

Management Accounting for sustainable development.

A chain related case study between Costa Rica and the Netherlands

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This paper is a first attempt to examine the role management accounting could play to support sustainable development. Both concepts are applied to a case study that strives to integrate economic and environmental considerations into the production and commercialisation of coffee between Costa Rica and the Netherlands.

1. Introduction

In 1987 the concept of sustainable development was introduced for the first time in the Brundtland report *Our common future*. The core of sustainable development according to this report is: "...to meet the needs of the present generation without compromising the ability of future generations to meet their own needs" (Brundlandt, 1987). One of the economic interpretations of sustainable development, in order to incorporate sustainable considerations into decision-making, is based on the concept of internalisation of environmental or sustainable related costs. Possibly the most important factor in an effective pursuit of sustainable development is "getting the price right". Unless prices for raw materials and products properly reflect the social costs, and unless prices can be assigned to air, water and land resources that presently serve as cost-free receptacles for the waste products of society, resources will tend to be used inefficiently and environmental pollution will likely increase (Schmidheiny, 1992: 17).

In their study towards the current practice and future trends of environmental-related management accounting, Bennet and James (1997) conclude that: "there is an increasing potential for environmental-related management accounting to make a substantial contribution to both business success and sustainable development". In this paper, management accounting for sustainable development is interpreted as management accounting used to support decision-making that incorporates the economic, environmental, institutional and social component.

A first attempt to explore the linkages between management accounting and sustainable development is based on an international case study concerning coffee. The objective of the case study is to stimulate sustainable aspects in the entire coffee chain between Costa Rica and the Netherlands. Among others supported through the design and implementation of a management accounting system. This management information system will support cost and benefit analysis for all participants in the chain, being the farmers, the processors in Costa Rica and the retailer in the Netherlands. The aim is to integrate economic, environmental, institutional and social aspects in the information system in order to be able to take decisions that support sustainable development, both at the individual level of the various participants and at the level of the coffee-chain as a whole.

A first step in the development of such a *sustainable management information system* is to investigate the relationship between management accounting and aspects of sustainability, which is explored in this paper. First, the functions of management accounting in general are dealt with. Then, some aspects of environmental related management accounting are described. Additionally, a summary is given of sustainability indicators, as developed by the Commission of Sustainable development (CSD). Subsequently, the concept of management accounting and sustainable development is applied to the international coffee case study. The paper will be finished with a discussion.

2. Management Accounting

Management accounting is the process of identifying, measuring, reporting and analysing information about economic events of organisations. The process should be driven by the informational needs of individuals *internal* to the organisation and should guide their operating and investment decisions (Atkinson et al, 1997). Figure 1 shows the four main functions of management accounting: operational control, product and customer costing, management control and strategic control.

The four different functions relate to the different demands for management accounting information. Generally speaking, operational information is primarily used to control and improve operations. Middle management uses the information to plan and take decisions, while at the highest organisational levels management information is used to support strategic decision making.

Figure 1: Functions of management accounting information

Operational control	Provide feedback information about the efficiency and quality of tasks performed
Product and customer costing	Measure the costs of resources used to produce a product or service and market and deliver the product or service to customers
Management control	Provide information about the performance of managers and operating units
Strategic control	Provide information about the enterprise's financial and long-run competitive performance, market conditions, customer preferences, and technological innovations.

Source: Atkinson et al, 1997: 12

Traditionally, management accounting has been dominated by quantitative, financial information. However, since the publication of *Relevance Lost* (Johnson & Kaplan, 1989), 'new' management accounting tools and techniques have been developed to support internal decision-making. These management accounting techniques, such as Activity Based Costing and the Balanced Business Score Card, are mainly developed as a reaction to changing information needs driven by a growing competitive environment. Activity Based Costing systems measure more accurately the costs of activities, products, services and customers. Balanced scorecards link current decisions and actions to long-term financial benefits (Atkinson et al, 1997). The balanced scorecard is used to evaluate business performance by a set of indicators with a financial, customer, business and organisational learning perspective. The difference between *traditional* management accounting systems and new developed techniques merely lies in the expansion of the type of management information they generate. Non-financial and qualitative information, such as quality and process times and more subject information on customer satisfaction and new product performance, are considered important aside the *traditional* financial related information.

