Environmental Economic Accounts for Forests (CEAF): Proposal of a Methodological and Institutional approach for Application in Brazil

José Antonio Sena (Instituto Brasileiro de Geografia e Estatística – IBGE)
Geraldo Sandoval Goes (Ministry of Environment)

Abstract

The growing concern about the environmental impacts of economic activity in contemporary society is reflected in the field of statistics. It has long been argued that the System of National Accounts (SNA), that measures economic activity, fails to measure the contribution of the environment to the economy and the subsequent impacts of the economy on the environment. Activities that contribute to environmental degradation are often recorded as positive contributions to the economy, and are accounted for as economic growth, in an expansion often supported by the depletion of non-renewable natural resources. Problems of this nature have led to an effort by the United Nations and the World Bank to reform the system, enabling it to properly record such phenomena and to produce indicators that reflect the impacts of environmental degradation promoted by production and consumption activities. In 2012, the United Nations adopted the System of Environmental-Economic Accounting Central Framework (SEEA) as a satellite system to the SNA in an effort to better understand the interactions between the environment and the economy.

This article presents a methodological proposal to carry out Environmental Economic Accounts for Forests based on the United Nation's SEEA framework. Databases, surveys and studies available in Brazil are also presented and can serve as input for the accounts. A proposal is presented to establish an institutional platform for the development of Forest Accounts in Brazil. This will allow the compilation of a system of satellite accounts that will enable the SNA to incorporate environmental dimensions, such as the physical and monetary accounts of forest and timber products.

The expected results of this work are related to the dissemination of the environmental accounting methodology and the incentive to build an institutional platform for the elaboration of the Environmental Economic Accounts for Forests (CEAF) in Brazil. This work will contribute to support the Brazilian Forest Service in the creation of an Interdepartmental Ordinance to establish an Executive Group and a Steering Committee for the compilation of Environmental Economic Accounts for Forests.

Keywords: Sustainable Development, Environmental Economic Accounts for Forests; Green GDP.

Contents

1) Consider what the key issue of your paper should highlight.

The construction of environmental economic accounts of forests in Brazil responds to demands of great relevance for Brazilian society, due the huge territorial extension of Brazilian forests, enormous stocks and the magnitude of the flows of this natural resource for economy as well as the importance of this resource for international trade. The article also highlights the existence of a large forest database in Brazil, which often needs to be adapted to the international statistical standards and the necessary specifications defined by the SEEA methodology for structuring the System Environmental Economic Accounts for Forestry. In addition to the issue of exploring a natural resource (timber), there are related issues such as climate change (CO2 emissions), water availability issues and biodiversity.

2) What input would you like to receive from the London group? – Design questions in your paper that we as readers can pick up and think over before the meeting

Exchanges of experiences with other countries, methodological advances in both the part regarding the collection of statistics, and in structuring of account (Inventory Assessment, Forest Flows for economy and the economy for the Forest) and economic valuation. How is the experience of the countries of world in building hybrid forest accounts? How could the value of intermediate consumption of forest products be assessed? (Total intermediate consumption and use for forestry resources)

3) What output would you like to provide to the London group and the furthering of the environmental economic and ecosystem accounts? – design a train of thought that is clear in the paper how you see this fitting in the grander scheme of global harmonization.

The London Group can improve a methodological proposal presented for Forest Accounts of Brazil, considering a need to know, measure and follow through an accounting system performed according to internationally accepted methodological standards. Establishment of conditions to optimize the sustainable use of the Brazilian's forest and respond a wishes of the international community, considering a wide range of areas and the global impacts that these activities cause (climate change and, weight and relevance for Global Biodiversity Balance). How the forest account in Brazil has not yet been implemented, we would also like to receive inputs regarding how the formulation of public policies can be improved through the use of inputs from these accounts. If possible successful experiences of countries that implemented such accounting and their use in the implementation of public policies in the field of economic planning, thereby a mechanisms for protection and preservation of the forest and biodiversity. We hope that with the implementation of the forest accounts in Brazil, in the coming years we can bring significant elements to the discussions and improvements for London Group.

1. Introduction

The methodological framework that underpins this proposal is the United Nation's System of Environmental-Economic Accounts – Central Framework (UNSD, 2009). In physical terms, the scope of measurement of each individual component of the system is wide and extends to include all the natural resources that can provide benefits to humanity. However, in monetary terms, the scope is limited to the individual components that have an economic value based on the valuation principles of the System of National Accounts (SNA) (United Nations, 2004). For example, in physical terms, all land within a country is within the scope of the System of Environmental Economic Accounts (SEEA) to allow a complete analysis of changes in the land cover and use. However, in monetary terms, some land may have zero economic value and therefore should be excluded. The wider scope applied in physical terms is intended to better assess the environmental characteristics of the individual components.

In the specific case of timber resources, both the cultivated timber resources and the natural timber resources should be considered in the accounts. According to the methodological assumptions of the United Nations Statistics Division (UNSD, op. cit.), Forest Accounts are related to Land Cover and Use Accounts, for which IBGE has already published and disseminated works. When Forest Accounts start to be developed, the scope can be wider, in view of the studies conducted by IBGE, according to the internationally accepted and published methodology.

For better understanding the issues related to Forest Accounts, we will direct the focus to the forest stocks in view of the land use, and a more specific focus will be directed to timber products, which are measured by economic surveys of IBGE. Methodologically, according to the UNSD, the forest accounts are "coupled" with the land use accounts, and IBGE has works related to this subject. We will present in this article the main aspects involving these two approaches, starting with the forest accounts under the perspective of land use.

2 Asset accounts for land cover and use: Tree Covered Areas

The land cover and use is central to economic and environmental accounts. Some of the issues that can be considered in the context of the land cover and use accounts include, besides an assessment of the land property and use as part of the economic output, the impacts of urbanization, the intensity of agricultural production and animal husbandry, forestry and deforestation, water use and other direct and indirect land uses.

