EVALUATION OF SUSTAINABLE ACCOUNTING PRACTICES IN THE ITALIAN BIOENERGY SECTOR

JEL classification: Q01

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Abstract. *Bioenergy is a vital component of the energy sector in Italy, contributing to the country's commitment for reduction in green house gas emission and enhancing its self reliance on energy production. At the same time, however, there are risks that the bioenergy sector may generate negative impacts on the environment and society, if it is not properly managed. Sustainable accounting is one of the important instruments by which, through stakeholder pressure, responsible actions by organizations can be enforced .For this reason it is necessary to develop better sustainable accounting practices, to report and to address the concerns over the sustainability of the bioenergy sector in order to avoid detrimental results masked as renewable energy. In addressing the above needs, the aim of this research is to evaluate current sustainable accounting practices in the Italian Bioenergy sector and to construct a conceptual framework for enhanced sustainable accounting practices. This research begins with an analysis of a few small and medium Italian bioenergy enterprises as regards their current accounting practices for sustainability using the content analysis method to identify the gaps in reporting. In this step, a considerable lack of reporting about the environmental and social impacts has been identified in a sample of small-and-medium-sized firms in the wood biomass sector. Based on the above findings, the study then develops a conceptual framework to fill the gap identified, with due consideration of the practical limitations for the companies to adopt it. The basis of this framework is the regulatory framework of the European Union and sector-specific selective indicators have been proposed for use. This set of indicators, providing information on bioenergy's sustainability impacts, will render a better picture of the company's action for the stakeholders.*

Keywords: *Sustainable Accounting, Sustainable Biomass, SME, Italian Bioenergy, Environmental Indicators, Social Indicators.*

1. Introduction

Energy has always been an essential component of the human system, enabling a better lifestyle and today, in the modern world, it is more so than ever. The European Commission states that "energy is at the heart of everybody's quality of life and a crucial factor for economic competitiveness and employment" (European Commission, 2010). Demand for energy is growing across the globe, widening the gap between supply and demand, increasing the cost of energy and energy poverty. In 2010, the total production of primary energy, the gross domestic consump-

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tion of primary energy and energy dependence (% of net imports in gross domestic consumption) in Italy are 30.19 Mtoe (million tons of oil equivalent), 175.52Mtoe and 83.78% respectively (Eurostat, 2010). This clearly shows that Italy has a huge gap between domestic supply and demand and depends heavily on imports for energy. Hence, Italy needs to increase its domestic production of energy in order to reduce the risk of price volatility and of potential energy disruptions due to energy import dependency.

Due to its commitment to address global warming by reducing carbon dioxide emissions, Italy needs to prioritize its focus on renewable energy systems in the process of increasing local energy production. The European Commission's recent study 'Energy Roadmap 2050' states that renewable energy must contribute at least 55 % of gross final energy consumption of member states by 2050, in order to meet its commitment to reduce greenhouse gas emissions to 80–95 % below 1990 levels (European Commission, 2012). The directive 2009/28/EC promoting the use of renewable energy, which sets a target of 17% of final energy consumption through renewable sources by 2020, has been adopted by Italy. Although the share of renewable energy in gross final energy consumption in 2009 is only 8.9% (Eurostat, 2010), bioenergy is one of the important renewable energy resources in Italy which has been in use for a long time. The abovementioned Directive, along with the new incentives adopted for electricity in Italy, provide a good opportunity for growth of the bioenergy sector (Pignatelli *et al.*, 2011). Primary renewable energy produced through biomass and renewable wastes in 2010 is 6.09 Mtoe (Eurostat, 2010) where it has been estimated by the ITABIA (Italian Biomass Association) that it has a potential to grow to the range of 24 - 30 Mtoe (Pignatelli *et al.*, 2011).