These management accounting techniques are mainly developed as a reaction to changing information needs based on the growing competition for both manufacturing and service companies. It seems that these techniques might be also useful to integrate sustainable considerations into decision-making, due to their growing attention for quality, non-financial aspects, activities and long-term perspective.

3. Environmental-related Management Accounting

Management accounting techniques, developed to support decision-making and control activities, are ceteris paribus related to information needs. Environmental legislation, changing consumer behaviour and organisational responsibility are amongst other factors, which influence the need for environmental information. Environmental related management accounting is ‘the generation, analysis and use of financial and non-financial information in order to improve corporate environmental and economic performance’ (Bennet & James, 1997: 36). Figure 2 explains the domains of environmental accounting relevant for the firm-level, based on their boundaries of attention.

Figure 2: Domains of Firm-level Environmental Accounting

	Organisation	Supply Chain	Society
Financial focus	Environment-related Financial Management	Lifecycle Cost Assessment	Environmental Externalities Costing
Non-financial focus	Energy and Materials Accounting	Lifecycle Assessment	Environmental Impact Assessment

Source: Bennett & James, 1997: 35.

Bennet and James describe the used terms as follows:

- Energy and Materials Accounting: the tracking and analysis of all flows of energy and substances into, through and out an organisation;
- Environment-related Financial Management: the generation, analysis and use of monetised information in order to improve corporate environmental and economic performance;
- Lifecycle Assessment: a holistic approach to identifying the environmental consequences of a product or service through its entire lifecycle and identifying opportunities for achieving environmental improvements;
- Lifecycle Cost Assessment: a systematic process for evaluating the lifecycle costs of a product or service by identifying environmental consequences and assigning measures of monetary value to those consequences;
- Environmental Impact Assessment: a systematic process for identifying all the environmental consequences of an organisation, site or project’s activities, and;
- Environmental Externalities Costing: the generation, analysis and use of environmental damage (and benefits) created by an organisation, site or project’s activity.

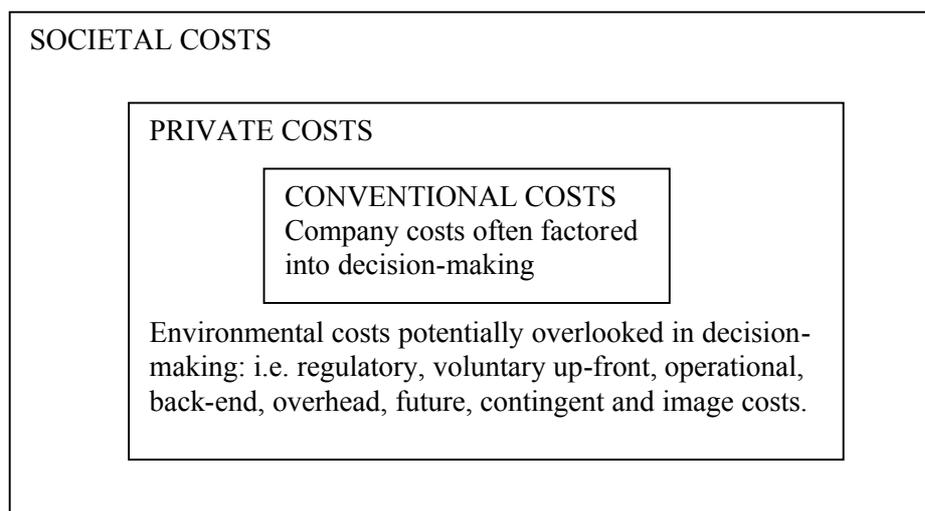
Within this framework, environmental-related management accounting is in practice primarily concerned with the information needed to steer the internal organisation.

