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Towards a System of Environmental Economic Accounting for Agriculture (SEEA-AGRI)

Paper prepared for FAO[1]

(for decision)

[1] Paper prepared by Juan-Pablo Castañeda and Jaime Luis Carrera, Institute of Agriculture, Natural Resources and Environment, Rafael Landívar University, Guatemala.

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1. Introduction

An intimate connection has always existed between the human economy and the natural environment, but it was until the last part of the twentieth century that this notion gained more recognition. It is now widely accepted that economic growth, human welfare and sustainable development are dependent upon the services provided by the environment. These services are related to the provision of natural resources for economic production and consumption, the absorption of wastes from socioeconomic activities and the provision of habitat for all living beings, including humans. On the other hand, the environmental impacts of mankind, particularly economic activity, have confirmed the vulnerability of the ecosystems under exploitation and pollution rates above their carrying capacity.

Consequently key questions arise about whether natural endowments are being used in a responsible, rational and sustainable way. Is the current level of use affecting natural capacity of ecosystems to bring basic services now and in the future? Are actual levels of pollution and environmental degradation threatening human health and the existence of species? Is natural capital being used in an economic and technical efficient way, in order to ensure that valuable resources are not being wasted? Answering these questions, among others, is essential in order to make the concept of sustainable development operational.

It is broadly accepted by the international community that only by integrating the economy and the environment can implications for sustainability of different patterns of production and consumption be examined or, conversely can the economic consequences of maintaining given environmental standards be studied (UN *et al*, 2003). An important step forward along this path is the development of the System of Integrated Environmental and Economic Accounting (SEEA) under the guidance of the UN's Statistical Commission. The SEEA provides a comprehensive and broadly accepted framework for incorporating the role of the environment and natural capital into the conventional system of national income accounts through a system of satellite accounts for the environment.

This paper describes the importance of using the SEEA as the basis of an integrated accounting framework, to capture the specific relationships between the agricultural sector and the natural environment *vis a vis*. This framework is defined as the System of Integrated Environmental and Economic Accounting for Agriculture (SEEA-AGRI). Within this framework, agriculture is interpreted in the broad sense as all activities related to crops, livestock, forestry and fisheries.

The paper provides an overview and discussion of some of the key issues that emerge for the construction of such a system. The first three sections explain the need and merits of an integrated approach as well as the linkages with other complementary systems. Section four defines the aim and scope of the proposed framework and in section five a preliminary implementation strategy is outlined. Finally, section six examines the framework limitations and the feasibility of country implementation of the SEEA-AGRI.

2. The need of an accounting framework for agriculture and the environment

The System of National Accounts (SNA) consists of a coherent, consistent and integrated set of macroeconomic accounts; balance sheets and tables based on a set of internationally agreed concepts, definitions, classifications and accounting rules (UN, 1993). It is the result of a succession of revisions and a process of standardization done since the 1940s until the most recent developments in 1993 and 2008. The SNA is particularly important because it constitutes the primary source of information about the economy and is widely used for analysis and decision-making in all countries.

Whilst it provides practical measures of macroeconomic performance, the SNA fails to reflect the full costs and benefits to society, of economic activities. One of the main shortcomings of the SNA is that the impact of the environment on the economy and the effects of the latter on natural capital have not been readily identifiable within the economic accounts. The SEEA, pioneered by the United Nations in 1993, is a response to these challenges. It augments traditional national accounts to integrate economic and environmental statistics in a unique framework that allows for evaluation of environmental sustainability of economic activity. With the publication of the revised SEEA Handbook in 2003, following more than a decade of conceptual work and empirical applications by national and international agencies, the international community considered that enough practice and methodological development had taken place and considered the SEEA mature to be mainstreamed in official statistics. The UN Statistical Commission at its session in 2007 recommended the elevation of the SEEA to the level of an international statistical standard and established the UN Committee of Experts on Environmental-Economic Accounting to oversee and provide guidance and direction to the revision of the SEEA.

There are several reasons that justify the use of an accounting framework for agriculture and the environment based on the SNA/SEEA structure. We group them in two: reasons related to the need to unravel the relationships between agriculture and the environment, and reasons that deal with the methodological statistical enhancement of exploiting an analytical accounting framework.