The land use classification in the System of Environmental Economic Accounts is presented in **Table 1**. At the highest level, the land use is classified by main types of surface: land and inland waters. The classification by type of surface is the main use of classification as a means of comparing alternative uses. Generally, the types of use of inland water areas and land areas are quite distinct; and these different areas tend to be managed in different ways.

Table 1 – Land use classification	
1	**Land**
1.1	Agriculture
1.2	Forestry
1.3	Land used for aquaculture
1.4	Use of built-up and related areas
1.5	Land used for maintenance and restoration of environmental functions
1.6	Other uses of land n.e.c.
1.7	Land not in use
2	**Inland waters**
2.1	Inland waters used for aquaculture or holding facilities
2.2	Inland waters used for maintenance and restoration of environmental functions
2.3	Other uses of inland waters n.e.c.
2.4	Inland waters not in use

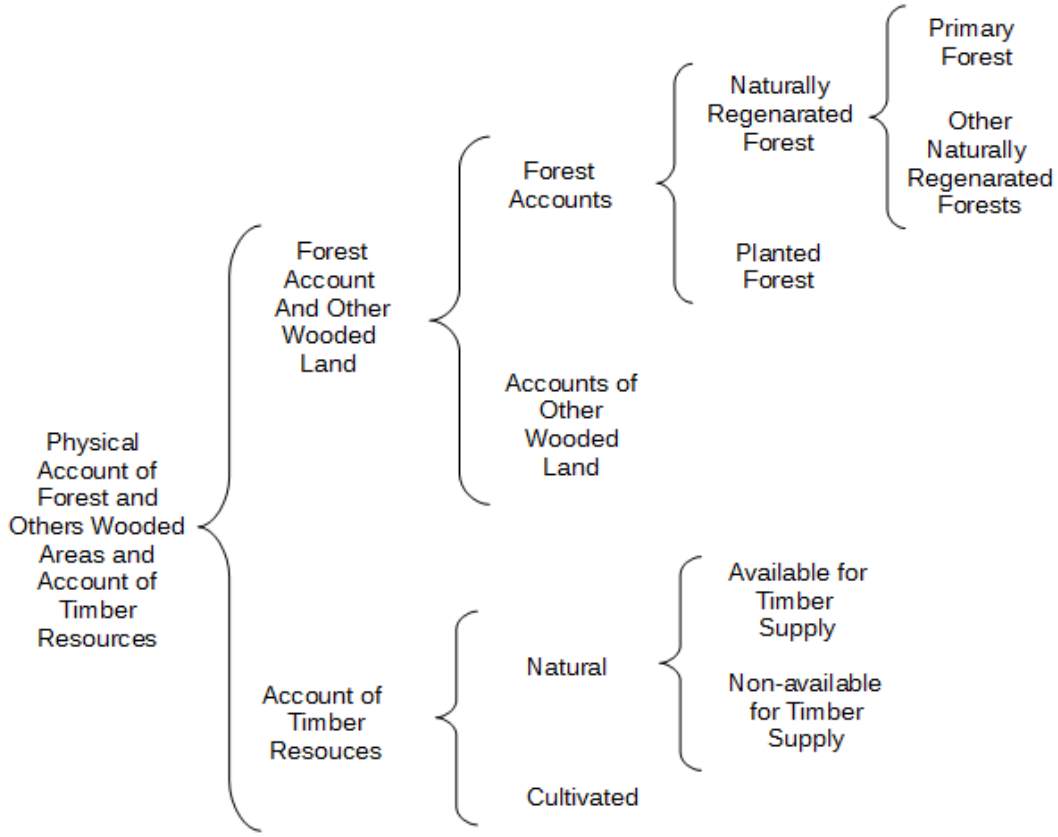
For standardization purposes and harmonization of statistical data sets, a classification composed of 14 classes was established as shown in Table 2. The 14 classes are a comprehensive set of types of land cover with clear boundaries based on LCCS settings that are mutually exclusive and unambiguous. This land cover classification can be used at all scales regardless of the observation method, so that it allows the combination of local and regional maps with continental and global maps, without loss of information.

Table 2 – Land cover classification	
Category	
1	Artificial surfaces
2	Herbaceous crops
3	Woody crops
4	Multiple or layered crops
5	Grassland
6	Tree covered areas
7	Mangroves
8	**Shrub covered areas**
9	Shrubs and/or herbaceous vegetation, aquatic or regularly flooded
10	Sparsely natural vegetated areas
11	Terrestrial barren land
12	Permanent snow and glaciers
13	Inland water bodies
14	Coastal water bodies and inter-tidal areas

In the first instance, the SEEA Central Framework (UNSD, op. cit.) recommends that countries develop estimates of the total area of land, classified by land cover, at the beginning and at the end of each accounting period. This is because the remote sensing data (aerial photographs or satellite images) related to vegetation cover are generally available and require less interpretation than land use. It is noted that the land cover and use are interrelated.

According to the SEEA Central Framework (UNSD, op. cit.), the accounts of forests and other wooded land, which are usually presented together with the timber resource

accounts, are examples of Land Use Accounts. The following diagram shows this structure.



The fundamental distinction between the physical assets account for forest and other wooded land and the timber resources asset accounts is that the scope of timber resources is not limited to timber from forests and other wooded land. Another important distinction is that the timber resources assets accounts focuses on the volume of timber resources, rather than on the land area covered by forests and other wooded land. But the focus of the accounts of forests and other wooded land is directed to changes on the area of land, for example, due to deforestation and afforestation, rather than to the quantity and the value of timber removed from forest covered and other wooded land. The scope of accounts of forest and other wooded land is defined consistently with the definition of land in the FAO *Global Forest Resources Assessment* 2010 (FAO, 2010).