The scale of the entity for which the information is used determines the boundaries of the type of management accounting techniques to be used (EPA, 1995). The scale can vary from the entire organisation to a specific business unit to a specific process or product.

For the three financial domains of environmental accounting the definition of the costs to be involved in the analysis play a central role. The scope of environmental accounting refers to the type of costs that are included in the analysis (EPA, 1995). This is closely related to the ‘different cost for different purposes’ principle (J.M.Clark, 1947), that indicates that cost definitions are depending on their use. The US-based Environmental Protection Agency (EPA) makes a distinction between three types of environmental related costs, as showed in figure 3.

Conventional costs are the costs that are taken into account in the decision-making process. This information is generally derived from the formal bookkeeping or management accounting system of an organisation. Private costs are the costs a business incurs or for which a business can be held accountable. Societal costs are in general more difficult to measure and represent the costs of business’ impacts on the environment and society for which business is not legally accountable. These costs are also called *externalities* or *external costs*.

Figure 3: Private and societal environmental costs



Source: based on EPA, 1995: p. 15.

Management information in general is used for directing management attention, for decision-making (purchasing, make or buy, product costing and pricing, process and product design, risk management) or controlling and motivating behaviour to improve business, whether it relates to economic development only or strives to integrate sustainable considerations.

Both the scale of the organisation and the scope of the information determine the development and content of a management accounting system. Before relating management accounting to the concept of sustainable development and subsequently apply them to the coffee project, the four aspects of sustainability will be briefly described.

4. Sustainable indicators

New requirements and methodologies require new instruments of measurement, which also counts for sustainable development. Definitions of sustainable development in general terms, such as used in *Our Common Future*, give no real direction but are widely accepted. On the other hand no consensus exists on precise definitions which interpretation depends on the readers, their discipline, and their representation of the world (Callens & Wolters, 1998). One initiative to generate a set of indicators to monitor sustainable development is developed by the Commission on Sustainable Development (CSD)¹ in co-operation with other United Nations organisations and non-governmental organisations. In April 1995, the CSD approved a work programme on indicators of sustainable development. The work programme included a dynamic and interactive *working list* of approximately 130 indicators classified in four categories:

- 1) Indicators for social aspects of sustainable development: such as combating poverty, demographic dynamics, promoting education, public awareness and training, protecting human health;
- 2) Indicators for economic aspects of sustainable development: such as changing consumption patterns, financial resources and mechanisms, transfer of environmentally sound technology, co-operation and capacity-building;
- 3) Indicators for environmental aspects of sustainable development; such as water, land, other natural resources, atmosphere, waste, and;
- 4) Indicators for institutional aspects of sustainable development: such as science for sustainable development, international legal instruments and mechanisms, information for decision-making, strengthening the role of major groups.

¹ The United Nations Commission on Sustainable Development (CSD) was established in 1993 by the UN General Assembly as a permanent forum to oversee the implementation of Agenda 21 which is one of the key documents produced by the Earth Summit held in Rio in 1992. It is a statement of intent and commitment for sustainable development into the 21st century organised in 40 chapters covering topics from poverty to deforestation and from health to waste management.

This set of criteria is incorporated in methodology sheets which are being developed to provide users at the national level with sufficient information about the concept, significance, measurement and data sources for each indicator so as to facilitate data collection and analysis. Although the indicators are intended for use at the national level by countries in their decision-making processes, they can be a guideline in the process of developing a framework at organisational or supply-chain level. The categorisation of indicators can be valid both at supply-chain or organisational level and at society level. Before applying these set of sustainability criteria to the case study, in the next section a brief description of the coffee case is given.

5. The case study: sustainable coffee from Costa Rica to the Netherlands

The objective of the coffee project between Costa Rica and the Netherlands is to stimulate a more sustainable way of producing and processing coffee. Consequently, two sector-related management systems are to be developed and implemented to be able to evaluate this process; an environmental management system (related to ISO 14001) and a management accounting system. The target organisation are participants of the entire coffee-chain, ranging from the farmer and coffee producer ('beneficio') in Costa Rica to the coffee roaster and retailer in the Netherlands. The duration of the project will be approximately four years (1997-2001). The project is organised in accordance with the objectives of organisations working in the field of international co-operation as well as to relevant parties in the coffee sector².