When exploring the ***relationships between agriculture and the environment***, conventional accounts are more limited. They only cover the economic performance and functions of agriculture as reflected in market activities and their evolution over time. However, they do not include other important issues in order to get an accurate value of its contribution to society, taking into account the true costs and benefits of agricultural production. In that context, the SEEA framework is a useful tool to evaluate environmental sustainability of those industries making extensive use of natural resources, either as inputs or sinks. On the one hand, the relationship between the environment and agriculture is so that natural environments basically provide a form of infrastructure and a flow of economically valuable and critical environmental assets to agricultural activity such as land, soil and water. In terms of natural resource use, the role of agriculture may be significant in an important share of the countries. For example, agriculture accounts for up to a 90 percent of water abstraction in many countries. On the other hand, agriculture uses, have a significant contribution to soil erosion, land degradation and water quality changes.

An important distinction to be made is between those assets that can be attributed to agriculture, since they are under its control (mainly land-based assets), and those that cannot. From there, two types of accounting adjustment may be distinguished for the agricultural assets. The first one would focus on the services derived from the land based stock of assets (habitat and species, landscape, etc). The second one would consider the impact of agricultural activities on the ability of assets to provide environmental services (e.g. sink functions), either by modifying the quality or quantity of the asset (Eftec, 2004).

Furthermore agriculture also may produce some benefits that are not registered nor valued in the system of national accounts. In fact agriculture produces ecosystem services like carbon sequestration, habitat for wildlife, mitigation of droughts and floods, beyond others. Therefore these environmental services that flow from considered agricultural assets should be attributed as additional income to the sector, in order to fully account for the sector contribution. In that context, a monetised environmental account for agriculture would provide an economic measure of the sustainability of the activity; an accurate value of its contribution to a nation's wellbeing; an indication of the extent agriculture affects the welfare generated by other sectors; and useful information and inputs for policy-making and cost benefit analysis for agricultural and related environmental policies.

From the ***methodological perspective***, to apply the SEEA framework into agricultural statistics will help improve and uplift the conceptual and analytical strength and capability of agricultural statistics, which is the goal of the Global Strategy to Improve Agricultural and Rural Statistics (GSIARS) (WB, FAO, UN, 2010). The SEEA-AGRI can play an important role in many aspects of the GSIARS, among others, three are of special importance.

First, adopting an accounting approach for a statistical framework has the advantage of having a set of standard classifications from which consistent and comprehensive set of data series are compiled that are comparable across countries. The coherence of the data series will subsequently ensure a mutually consistent set of derived analytical indicators. Second, the accounts can provide a complete set of variables and standard terminologies for identifying and designing a core and minimum set of agricultural indicators, all based on the standard classifications both from the SNA and the SEEA. The accounts can also be used to develop new indicators, such as environmentally-adjusted macro-aggregates which would not otherwise be available. Third, the framework also responds to the need of having a multipurpose information system that can be used to combine and harmonize data from various surveys and censuses together into an integrated database.

It is important to mention that there are many initiatives towards RIO+20 appearing at global level that see the relevance of greening the economy or redefining the path towards sustainable development. OECD's Green Growth Strategy (GGS) and UNEP's Green Economy have become particularly relevant due to its potential political impacts at global level. Other initiatives are EU2020, Beyond GDP, Sustainable development indicators, Wealth accounting, EEA Ecosystem Accounting. These initiatives, although generated outside the official statistics community, are important sources of information and/or require sets of progress indicators. Most of them recognize the need of a standardized framework, which falls on the realm of the SEEA 2012.

3. Integrating agriculture activities in one framework

The primary activities rooted in the physical environment (e.g. agriculture, mining, forestry and fishing), are particularly the major sources of the less developed countries' wealth. As the environment is seriously degraded and depleted the basis of this natural capital is undermined. Revised and fully integrated environmental accounting is a priority concern for all countries, but especially for those countries that are running down natural resources, and for which conventional accounting distorts macroeconomic measurement, analysis and policy (El Serafy, 1997).

Agriculture as defined by ISIC revision 4, Section A, includes the exploitation of vegetal and animal natural resources, comprising the activities of growing of crops, raising and breeding of animals, harvesting of timber and other plants, animals or animal products from a farm or their natural habitats. Section A is divided in three groups: (01) Crop and animal production, hunting and related service activities; (02) Forestry and logging; and (03) Fishing and aquaculture (UNSD, 2011).