A United Nations (UN) report states that "without access to sustainable energy, there can be no sustainable development" (UN, 2012). In order to emphasize and promote the importance of sustainable energy, the UN has announced 2012 as the 'International Year of Sustainable Energy for All'. Addressing the obstacles in the path of reaching the objectives, Ban Ki-moon, the Secretary-General of the UN states that "achieving sustainable energy for all is an ambitious but achievable goal" (UN, 2011). Bioenergy can be an important source of sustainable energy; it can create many positive impacts (for example: CO_2 reduction, job creation, local growth, etc) along with providing energy, but it can also create negative impacts (for example: conflict with food security, indirect emissions, local opposition, etc.) if it is not properly managed. This makes it necessary that sustainable bioenergy systems be balanced between economic, social and environmental systems because it is in our best interest to produce energy that allows us and future generations to enjoy a better quality of life. This is only achievable by reconciling investors' interest and sustainability in the process of creating energy. Those individuals who invest in energy creation must pay attention to value maximization over a long period through sustainability rather than focusing on easy earning strategies in the short term.

Reporting is one of the tools used by organizations to engage with various stakeholders, and is also a resource for creating pressure on activities of the organizations involved. Corporations need accountability mechanisms which are able to recognize stewardship for the resources entrusted to them (Gray and Guthrie, 2007) and to demonstrate and raise the trustworthiness as a part of a reputation-building process (Owen *et al.*, 2001). Sustainable accounting practices providing information on positive and negative impacts of the companies, can provide a complete picture of the company to the stakeholders. That can create pressure on the companies to act and enhance their sustainable performance for the future. In order to achieve and manage sustainable bioenergy it is important that companies account for their environmental and social performance along with their financial performance. The UN vision statement for 'sustainable energy for all'

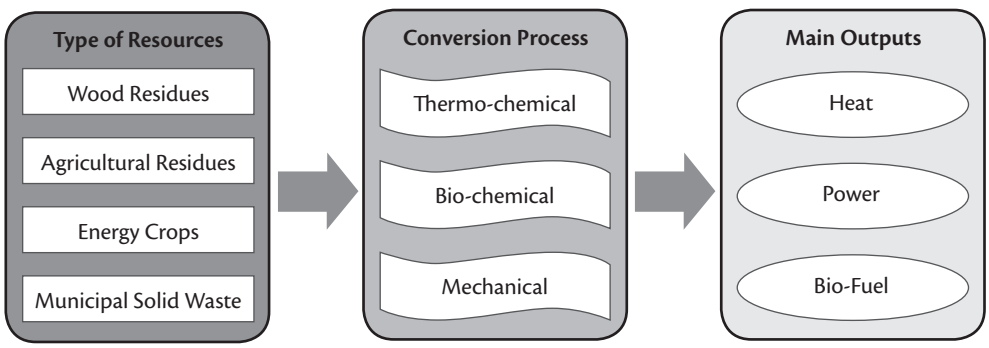
also emphasizes the need to develop supportive policies and regulatory frameworks that can ensure social and environmental sustainability in the energy industry (UN, 2011).

Given its importance for bioenergy sustainability and the need for the sustainability reporting framework, this research evaluates the current sustainable accounting practices in Italian bioenergy sector and develops a conceptual framework for sustainable accounting of bioenergy companies. This, in turn, can be used as a means for improving the sustainable performance of the organizations due to its public exposure. In addressing the aim of this research, the article is structured as follows: it reviews bioenergy sustainability and sustainable accounting practices in Italy in the second and third sections below respectively. There follows, in the fourth section, an analysis of the current sustainability accounting practices of a sample of Italian bioenergy companies. A conceptual framework to fill the gap is identified in section five and in section six the conclusions are presented.

2. Sustainable bioenergy

The Food and Agriculture Organization of the United Nations (FAO) defines bioenergy as "all energy derived from biofuels"; biofuels as "fuel[s] produced directly or indirectly from biomass" and biomass as "material of biological origin excluding material embedded in geological formations and transformed to fossil" (FAO, 2004). Biomass resources can be divided into four groups; wood residues, agricultural residues, energy crops and municipal solid waste (Easterly and Burnham, 1996). Wood residues are generated from wood products industries. Agricultural residues are generated by crops, agro-industries and animal farms. Energy crops are crops and trees dedicated to energy production. Municipal solid waste is the waste generated by households and the general public: it contains both degradable and non-degradable wastes. Biomass can be converted into three main forms of energy products namely heat, power or transport fuels. These energy products can be formed by different conversion processes from biomass to energy. Three main categories of conversion processes are thermo-chemical, bio-chemical / biological and mechanical. Thermo-chemical conversion of biomass to energy can be carried out through combustion, pyrolysis, gasification and liquefaction processes. Bio-chemical conversion consists of two main processes namely digestion and fermentation. Extraction is the mechanical process used for the conversion (McKendry, 2002b). These process associations are shown below (Figure 1):