Costa Rica has established a good reputation for producing washed Arabics³ of a consistently high quality. In 1996, the Netherlands, which are classified as the fourth coffee-drinking country in the world, imported 5% of the Costa Rican coffee, a 50% increase compared with 1994.

In Costa Rica, coffee accounts for around 25% of the countries export income which corresponds with 3% of the world trade of coffee. The export is mainly in the hands of private traders.

However, the Government maintains supervision and control through the "Instituto del Cafe" (ICAFFE), representing all sectors of the coffee industry.

² An example of a relevant organisation is Eco-operation, a Dutch organisation within the Ministry of Foreign Affairs -International co-operation- that is responsible for the so-called sustainability agreement with Costa Rica, Benin and Buthan. Examples of sector-related parties are the International Coffee Organisation and the Common Fund for Commodities.

³ The most important tradable species are *Coffea Arabica* and *Coffea Robusta*. Arabica accounts for almost 70% of global production, Robusta around 30%. Within the species Arabica exist various different main types ranked by quality and origin. The hard-beans (milds) generally come from Central-American countries and are grown in husbandry at high altitudes. Due to the striving for quality coffee, it is forbidden by law to grow Robusta coffee in Costa Rica.

The main role of ICAFE is to control the production and marketing of the coffee sector in Costa Rica, represented by farmers, beneficios, exporters and roasters. As a result, many rules and regulations exist that prescribe the relationship between the actors in the coffee sector. These laws and regulations vary from quota and price conditions to prescriptions for activities within either the beneficios or at the level of the coffee producer.

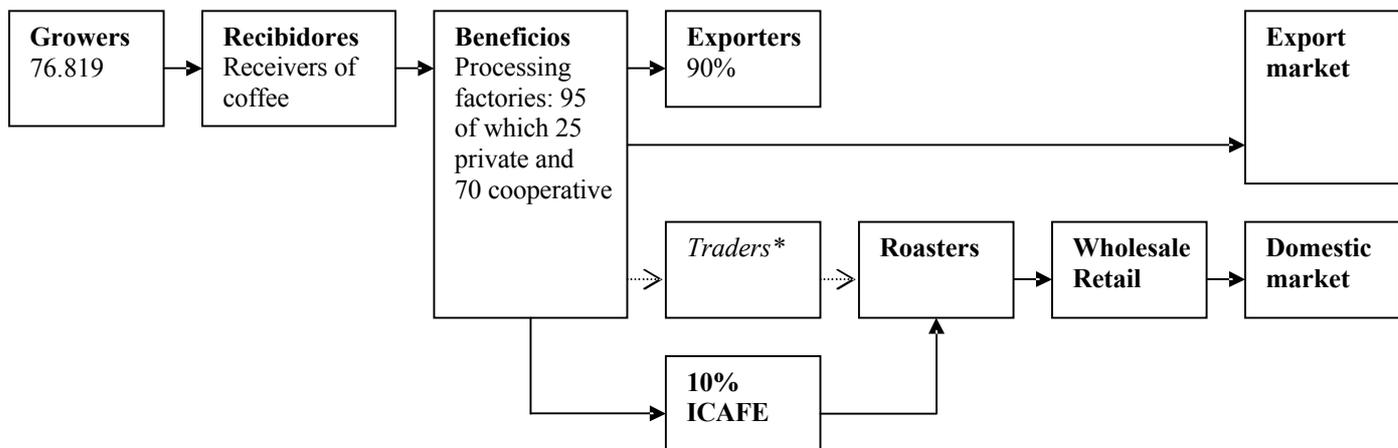
The majority of coffee farms is medium sized (10 to 15 hectare), which generally sell their coffee as fresh cherries to large private and co-operative 'beneficios'. The ' beneficio' turns the red cherry into a green-dry-bean by using large pulpers, fermenting tanks, washing channels and drying facilities, both natural and mechanical. Especially during this stage, the environmental impact and costs are significant, which will be briefly addressed below. The high coffee productivity per hectare (1.6 ton/ha in 1994) is closely related to the environmental impact of coffee as well. The intensive coffee production in Costa Rica uses improved husbandry techniques, including high-density planting, pruning, intensive use of fertilisers and pesticides, and replanting with high-yielding drought- and disease-resistant varieties.