There are at least two important reasons for the inclusion and integration of agriculture (crops and livestock), forestry and fishery in a same accounting framework. The first reason is that the three activities are major users of one or more environmental assets, in particular soil, water, biological resources, land and ecosystems. Regarding land use at the national level these activities as a whole (including livestock grazing in the case of agriculture and considering aquaculture in the case of fishing) might occupy the most significant portion of the economic available land of most countries. Furthermore it is not strange to find farms that are engaged in more that one of these activities and it is not uncommon for agricultural surveys and censuses to include some information about this group of activities. In any case it is clear that an important share of rational and sustainable use of the environment is related to the economic and technical performance of such activities. As a result the benefits of evaluating and monitoring these activities in an integrated accounting framework might be very valuable for policy formulation for agricultural, land use and related environmental issues.

The second reason is that the three sectors are strongly related to basic population needs of food, energy, shelter and other raw materials. Thus it is strongly advisable to explore the potential of the SEEA framework in order to include and address important issues related to food security, poverty, biofuels production, informal and rural employment, climate change adaptation, property and use rights of land, beyond others. The need for integrated and cross sector information that can be useful for decision making in a complex and globalized world facing global warming is a challenge that can be assumed from an extended SEEA framework for agriculture.

For instance, the SEEA identifies as an environmental asset agricultural land distinguishing between i) cultivated land (for temporary crops, for permanent plantations, for kitchen gardens and temporarily fallow land); ii) pasture land (improved and natural); and iii) other agricultural land. Additionally, the SEEA recommends compiling information about irrigated land in order to establish water abstraction from agricultural production, even if this abstraction may not be associated to an economic or market transaction. It is evident that this kind of information is strategic for agricultural and environmental policies. Moreover the information about agricultural land could be

organized according to the type of ownership or use rights (public, private, communal, under foreign contractual control) or according to the final destination of production (national market, exportation, self consumption). That kind of information is useful for analysis that goes beyond the agricultural sector.

New challenges are emerging, such as the establishment of large plantations of crops intended to the production of biofuels, increasing the risk of conflict over land and impairing food security. The SEEA framework for agriculture would have the potential to consistently analyse important trends to be taken into consideration at the macro and national level. In that case the SEEA-AGRI could give insights about relevant environmental, economic and social issues such as the increase of water demand and abstraction, land use changes, forest clearing, etc. Furthermore this information could be related to the physical food balances elaborated by FAO, in order to assess the impact of such phenomenon on food supply and availability, key issue to be considered on food security analysis.

4. Scope and coverage of SEEA-AGRI

The SEEA-AGRI can be defined as a comprehensive and standard satellite account for the integration of agriculture and environmental data based upon internationally agreed concepts, definitions, classifications and inter-related tables and accounts. It is designed for analysis, decision-taking and policy-making, whatever the industrial structure or stage of economic development reached by the country. The basic concepts and definitions depend upon economic reasoning and principles which should be universally valid an invariant to the particular circumstance in which they are applied. Similarly, the classifications and accounting rules are meant to be universally applicable.

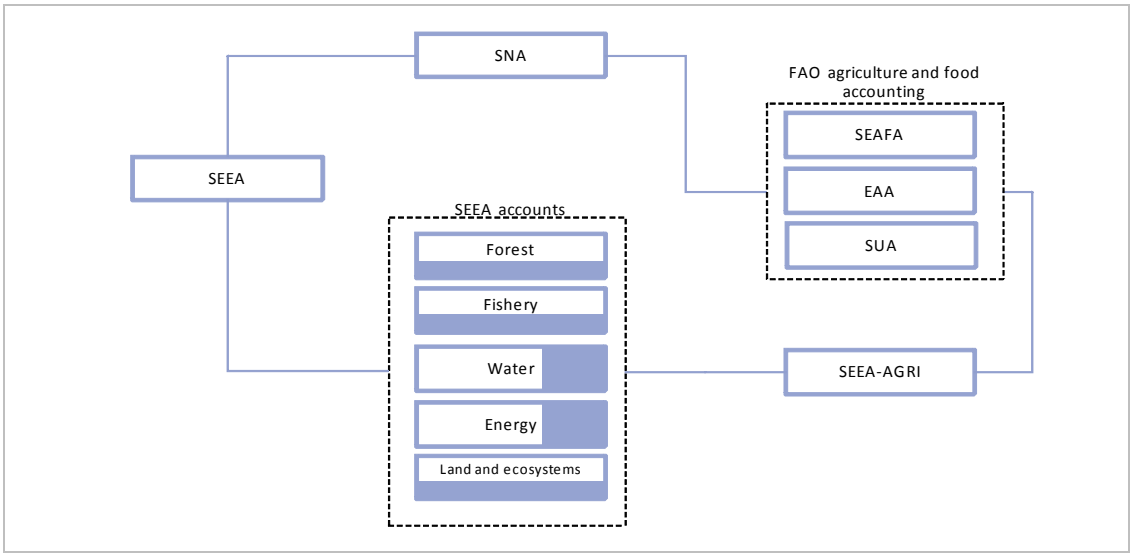
The SEEA-AGRI aims to:

- Translate policy issues into data needs and requirements in a standard and coherent manner.
- Provide a sound basis for the measurement of a set of economic, social, and environmental indicators for agriculture.
- Provide a consistent, comprehensive, and coordinating data framework to link data collected by different surveys and censuses together to build up an integrated database.
- Provide a framework to interact with other accounting frameworks, specially satellite accounts to the SNA.
- Enhance the use of agricultural statistics and the common frameworks (supply and utilization tables and food balances and) by providing the integration framework for basic statistics consistent with the SNA.
- Provide a framework to expand the analytical capabilities of the original SEAFA and EAA frameworks.

The SEEA has the characteristic that is a flexible system, one in which the core central framework is fed by different environmental assets and their flows. These assets[3] and their flows can also be studied separately as subsystems of the SEEA, bringing more details but always using the same classifications and definitions, providing the same consistency and comparability. Likewise, the system allows to examine specific activities and their relation to the environment.

When looking at agricultural activities within the SEEA-AGRI, agriculture interpreted in a broader sense (i.e. crops, livestock, forestry and fisheries), can be placed at the centre of the analysis, allowing for the assessment of the interactions with other sectors, but concentrating much effort on looking at the particular indicators of the environment-economy relationships. This framework can be considered a subsystem of the SEEA, one with a primary and intensive use of environmental goods and services (Figure 1). This is different from other subsystems of the SEEA in the sense that rather than focusing on one specific resource, it focuses on one activity, and consider the relationship between these activities with environmental assets. Thus, specific aspects of other accounts (e.g. water accounts) are used in the SEEA-AGRI. This is the opposite, for example, to SEEA-Water where a closer look at hydrological system and how it interacts with the economy (all economic activities supply and use water).

Figure 1. SEEA-AGRI and other accounting frameworks



As shown in Figure 1, on one side, the SEEA-AGRI links to the SEEA and its assets providing new elements of analysis which are not necessarily incorporated in the SEEA (in figure 1 only some specific SEEA accounts are shown). In turn the SEEA provides the elements that are of interest for the SEEA-AGRI (e.g. water abstraction and consumption for agricultural activities). On the other side, FAO's current frameworks, mainly Food Balance Sheets (FBS) and Supply and Utilization Accounts (SUA) are completely integrated to the framework. Furthermore, previous efforts (i.e. System of Economic Accounts for Food and Agriculture -SEAFA- and Economic Accounts for Agriculture -EAA-) are incorporated at least in the conceptual aspects relevant to SEEA-AGRI.

[3] The SEEA main asset classification: EA.1 Natural resources (soil, water and biological resources such as forest and fisheries); EA.2 Land and surface water (water bodies, agricultural land and wood land), EA.3 Ecosystems (Terrestrial, aquatic and atmospheric)

The relationship of the agriculture related accounts (EEA, SEAFA, SUA, FBS) and the environmental related accounts (SEEA accounts such as SEEA-Water) can be expressed in several issues, but it is clear that there are crosscutting themes that can be visibly addressed when integrating the frameworks shown in Figure 1. This integration is rather straightforward when considering that there is a common set of classifications and definitions. Of course these definitions have to be revised and expanded accordingly when developing a SEEA-AGRI framework. In any case, the SEEA allows for the broadening of analysis with its physical and hybrid supply and use tables, covering flows of products, residuals, natural resources and ecosystem services; its physical and monetary asset accounts; its accounts for environmental expenditures, taxes and subsidies; and its adjusted indicators accounts.

Three crosscutting themes are biofuels (relative to energy accounts), land (relative to land accounts) and water (relative to water accounts). ***Energy*** from Biofuels may reduce carbon emissions from burning fossil fuels and raise income for producers. The supply effects of converting food and feed crops to biofuel production can also raise food prices, quite possibly to a level that pushes consumers into poverty. Output quantities and input prices relevant to biofuel issues are also relevant to the measurement of productivity. These, however, must be available in a disaggregated form in order to measure the relative costs and benefits of biofuel commodities and other agricultural commodities, particularly food crops.