2.1. Changes in Land Cover and Use Accounts of Brazil (2000-2010-2012-2014) as an input to the Forest Accounts

The Brazilian Institute of Geography and Statistics (IBGE) conducted a work that applies the methodology of Environmental Economic Accounts to land use. In the present paper, the issue of changing cover and use of forest areas for other types of cover and use was quite stressed. The main points of this work in the aspects most related to the issue of forests are presented below.

The mapping of the land cover and use, repeated at regular time intervals, allows the detection of changes in the dynamics of forms of occupation and organization of space. Similarly, these results, translated into numerical aggregate values, provide important support to studies that assess the state of ecosystems, enabling the measurement of stocks in terms of existing area, pointing out the main flows of change and the main

drivers of pressures exerted by human activity on the use of these natural resources. The project Changes in Land Cover and Use (IBGE, 2015) aims to monitor changes in Land Cover and Use in Brazil every two years. The present report lists the changes between the years 2000, 2010, 2012 and 2014.

The information on the dynamics of the forms of land use are an important subsidy to managers involved in the design and implementation of environmental planning and land use policies. Knowledge of the method and the rate of change of the space occupation forms are an essential support to the management of natural resources and the research that follow up climate change. They are also an instrument that can provide the basis for construction of Environmental Accounts, which include, among others, the Physical Flows Accounts (water, energy and materials), Asset Accounts (agriculture, forestry, soil-related, energetic and biotic) and Experimental Ecosystem Accounts, which seek to aggregate the information from the various accounts previously mentioned.

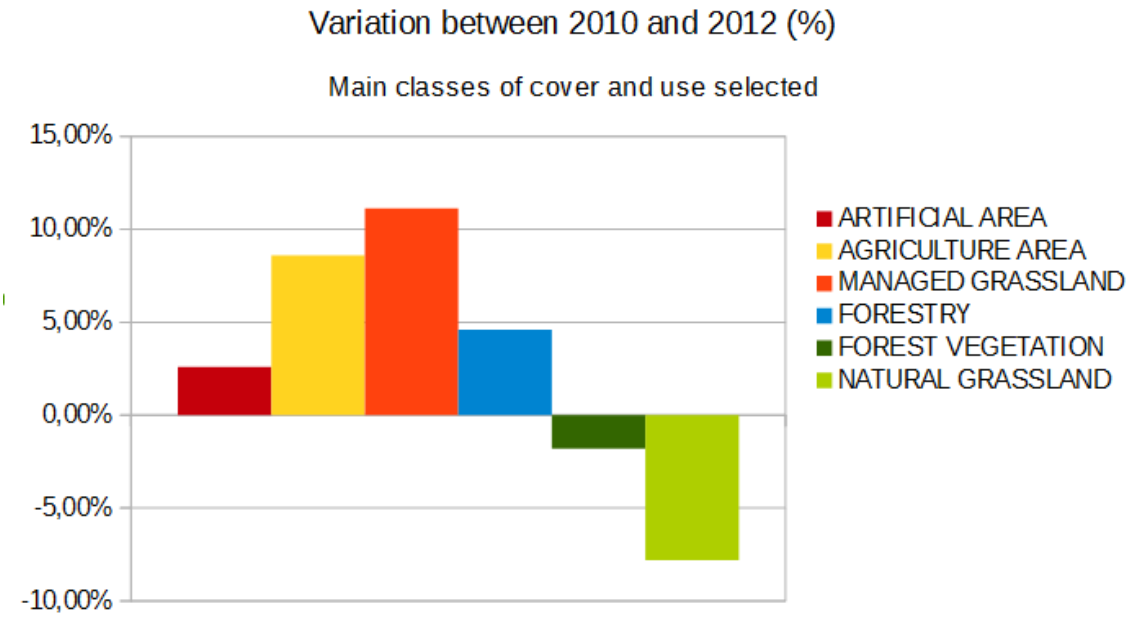
The monitoring of changes is also included in the construction of Sustainable Development Goals (SDG), specifically in goal number 15, whose purpose is to "protect, restore and promote the sustainable use of terrestrial ecosystems, sustainable management of forests, combating desertification, stop and reverse land degradation and halt the loss of biodiversity" (UNITED NATIONS, 2016). The identification of changes basically follows the visual interpretation of satellite images; consultations of other cartographic materials; answering questions on the web tools SERIES-INPE and SATVeg-EMBRAPA; and queries on GoogleEarth. Other being consulted are the statistical data produced by IBGE, especially agricultural surveys, and field survey is conducted in the different Brazilian biomes, to contemplate specific regional concerns.

2.2. Results, Analysis and Discussion of the Land Cover and Use Accounts

As the main results of the work, it was observed that in the period 2012-2014 about 4.6% of Brazilian territory had one kind of change. This change rate is slightly higher than that observed in the previous period (2010-2012), which was 3.5%. Most of this difference is directly related to changes in forms of land cover and use.