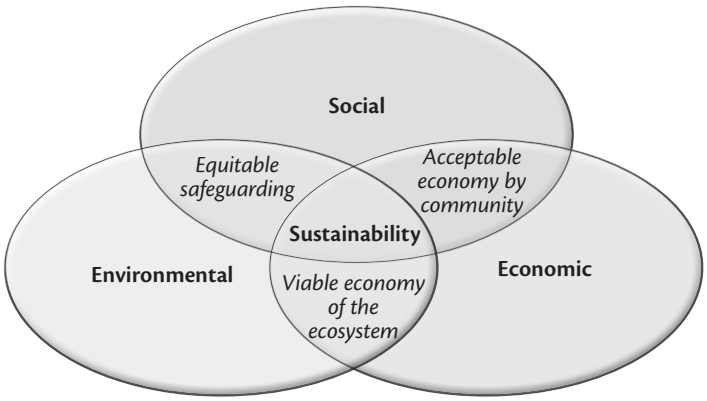
Fig. 1 - Bioenergy Process



Source: Based on McKendry (2002b)

Sustainable development is described more commonly by the definition of the Brundtland Commission (WCED, 1987), "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." According to Adams (2006), sustainability requires the reconciliation of environmental, social and economic demands, which are known as the 'three pillars' of sustainability. Dyllick and Hockerts (2002) also argue that corporate sustainability can be seen as three components, which need to be met in order to achieve sustainability: business case (economic), the natural case (environmental) and the societal case (social). Integration of these three components is also required by the 'triple bottom line' model proposed by Elkington (1997). These considerations are illustrated summarily in Figure 2:

Fig. 2 - Sustainability



Source: Based on Elkington (1997)

Alongside these studies, Boyle *et al.* (2003) describe sustainability in the context of energy as energy sources which are not substantially depleted by regular usage, not polluting nor creating other hazards to the environment in major scale, not involving any social injustice or health hazards to people. In the context of bioenergy the European Biomass Association (AEBIOM) defines sustainability as "a production and utilization of biomass without harming nature – water, soils, biodiversity, the carbon stock of biomass - and maintaining the capability of nature to produce biomass in a permanent way in the future (AEBIOM, 2010)."

Biomass-based power generation can contribute to significant reductions in greenhouse gas emissions, along with greater potential for positive impacts. Escobar *et al.* (2009, p. 1286) states that "the fight against hunger in the world goes through the sustainable development of rural regions, which would allow access to jobs and income for millions of people. Programs aiming at growing oleaginous plants and the production of bio-fuels could contribute towards this fight, mainly in degraded areas." International Energy Agency (IEA, 2007, p. 4) supports this by stating, "biomass can be important for using marginal land and bringing socio-economic benefits in those (under developed) regions."

At the same time, there are concerns about some of the economic, environmental and social

aspects of bioenergy such as 'operating and investment cost' (Thornley *et al.*, 2009), 'efficient use of natural resources' (Rovere *et al.*, 2010), 'impacts on food production' (Escobar *et al.*, 2009), 'amount of land and water use' (Evans *et al.*, 2010), 'energy crops grown using high amounts of fertilizers' (Evans *et al.*, 2010), 'appropriate working conditions and decent remuneration for workers (Escobar *et al.*, 2009) and 'lack of benefits for smallholders' (Schlegel *et al.*, 2007). Therefore, in order to understand the complete picture of these operations, it becomes important to assess and account bioenergy systems not only using technical and economic factors but also using environmental and social parameters.

3. Sustainability accounting

"The use of accounts is a method of avoiding the stigma of an accusation of (…) deviance" (Abercrombie *et al.*, 1984, p. 13). Because these deviances are not always economic but can also be environmental and social, accounting is required for all deviances. In order to achieve this, sustainability accounting has been proposed to report on an organization's economic, social and environmental impacts (Lamberton, 2005). The Global Reporting Initiative (GRI, 2011), describes the process of reporting for sustainability by companies as "the practice of measuring, disclosing, and being accountable to internal and external stakeholders for organizational performance towards the goal of sustainable development." An integrated system of social, environmental and economic disclosures could "improve the social and environmental performance of companies and represents the instrument *par excellence* for managing stakeholder relations… as such, it is a concrete manifestation of a company's commitment to transparency" (Kaptein, 2007, p. 72). In fact, through all "forms of accounts which go beyond the economic" (Gray 2002, p. 687), business organizations could legitimate their activities (Hogner 1982; Hopwood 2009) and users could assess whether the entity is socially, financially and environmentally responsible (Gray and Guthrie 2007).