Land is the foundation of agriculture and forestry. How the land is used determines its sustainability and productivity. The use of land can also have environmental consequences that range from pollution of waterways to global warming. Agricultural expansion is the principal factor contributing to deforestation, which results in increasing levels of carbon dioxide in the atmosphere. Forests and woodlands absorb carbon dioxide (a major cause of global warming) from the atmosphere, thus mitigating the effect of carbon emissions from burning fossil fuels. It is necessary to monitor land cover over time to reveal changes resulting from deforestation, urbanization, desertification, and other measures related to not only agricultural productivity but also to the overall affect on the environment and global warming.

Like land, ***water*** is a critical integrating variable that cross cuts with agriculture, forestry, and fisheries, which, in combination, affect the environment, climate change, and food security. Water for irrigation is a major factor in improving land productivity and crop yields. According to AQUASTAT, FAO's global information system on water and agriculture, agriculture uses 70 percent of freshwater withdrawals globally. Demand for water is increasing for both agricultural and non agricultural uses. In some countries, this is leading to unsustainable extraction of groundwater. There is a lack of data concerning water use for agriculture, the distribution of irrigated land, and water use practices, including aquaculture. SEEA-Water addresses many of these issues and could be expanded according to the needs of information relative to agriculture. For instance, agricultural activities have a big potential for water reuse, an important issue to be evaluated for a sustainable and integrated management of water resources.

The crosscutting themes just described should be tied to the SEEA-AGRI, which in turn should follow the accounting approach of the SEEA. That is, it should take into account the four different categories of accounts of the system design.

The ***asset accounts*** incorporate different natural assets and its changes during the accounting period in physical and monetary values. They are relevant to the measurement of sustainable development from the capital perspective within approaches of weak or strong sustainability. They also help to determine where income is arising from the use of resources and how it is apportioned between the extractor and the owner. Thus, they are relevant to the intra- and inter-generational equity issues of sustainable development.

The ***flow accounts*** are divided into physical and hybrid flow accounts. They provide information at the industry level about the use of materials as inputs to production and final demand and the generation of pollutants and solid waste. The objective is to see the extent to which the economy is dependent on particular environmental inputs and the sensitivity of the environment to particular economic activities.

The ***environmental protection accounts*** identify expenditures in the conventional SNA incurred by industry, government and households to protect the environment or manage resources. Environmental protection accounts are used to compile environmental expenditures by activities and products. They give an assessment of the economic costs and benefits, including sectoral impact, of reducing human impact on the environment.

The ***adjusted macro indicators accounts*** aim to extend SNA aggregates to account for depletion, defensive expenditures and degradation. The SEEA recommends adjustments to the main aggregates which include indicators of sustainability such as environmentally adjusted net domestic product (eaNDP). These accounts implicitly adopt the perspective of weak sustainability.

For the accounts just mentioned, in many cases, measurement in physical as well as in monetary values is possible, but in other cases (i.e. most of the agri-environmental services valuation) valuation is still a subject under discussion, however hybrid indicators are usually possible within the framework.

As mentioned before one key aspect that the SEEA-AGRI framework must tackle, are the issues examined in the GSIARS. In Table 1, the dimensions of data demands and the key issues of the GSIARS are presented, showing how can they be analyzed within the four accounting categories described above. This is by no means a thorough examination, but gives a general idea of the potential of the framework. It also helps to clarify that the basic data needed to build the SEEA-AGRI is the same as the data commonly used to produce certain indicators. The difference is the way it is integrated.