In Costa Rica the process of making the coffee production more sustainable has already started. At beneficio-level, technical adjustments, which are supported by governmental laws, decreased the level of water contamination of the coffee de-pulping and washing processes. At farm level, several coffee producers switch to more sustainable or organic farming. These changes indicate a growing awareness in the Costa Rican part of the coffee-chain. At the other end of the chain, in the Netherlands, changes take place at the level of roasting companies and coffee retailers. The roasters, for example, use environmentally friendly production techniques and make environmentally sound investments. At retail level, a Dutch retailer introduced a proper ecological-retail trademark, including coffee. Figure 4 visualises these participants of the coffee chain as relevant at this stage of the project.

For each of the participants, management information will be valuable to calculate costs and benefits. Subsequently sustainable indicators can be used to integrate ecological, economic and social aspects in the information system, which enables sustainable decision-making at all levels of the coffee-chain.

After this description of the coffee chain between Costa Rica and the Netherlands, in the next section the concept of management accounting and sustainability will be applied to the coffee chain.

Figure 4: Participants of the Costa Rican part of the coffee chain



* : The quantity reserved for the domestic production is sold through auctions, either directly to local roasting firms or indirectly through traders (Rodríguez Muñoz, 1980), De Graaff 1986: 171.

6. Management accounting for sustainable development applied to the coffee case

As described in section 3 a first step in developing a management accounting system is to determine the scale of the project. The scale of the coffee case is both directed towards the individual participant and the entire coffee chain or the (coffee) society as a whole. Starting point for the development of management information are the individual participants. Dependent on their level of current use of management information and systems, the focus is on specific functions of management accounting. For the farmers and *smaller* producers in Costa Rica, the management accounting system (MAS) will probably focus more on operational control and product and consumer costing. The roasting and retail organisation in this coffee-chain (figure 4) on the other hand, is equipped with a MAS that is also used for management and strategic control and will probably focus on all four functions of management accounting as showed in figure 1.

A second step of importance is the translation of the concept of sustainability to the entire coffee chain. For instance at the level of the farmer, definitions of sustainable coffee incorporate the need for agricultural practices to be economically viable, to be environmentally less damaging, to be concerned with social issues such as quality of life and to be institutionally organised in an efficient and effective way. To enable the farmers to make trade-off decisions amongst the four aspects of sustainability, information plays a central role. In figure 5 the conventional production costs are listed for the agricultural part of the coffee chain in Costa Rica. A first attempt is made to classify these costs in sustainability relevance.

Figure 5: Production costs and sustainability relevance

COSTS	Detailed	Sustainability Aspect			
		Economic	Environment	Social	Institutional
Labour	Pruning	x	x	x	
	Shade regulation	x	x	x	
	Weeding of trees	x	x	x	
	Basins	x		x	
	Replanting	x	x	x	
	Disease control	x		x	
	Fertilising	x	x	x	
	Apply herbicides	x	x	x	
	Control of weeds	x	x	x	
	Improvements	x	x	x	x
	Fraying	x		x	
	Maintenance paths	x		x	
	Soil conservation	x	x	x	
	Social security (23%)	x		x	x
Transport	Recollection	x	x	x	
	Cherry transport	x	x		x
	Material transport	x	x		x
Material input	Plants for replanting	x	x		
	Fertilisers complete	x			
	Fertilisers nitrogen	x			
	Calcium	x			
	<i>Fungicides</i>	x	x	x	
	<i>Herbicides</i>	x	x	x	
	<i>Insecticides</i>	x	x	x	
	Total variable costs				

