 1.77. This indicated that an increase of one FTE employee in the commercial activity would create an additional 0.77 FTE employees in the Municipality of Guaraqueçaba's economy. The *per dollar* SAM FTE employment multiplier for the commercial activity was 0.000389. This indicated that every additional dollar spent in the commercial sector would create 0.000389 FTE employees in the Municipality of Guaraqueçaba's economy. Table 5 also illustrates the relationship between Type I, Type II, and SAM multipliers and *per dollar* Type I, Type II, and SAM multipliers:

$$\text{Per Dollar Multiplier} = \text{Direct Effect} * \text{Multiplier}$$

where "Multiplier" denotes either a Type I, Type II, or SAM multiplier.¹⁶ For example, the *per dollar* Type I FTE employment multiplier was 0.003208 (= 0.002083 * 1.54) and the *per dollar* SAM FTE employment multiplier was 0.003868 (= 0.002083 * 1.86).

¹⁵The assumption of any output multiplier is that as total expenditures increase (in the activity sub-accounts this would be due to changes in final demand and in the institution sub-accounts this would be due to increases in income) they will spend these additional monies in exactly the same manner as defined by Figure 3. This assumption could be important depending on the magnitude of the income change in, for example, the subsistence household sub-account. As their income increases, they may change their expenditures patterns to be more like low or medium household sub-accounts. This would reduce the inter- and extra-group effects thereby reducing the regional economic impacts.

¹⁶Type I, Type II, and SAM and *per dollar* Type I, Type II, and SAM output multipliers are equal. This is because the direct effect for each activity sub-account is equal to \$1.00, by definition.

Table 5 shows the Type I FTE employment multipliers ranged from a high of 1.54 in the rudimentary rural farm activity to a low of 1.00 for the government enterprise activity. The large Type I FTE employment multiplier in the rudimentary rural farm activity was due to the large number of rudimentary rural farmers (Table 3) and to the large purchase of intermediate inputs from themselves (Figures 2 and 3). The Type II FTE employment multipliers ranged from a high of 2.15 for the manufacturing activity to a low of 1.03 for the government enterprise activity. The SAM FTE employment multipliers ranged from a high of 2.32 for the manufacturing activity to a low of 1.04 for the government enterprise activity. The large Type II and SAM FTE employment multipliers in the manufacturing activity were due to its large wage payments to household labor which were transferred to subsistence households directly (Figures 2 and 3). In addition, subsistence households constituted the largest single institution that spent its monies locally (Figure 2). Overall, there was not much difference between the Type I, Type II, and SAM FTE employment multipliers. This was due to the activities importing between 90% and 100% of their intermediate inputs resulting in small inter- and extra-group FTE employment effects.

The *per dollar* Type I, Type II, and SAM FTE employment multipliers indicated that the most employees were generated per dollar by purchasing the output from the rudimentary rural farm activity. The next largest per dollar employment impact was associated with the manufacturing activity. These two activities had the greatest per employment impact due to the large number of FTE employees (Table 3) and the large payments to employees without formal employment contracts. These wage payments were transferred to subsistence households directly.

Most ecotourists will spend their monies in the commercial, service, and transportation activities, but the commercial, service, and transportation activities had low per dollar FTE employment impacts. Therefore, ecotourism expenditures could only create a reasonable number of FTE jobs if there were large expenditures in these sectors. It would require an expenditure of approximately \$2,639.00 in the commercial sector to create 1 FTE job using the SAM approach, \$3,610.00 using the Type II approach, and \$3,984.00 using the Type I approach. However, the commercial and service businesses paid between 1 and 2 minimum salaries to their employees, which is not much better than what a rudimentary rural farmer earns currently.

Type I, Type II, and SAM FTE employment multipliers can be used to determine the change in employment given a change in final demand for the output of any activity sub-account. This is a two-step process:

1. Convert the change in final demand to a direct employment effect using the FTE Direct Effect. For example, the FTE direct effect of a \$10,000.00 change in final demand in the commercial sector is 2.37 ($=10,000.00 \times 0.000237$). This implies that approximately 2 FTE commercial sector jobs would be created within the municipality of Guaraqueçaba due this change in final demand.

2. Determine the employment impact by multiplying the result of step 1 by either the Type I, Type II, or SAM FTE employment multiplier. For example, the total FTE employment effects of a \$10,000.00 change in final demand in the commercial sector would be 2.51 ($=2.37*1.06$) FTE jobs using the Type I multiplier, 2.77 ($= 2.37*1.17$) FTE jobs using the Type II multiplier, and 3.79 ($=2.37*1.60$) FTE jobs using the SAM multiplier.

Tables 6, 7, and 8 show the Type I, Type II, and SAM multipliers for indirect business taxes, salaried employees without formal employment contracts, and salaried employees with formal employment contracts, respectively. The Type I, Type II, and SAM multipliers and the *per dollar* Type I, Type II, and SAM multipliers in Tables 6, 7, and 8 are interpreted in the same manner as the FTE employment multipliers in Table 5. The indirect business tax multiplier could be useful to examine the amount of revenue that the municipality might gain from a possible "tourism tax" on the value added of tourism related goods and services. Examining Table 7 shows that the largest wage impacts for salaried employees without formal employment contracts are in the rudimentary rural farm, manufacturing, and rural entrepreneurial activities, respectively. This is not surprising given the nature of these businesses. Examining Table 8 shows that the largest wage impacts for salaried employees with formal employment contracts are in the commercial and transportation activities, respectively. This is due, in part, to these activities paying the largest percentage of total expenditures in wages (see Figure 3). However, the greatest over all wage impact would be associated with the rudimentary rural farm and the manufacturing activities neither of which are currently involved in ecotourism. Manufacturing is involved primarily the harvesting of palms and processing of *palmito*. While the rudimentary rural farm activity does market small quantities of bananas, manioc, and fish, it has not been cultivated to meet the needs of ecotourists.

IMPACT ANALYSIS

One of the principal reasons for building a SAM or I/O model was its predictive capability. To calculate the regional economic effects of ecotourism, we needed estimates of ecotourist's expenditures and length of a visit and the number of ecotourists in a party. A study by Holmes et al. (1995) provided the necessary information. The expenditure data Holmes et al (1995) collected was in 1994 dollars, while the regional economic data used to generate the multipliers was defined as 1989 to 1994 (Tables 2, and 3). Therefore, we deflated the expenditure data to 1992 dollars using the Consumer Price Index for all Urban Consumers (U.S. Department of Labor 1994). Table 9 summarizes some of their results. An ecotourist spent approximately \$15.15 per day and stayed approximately 4 days. In addition, there were approximately 2 ecotourists per party. Therefore, the total expenditure per trip was \$121.20.

Table 10 shows the expenditures by business activity. Allocating the per person expenditures between business activities was straight forward except for the food

expenditures. Based on the survey information collected by Holmes et al. (1995), restaurants were allocated 75% of the total food expenditure and supermarkets were allocated the remaining 25%. The commerce activity was the sum of the fuel expenditure and 25% of the food expenditure. The service activity was the sum of the hotel and camping expenditures plus 75% of the food expenditure. Finally, the transportation activity was allocated the total public transportation expenditure. The per trip expenditures were estimated by multiplying each individual expenditure by 8 (= 4 days * 2 persons).

Table 11 summarizes the regional economic impact of one ecotourist day.¹⁷ For example, the Type I output impacts of a \$15.15 expenditure were \$15.63 (= $1.07*3.11 + 1.03*8.86 + 1.00*3.18$), the Type II output impacts were \$20.97, and the SAM output impacts were \$32.61. Estimating the impacts uses the information from Tables 4 and 10. As can be seen, the inter- plus extra-group effects, due to wage and capital payments to households, account for an additional \$16.98 worth of production activity. This illustrates the importance of accounting for more than just interindustry transactions or a Type I multiplier; the multipliers should reflect the circular flow of income that characterizes the multiplier process of demand, production, and income distribution (Pyatt and Round 1985b).