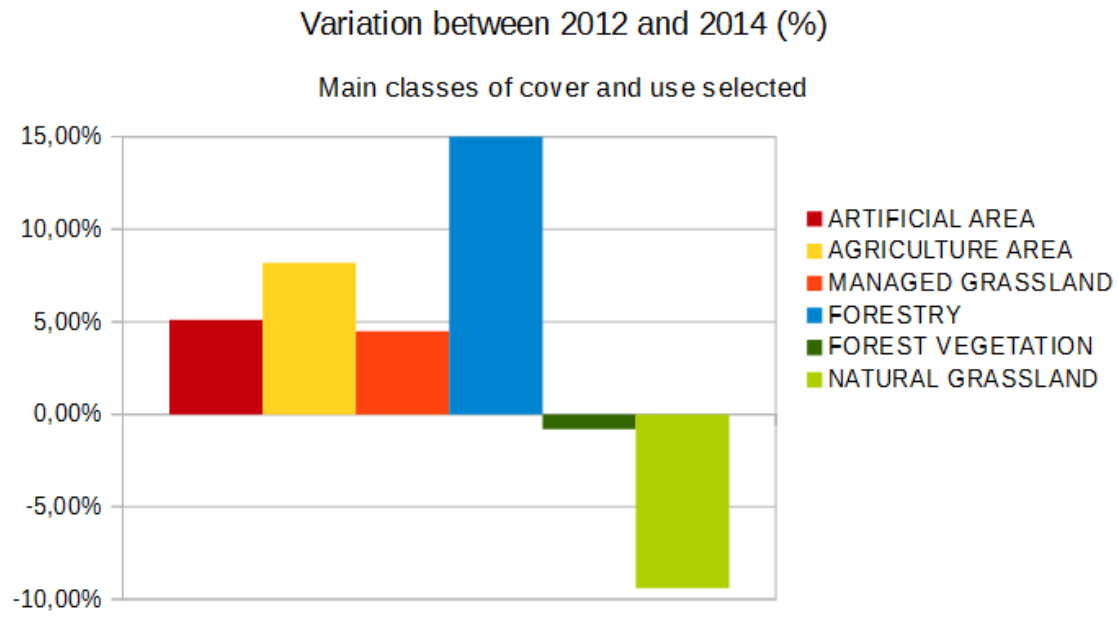
Comparing these changes and those that occurred in the previous period can highlight some situations, such as the expansion of agriculture, managed grassland, forestry and artificial areas, and reductions of forest vegetation and natural grassland (Graphs 1 and 2).

Graph 1: Changes in Land Cover and Use between 2010 and 2012



Source: IBGE. Directorate of Geosciences. Project: Changes in Land Cover and Use in Brazil

Graph 2: Changes in Land Cover and Use between 2012 and 2014



Source: IBGE. Directorate of Geosciences. Project Changes in Land Cover and Use in Brazil

As for the reductions, there are the noteworthy classes of forest vegetation and natural grassland. The first one decreased by 1.8% in the period 2010-2012 and 0.8% in the period 2012-2014. The data show that, although there is still a loss of forests, this process has happened at a slower pace. The analysis of this information allows to observe a trend of expansion of agricultural areas with managed grassland rather than

natural grassland (natural non-woody vegetation areas subject to grazing, which predominate in the biomas cerrado, caatinga and pampa).

TABLE 3 - CLASSES OF LAND COVER AND USE	
1 - Artificial area	More than 75% of the employed polygon with urban use, structured buildings and road system, dominated non-agricultural artificial surfaces. Included in this category are the cities, towns, villages, areas of roads, services and transport, energy networks, associated communications and land areas occupied by industries, industrial and commercial complexes and buildings that can, in some cases, be located in peri-urban areas. Also belong to this class Indian villages and mining areas. Urban areas can be continuous or discontinuous.
2 - Agriculture area	More than 75% of the polygon is occupied by temporary and permanent crops, irrigated or not, and the land used for the production of food, fibers and agribusiness commodities. It includes all cultivated land, which can be planted or rest and also the cultivated flooded areas. It can be represented by heterogeneous agricultural areas or extensive areas of plantations.
3 – Managed grassand (formerly planted pasture)	Area predominantly occupied by cultivated herbaceous vegetation. They are places for livestock grazing and other animals, formed by planting perennial forage, subject to high-intensity anthropogenic interference, such as cleaning of the earth (and stumps), liming and fertilization.
4 – Agriculture area with forest remains mosaic	Area containing more than 50% and less than 75% of the polygon used for agriculture, pastures and/or forestry and the remainder occupied by remaining forests. It might occur to a lesser extent other vegetable formations (grasses and shrubs).
5 - Forestry	Area characterized by growing forests planted with exotic species. In this class more than 75% of the polygon must be occupied by forestry.
6 - Forest vegetation	More than 75% of the polygon occupied by forests. Are considered forest the tree formations higher than 5 meters, including therein the areas of Dense Forest (forest structure with a continuous top cover), Open Forest (forest structure with varying degrees of disruption of the upper cover as its kind with vines, bamboo, palm or sororoca), of Seasonal Forest (forest structure with loss of leaves in the upper strata during unfavorable season – dry and cold), and the Araucaria Forest (forest structure comprising the natural distribution area of *Araucaria angustifolia* striking element in the upper strata which form generally continuous coverage). It includes other features due to its size exceeding 5 m in height, such as forested Savannah,
7 - Forest vegetation with agriculture activity mosaic	Area containing more than 50% and less than 75% of the polygon with forest vegetation and the remainder occupied by temporary crops tiles, irrigated or not, permanent crops, pastures and/or forestry.
8 - Shrub vegetation	More than 75% of the polygon occupied by non-woody formations (Country). It is understood as the different

	countryside physiognomically vegetation very different categories of forest, i.e., those that are characterized by a stratum predominantly shrub, sparsely distributed over a grassy-woody mat. Included in this category are the savannas, steppes, steppe-like savannas, Pioneer Formations and Ecological Refuges. They are spread by different phytogeographic regions comprising different primary types: planaltinas steppes, rocky fields of coastal mountains and coastal hidroarenosos fields (sandbank) according to the Technical Manual of Land Use (2013).
9 - Wetland (Formerly flooded grassland)	Area occupied by herbaceous natural vegetation (10% coverage or more), continuously or periodically flooded with fresh water or brackish (estuaries, ponds, etc.). It includes the ponds of land, marshes, swamps, among others. The flood period should be at least two months a year. May occur shrubs and woody vegetation, provided that they occupy less than 10% area of the total.
10 - Natural grassland	Area occupied by grassland (natural) and other grazing subjected to low intensity anthropogenic interference.
11 - Agriculture area with shrub remains mosaic	Area containing more than 50% and less than 75% of the polygon used for agriculture, pastures and/or forestry and the remainder occupied by Country remaining. Might occur, to a lesser extent, woody plant formations.
12 - Body of continental water	It includes all inland waters, such as rivers, streams, canals and other bodies of water linear. It also encompasses bodies of naturally closed water (natural lakes) and artificial reservoirs (artificial water impoundments built for irrigation, flood control, water supply and power generation).
13 - Body of coastal water	It includes all coastal waters (lagoons, estuaries and bays that occupy the Coastal Plains) and inserted into the waters 12 nautical miles, according to Law No. 8,617, of January 4, 1993.
14 - Uncovered area	This category includes rock outcroppings, cliffs, reefs and land with active erosion processes. It includes abandoned extraction sites with no vegetation, where 75% of the surface is covered with rocks, blocks and debris. It also includes the dunes, coastal and inland, and gravel buildup along the rivers.