Concerning the information about social and environmental impact, the principal laws should guarantee procedural fairness and transparency and avoidance of the phenomenon of expropriation of resources which belong to all the stakeholders involved in a system. In Italy, the financial statements of companies which do not adopt international accounting standards particularly for the balance sheet (art. 2424 Civil Code) and for the income statement (art. 2425 Civil Code), the law does not require disclosure of precise information about social and environmental impact on the public. The notes to the financial statement (art. 2427 Civil Code) explain the values of the documents cited with the purpose of giving a true and correct representation of the situation of a company from the economic and financial points of view, as well as of its assets. There is neither a special section nor supplementary information on social and environmental impacts. Instead, in the management report (art. 2428, sub-paragraph 1 and 2, Civil Code), qualitative information is given, but not in detail, for sustainable aspects and without a specific framework to follow as regards the environmental and social impacts. In this report, management must make an analysis about the situation of the company and trends in different sectors in which it is operating. They look at costs, revenue and investments, and a description of the principal risks and uncertainties to which the company is exposed. This analysis should be more detailed in order to give an understanding of each company's situation, management trends and results. This would require disclosure of financial and non-financial indicators, including

information on the environmental and personnel and an estimate of value created or destroyed for the community[3].

In order to reinforce the community's perception and to disclose information about the physical environment, annual reports may be used to demonstrate management's responsiveness to environmental issues and to answer the stakeholders' demand for information (Wilmshurst and Frost, 2000). The information reported in annual reports is regarded with a high degree of credibility (Tilt, 1994); this resource could be a main form of corporate communication (Adams and Harte, 1998) also for disclosing environmental information (Deegan and Rankin, 1997). However these annual reports are not able to cover aspects that occur over a long period of time and that "may result in a somewhat incomplete picture of disclosure practices" (Roberts, 1991, p. 63; Unerman, 2000). In fact, previous studies have demonstrated that environmental information in annual reports is often incomplete: the available data does not reveal the effect of business activity on natural resources, for example, in terms of the amount, timing, or uncertainty of future cash flows (Harte and Owen, 1991; Deegan and Gordon, 1996).

To address these gaps, firms need to collect and disclose information related to the organization's impact on the physical environment (pollution), consumer relations, human resources, community involvement, energy conservation, worker safety, worker health, and product safety (Epstein and Freedman, 1994; Mathews and Perera, 1995). Companies should consider a range of information from financial to "a combination of quantified non-financial information and descriptive, non-quantified information" (Gray, 2000, p. 250), to be disclosed through several communication tools.

If the annual report is the main communication for disclosing financial information, as argued before, then other tools could be used by firms to report their socially responsible behavior. In addition to social and environmental reports, media such as web sites, press releases, advertisements, corporate brochures should produce social and environmental information that is able to influence stakeholder opinion (Unerman, 2000; Unerman and Bennett, 2004; Thomson and Bebbington, 2005; Adams and Frost, 2006). In particular, considering that internet increases the velocity of the public relations process, facilitating two-way interaction, through its speed of dissemination, access and feedback, it could be argued that it is the main facilitator of corporate communicative action (Sikka, 2006). The internet is also a low cost direct communication channel, however, it must be noted that its use could be prevented by barriers in the form of limited access to new technologies (Pinterits and Treiblmaier, 2006).

4. Empirical analysis

As discussed above accounting for sustainability which requires the disclosure of social and environmental information can create public pressure on companies to act in a correct way; such disclosure is important for the bioenergy sector due to its characteristics and the possible consequences of improper management in this sector. For example, the sector is heavily dependent on the consumption of raw material. If raw material is not available in sufficient quantity locally to satisfy market demand, there can be over-exploitation of available forests, with

[3] So for the unlisted companies which draw up the financial statement in an abbreviated form (art.2435-bis Civil Code), which does not include the management report, there is no specific information about environment and personnel.

danger to the natural environment or to the import of raw materials from abroad, generating an increase in transport-related costs and pollution. Hence the analysis of the selected sample of companies is carried out in order to understand the present situation about accounting for sustainability and also the availability of information to the companies involved in the wood biomass sector in Italy.