Table 1. The SEEA-AGRI and the linkages with the dimensions of the GSIARS

Dimensions of agricultural statistics data requirements	Asset accounts	Flow accounts	Expenditure and transaction accounts	Macroeconomic aggregates and indicators
Economic dimension				
Crops and livestock	Product stocks and resource stocks, as well as capital stock such as equipment, buildings, irrigation systems.	Inputs for production, outputs form production, agroprocessing, prices, final consumption. Value of imports and exports. Subsidies and taxes	International transfers, goverment expenditures, private expenditures, rural expenditure, infraestructure expenditure. Subsidies and taxes	GDP and NDP for the agricultural sector
Forestry and logging				
Fishing and aquaculture				
Environmental dimension				
Water	Changes in water quality, changes in water availability.	Abstraction and consumption of water by the agricultural sector and subsectors. Flows of pollutants emissions	Expenditures according to CEPA and CEM. Economic instruments and environmental transactions within the agricultural sector.	Adjustments of the macroeconomic aggregates. Depreciation by depletion, degradation and defensive expenditures accrued to the agricultural sector. Intensity and efficiency indicators of resourse use.
Land cover and use	Changes in land cover and land use (possible to register ecosystems associated with land). Changes in lanscape.	Agricultural sector land use according to subsector.		
Energy	Use of stocks of agriculture food product land for biofuels. Energy plantations	Biofuels production and consumption. Firewood use.		
Climate change	Associated with land cover and land use. Changes within agriculture (i.e. from crops to livestock)	Emissions of GHGs and energy supply and use for the agricultural sector. Firewood use.		
Soil	Changes in soil composition and attributes	Soil losses and gains according subsectors.		
Wastes		Generation of waste and disposal of wastes from agricultural activities		
Biodiversity	Changes in biodiversity due to agricultural activities.	Activities within the sector that contribute to biodiversity maintenance.		
Social dimension				
Food security	Food availability, household capital stocks	Food consumption in terms of calories and nutrients available and consumed.	Public investments	Efficiency indicators and indicators of wellbeing.
Poverty reduction		Income of rural households from the agricultural sector		
Risk and vulnerability	Capital stocks	Commodoty prices.		
Gender		Sex distribution factors.		

Based on WB, UN, FAO (2011)

5. SEEA-AGRI handbook proposed development process

The United Nations Committee of Experts on Environmental Economic Accounting (UNCEEA) and the London Group on Environmental Accounting (LG) are the best forums for review and discussion towards development of agri-environmental accounting.[4] Precisely, one of UNCEEA's fundamental objectives is to mainstream environmental-economic accounting and related statistics. In that context, efforts on the development of the SEEA-AGRI should take advantage of the present ongoing work program in elevating the SEEA to a statistical standard in 2012 under the guidance of the UNCEEA and the mandate of the United Nations Statistical Commission. Additionally, the European Community plays an important role, articulating previous European advances on environmental accounting, to the work being done by the UNCEEA.

The LG plays a key role in advancing the methodologies on environmental-economic accounting through a collaborative work with UNCEEA. Their past experience establishing working sub-groups to address specific issues and develop compilation guidelines (e.g. subgroup on water accounting), should be considered a reasonable model in advancing towards the implementation of the SEEA-AGRI. Therefore, an agri-environmental accounting subgroup is envisioned, under the umbrella of UNCEEA/LG and with FAO-Statistics guidance and leadership.

Within this framework the SEEA-AGRI should include agricultural-related detail in the classifications, concepts, definitions and policy applications through extensive and timely consultations at country and international level. Additionally, experts and specialists of both the UNCEEA and the LG should get involved in the process.

The proposed roadmap should include at least the following five stages in a 2(3) year process:

A. Conceptualization
B. Organization
C. Consultation.
D. Drafts and final document
E. Pilot application and feedback

Table 3. Timetable

Stage	Months																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A. Conceptualization	Conceptual framework definition			Outline preparation																				
B. Organization			Assign duties			Drafting and consultation management												Applications and assessment				Final drafting and reporting		
D. Consultation			FAO internal discussions				Discussion meetings with: FAO-ESS, UNCEEA, London Group																	
E. Drafts and final document															Final draft preparation						Final document and approval process			
F. Pilot application and feedback																		Pilot applications in developing countries						

[4] Additional information on the London Group and the UNCEEA in:
http://unstats.un.org/unsd/envaccounting/londongroup/
http://mdgs.un.org/unsd/envaccounting/ceea/default.asp

6. A final comment on framework limitations and feasibility of implementation

There are two aspects that need special consideration when referring to possible country application of a SEEA-AGRI. One is the methodological aspects that still need to be resolved within the SEEA framework. The other one is related to the feasibility of implementing the SEEA-AGRI guidelines once they are put in place, especially in the countries where data is not necessarily accessible in terms of quantity and quality.

At least four relevant issues, among others, can be mentioned regarding ***the methodological aspects*** of the SEEA. The first is that the SEEA offers for the compilation of much information relevant to environmental and economic systems, but relatively little for understanding social systems. According to Linttot (1996) issues of inequality and poverty, essential to a more robust view of sustainability are ignored in the SEEA. Thus, the specific interactions between the environmental and social dimensions are not consistently taken into account, offering a limited view concerning the three pillar approach to sustainability.