Source: IBGE, Directorate of Geosciences, Coordination of Natural Resources and Environmental Studies, Land Cover and Use Change 2000 - 2010 - 2012 - 2014, 2016.

The full table of variation of land cover and use, according to classes, which shows the variation of stocks according to the different classes of use may be seen in the Annex.

3. Timber Resources Account

Timber resources accounts are presented in the SEEA – Central Framework methodology, together with the accounts of forests and other forested areas. In this section, we present the boundary between cultivated and natural timber resources and the timber resources assets accounts.

3.1. .Timber resources assets account

Timber resources are important environmental assets in many countries. They provide inputs for construction and the production of paper, furniture and other products, and are both fuel source and an important outlet of carbon.

The development of the asset accounts for timber resources is a measurement tool that provides information to evaluate and manage changes in timber resources and the services they provide. For a complete assessment of timber resources, it is also important to build active accounts in relation to the stock of land associated with timber resources, especially forests and other forested areas. Changes in the stock of forests and other forest cover due to afforestation and deforestation may be of special interest.

3.2. Physical asset accounts for timber resources

Physical asset accounts for timber resources record the volume of timber resources at the beginning and end of an accounting period and the change in this stock during the accounting period. The analysis of the natural growth of timber resources compared to removals is of particular interest.

Although there are no further systematic work on the accounting of timber stocks under a satellite account, IBGE systematizes economic information on timber products and plant extraction through the National Classification of Economic Activities (CNAE 2.0) and the Survey on the Production of Plant Extraction and Forestry (PEVS). The tables in the Annex present the information available on the subject in the IBGE surveys and have periodicity compatible with the formation of an accounting system for timber and non-timber forest products. This information is a relevant input for the future preparation of the forest accounts, and for this reason they will be presented in the following section.

4. Information basis for the Forest Accounts in IBGE Economic Surveys: Survey on the Production of Plant Extraction and Forestry (PEVS) and the Brazilian Forest Inventory (IFN)

The main objective of IFN is to produce information on forest resources in Brazil, both natural forests and planted forests, every five years, serving as a subsidy to the formulation of public policy for development, use and conservation. The scope of IFN comprises forest resources in general, the evaluation of the quality and conditions of forests and their importance to people. It was designed as a continuous forest inventory to monitor changes related to forests every five years. It is nationwide and uses a standardized methodology. In addition, the main focus of IFN is the production of strategic information for applications in public policies.

IFN is coordinated by the Brazilian Forest Service. Other institutions contribute in implementation and States also participate as partners and important beneficiaries of the data and information. The completion of the IFN is included in the new Forest Code (Law N. 12,651/2012) and the responsibility for their coordination by the Forest Service was understated in a federal law of 2007. When fully completed, IFN will represent an extremely important subsidy as a source of information for the Forest Accounts.

IBGE's Survey on the Production of Plant Extraction and Forestry (PEVS) is one of the main sources of information to fill the tables of the Forest Accounts. Below, it is presented a brief description of the research, according to the IBGE website. The Production of Plant Extraction investigates all existing natural and spontaneous forest formation in the

municipality from which products are collected. Forestry production is investigated in all existing forestry formation in the municipality that has been planted and led by man's action to the harvest. There are some forest species in Brazil that are found in natural stands (formations that arise without the interference of man and that constitute the forests and natural forests of the country) and that are also grown by man in a technical and ordered form, with the objective of obtaining greater economic results.

So, for statistical research purpose, these species are grouped in different surveys, according to being found in native or cultivated state. An example commonly found in the two states (native and planted) is the Brazilian pine. The black acacia, eucalyptus and pine are the American exotic species, that is, from other countries, not being found in native state in Brazil.

Research of Plant Extraction Production and Forestry aims to provide statistical information on the number and value of production obtained by the process of exploitation of natural forest resources, called plant extraction, as well as the exploitation of planted forest areas (forestry). The scope of the survey is the entire geographical area of the national territory, with the information being gathered at the municipal level. The periodicity of the survey is annual. For all investigated products, the quantities and average unit prices have as reference the base year of the survey. The research unit is the municipality where plant extraction and forestry activities take place.

The investigated variables are the output of plant extraction; forestry output; average price paid to producers. Products studied in this survey were classified in groups according to their forms of exploitation to provide greater efficiency in the stages of collection and calculation, as well as to facilitate the use of data by users. The following Table 4 presents the main products from the plant extraction activities in Brazil for the year 2015 recorded by the IBGE survey in physical quantities (tons) and monetary values.