We also estimate the impacts on FTE employment, indirect business taxes, labor: household, and labor: salary. A \$15.15 expenditure will create 0.00429 (= $0.000389*3.11 + 0.000256*8.86 + 0.000255*3.18$) FTE jobs using the SAM multipliers. Therefore, it would take approximately 233 (= $1/0.00429$) ecotourist days to create 1 FTE job. If Type II or Type I FTE employment multipliers are used, it would take approximately 321 or 360 ecotourist days to create 1 FTE job, respectively.

The estimated economic impacts on indirect business taxes, labor: household, and labor: salary are calculated likewise. One ecotourist day is estimated to generate \$0.35 of wage payments to employees working without a formal employment contract, while it would generate \$2.24 of wage payments to employees working with a formal employment contract. Therefore, it would take approximately 1,371 ecotourist days to generate 1 minimum salary for employees working without a formal employment contract, while it would take approximately 214 ecotourist days to generate 1 minimum salary for employees working with a formal employment contract.

Holmes et al. (1995) provided a conservative estimate that the APA de Guaraqueçaba will generate between 5,000 and 10,000 ecotourist days per year. The majority of the ecotourists will visit the area between December and March. We used the midpoint of 7,500 ecotourist days to estimate the total regional economic impacts. In addition, we bracketed the results by the remaining $\pm 2,500$ ecotourist days. Table 12 summarizes the estimated total annual economic impact on the Municipality of Guaraqueçaba from ecotourism.

¹⁷An ecotourist day is defined as one ecotourist spending \$15.15 per day.

The 7,500 ecotourists are predicted to generate approximately \$244,575 worth of additional goods and services. This will create approximately 32 FTE jobs regionally. In addition, the ecotourists expenditures will generate approximately \$2,625 worth of wage payments to employees without a formal employment contract and approximately \$16,800 worth of wage payments to employees with a formal employment contract annually. The estimated wage payments translated into approximately 40.5 one minimum salary payments ($= [\$3,975 + \$22,725] / \$480$); this is similar to the 32 estimated FTE jobs created. Therefore, the vast majority of the FTE jobs created will probably pay one minimum salary or approximately \$480.00 annually.

SENSITIVITY ANALYSIS

We also conducted a sensitivity analysis to identify sub-matrices which have the greatest effect on the resulting SAM output multipliers.¹⁸ We examined both an absolute and a relative change in each sub-matrix to reflect possible errors in estimating the SAM. The absolute change increased/decreased each element in the sub-matrix by 10%. Table 13 illustrates an increase of 10% in the rudimentary rural farm activity's technical coefficients. An absolute change alters each element proportionately and did not change the relative importance of each expenditure. The relative change increased/decreased the column sums of each sub-matrix by 0.10. This change was distributed to the column elements proportionally. Table 14 illustrates an increase of 0.10 in the rudimentary rural farm activity's technical coefficients. A relative change did affect the importance of each expenditure as compared to an absolute change. There was one rule used in estimating the relative changes:

If a relative change of -0.10 is greater in absolute value than any sub-matrix column sum, then the largest relative change used was the negative of the column sum. For example, the column sum of the technical coefficients sub-matrix (Figure 3) for the transportation activity was 0.00141. This value was less than the absolute value of -0.10 (i.e., $0.00141 < 0.10$). A relative change of -0.10 would imply the transportation activity was selling rather than buying inputs in its production process. Therefore, the relative change used in the transportation activity was -0.00141. This implies that the transportation activity imported all its inputs.

Elements in the selected sub-matrix were modified based on either the absolute or relative changes. An increase (decrease) in the elements would imply that total expenditures would be greater than (less than) total receipts, ceteris paribus. However, we accounted for these changes using import substitution, namely, increasing or

¹⁸Only SAM output multipliers were examined due to the importance of inter- and extra-group effects resulting from the wage and capital payments to households.

decreasing imports.¹⁹ The SAM output multipliers were then re-estimated. This technique is similar to the one described by West (1982).

We examined the sensitivity of the multipliers to the absolute and relative changes using a three-step process:

1. For each sub-matrix, we calculated the differences between the original multipliers and the effects of the absolute and relative changes. For example, the SAM output multiplier for the rudimentary rural farm sector was estimated to be 4.48. An absolute decrease of 10% resulted in an output multiplier of 4.20, while an increase of 10% resulted in a multiplier of 4.80. The differences were 0.28 and -0.32, respectively.
2. For each sub-matrix, we estimated the mean of the differences for the increases and decreases. This provided a sample of 30 (= 5 sub-matrices * 3 accounts * 2 differences) mean differences. The relevant portion sales sub-matrix was zero filled and therefore not included in the sensitivity analysis.
3. We estimated the population mean and standard deviation of the 30 sample mean differences for absolute and relative changes.

The population mean and standard deviation provided descriptive statistics we used in developing three rules for examining the sensitivity of sub-matrices. We know that for a given population possessing a mound-shaped histogram:²⁰

1. Approximately 68% of the samples are contained within the interval defined by the population mean \pm 1 standard deviation.
2. Approximately 95% of the samples are contained within the interval defined by the population mean \pm 2 standard deviation.

Given this information, we developed the following rules for examining sensitivity of the output multipliers to changes in the coefficients of the sub-matrices:

¹⁹A negative import implies a subsidy or an export.

²⁰The Shapiro-Wilk test for normality (Judge et al. 1985) showed both sample populations could have been independent drawings from normal distributions. The Shapiro-Wilk test statistics for the absolute and relative changes were 0.8474 and 0.1663, respectively.

1. If the sample mean difference for any sub-matrix was within the interval of the population mean ± 1 standard deviation, then the output multipliers were not sensitive to the absolute or relative changes.
2. If the sample mean difference for any sub-matrix was within the interval bounded by the population mean ± 1 standard deviation and the population mean ± 2 standard deviation, then the output multipliers were considered to be affected slightly by the absolute or relative changes.
3. If the sample mean difference for any sub-matrix was greater than population mean ± 2 standard deviation, then the output multipliers were considered to be affected readily by the absolute or relative changes.

Table 15 summarizes the descriptive statistics and the effects on the SAM output multipliers given the absolute and relative changes in the sub-matrices. As can be seen by the population means, absolute or relative decreases has a greater effect than similar increases. The relative changes appear to have had a greater effect. However, statistically there is no difference between the population means (t statistic = 0.3869) while the variances are significantly different at the 95% level of confidence (F statistic = 4.3288).

The Activity SAM output multipliers were affected slightly by absolute changes in the Distribution sub-matrix and relative changes in the Interindustry Transactions and Value Added sub-matrices and were affected readily by absolute changes in the Value Added sub-matrix. The Factors SAM output multipliers were affected slightly by absolute and relative changes in the Distribution and Final Demand sub-matrices. The Institution SAM output multipliers were affected slightly by relative changes in the Final Demand sub-matrix. Figure 3 shows the per dollar transactions by the Activity sub-accounts were greatest for the components of the Value Added sub-matrix.

This analysis shows that the Activity SAM output multipliers are the most sensitive to changes in the Value Added sub-matrix. For example, an increase of 0.10 in the column sums of the Value Added sub-matrix would imply \$34,0010 of additional output due to ecotourism. This would result in a total of approximately 36 FTE jobs or an increase of 4 FTE jobs paying approximately 1.5 minimum salaries. Additional care should be used in verifying the coefficients of sub-matrices affecting the institutional output multipliers. However, given the magnitude of the changes resulting from the sensitivity analysis, we are confident in the implications resulting from the impact analysis.

POLICY IMPLICATIONS

The SAM provides a concise framework for synthesizing and displaying the structure of a region's economy. This structure describes the production and consumption of goods/service and the distribution and composition of income within the

region. In addition, the SAM provides a predictive tool for estimating economic impacts.