A second relevant issue is that, as the SNA, the SEEA is compiled annually. Several environmental issues which are seasonal, ephemeral, persistent or local, such as water shortages or air pollution are not subject to a year-based system (UN, 2003). Doing monthly accounts could be conducive to a more accurate compilation but limitations in data collection are a clear difficulty. Holub *et al* (1999) argues that the time intervals for the measurement of environmental factors cannot be arbitrarily appointed, but must be determined according to the type of ecosystem and the specific inquiry.

Related to the above, a third issue, is that environmental aspects can vary greatly also in the space dimension. It is generally difficult to introduce a high degree of spatial detail in the accounts (Atkinson *et al*, 1997). Holub *et al* (1999) argues that the exclusive use of large geographical observations units, which is common in regional economics, is not appropriate in ecology. They argue that when using larger units the results not only become rougher, but for many ecological questions, also useless. Alsfen (1993) notes that the accounts are better suited to measuring quantity rather than quality, although this is not an insurmountable problem (in Atkinson *et al*, 1997)

A fourth aspect is related the still unresolved issues regarding the valuation techniques, some of which may be resolved in the SEEA 2012, but still further methodological improvements are required. Even among those researchers who accept that valuation is a valid approach, there is debate over the most appropriate techniques to use (UN *et al*, 2003). Lintott (1996) considers that the problems of valuation are likely to lead to underestimation of environmental costs. The need to use widely differing units of quantity and quality aggregated in a single unit lead to misinterpretations. Also, when inputting money values, comparisons overtime could become quite unreliable, even small variations in approach and data availability may affect the indicator more than actual changes in what it purports to measure (Bartelmus, 1994).

From the implementation side and its feasibility, concerns arise around data demands, technical capabilities and usability of the framework for the purpose it is built for. One of the main concerns is that a great deal of data may be required to implement the accounts and these data may not completely exist. Furthermore the accuracy of the data collected is usually filled with uncertainties. In any case, these are well known shortcomings of data that is already managed at global level by FAO and still there are

sets of core indicators and basic data that is provided by countries and used for comparability. A good example is the statistics being published through FAOSTAT.

One of the characteristics of the SEEA is its implementation flexibility. Although conceived as a complete system which is internally consistent, it has been designed such that it can be implemented equally well in part or in whole (UN *et al*, 2003). Depending upon the specific environmental issues faced, a country may choose to implement only a selection of the accounts included in the SEEA. Even if a country desires eventually to implement the full system, it may decide to focus its initial efforts on those accounts that are most relevant to the issues it wishes to address.

In a study developed by Hecht (2000) results showed that the general objectives for environmental accounting have been just partially fulfilled. Although he argues that its use has not steered the economy into a more sustainable path, he states that data from the accounts have been quite successful in making easier to analyse sectoral and macroeconomic issues for policy design. Furthermore, it also helped systematize existing data in the countries were it have been applied. This by itself is a very important role that the framework plays, as it integrates to the National Statistical Systems.

Finally, it is important to mention that for SEEA 2012, UNCEEA has initiated discussions regarding implementation and has developed a categorisation of three datasets to assess the scope of implementation: (i) a *minimum requirement* dataset, which is the 'minimum requirement' for a country before it can claim implementation of the SEEA; (ii) a *recommended* dataset comprise accounts recommended for compilation by all countries; (iii) a *desired* dataset which comprises useful data that should be compiled, if possible.

For SEEA-AGRI a core account (central framework) should be developed considering this categorisation. It should be built upon the variables used for the Supply and Utilization Accounts used by FAO, the Food Balance Sheets by FAO and the SNA set of accounts.

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Annex 1. Proposed outline for the SEEA-AGRI

Tentatively we foresee the following outline:

- Chapter 1. Introduction
- Chapter 2. From SEEA to SEEA-AGRI: The framework
- Chapter 3. Asset accounts
- Chapter 4. Flow accounts
- Chapter 5. Expenditure and transaction accounts
- Chapter 6. Macroeconomic aggregates and other indicators
- Chapter 7. Extensions and policy applications
- Chapter 8. Valuation of agricultural services and environmental costs and benefits
- Annex 1. Standard tables
- Annex 2. Complementary tables