TABLE 4

Quantity and value of products from plant extraction - 2015

Main products	Quantity	Value (R$ 1,000)
Alimentary (Tons)		
Açaí (fruit) (Tons)	216 071	480 637
Cashew-nut (Tons)	2 280	4 906
Brazil-nut (Tons)	40 643	107 443
Erva-mate (Tons)	338 801	396 282
Mangaba (fruto) (Tons)	663	1 575
Heart of palm (Tons)	4 669	14 406
Pequi (fruto) (Tons)	18 866	14 236
Pinhão (Tons)	8 393	21 187
Umbu (fruit) (Tons)	8 094	10 154
Rubber (Tons)		5 245
Hevea (coagulated latex) (Tons)	1 447	4 838
Hevea (liquid latex) (Tons)	52	407
Waxes (Tons)		
Carnaúba (wax) (Tons)	2 060	29 976
Carnaúba (powder) (Tons)	19 974	195 649
Fibers (Tons)	46 840	107 036

Buriti (Tons)	451	2 226
Carnaúba (Tons)	1 298	2 517
Piaçava (Tons)	44 805	101 300
Others (Tons)	286	994
Non-elastic gums (Tons)		
Sip (Tons)	1	2
Oleaginous (Tons)		
Babaçu (nut) (Tons)	77 955	107 746
Copaíba (oil) (Tons)	153	3 432
Cumaru (nut) (Tons)	97	2 911
Licuri (nut) (Tons)	4 072	4 039
Oiticica (seed) (Tons)	12	9
Pequi (nut) (Tons)	2 228	4 897
Tucum (nut) (Tons)	489	1 166
Others (Tons)	674	1 649
Tanning (Tons)		
Angico (bark) (Tons)	112	116
Barbatimão (bark) (Tons)	5	9
Others (Tons)	2	16

Source: IBGE - Produção da Extração Vegetal e da Silvicultura (PEVS)

5. Proposal of an institutional platform for forest accounts in Brazil

In Brazil, there are two institutions that can serve as support for the forest accounts, the Brazilian Forest Service (SFB), the body of the Ministry of Environment that was established in 2006 for the management and promotion of public forests and that is responsible for the National Forest Inventory (IFN), and the Brazilian Institute of Geography and Statistics (IBGE), which produces systematic information on a great part of the Brazilian forest production in its economic research.

The idea for the development of Forest Accounts is to use as a basis a system of forest information, which can aggregate and harmonize a wide range of information from the databases of the National Forest Inventory, the Rural Environmental Registry (CAR) and the National System of Rural Registration (SICAR), among others. Importantly, the collaboration with other institutions working with environmental and land issues is essential for getting significant information to fulfill all requirements of the recommendations for the development of Forest Accounts.

The institutional platform shall be designed and may have as example what was done for the Environmental Economic Accounts for Water, which regulated the participation of institutions involved (National Water Agency – ANA, Department of Water Resources and Urban Environment – SRHU and the Brazilian Institute of Geography and Statistics) through an interministerial ordinance signed in March 2012.

In the case of Environmental Economic Accounts for Water, the Interdepartmental Ordinance of March 2012 officially establishes the institutional partnership between IBGE, ANA and SRHU for the realization and implementation of the project. Thus, studies were concentrated on a set of institutions. IBGE is the coordinator of the compilation and analysis of the economic and demographic information, with the National Water Agency

(ANA) being responsible for water information (stocks) and the Department of Water and Urban Environment Resources (SRHU), for the information about the management of water resources. It is emphasized the importance of data and analysis of ANA's information that were critical for the early part of the work (stock assessment) with a view to providing a wide range of information that few countries have, considering the Brazilian continental dimensions.

For the Economic Water Accounts Committee to be established, the Ministry of Environment and the Ministry of Planning, Budget and Management considered the need to track and monitor the interactions between the economy and the water resources because of the importance of water for the development of economic activities. Besides representatives of the two ministries, representatives of ANA and IBGE also form the group. ANA has been developing studies on the outlook of water resources of the country – the Monthly Economic Report of Water Resources in Brazil – which will serve as an input for IBGE to do the accounting on the economic impacts of water.

The institutional structure created is made up of a Steering Committee, which represents the Boards of the three institutions that develop the Water Accounts and deliberate the proposals and referrals taken to them by the Executive Group, which represents the technical part, effectively developing and applying the methodology of the Environmental Economic Accounts for Water of Brazil, according to the international parameters already mentioned.

Since 2012, regular meetings of the Executive Group are being held, usually every six months, where the goals and short, medium and long term objectives and the necessary operational measures to implement them are discussed and analyzed. Similarly, at least once a year, there are meetings of the Steering Committee, which has a more institutional and decision character on procedures, understandings and referrals raised by the Executive Group.

The institutional coordination is crucial so that the information generated by different institutions can be shared on a common basis, and especially be the subject of a joint methodological effort, given that, even if there is a standard methodology developed by the Statistics Division the United Nations, its implementation requires adaptations to the specific characteristics of the type of data available and the relative importance of each element of Economics and of Natural Resources at the national level. In this sense, it is necessary to seek, for the Environmental Economic Accounts of the Forest, a similar structure so that this challenge can be performed.

The institutions that could participate in this institutional arrangement are, in the Ministry of Planning, IBGE, in the Ministry of Environment, the Brazilian Forest Service (SFB), the Secretariat of Biodiversity and Forest (SBF) and the Executive Secretariat (SECEX), and in the Ministry of Science and Technology, the National Institute for Space Research (INPE). Later, other institutions could join that interministerial platform according to their affinity to the theme and possible contributions to Forest Accounts.

6. Contribution of Forest Account to the Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs) represent a change in the overall policy from a predominantly economic focus to a perspective that includes more holistically the environment, the society and the governance. The measurement and monitoring of SDGs will therefore require an even more integrated approach at national and international level, based on a better understanding of the interactions and trade-offs between the different aspects of sustainability. This process should be supported by an

improved information system that integrates, in a comprehensive and coherent form, environmental, economic and social information. The Environmental Economic Accounting System (SEEA) provides the statistical framework required to support this approach, focusing on the integration of environmental information with economic information from the System of National Accounts.