The SAM can be used as a tool for changing the structure of the region's economy to capture more of the economic benefits associated with ecotourism and plan for sustainable development. As can be seen by the regional output multipliers, most of the inputs used in the production process are imported as are most of the commodities purchased by local households. Therefore, ecotourism alone will not bring much benefit to the municipality and not increase the incentives to protect the critical environment associated with ecotourism.

The SAM quantifies the idea that the more a dollar is respent in the municipality the greater the economic benefits. A possible structural change would be to include subsistence households and the rudimentary rural farm activity in the formal economy through linkages to the commercial and service activities. The rudimentary rural farm activity has the largest Type I and SAM and the second largest Type II output multiplier (Table 4). Therefore, if linkages could be developed between this activity and other activities, then this structural change could increase the economic benefits of ecotourism. For example, most ecotourist will spend their monies in the commercial and service activities (Table 10). A possible linkage between the commercial and service activities and the rudimentary rural farm activity would be to provide the commercial activity with farm products for sale to ecotourist and the service activity (restaurants) with local vegetables and fruits. Another possible linkage would be to sell souvenirs produced by local artisans in commercial businesses.

A future policy goal could be to create new ecotourism business activities that would target purchasing outputs from rudimentary rural farmers and purchasing souvenirs from local artisans. These business activities could range from small commercial shops and restaurants to new hotels. In addition, if the capital for establishing these ecotourism activities could be raised locally (e.g., local cooperatives), then the profits from these businesses would also remain within the region and distributed to it members instead of a single, possible external, owner.²¹ This type of activity would constitute major structural changes that could be modeled using the SAM.

A SAM does have limitations; Briassoulis (1991), for example, discusses that tourism may impact the environment as well as the economy. An additional policy consideration is the ability of Guaraqueçaba's infrastructure and environment to handle the additional wastes generated by the ecotourists. The majority of the ecotourist will visit the area between December and March (Holmes et al. 1995). The stresses on the infrastructure are different if ecotourism was consistent throughout the year rather than

²¹An example of this type of sustainable development is a project proposed by Bollmann (1994).

the majority clumped into four months. We feel it is important to raise this concern. However, addressing this concern is beyond the scope of this study.

CONCLUSIONS

Ecotourism emphasizes the central role of the ecosystem as the basis for tourism and is seen as a means to sustainably use the natural resources and to provide income and economic security for a region. Therefore, an important component in assessing the merits of ecotourism is determining the economic activities in the designated area. In areas with only a slightly developed economy, however, measuring the impacts of ecotourism or most other activities is extremely difficult. Nevertheless, if one is to estimate whether ecotourism could benefit the region and the amount of those benefits, a descriptive and predictive model of economic activity is necessary.

We used a SAM to examine the economic effects of ecotourism in the APA de Guaraqueçaba. A SAM was chosen for three reasons. First, a SAM describes the structure of an economy; the links among production activities, income distribution, consumption of goods/services, savings and investment, and external trade. A SAM, therefore, describes the links between demand, production, and income within a region's economy. Second, a SAM provides a concise framework for synthesizing and displaying the data on a region's economy. This is important since regional economic data are gathered by different governmental agencies and stored in different formats; each agency has knowledge about its specific purview but often not on how it all fits together. Finally, it allows for calculating regional economic multipliers for estimating the impacts of ecotourism on production, income distribution, and demand given the existing structure of the economy.

The business activities imported a majority of their inputs and only two exported any output. The rudimentary rural farm activity was the second largest sector in terms of its total output. However, this activity had minimal interactions with the rest of the local business activities. More than a third of the profits generated from the business activities were exported to absentee business owners. While the local population did shop at the local business, the majority of their purchases were for imported commodities. In addition, a majority of the local households were identified as earning less than 3 minimum salaries annually. Furthermore, a Brazilian governmental study showed that households earning less than 10 minimum salaries spent more than they earned. This deficit spending was financed using imported capital. Therefore, due to the large amount of imported inputs, commodities, and capital, the economic impacts of any spending by ecotourists would be small.

A related study determined the demand for ecotourism in the APA de Guaraqueçaba. Two of the results of the related study were estimates of ecotourist expenditures per day and the total number of ecotourists that visit the region per year. An ecotourist was estimated to spend \$15.15 per day. Given this information

combined with the predictive ability of the SAM, it would take approximately 233 ecotourist days to generate 1 full-time equivalent job, 1371 ecotourist days to generate 1 minimum salary employees working without a formal employment contract, and 214 ecotourist days to generate 1 minimum salary for employees working with a formal employment contract. In addition, ecotourists spend the majority of their monies in the service and commercial activities whose wage payments are not much better than those earned currently by subsistence households. The majority of the monies spent by ecotourists will accrue to the business owners and to pay for imports.

The total number of ecotourists estimated to visit the APA de Guaraqueçaba was 7,500 \pm 2,500. Their combined expenditures were estimated to generate \$244,575 worth of additional goods and services. These expenditures would create 32 FTE jobs and a combined salary payment of \$19,425. Given the existing structure of Guaraqueçaba's economy, ecotourism would generate a reasonable number of FTE jobs. However, the vast majority of the FTE jobs created would pay only one minimum salary. Therefore, it would do nothing to break the cycle of deficit spending by local households.

The SAM does provide a tool for economic planning. Generally, the greatest economic impacts are associated with rudimentary rural farmers and households. This is due to the fact that the rudimentary rural farm activity does not import any inputs and the large number of families defined as subsistence. If an ecotourism business activity could be developed that targeted purchasing outputs from rudimentary rural farmers (e.g., local restaurants purchasing locally grown vegetables from rudimentary rural farmers) and purchasing souvenirs from local artisans, then more of the ecotourist's dollars will be respent within the region creating more economic benefit. In addition, if the capital for establishing these tourism businesses could be raised locally (e.g., local cooperatives), then the profits from these businesses will also remain within the region and distributed to it members instead of a single, possibly external, owner. Therefore, given the existing structure of Guaraqueçaba's economy, ecotourism will have a limited economic effect.

Appendix A: TECHNICAL DEFINITIONS ACTIVITIES

Rudimentary Rural Farm and Rural Entrepreneurs - The agriculture sectors comprise products from farming, fishing, forestry, and livestock. The product categories were classified using *Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renovaveis* (IBAMA) and IBGE definitions:

1. *Produção Agrícola Municipal*: Agricultural production (e.g., rice, coffee, sugar cane, mandioca).
2. *Produção da Pecuária e de Aves & Produção da Pecuária e De Aves - Outros Rebanhos*: Various types of domestic ranch and range animals (e.g., cattle, horses, chickens, sheep, pigs, buffalos, goats, mules, wool producing sheep, and milk cattle).
3. *Produção de Origem Animal*: Products from animals (e.g., wool, milk, bee honey, and chicken eggs).
4. *Produção de Pescados*: Products from fishing.
5. *Produção Vegetal*: Flora products other than those defined under category 1 (e.g., coal, firewood, dimension lumber, and palmetto).

The rural entrepreneurial sector was defined as *Atividade 0100 - Agropecuária, Extração Vegetal, Silvicultura, Caça e Pesca* from the 1980 Brazilian Input-Output model (IBGE 1989).

Construction - The building of new buildings and their upkeep. The *Censos Econômicos de 1985, Municípios Volume 4 - Região Sul* classifies activities defining the construction sector (IBGE 1985). In terms of the 1980 Brazilian Input-Output model (IBGE 1989) this activity was defined as *Atividade 3401 - Construção Civil*.

Manufacturing - The manufacturing of goods for either final demand or as inputs into another production process. The *Censos Econômicos de 1985, Municípios Volume 4 - Região Sul* classifies activities defining the industrial sector (IBGE 1985). The predominate industry in the manufacturing sector was "*Produtos Alimentares*" or food production (SEFA 1989). In terms of the 1980 Brazilian Input-Output model (IBGE 1989) this activity is defined as *Atividades 2640 - Beneficiamento de Outros de origem vegetal para Alimentação*.