Content analysis method is used to identify the state of accounting for sustainability and environmental and social disclosure practices. Content analysis is defined as "a research technique for making replicable and valid inferences from data to their context" (Krippendorff, 1980). Content analysis is a method of codifying text or content of a piece of writing into various groups or categories depending on selected criteria (Weber, 1988). This method involves the construction of a classification scheme (defining a set of boxes into which to put the data) and developing a set of rules about "what" and "how" to code, measure and record the data to be classified (Milne and Adler, 1999). In this study the investigation is carried out in the dimensions related to environment, energy, products/consumers, community, employee/human resources and fair business practices, exposed through monetary and non-monetary quantification or declaration.

We have selected four enterprises operating in the wood biomass sector which are case studies in a national project (dated 2010) promoted by ENAMA (national agricultural mechanization association). Our sample is formed by non listed companies (small and medium-sized enterprises) in the wood biomass sector. The purpose of this examination is to present the principal information of companies that adopt the national accounting standards which are declared in the abbreviated form (in 3 of the cases analysed) and in the normal form of the financial statement 2010 (only one case of our sample). We only consider joint stock companies because they are obliged to draw up a financial statement which can be in the ordinary or in the abbreviated form. Disclosures in the financial statement, stand-alone reports (in particular, reports available on the ENAMA web site) and company web pages are examined. The focus of the analysis is on environmental and social impact disclosures. In particular, after examination of economic and financial information in the financial statement, the analysis (on the ENAMA on-line documents and web site) is concentrated on the following topics: energy consumption, solid waste disposal and recycling, air emissions, materials and water consumption, transportation, employment generation and other sustainability issues of bio-energy. The first step of our analysis is concentrated on the information disclosed in the financial statement (31/12/2010) (Table 1); this is organized according to the main topics required by national law. Only one company had a management report where they gave a little information about employees, salaries and their working conditions; and some description of environmental impact. In notes to the financial statement, business descriptions have been provided by two companies and the number of jobs by one company. It can be seen very clearly from the Table 1 that not enough information has been provided for environmental and social impacts by the companies analyzed.

Tab. 1 - Financial Statement Information						
Category	**Information**	**Type of information**	**Case study 1**	**Case study 2**	**Case study 3**	**Case study 4**
Balance sheet	- Total non-current assets	Quantitative	x	x	x	x
	- Total current assets	Quantitative	x	x	x	x
	- Total equity	Quantitative	x	x	x	x
	- Total non-current liabilities	Quantitative	x	x	x	x
	- Total current liabilities	Quantitative	x	x	x	x
Income statement	- Revenue	Quantitative	x	x	x	x
	- Profit	Quantitative	x	x	x	x
	- Personnel costs	Quantitative	x	x	x	x
Notes to the financial statement	- Business description	Qualitative	x		x	
	- Number of people employed by category	Quantitative		x		
	- Turnover employee	Quantitative	x			
	- Personnel costs by professional profile	Quantitative		x	x	
	- Analytical costs of raw materials and services	Quantitative			x	
Management report	- Economic and financial Index analysis	Quantitative	not required by national law	x	not required by national law	not required by national law
	- Operating profit	Quantitative		x		
	- Research and development projects	Qualitative		x		
	- Number of people employed by category and gender	Quantitative		x		
	- Accidents at work	Qualitative		x		
	- Respect for environmental system	Qualitative		x		

Source: From original survey data

In the second step of our analysis we focused on economic, environmental and social information on these case studies available in any other stand alone report (we find some reports of these companies in the ENAMA web site) (Table 2). The purpose of the analysis is to identify the information disclosed and to highlight the type and nature of voluntary information disclosed by the sample firms. We aggregated several topics into categories of information required by the European framework, in order to easily recognize and compare the different information available in these documents. Some of the information required by the European framework for bioenergy sustainability has been disclosed in these reports, but not all. Information is not provided uniformly by all the organizations: there is a difference in the type and depth of information disclosed.