To optimize the monitoring process of the SDG, it is recommended to use a monitoring framework consisting of indicators that are selected based on their ability to meet the minimum requirements, ensuring the policy relevance, analytical and methodological soundness and the practicality of the measurement. The System of Environmental Economic Accounts, adopted as an international statistical standard in 2012, was recognized as an important tool in this process of monitoring for data integration. Both through its ability to support the development of robust indicators for these requirements and through its role in the integration and rationalization of the statistical production process for a more efficient production of environmental and economic indicators at national level.

The 17 SDGs address different aspects of the environment and its relation to the economy, and the form in which those different objectives are monitored, must have a coherent approach to support the integrated policies agenda. The SEEA has a consistent approach to measure different environmental issues (including water, energy, air emissions, land, forestry, agriculture, etc.). By providing a standard set of definitions, classifications and methodologies for the integration of information, the use of SEEA provides a more sound set of indicators that comprise all the goals. In addition, the use of SEEA to support the monitoring of specific objectives can also ensure an approach based on consistent standards between individual goals. For example, in the case of Objective 6 (water), SEEA provides a basis for developing an integrated approach of monitoring to consistently assess the flows of water and sewage between the environment and the economy. This supports the robust measurement of a series of water indicators and their breakdown by industry sector.

Directly related to Environmental Economic Accounts, the SDG 12 (Ensure Sustainable Production Standards), also identified as a cross-facilitator for other purposes, refers to the efficient use of services and related products, while minimizing the use of natural resources and toxic materials, emissions of waste and pollutants. The accounting approach used by the SEEA provides a mechanism to measure a series of indicators related to sustainable production and consumption patterns, linking physical flow information with economic information (to support the decoupling analysis), providing a mechanism for assessing the environmental impact of economic activities and highlighting funding and investment in sustainable production and consumption.

Another objective that is related to the Forest Accounts is SDG 15: Protect, restore and promote the sustainable use of terrestrial ecosystems, sustainable management of forests, combating desertification, stop and reverse land degradation and halt the loss of biodiversity. Specifically in target 15.2, which is, by 2020, to promote the implementation of sustainable management of all types of forests, to stop deforestation, to restore degraded forests and to substantially increase afforestation and reforestation globally.

7. Conclusions

This article aimed to present two important aspects:
(i) present the methodology of the Environmental Economic Accounts – Central Framework (SEEA – CF) of the United Nations Statistics Division, as well as the limitations for its adaptation to the Brazilian reality.
(ii) the sources of information available in the country, that can serve as inputs for the preparation of the Forest Accounts according to the SEEA Central Framework methodology, targeting an initial assessment of data and gaps to fill the reference tables of this methodology.
(iii) show the technical and institutional state of art in the trajectory of the implementation of the Environmental Economic Accounts for Forests in Brazil.

A limitation found in the methodology proposed by the SEEA Central Framework is the treatment of non-wood products, which have not been highlighted on this methodology, but which have significant importance for the Brazilian reality. We believe that the development of forest accounts in Brazil may contribute and collaborate with the UN Statistics Division (UNSD) for the development of this methodological approach.

Finally, we would like to point out that:

i) The methodologies for the construction of Environmental Economic Accounts for Forests (CEAF) of the SEEA-CF of the United Nations Statistics Division (UNSD, 2014) and the System of Environmental Economic Accounts – Agriculture, Forests and Fisheries (SEEA-AFF) of FAO, although not fully consolidated as other satellite accounts (e.g.: Water, Health and Culture), are available for use and are applied in a continuous improvement process of this methodology.
ii) There are data, information, studies and surveys in Brazil which are dispersed and can be used as inputs for the construction of Environmental Economic Accounts for Forests (CEAF), such as the National Forest Inventory (IFN) of the Brazilian Forest Service/Ministry of Environment and IBGE's PEVS survey;
iii) The urgent need to build an institutional platform for the development of the Environmental Economic Accounts for Forests in Brazil.

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ANNEX

Physical account to land cover and use (km²) - Brazil, 2000 - 2010 - 2012 - 2014.

Variation of land cover and use, according classes

		Artificial areas	Agriculture areas	Managed grasslad	Agriculture area with forest remaind mosaic	Forestry	Forest Vegetation	Forest vegetation with agriculture activity mosaic	Shrub vegetation	wetlands	natural grassland	Agriculture area with shrub remains mosaic	uncovered area
Opening stock(2010)		**39.366**	**475.509**	**860.237**	**791.492**	**66.396**	**3.259.721**	**461.309**	**91.917**	**44.456**	**1.915.225**	**229.589**	**5.640**
1. Additions to stock	Artificial areas	0	82	55	100	6	0	32	0	0	4	30	1
	Agriculture area	12	0	242	227	71	0	40	0	1	123	277	0
	Managed grassland	7	189	0	562	67	6	472	0	0	679	94	0
	Agriculture area with forest remains mosaic	351	8.259	13.231	0	2.182	40	6.639	1	1	481	22	0
	Forestry	24	1.270	958	3.272	0	2	1.238	0	0	76	82	0
	Forest vegetation	307	3.452	18.483	12.268	478	0	24.300	9	18	66	23	25
	Forest vegetation with agriculture activity mosaic	162	4.190	13.646	25.055	3.787	152	0	0	50	122	26	6
	Shrub vegetation	3	40	99	3	3	0	1	0	1	2.195	206	1
	Wetland	3	26	42	35	0	3	39	9	0	2.561	53	0
	Natural grassland	397	23.590	50.242	232	3.342	1	302	88	77	0	78.123	32
	Agriculture area with shrub remains mosaic	14	590	709	12	26	0	5	0	2	444	0	2
	Uncovered area	26	13	1	1	27	0	7	0	0	5	22	0
	Revaluation	17	92	144	175	10	8	186	4	60	76	74	3
	Total adiction of stock	**1.323**	**41.792**	**97.852**	**41.943**	**9.997**	**212**	**33.261**	**112**	**211**	**6.832**	**79.031**	**70**
2. Reduction in stock	Artificial areas	0	12	7	351	24	307	162	3	3	397	14	26
	Agriculture area	82	0	189	8.259	1.270	3.452	4.190	40	26	23.590	590	13
	Managed grassland	55	242	0	13.231	958	18.483	13.646	99	42	50.242	709	1
	Agriculture area with forest remains mosaic	100	227	562	0	3.272	12.268	25.055	3	35	232	12	1
	Forestry	6	71	67	2.182	0	478	3.787	3	0	3.342	26	27
	Forest vegetation	0	0	6	40	2	0	152	0	3	1	0	0
	Forest vegetation with agriculture activity mosaic	32	40	472	6.639	1.238	24.306	0	1	39	302	5	7
	Shrub vegetation	0	0	0	1	0	9	0	0	9	88	0	0
	Wetland	0	1	0	1	0	18	50	1	0	77	2	0
	Natural grassland	4	123	679	481	76	66	122	2.195	2.561	0	444	5
	Agriculture area with shrub remains mosaic	30	277	94	22	82	23	26	206	53	78.123	0	22
	Uncovered area	1	0	0	0	0	25	6	1	0	32	2	0
	Total reduction of stock	**311**	**992**	**2.076**	**31.206**	**6.922**	**59.434**	**47.198**	**2.552**	**2.772**	**156.426**	**1.805**	**102**
Closing stock (2012)		**40.377**	**516.309**	**956.013**	**802.229**	**69.471**	**3.200.499**	**447.372**	**89.477**	**41.895**	**1.765.632**	**306.816**	**5.609**