Commerce - The business sector is where consumers buy goods for final consumption. This sector includes both wholesale and retail trade. The *Censos Econômicos de 1985, Municípios Volume 4 - Região Sul* classifies activities defining the commerce sector (IBGE 1985). In terms of the 1980 Brazilian Input-Output model (IBGE 1989) this activity is defined as *Atividade 35 - Comercio*.

Service - This activity includes restaurants (food purchased at supermarkets is included in the commerce sector), lodging, personal services, health, insurance, electric energy and finance. All activities dealing with finance are also included. The *Censos Econômicos de 1985, Municípios volume 4 - Região Sul* classifies activities defining the service sector (IBGE 1985). The Secretary of Finance (*Secretaria da Fazenda do Parana*) also includes Transportation and Communications in this activity for summary purposes. We will separate Transportation into an individual sector. Communications, however, will remain part of the Service activity.

This activity included non-governmental organizations (e.g., churches and other not-for-profit organizations). Also included are rental payments (and imputed rental payments) for housing. This is not to be confused with the financial sector. The income from the financial sector is the difference between interest received and interest paid.

This activity also included electrical power utilities. The reason we included electrical power in the service activity was that the municipality of Guaraqueçaba imported all its electrical energy. The Energy Utility of Paraná (*Companhia Paranaense de Energia - COPEL*) employed 1 person to deliver energy bills. Using the data provided by COPEL, we estimated that in 1991 approximately 50% of all households (rural and urban) had electricity.

A report by the Secretary of Finance (SEFA 1989) showed that the only services recorded in Guaraqueçaba were *Comunicações and Serviços de Alojamento e Alimentação*. In terms of the 1980 Brazilian Input-Output model (IBGE 1989) this activity is defined as the aggregation of *Atividade 33 - Energia Elétrica, Atividade 37 - Comunicações, and Atividade 39 - Serviços Prestados as Famílias*.

Transportation - The transportation of goods and people by highway, rail, metro, water, and air. The *Censos Econômicos de 1985, Municípios volume 4 - Região Sul* classifies activities defining the transportation activity (IBGE 1985). For Guaraqueçaba, transportation is by highway and water. In terms of the 1980 Brazilian Input-Output model (IBGE 1989) this activity is defined as *Atividades 3610 - Transporte Rodoviario and Atividades 3630 - Transporte Hidroviario*.

Government Enterprise - This activity is a combination of government industries and an accounting tool for reporting salary payments by the municipal government. A government industry is an activity that is similar to a privately owned industry. The legal harvesting of *palmito* is an example of a sale of an output by a government industry. The only entry in the column is the total expenditure by the municipal government on salaries. Municipal, state, and federal government's expenditures on the goods/services are recorded as final demand purchases.

PRIMARY FACTORS OF PRODUCTION

Capital Rent - Dividends, interest, and rental income and other nonwage payments for the use of capital. Capital rent also included payments to partnerships and sole proprietorships. This was defined as variable *Excedente Operacional Bruto (N2)* in the 1980 Brazilian Input-Output model (IBGE 1989). In addition, the capital rent of the service sector includes the implied rental payments of home ownership.

Indirect Business Taxes - This covers sales, excise, and value added taxes, as well as customs duties. Other types of taxes, such as income and property taxes, are paid out of income and not included as indirect business taxes. These taxes are a direct result of the production process. They are defined as the sum of *IPI ou ISS sobre consumo intermediario das atividades (500)*; *Impostos sobre Circulação Mercadorias e Servicos - ICM/ICMS*; *Outros impostos liquidados de subsídios, sobre o consumo intermediario das atividades (700)*; and *Imposto de importação (800)*. These were taken from the Brazilian Input-Output model (IBGE 1989). In the 1980 Brazilian Input-Output model, indirect business taxes are included in the purchases of intermediate inputs. However, since indirect business taxes are paid directly to an institution (i.e., governments), they were included as an element in the primary factors of production.

Labor - Labor is divided into two categories: Salaried and Household.

1. Salaried - Employees with a formal employment contract (*com vinculo empregatício*). This includes employees' wages and profit withheld by owners or partners with shares in the company. It is recorded as the total amount paid during the year as fixed salaries, bonuses, profit withheld, commissions, and tips, as well as paid vacations, without any deductions of the payments made to the Retirement and Social Assistance Institute (*Censos Econômicos de 1985, Municípios volume 4 - Região Sul*, IBGE 1985). This was defined as the sum of *Salários com vinculo empregatício (R111)*, *Contribuições sociais efetivas a cargo do empregados (R12)*, and

Contribuições sociais fictícias (R13) from the Brazilian Input-Output model (IBGE 1989).

2. Household - This denotes the imputed value of benefits from subsistence type activities and other non-salaried activities, as well as wages paid to employees without a formal employment contract (*sem vínculo empregatício*). The definition was taken in part from The *Censos Econômicos de 1985, Municípios volume 4 - Região Sul* (IBGE 1985) This was defined as *Salários sem vínculo empregatício(R112)* from the Brazilian Input-Output model (IBGE 1989).

INSTITUTIONS

Households - Households are defined by annual income levels. We divided household income into four levels:

1. Subsistence (*Subsistência*) - less than or equal to the base or minimum salary (*salário mínimo*);
2. Low (*Baixo*) - from 1 to 3 times the minimum salary;
3. Medium (*Medio*) - from 3 to 20 times the minimum salary; and
4. High (*Alto*) - more than 20 times the minimum salary.

The minimum monthly salary was estimated to be \$40.00 (United States dollars) or \$480.00 annually. The split between income levels was based on the number of families in each income level (SNIPC 1992, Table 4.1).

Capital for Investment - This account is used to define savings by households and surpluses or deficits by governments.

Enterprises & Corporations - Enterprises are defined as partnership or a sole proprietorship. Corporations are defined as a legal entity that are different from a partnership or a sole proprietorship. Enterprises distribute profits to the owners or households. Corporations distribute earnings through dividends to the owners or households and other corporations. Enterprises can also earn profits as can corporations as retained earnings.

Governments - Government organizations are defined as municipal, state, and federal.

EXPORTS/IMPORTS

There was one export/import region

Brazil - In the case of institutions, their import account also defines the capital accounts with respect to the region. For example, if the state government receives more (less) in taxes than it transfers to the region, this is a surplus (deficit) of capital and would be recorded in the import account as a positive (negative) number. For households, the SNIPC (1992) report showed that below an income level of ten times the minimum salary, households spent more than they earned. Therefore, this account also shows the expenditures to service that debt.

TOTALS

Total Industry Outlay - Gross Sales.

Total Value Added - Value added is defined as those costs which are added to the intermediate costs of producing goods and services and is the sum of the components of the primary factors of production. We have included indirect business taxes in the definition of total value added. This is different from that used by the 1989 Brazilian Input-Output model (IBGE 1989). The Secretary of Finance defines value added as Gross Sales minus Intermediate Demand for Inputs plus Changes in Inventory. We assumed changes in inventory for this mostly subsistence economy were zero.

Appendix B - MATHEMATICAL DEVELOPMENT OF OUTPUT MULTIPLIERS

One of the principal reasons for building a Social Accounting Matrix (SAM) is its predictive capability. When an ecotourist visits the *Área de Proteção Ambiental de Guaraqueçaba* they will spend money at local businesses. They might purchase meals, hotel rooms, souvenirs, or guide services. These expenditures will cause additional economic activity as the monies are respent within the region's economy. The following is a development of the Type I, Type II, and SAM output multipliers. Capital letters will be used to denote matrices and lowercase letters will be used to denote vectors (e.g., q denotes a column vector while q' denotes its transpose or a row vector).