Tab. 2 - Information on case studies available in ENAMA (update in 2010)

Category	Information	Type of information	Case study 1	Case study 2	Case study 3	Case study 4
Environmental	- Land used for bio energy (type, wood grown)	Quantitative	x	x		x
	- Co2 avoided	Quantitative		x	x	
	- Waste management	Qualitative			x	
	- Replaced methane	Quantitative		x		
Socio-economic	- Human resources employed	Quantitative		x		
Governance	- Framework regulatory	Qualitative	x	x	x	x
	- Type of incentives	Qualitative	x		x	
	- Amount of incentives	Quantitative			x	
Economical	- Cost/benefit analysis	Quantitative	x		x	
	- Payback period	Quantitative	x		x	x
Energy	- Thermal energy and electricity production	Quantitative	x	x	x	x
	- Energy for internal use in %	Quantitative			x	
	- Thermal energy and electricity destination	Qualitative	x	x	x	x
Information about Raw material	- Type of raw material	Qualitative	x	x	x	x
	- Suppliers and their locations	Qualitative	x			x
	- Origin of raw material	Qualitative	x	x	x	x
	- Characteristics (humidity, calorific value, etc....)	Quantitative	x	x	x	x
	- Distance travel led by raw material	Quantitative			x	
	- Raw material costs	Quantitative		x	x	x
	- Average consumption	Quantitative	x	x	x	x
Process Information	- Type of technology	Qualitative	x	x	x	x
	- Year of implementation	Quantitative	x	x	x	x
	- Cost related to each activity (during the process)	Quantitative		x		x
	- Supply chain information	Qualitative		x	x	
Other information	- Ownership	Qualitative	x	x	x	x
	- Partners	Qualitative	x	x	x	x

Source: From original survey data

The third step is the analysis of websites to determine whether the sample firms disclose voluntary information on this "facilitator of corporate communicative action". The findings show that this communication tool is not used by all the firms and most of the information is not updated (Table 3).

Tab. 3 - Sustainability information on internet

Category	Information	Type of information	Case study 1	Case study 2*	Case study 3	Case study 4
Web information	- Raw material location	Quantitative	x		Not available	Not active
	- Type of raw material	Quantitative	x	x		
	- Raw material growth	Qualitative		x		
	- Raw material details	Quantitative		x		
	- Co2 saved	Quantitative	x			
	- System type	Quantitative	x			
	- System capacity	Quantitative	x	x		
	- Operational efficiency	Quantitative	x			
	- Impact on landscape	Quantitative	x			
	- Supply chain information	Quantitative	x			

** Information is updated to 2009*
Source: From original survey data

This analysis shows that information disclosed from different sources is incoherent. The GRI's sustainability reporting guidelines (2011) states that sustainability reporting, "should provide a balanced and reasonable representation of the sustainability performance of a reporting organization – including both positive and negative contributions". But the current reporting elements do not provide much information on its negative impacts. With the current practices of the firms as regards the collection and disclosure of social and environmental information, it is not possible to assess correctly their impact on society and stakeholder's opinion.

5. The conceptual framework

The belief that "if the quality of (sustainability) information is improved, organizational change toward sustainability will occur" (Lamberton, 2005, p. 13) is the driving force behind the proposal aimed at increasing the transparency of organizations' social and environmental impacts through sustainability accounting practices. But the above assessment clearly shows that the current practices of disclosure are not fit for the purpose. The level of disclosures can be influenced by corporate size (Cho and Patten, 2007; Patten, 2002), regulation designed to protect the social and environmental interests (Porter and van der Linde, 1995; Neu *et al.*, 1998), industry (Gray *et al.*, 2001) and the country of origin of a company (Guthrie and Parker 1990; Roberts 1991; Adams, Hill *et al.* 1998), as well as social and political context (Burchell *et al.*, 1985; Adams and Harte, 1998).