Physical account to land cover and use (Km²) - Brazil, 2000 - 2010 - 2012 - 2014

Variation of land cover and use, according classes

		Artificial areas	Agriculture areas	Managed grasslad	Agriculture area with forest remaind mosaic	Forestry	Forest Vegetation	Forest vegetation with agriculture activity mosaic	Shrub vegetation	wetlands	natural grassland	Agriculture area with shrub remains mosaic	uncovered area
Opening stock(2012)		**40.377**	**516.309**	**956.013**	**802.229**	**69.471**	**3.200.499**	**447.372**	**89.477**	**41.895**	**1.765.632**	**306.816**	**5.609**
1. Additions to stock	Artificial areas	0	0	0	0	0	0	0	0	0	0	0	1
	Agriculture area	264	0	6.981	5.178	1.614	0	1.336	0	4	0	5.841	0
	Managed grassland	700	24.461	0	7.450	5.201	0	2.161	3	1	13.966	9.200	0
	Agriculture area with forest remains mosaic	842	8.690	19.332	0	3.172	614	3.785	0	0	0	0	0
	Forestry	22	788	564	759	0	6	308	0	0	294	417	0
	Forest vegetation	99	1.676	6.290	4.740	332	0	15.008	0	0	0	0	0
	Forest vegetation with agriculture activity mosaic	202	1.980	7.611	7.655	1.191	2.082	0	0	0	0	0	0
	Shrub vegetation	4	55	84	0	29	0	0	0	164	1.076	23	323
	Wetland	0	4	11	0	0	0	0	272	0	16	0	0
	Natural grassland	779	24.680	62.818	0	7.381	0	0	265	0	0	87.201	0
	Agriculture area with shrub remains mosaic	100	5.588	3.163	0	671	0	0	0	1	3.962	0	3
	Uncovered area	27	3	4	0	49	0	0	0	0	9	0	0
	Revaluation	0	242	249	5.102	19	1.707	5.846	211	833	7.612	2.486	0
	Total adiction of stock	**3.038**	**68.165**	**107.107**	**30.883**	**19.659**	**4.409**	**28.444**	**751**	**1.002**	**26.935**	**105.169**	**328**
2. Reduction in stock	Artificial areas	0	264	700	842	22	99	202	4	0	779	100	27
	Agriculture area	0	0	24.461	8.690	788	1.676	1.980	55	4	24.680	5.588	3
	Managed grassland	0	6.981	0	19.332	564	6.290	7.611	84	11	62.818	3.164	4
	Agriculture area with forest remains mosaic	0	5.178	7.450	0	759	4.740	7.655	0	0	0	0	0
	Forestry	0	1.614	5.201	3.172	0	332	1.191	29	0	7.381	671	49
	Forest vegetation	0	0	0	614	6	0	2.082	0	0	0	0	0
	Forest vegetation with agriculture activity mosaic	0	1.336	2.161	3.785	308	15.008	0	0	0	0	0	0
	Shrub vegetation	0	0	3	0	0	0	0	0	272	265	0	0
	Wetland	0	4	1	0	0	0	0	164	0	0	1	0
	Natural grassland	0	0	13.966	0	294	0	0	1.076	16	0	3.962	9
	Agriculture area with shrub remains mosaic	0	5.841	9.200	0	417	0	0	23	0	87.201	0	0
	Uncovered area	1	0	0	0	0	0	0	323	0	0	3	0
	Revaluation	978	4.708	1.035	3.744	0	1.166	1.534	150	154	9.204	1.635	0
	Total reductionof stock	**979**	**25.926**	**64.177**	**40.179**	**3.158**	**29.311**	**22.255**	**1.907**	**458**	**192.328**	**15.123**	**93**
Closing stock (2014)		**42.437**	**558.549**	**998.944**	**792.933**	**85.972**	**3.175.597**	**453.560**	**88.320**	**42.440**	**1.600.238**	**396.863**	**5.844**

Fonte: IBGE, Diretoria de Geociências, Coordenação de Recursos Naturais e Estudos Ambientais, Mudanças de Cobertura e Uso da Terra 2000 – 2010 – 2012 – 2014, 2016.