Figure 1B can be represented mathematically using matrices:¹

¹For more complete discussion of developing these mathematical models see Miller
(continued...)

$$\begin{pmatrix} q_1 \\ q_2 \\ q_3 \end{pmatrix} = \begin{pmatrix} A_{11} & 0 & A_{13} \\ A_{21} & 0 & 0 \\ A_{31} & A_{32} & A_{33} \end{pmatrix} \begin{pmatrix} q_1 \\ q_2 \\ q_3 \end{pmatrix} + \begin{pmatrix} e_1 \\ e_2 \\ e_3 \end{pmatrix} \quad (\text{B1})$$

$$q = Aq + e$$

with

$$A_{ij} = T_{ij} \hat{q}_j^{-1} \quad \forall i, j = 1, 2, 3 \quad (\text{B2})$$

where \hat{q}_j defines a diagonal matrix with the vector q_j on the principal diagonal and e_j defines the exogenous components of demand.

Type I output multipliers developed using the traditional Input-Output model are only based on the interindustry transactions matrix or the Activity sub-account matrix:

$$q_1 = A_{11}q_1 + e_1 \quad (\text{B3})$$

where e_1 defines the exogenous components of demand. Solving for q_1 gives

$$q_1 = (I - A_{11})^{-1}e_1 \quad (\text{B4})$$

where I is the identity matrix and $(I - A_{11})^{-1}$ is the Leontief inverse. The column sums of this matrix define the Type I output multipliers for the Activity sub-accounts (Miller and Blair 1985).

Type II output multipliers are estimated by closing the interindustry transactions matrix with respect to household consumption and wages (Miller and Blair 1985). Specifically, the FACTOR matrix T_{21} and the TOTAL vector q_2 includes only the Labor:

(...continued)

and Blair (1985), Pyatt and Round (1985), and Bulmer-Thomas (1982).

Household and Salary sub-accounts; the INSTITUTION matrices T_{31} , T_{32} , and T_{33} and the TOTAL vector q_3 include only the Household: Subsistence, Low, Medium, and High sub-accounts (Miller and Blair 1985). Therefore, equation (B1) can be re-written as:

$$q = \bar{A}q + e \quad (\text{B5})$$

where \bar{A} defines the A matrix with the correct sub-accounts. Equation (B5) can be solved for q :

$$q = [I - \bar{A}]^{-1} e \quad (\text{B6})$$

The column sums of the $[I - \bar{A}]^{-1}$ matrix define the Type II output multipliers (Miller and Blair 1985).

A Type II output multiplier includes only the additional economic impacts due to wages and salaries received by households from the local enterprises and businesses in payment for their labor (Miller and Blair 1985). The detail provided by a SAM allows the interindustry transactions matrix to be closed with respect to other sub-accounts. Given the information contained within a SAM, the question of which other sub-accounts that might be defined as endogenous is important. Thorbecke (1985) states that the interindustry transactions sub-matrix should be closed so that it contains all the necessary behavioral and technical relationships of the economic system in a consistent way. Pyatt and Round (1985b) also state the multipliers should reflect the circular flow of income that characterizes the multiplier process of demand, production, and income distribution. Stone (1985) and Bulmer-Thomas (1982) defined a SAM output multiplier by closing the interindustry transactions sub-matrix, T_{11} , with respect to wage and capital payments to households. Specifically, the FACTOR matrix T_{21} and the TOTAL vector q_2 includes the Capital Rent and Labor: Household and Salary sub-accounts; the INSTITUTION matrices T_{31} , T_{32} , and T_{33} and the TOTAL vector q_3 include the Household: Subsistence, Low, Medium, and High and Enterprise sub-accounts. Including capital payments is important if households receive a large portion of their total income from capital payments, as with this study. Given the existing structure of Guaraqueçaba's SAM, no other sub-accounts are defined as endogenous. Therefore, equation (B1) can be re-written as:

$$q = \hat{A}q + e \quad (\text{B7})$$

where \hat{A} defines the A matrix with the correct sub-accounts. Equation (B7) can be solved for q :

$$q = [I - \hat{A}]^{-1} e \quad (\text{B8})$$

The column sums of the $[I-\check{A}]^{-1}$ matrix define the SAM output multipliers (Bulmer-Thomas 1982).

Unfortunately, using this setup obscures all the information contained in the \check{A} matrix. Consider, for example, a change in the final demand in the Activity account due to expenditures by ecotourists visiting the region. These expenditures will result in a corresponding increase in production from the other business activities. This is the conventional interindustry multiplier effect.² This can be called the "intra-group" effect. However, the increased expenditures will also cause changes in the Primary Factor of Production and Institution accounts that also impact the Activity account. For example, the inter-group effect of an ecotourist purchasing a hotel room would be the impacts on the Activity account resulting from increased household income (the Value Added account) causing an increase in households' purchases of goods and services (the Institution account). This can be called the "inter-group" effect. Finally, expenditures in the Activity accounts will also impact other accounts. For example, the effect of an ecotourist purchasing a hotel room would be the impacts of changes in household income (the Value Added account) and in consumption (the Institution account). These can be called the "extra-group" effects.

The intra-group, inter-group, and extra-group effects can be seen clearly by partitioning the \check{A} matrix:

$$\check{A} = \left| \begin{array}{ccc|ccc} A_{11} & 0 & 0 & 0 & 0 & \check{A}_{13} \\ 0 & 0 & 0 & \check{A}_{21} & 0 & 0 \\ 0 & 0 & \check{A}_{33} & \check{A}_{31} & \check{A}_{32} & 0 \end{array} \right| + \left| \begin{array}{ccc|ccc} 0 & 0 & \check{A}_{13} & 0 & 0 & 0 \\ \check{A}_{21} & 0 & 0 & 0 & 0 & 0 \\ \check{A}_{31} & \check{A}_{32} & 0 & 0 & 0 & 0 \end{array} \right| \quad (\text{B9})$$

or

$$\check{A} = \hat{A} + \acute{A} \quad (\text{B10})$$

Then equation (B7) can be rewritten as:

$$q = \acute{A}q + e = \hat{A}q + \acute{A}q + e = \hat{A}q + [\acute{A} - \hat{A}]q + e \quad (\text{B11})$$

²This is analogous to the Leontief inverse output multipliers.

The \hat{A} matrix isolates the interindustry and the intra-consumption transactions or the intra-group effects.³ The \check{A} or the $[\check{A}-\hat{A}]$ matrix isolates the between accounts effects. The matrix $[\check{A}-\hat{A}]$ is used to represent \check{A} because the between group effects are a result of the intra-group effects.

Equation (B11) can be rewritten as:

$$\begin{aligned}
 q - \hat{A}q &= [\check{A} - \hat{A}] + e \\
 [I - \hat{A}]q &= [\check{A} - \hat{A}] + e \\
 q &= [I - \hat{A}]^{-1} [\check{A} - \hat{A}]q + [I - \hat{A}]^{-1}e \\
 q &= \tilde{A}q + [I - \hat{A}]^{-1}e
 \end{aligned}
 \tag{B12}$$

where $\tilde{A} = [I - \hat{A}]^{-1}[\check{A} - \hat{A}]$. Multiplying both sides of equation (B12) by \tilde{A} and substituting the resulting expression into equation (B12) into the result gives:

$$q = \tilde{A}^2q + [I + \tilde{A}] [I - \hat{A}]^{-1}e \tag{B13}$$

Multiplying both sides of equation (B13) by \tilde{A}^2 and substituting the resulting expression into equation (B13) gives:

$$q = \tilde{A}^3q + [I + \tilde{A} + \tilde{A}^2] [I - \hat{A}]^{-1}e \tag{B14}$$

Solving equation (B14) for q gives:

$$\begin{aligned}
 q &= [I - \tilde{A}^3]^{-1} [I + \tilde{A} + \tilde{A}^2] [I - \hat{A}]^{-1}e \\
 &= M_3M_2M_1e \approx [I - \hat{A}]^{-1}e
 \end{aligned}
 \tag{B15}$$

where

- M_1 = the intra-group multiplier effects;
- M_2 = the extra-group multiplier effects; and
- M_3 = the inter-group multiplier effects.