FIXED COSTS	Sustainability Aspect			
	Economic	Environment	Social	Institutional
Exhaustion soil	x	x		
Depreciation equipment	x			
Depreciation constructions (houses)	x		x	
Maintenance of machines and constructions	x	x		
Maintenance trucks	x	x		
Administration cost	x			x
Social security (23%)	x		x	x
Taxes	x			x
Interest	x			x

This classification of production costs should be further elaborated based on input of the farmers and their decision-making process. As indicated in figure 3, three types of environmental costs exist: conventional, private and societal. The acceptance of private and societal costs by the participants and the magnitude of their responsibility will further influence the development of the type of costs that will be included in the Management Accounting system.

Next to the definition and classification of costs to be used in the MAS, performance indicators play a central role to support decision-making and control activities. A first classification of indicators based on the aforementioned CSD classification of indicators is described in figure 6. The sustainable indicators for the different scales of the coffee chain are based on several sources of information, such as criteria for Eco-labelling schemes, conversations with participants in the coffee chain and reports on coffee production.

Figure 6: Sustainability indicators matrix for coffee.

Scale of Entity →	ORGANISATION			SUPPLY CHAIN	SOCIETY
Scope of Information ↓	<i>Farmer</i>	<i>Beneficio</i>	<i>Roaster</i> <i>Retailer</i>		
Economic	- yield/production - cost/hectare - margin (Break Even)	- yield/input - process cost - margin (BE) - world price	- yield/input - process cost - margin (BE) - world price	- income/participant - cost/participant	- yield related to world production - relevance in national income
Social	- # workers/prod. - # fixed workers - wage - conditions	- safety - wage - conditions	- # suppliers - type of contracts	- distribution of income - vertical & horizontal integration	- labour - poverty - education - women
Environmental	- chemicals/hectare - % shade - biodiversity - soil pollution	- water contamination - bad smell - wood/ pulp	- production process: noise, waste - packaging	- input-output relation - total waste & contamination	- Environmental impact related to other products and countries
Institutional	- type of organisation - access to information - ICAFE law	- information - ICAFE law	- type of organisation - import rules	- Transparency of supply chain supporting organisations	- # and quality of institutional organisations - export/import rules

Once a general and accepted set of indicators is determined, the next step is to quantify and measure the indicators. Information of coffee chain participants' serves as input for this process.

Both, information derived from an elaborated management system used by the roasting and retail organisation and information derived from practical knowledge of the farmer and the *beneficio* seem to be valuable in this respect.

7. Discussion

In general management information exists of financial and non-financial information expressed in quantitative cost (and benefit) figures or performance indicators. A first indication of types of costs and indicators, relevant for the coffee case, is subsequently described in figure 5 and 6. To be able to develop the type of information used in a management accounting system, further analysis and interviews with users of the system have to be carried out. As made clear *by the different costs for different purposes* concept, the scope of the information is determined by its purpose.

However, management accounting information can play a role in the integration of sustainable considerations into decision-making and control process, its contribution is not made specific in this paper. In general the existing management accounting information can be used to link sustainable aspects, as showed in figure 5. The integration of sustainability aspects in the existing information is valuable to create awareness for costs that relate to sustainability and it also provides a framework to start the dialogue on private or societal related costs. The sustainability indicators, as described in figure 6, can play a role in all four main functions of management accounting: operational, product and customer, management and strategic control. The use of *new* management accounting tools and techniques, such as the balanced Business Scorecard, need to be further investigated. Both the farmer that wants to eliminate chemicals and the *beneficio* or roaster that have to make an investment in a new machine could decide to behave more sustainable based on adopted information. Moreover, at supply chain or society level sustainable-related information can be input for institutional improvements such as the re-structuring of the role of supporting institutes (e.g. ICAFE).

The case study of the sustainable coffee chain will be used to further investigate the practical implications of the concept of internalisation of sustainable related cost in management accounting systems. The development, implementation and evaluation of the management accounting systems are used to further elaborate the process of integrating sustainable criteria in decision-making. Both developments in the concept of sustainable development and management accounting can contribute to this process.

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