³Note there are no intra-factor effects, since factors do not make transfers to each other (see Figure B1).

Figure 1B. Social Accounting Matrix

| RECEIPTS | EXPENDITURES | | | | |
|--|--------------|----------|----------|----------|--------|
| | ACTIVITY | FACTOR | INST | EXPORTS | TOTALS |
| ACTIVITY RRF RE Const Manu Com Serv Trans GE | T_{11} | | T_{13} | T_{14} | q_1 |
| FACTOR IBT CR Labor | T_{21} | | | T_{24} | q_2 |
| INST HH Capital Ent Gov't | T_{31} | T_{32} | T_{33} | T_{34} | q_3 |
| IMPORTS | T_{41} | T_{42} | T_{43} | T_{44} | q_4 |
| TOTALS | q'_1 | q'_2 | q'_3 | q'_4 | |

Definitions:

ACTIVITY

RRF - Rudimentary Rural Farms
RE - Rural Entrepreneurs
Const - Construction
Manu - Manufacturing: Food Production
Com - Commerce
Serv - Service
Trans - Transportation
GE - Government Enterprise

FACTOR - Primary Factors of Production

IBT - Indirect Business Taxes
CR - Capital Rent
Labor - Labor: Households and Salary

INST - Institutions

HH - Households: Subsistence, Low, Medium, and High
Capital - Capital for Investment
Ent - Enterprises
Gov't - Government: Municipal, State, and Federal

T_{11} - Interindustry transactions matrix

T_{21} - Value added matrix

T_{31} - Sales and taxes matrix

T_{41} - Activity imports matrix

T_{32} - Distribution matrix

T_{42} - Factor imports matrix

T_{13} - Final demand matrix

T_{33} - Transfers matrix

T_{43} - Institutional imports matrix

T_{14} - Activity exports matrix

T_{24} - Factor exports matrix

T_{34} - Institutional exports matrix

T_{44} - Transshipments matrix

q_1 - Total industry outlay/output vector

q_2 - Total factor outlay/receipt vector

q_3 - Total institutional expenditures/receipt vector

q_4 - Total imports/exports vector

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TABLES

Table 1. Value Added by Economic Sector for Guaraqueçaba, Brazil - 1989.

| <u>Economic Sector</u> | <u>NCz\$[‡]</u> | <u>Percent</u> |
|----------------------------------|--------------------------|----------------|
| Agriculture (Setor Primario) | 2.864.835 | 31% |
| Manufacturing (Setor Secundario) | 5.166.297 | 55% |
| Commercial (Setor Comercial) | 971.539 | 10% |
| Service (Servicos) | 374.927 | 4% |
| Total Value Added | <u>9.377.598</u> | |

[‡] NCz\$ denotes Novo Cruzado, the monetary unit used between January 1989 and August 1993.

Source: The Secretary of Finance for the State of Paraná.

Table 2. Estimated Wages and Full- & Part-Time Employment for the Municipality of Guaraqueçaba, Brazil - 1989.[§]

| Sector | Wages | | | Full- & Part-Time Employment | | |
|-------------------------|--------|----------|----------------|------------------------------|----------|----------------|
| | Formal | Informal | Not Classified | Formal | Informal | Not Classified |
| Rudimentary Rural Farms | | 1 | | | 1298 | |
| Rural Entrepreneurs | 1.2 | 1 | | 15 to 30 | 600 | |
| Construction | | | 3 | | | 80 to 100 |
| Manufacturing | 2 | 2 | | 137 | 454 | |
| Commercial | | | 1 to 2 | | | 20 to 30 |
| Service | | | 1 to 2 | | | up to 30 |
| Transportation | 2 to 4 | 2 | | 45 | 45 | |
| Government Industries | 1 | | | 277 | | |

[§]The initial official employment figures for each sector were obtained from the Município do Trabalho e da Administração, Instituto Paranaense de Desenvolvimento Econômico e Social, and Relação Anual de Informações Sociais. These data were modified using the structured interviews. In addition, the interviews provided estimates of the wages. Wages were defined in terms of minimum salaries. Formal was defined as the number of employees with a formal employment contract. Informal is defined as the number of employees without a formal employment contract.

Table 3. Estimated Full-Time Equivalent Employment in the Municipality of Guaraqueçaba, Brazil - 1989.

| Activity | Estimated FTE [§] | | Total FTE Employment |
|-------------------------|----------------------------|----------|----------------------|
| | Formal | Informal | |
| Rudimentary Rural Farms | | 1298 | 1298 |
| Rural Entrepreneurs | 19 | 98 | 117 |
| Construction | 6 | 9 | 15 |
| Manufacturing | 137 | 454 | 591 |
| Commercial | 31 | 2 | 33 |
| Service | 13 | 1 | 14 |
| Transportation | 22 | 4 | 26 |
| Government Industries | 277 | | 277 |

[§]FTE denotes full-time equivalent employment. A full-time equivalent standardizes the unit of work to a year. Therefore, two 6-month part-time jobs or twelve 1-month part-time jobs equals 1 full-time equivalent job. Formal was defined as the number of employees with a formal employment contract. Informal was defined as the number of employees without a formal employment contract.

Table 4. Regional Economic Output Multipliers for the Municipality of Guaraqueçaba, Brazil.

| <u>Activity</u> | <u>Output Multipliers[†]</u> | | |
|--------------------------------|---------------------------------------|---------|------|
| | Type I | Type II | SAM |
| Rudimentary Rural Farms | 1.56 | 2.70 | 4.48 |
| Rural Entrepreneurs | 1.03 | 1.44 | 2.78 |
| Construction | 1.14 | 1.66 | 2.34 |
| Manufacturing: Food Production | 1.05 | 2.06 | 2.67 |
| Commerce | 1.07 | 1.64 | 2.76 |
| Service | 1.03 | 1.22 | 2.03 |
| Transportation | 1.00 | 1.59 | 1.90 |
| Government Enterprise | 1.00 | 3.39 | 3.59 |
| <u>Factors</u> | | | |
| Indirect Business Taxes | - | - | - |
| Capital Rent | - | - | 2.50 |
| Labor: Households | - | 2.97 | 3.66 |
| Labor: Salary | - | 2.39 | 2.59 |
| <u>Institutions</u> | | | |
| Household: Subsistence | - | 1.97 | 2.66 |
| Household: Low | - | 1.43 | 1.65 |
| Household: Medium | - | 1.34 | 1.49 |
| Household: High | - | 1.24 | 1.34 |
| Capital for Investment | - | - | - |
| Enterprises | - | - | 2.34 |
| Government: Municipal | - | - | - |
| Government: State | - | - | - |
| Government: Federal | - | - | - |

[†] The dash marks indicate the sub-accounts that were not used in estimating the output multipliers. The Type I output multipliers were estimated using only the activity sub-accounts. The Type II output multipliers were estimated by including the labor and household sub-accounts. The SAM output multipliers were estimated using the activity, capital rent, labor, household, and enterprise sub-accounts.

Table 5. Regional Economic Total Full-Time Equivalent Employment Multipliers for the Municipality of Guaraqueçaba, Brazil.[§]

| Activity | FTE Direct Effect [†] | FTE Employment Multiplier [‡] Per Dollar FTE Employment Multipliers | | |
|--------------------------------|--------------------------------|---|-------------------------|-------------------------|
| | | Type I | Type II | SAM |
| Rudimentary Rural Farms | 0.002083 | 1.54 <i>0.003208</i> | 1.77 <i>0.003689</i> | 1.86 <i>0.003868</i> |
| Rural Entrepreneurs | 0.000282 | 1.02 <i>0.000288</i> | 1.54 <i>0.000433</i> | 2.01 <i>0.000566</i> |
| Construction | 0.000204 | 1.14 <i>0.000233</i> | 1.57 <i>0.000321</i> | 1.91 <i>0.000390</i> |
| Manufacturing: Food Production | 0.000339 | 1.21 <i>0.000410</i> | 2.15 <i>0.000730</i> | 2.33 <i>0.000791</i> |
| Commerce | 0.000237 | 1.06 <i>0.000251</i> | 1.17 <i>0.000277</i> | 1.64 <i>0.000389</i> |
| Service | 0.000156 | 1.04 <i>0.000162</i> | 1.12 <i>0.000174</i> | 1.64 <i>0.000256</i> |
| Transportation | 0.000176 | 1.00 <i>0.000176</i> | 1.27 <i>0.000224</i> | 1.44 <i>0.000255</i> |
| Government Enterprise | 0.002122 | 1.00 <i>0.002122</i> | 1.03 <i>0.002192</i> | 1.04 <i>0.002211</i> |

[§] The FTE employment multipliers were estimated using total FTE employment figures. Total employment was the sum of the number of FTE employees working without plus with a formal employment.

[†] The Direct Effect was defined as the immediate FTE Employment per \$1.00 of total output. The direct effect does not include any indirect employment impacts.

[‡] The Type I FTE multipliers were estimated using only the activity sub-accounts. The Type II FTE multipliers were estimated by including the labor and household sub-accounts. The SAM FTE multipliers were estimated using the activity, capital rent, labor, household, and enterprise sub-accounts.

Table 6. Regional Economic Indirect Business Tax Multipliers for the Municipality of Guaraqueçaba, Brazil.

| <u>Activity</u> | <u>IBT Direct Effect</u> [§] | <u>IBT Multiplier</u> [†] | | |
|--------------------------------|---------------------------------------|------------------------------------|-------------------------|-------------------------|
| | | <i>Per Dollar IBT Multipliers</i> | | |
| | | Type I | Type II | SAM |
| Rudimentary Rural Farms | 0.0 | - | - | - |
| Rural Entrepreneurs | 0.014785 | 1.02 <i>0.015081</i> | 1.03 <i>0.015278</i> | 1.06 <i>0.015672</i> |
| Construction | 0.001967 | 1.47 <i>0.002891</i> | 1.63 <i>0.003208</i> | 1.73 <i>0.003410</i> |
| Manufacturing: Food Production | 0.006305 | 1.03 <i>0.006494</i> | 1.11 <i>0.007015</i> | 1.14 <i>0.007190</i> |
| Commerce | 0.014883 | 1.03 <i>0.015329</i> | 1.05 <i>0.015699</i> | 1.07 <i>0.016029</i> |
| Service | 0.002143 | 1.12 <i>0.002400</i> | 1.17 <i>0.002516</i> | 1.28 <i>0.002755</i> |
| Transportation | 0.004319 | 1.00 <i>0.004319</i> | 1.09 <i>0.004697</i> | 1.11 <i>0.004789</i> |
| Government Enterprise | 0.0 | - | - | - |

[§] The IBT Direct Effect was defined as the immediate indirect business taxes paid per \$1.00 of total output. The direct effect does not include any indirect business tax impacts.

[†] Type I IBT multipliers were estimated using only the activity sub-accounts. The Type II IBT multipliers were estimated using the activity, labor, and household sub-accounts. The SAM IBT multipliers were estimated using the activity, capital rent, labor, and household sub-accounts. Since rudimentary rural farms and government enterprises pay no indirect business taxes, no multipliers may be calculated.

Table 7. Regional Economic Labor: Household Multipliers for the Municipality of Guaraqueçaba, Brazil.

| <u>Activity</u> | <u>Direct Effect Labor: Household[§]</u> | <u>Labor: Household Multiplier[†] Per Dollar Labor: Household Multipliers</u> | | |
|--------------------------------|---|--|-------------------------|-------------------------|
| | | Type I | Type II | SAM |
| Rudimentary Rural Farms | 0.249120 | 1.54 <i>0.383645</i> | 1.77 <i>0.442051</i> | 1.86 <i>0.463946</i> |
| Rural Entrepreneurs | 0.112850 | 1.01 <i>0.113979</i> | 1.17 <i>0.131589</i> | 1.31 <i>0.147990</i> |
| Construction | 0.059280 | 1.07 <i>0.063430</i> | 1.25 <i>0.074408</i> | 1.40 <i>0.082837</i> |
| Manufacturing: Food Production | 0.250476 | 1.00 <i>0.250476</i> | 1.15 <i>0.289463</i> | 1.18 <i>0.296970</i> |
| Commerce | 0.006644 | 1.21 <i>0.008039</i> | 1.70 <i>0.011309</i> | 3.77 <i>0.025040</i> |
| Service | 0.005265 | 1.19 <i>0.006265</i> | 1.50 <i>0.007893</i> | 3.39 <i>0.017836</i> |
| Transportation | 0.025644 | 1.00 <i>0.025644</i> | 1.23 <i>0.031510</i> | 1.38 <i>0.035341</i> |
| Government Enterprise | 0.0 | - - | - - | - - |

[§] The Direct Effect for Labor: Household were defined as the immediate total salaried payments to employees without a formal employment contract per \$1.00 of total output. The direct effect does not include any indirect impacts of salary payments to employees without a formal employment contract.

[†] Type I Labor: Household multipliers were estimated using only the activity sub-accounts. The Type II Labor: Household multipliers were estimated using the activity, labor, and household sub-accounts. The SAM Labor: Household multipliers were estimated using activity, capital rent, labor, household, and the enterprise sub-accounts. Since the government enterprise sector recorded no laborers employed without a formal employment contract, no multipliers could be estimated.

Table 8. Regional Economic Labor: Salary Multipliers for the Municipality of Guaraqueçaba, Brazil.

| <u>Activity</u> | <u>Direct Effect Labor: Salary[§]</u> | <u>Labor: Salary Multiplier[†] Per Dollar Labor: Salary Multipliers</u> | | |
|--------------------------------|--|--|-------------------------|-------------------------|
| | | Type I | Type II | SAM |
| Rudimentary Rural Farms | 0.0 | - | - | - |
| Rural Entrepreneurs | 0.026795 | 1.18 <i>0.031618</i> | 1.36 <i>0.036492</i> | 1.74 <i>0.046757</i> |
| Construction | 0.115950 | 1.20 <i>0.139140</i> | 1.27 <i>0.147593</i> | 1.32 <i>0.152868</i> |
| Manufacturing: Food Production | 0.074746 | 1.48 <i>0.110624</i> | 1.65 <i>0.123064</i> | 1.71 <i>0.127763</i> |
| Commerce | 0.214281 | 1.06 <i>0.227138</i> | 1.11 <i>0.238446</i> | 1.15 <i>0.247040</i> |
| Service | 0.069510 | 1.07 <i>0.074376</i> | 1.12 <i>0.078181</i> | 1.21 <i>0.084400</i> |
| Transportation | 0.215491 | 1.00 <i>0.215491</i> | 1.05 <i>0.226573</i> | 1.06 <i>0.228971</i> |
| Government Enterprise | 1.0 | 1.00 <i>1.00</i> | 1.05 <i>1.046542</i> | 1.05 <i>1.048053</i> |

[§] The Direct Effect for Labor: Salary were defined as the immediate total salaried payments to employees with a formal employment contract per \$1.00 of total output. The direct effect does not include any indirect impacts of salary payments to employees with a formal employment contract.

[†] Type I Labor: Salary multipliers were estimated using the activity sub-accounts. The Type II Labor: Salary multipliers were estimated using the activity, labor, and household sub-accounts. The SAM Labor Salary multipliers were estimated using the activity, capital rent, labor, household, and enterprise sub-accounts. Since the rudimentary rural farm sector did not hire laborers with a formal employment contract, no multipliers could be estimated.

Table 9. Ecotourism expenditure information for the APA de Guaraqueçaba, Brazil.

| | <u>1994[§]</u> | <u>1992[†]</u> |
|--|-------------------------|-------------------------|
| Daily expenditure per person = | \$ 16.00 | \$ 15.15 |
| Fuel expenditures per person per day = | \$ 2.40 | \$ 2.27 |
| Public transport expenditures per person per day = | \$ 3.36 | \$ 3.18 |
| Hotel expenditures per person per day = | \$ 6.08 | \$ 5.76 |
| Food expenditures per person per day = | \$ 3.52 | \$ 3.33 |
| Camping expenditures per person per day = | \$ 0.64 | \$ 0.61 |
| Number in party = | 2 persons | |
| Length of visit = | 4 days | |
| Total expenditure per trip = | \$128.00 | \$121.20 |

[§] These data were taken from Holmes et al. (1995). The expenditures were in 1994 US dollars.

[†] The 1994 data were deflated to 1992 by using the Consumer Price Index for all Urban Consumers (U.S. Department of Labor 1994).

Table 10. Ecotourism expenditures by business activity for the APA de Guaraqueçaba, Brazil.[§]

| | Expenditures Activity per trip per day 1992 | Expenditures per ecotourist 1992 |
|-------------------------|---|--|
| Rudimentary Rural Farms | \$ 0.00 | \$ 0.00 |
| Rural Entrepreneurs | \$ 0.00 | \$ 0.00 |
| Construction | \$ 0.00 | \$ 0.00 |
| Manufacturing | \$ 0.00 | \$ 0.00 |
| Commerce | \$ 3.11 | \$24.88 |
| Service | \$ 8.86 | \$70.88 |
| Transportation | \$ 3.18 | \$25.44 |
| Government Enterprise | \$ 0.00 | \$ 0.00 |
| Total | \$15.15 | \$121.20 |

[§]These data were taken from Holmes et al. (1995). The 1994 data were deflated to 1992 by using the Consumer Price Index for all Urban Consumers (U.S. Department of Labor 1994).

Table 11. Estimated regional economic impacts of one ecotourist day for the Municipality of Guaraqueçaba, Brazil.[§]

| | Output [†] (\$) | FTE ^{††} Employment (jobs) | IBT [‡] (\$) | Labor ^{‡‡} | |
|-----------|-----------------------------|---|--------------------------|---------------------|----------------|
| | | | | Household (\$) | Salary (\$) |
| Type I | 15.63 | 0.00278 | 0.08 | 0.16 | 2.05 |
| Type II | 20.97 | 0.00312 | 0.09 | 0.21 | 2.15 |
| SAM 32.61 | 0.00429 | 0.09 | 0.35 | 2.24 | |

[§] Economic impacts were based on a total estimated expenditure per day of \$15.15 (Holmes et al. 1995).

[†] The units are 1992 US dollars.

^{††} FTE defines full-time equivalent employment. The units are number of jobs.

[‡] IBT denotes indirect business taxes. The units are in 1992 US dollars.

^{‡‡} Labor: Household and Labor: Salary denotes salary payments to employees without and with a formal employment contract, respectively. The units are in 1992 US dollars.

Table 12. Estimated total regional economic impacts of 7,500 \pm 2,500 ecotourist days for the Municipality of Guaraqueçaba, Brazil.[§]

| | Type I | Type II | SAM |
|--|----------------------|----------------------|----------------------|
| Output [†] (\$) | 117,225 \pm 39,075 | 157,275 \pm 52,425 | 244,575 \pm 81,525 |
| FTE Employment ^{††} (jobs) | 20.85 \pm 6.95 | 23.40 \pm 7.80 | 32.18 \pm 10.73 |
| IBT [‡] (\$) | 600 \pm 200 | 675 \pm 225 | 675 \pm 225 |
| <u>Labor^{††}</u> | | | |
| Household (\$) | 1,200 \pm 400 | 1,575 \pm 525 | 2,625 \pm 875 |
| Labor (\$) | 15,375 \pm 5,125 | 16,125 \pm 5,375 | 16,800 \pm 5,600 |

[§] Economic impacts were based on an estimated expenditure per day of \$15.15 and an estimate of 7,500 \pm 2,500 annual ecotourist days (Holmes et al. 1995).

[†] The units are 1992 US dollars.

[†] FTE defines full-time equivalent employment. The units are number of jobs.

[‡] IBT denotes indirect business taxes. The units are in 1992 US dollars.

^{††} Labor: Household and Labor: Salary denotes salary payments to employees without and with a formal employment contract, respectively. The units are in 1992 US dollars.

Table 13. An absolute change of 10% in the technical coefficients for the subsistence agriculture sector.

| Activity | Technical Coefficients | A 10% Change | New Technical Coefficients |
|-------------------------|------------------------|--------------|----------------------------|
| Rudimentary Rural Farms | 0.34997 | 0.03500 | 0.38497 |
| Rural Entrepreneurs | 0.00648 | 0.00065 | 0.00713 |
| Construction | 0.00000 | 0.00000 | 0.00000 |
| Manufacturing | 0.00010 | 0.00001 | 0.00011 |
| Commerce | 0.00300 | 0.00030 | 0.00330 |
| Service | 0.00330 | 0.00033 | 0.00363 |
| Transportation | 0.00009 | 0.00001 | 0.00010 |
| Government Enterprise | 0.00000 | 0.00000 | 0.00000 |
| Total | 0.36294 | 0.03630 | 0.39924 |

Table 14. A relative change of 0.10 in the purchases of intermediate inputs for the subsistence agriculture sector.

| Activity | Technical Coefficients | A 0.10 Change | New Technical Coefficients |
|-------------------------|------------------------|---------------|----------------------------|
| Rudimentary Rural Farms | 0.34997 | 0.09643 | 0.44640 |
| Rural Entrepreneurs | 0.00648 | 0.00179 | 0.00827 |
| Construction | 0.00000 | 0.00000 | 0.00000 |
| Manufacturing | 0.00010 | 0.00003 | 0.00013 |
| Commerce | 0.00300 | 0.00083 | 0.00383 |
| Service | 0.00330 | 0.00091 | 0.00421 |
| Transportation | 0.00009 | 0.00002 | 0.00011 |
| Government Enterprise | 0.00000 | 0.00000 | 0.00000 |
| Total | 0.36294 | 0.10000 | 0.46294 |

Table 15. Summary of the sensitivity analysis results.

| Absolute Change of ±10% | | |
|---------------------------------|--------------------------------|---|
| <u>Descriptive Statistics</u> | | |
| | Population Mean | = - 0.002492 |
| | Standard Deviation | = 0.103489 |
| | N | = 30 |
| <u>Sub-Matrix</u> | <u>Multipliers[§]</u> | <u>Degree of Confidence[‡]</u> |
| Interindustry Transactions | - | - |
| Value Added | Activity | ±2 SD |
| Distribution | Activity | ±1 SD |
| | Factors | ±2 SD |
| Final Demand | Factors | ±1 SD |
| Transfers | - | - |
| Relative Change of ±0.10 | | |
| <u>Descriptive Statistics</u> | | |
| | Population Mean | = - 0.019367 |
| | Standard Deviation | = 0.215315 |
| | N | = 30 |
| <u>Sub-Matrix</u> | <u>Multipliers[§]</u> | <u>Degree of Confidence[‡]</u> |
| Interindustry Transactions | Activity | ±1 SD |
| Value Added | Activity | ±1 SD |
| Distribution | Factors | ±1 SD |
| Final Demand | Factors | ±1 SD |
| | Institutions | ±1 SD |
| Transfers | - | - |

[§]The dash indicates no affect was measured.

[‡]The degree of confidence was measured using the population mean ±1 standard deviation (±1 SD) or the population mean ±2 standard deviations (±2 SD). A ±1 SD degree of confidence indicated the SAM output multipliers were affected slightly by the absolute or relative changes. A ±2 SD degree of confidence indicated the SAM output multipliers were affected readily by the absolute or relative changes.