In this study the 'small and medium size' (SME's) of the Bioenergy companies is one of the important reasons behind the above findings of inadequate disclosures. SME's constitute a big share in the Italian economy. SME's collective impact on the economy, society and environment is vast, due to the immediate influence that a small business has on the local environment and community (Roth 1982). In particular, the role of SME's in the Italian business context in terms of the country's balance of trade, their environmental contribution to industrial pollution and their impact on the society is relevant. In 2010, there were 669 bioenergy plants in Italy with an

average size of plant of 3.5Mw and gross maximum capacity of 2352 Mw (GSE, 2011). These small and medium size plants contribute significantly in Italy's Bioenergy portfolio. However, these SME's face challenges due to budgetary and human resource limitations. These limitations make it difficult for them to implement an environmental management system to report the impact of their activities on natural resources (Seiffert, 2008) - not only the environmental but in fact all sustainable impact disclosures are difficult for these organizations.

At the same time, the measurement of sustainability is not an easy task "sustainability, being a multi-dimensional concept, is not directly measurable and requires a set of indicators to enable performance toward its multiple objectives to be assessed" (Lamberton, 2005, p. 13). There are different sustainability frameworks available such as GRI (Global Reporting Initiative) which provide different objectives and their indicators to be measured for the sustainability impact. But again these initiatives have a large number of indicators which are difficult for SME's to measure and these indicators are not business and context specific which again hinders the application.

Starting from these considerations, in order to develop sustainable accounting practices (which in turn will impact on the operating practices) for the small and medium bioenergy enterprises, in this section of the research a set of sustainable objectives and indicators is proposed. The Directive 2009/28/EC of the European Union (European Commission, 2009) recognized a regulatory framework with a set of sustainability criteria for biofuels and bioliquids, but it can be also adopted for bioenergy because of the growing concerns about the sector. This EU framework relates mainly only to the three environmental aspects (biodiversity, the protection of ecosystems and savings in greenhouse gas emission) but at the same time, concerning other aspects of sustainability, the European Union requires the Commission to report to the EU Parliament on a few other aspects (FAO, 2010). Therefore, in the intention of creating an easy (usable) and effective (measuring the essential) disclosure framework, the reporting requirements of the Commission together with the regulatory framework can be seen as the minimum to be revealed by companies. They define the important social and environmental information to be disclosed in addition to the financial statement of the non-listed companies which are involved in the production of energy through biomass.

A sustainability reporting framework for the bioenergy sector based on Directive 2009/28/EC of the European Union (European Commission, 2009), Bioenergy and Food Security Criteria and Indicators - BEFSCI (FAO, 2010), Global Bioenergy Partnership (GBEP, 2011) and the Global Reporting Initiative (GRI, 2011) is suggested here (Table 4).

Tab. 4 - Sustainability Reporting Framework

	Objectives	Indicators
ENVIRONMENTAL	Land-use changes (both direct and indirect)	- Total area of land for bioenergy feedstock production (GBEP, 2011) - Percentages of bioenergy from residues and wastes (GBEP, 2011) - Percentages of bioenergy from degraded or contaminated land (GBEP, 2011) - Net annual rates of land-use types conversion caused directly by bioenergy feedstock production (GBEP, 2011)
	Biodiversity and ecosystem services	- EN11 Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas (GRI, 2011) - EN12 Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas (GRI, 2011)
	Productive capacity of land	- EN1 – Raw Materials used by weight or volume. (ton/Mw) (GRI, 2011) - Annual harvest of wood resources by volume of an area (GBEP, 2011) - The percentage of the annual harvest used for bioenergy (GBEP, 2011)
	Water availability and quality	- Volume of water withdrawn and used for the production and processing of bioenergy feedstock per unit of useful bioenergy output, disaggregated into renewable and non-renewable water sources (GBEP, 2011) - Percentage of pollutant loadings from total agricultural (biomass) production in the watershed(GBEP, 2011) - Pollutant loadings to waterways and bodies of water attributable to bioenergy processing effluents in percentage (GBEP, 2011)
	GHG emissions	- EN16 Total direct and indirect greenhouse gas emissions by weight/Mw (GRI, 2011) - EN18 Initiatives to reduce greenhouse gas emissions and reductions achieved (GRI, 2011)
	Air quality	- EN19 Emissions of ozone-depleting substances by weight (GRI, 2011) - EN20 NO, SO, and other significant air emissions by type and weight (GRI, 2011)
	Waste management	- Percentages of bioenergy produced from residues and wastes (GBEP, 2011)
	Environmental sustainability (cross-cutting)	- EN29 Significant environmental impacts of transporting products and other goods and materials used for the organization's operations, and transporting members of the workforce (GRI, 2011) - EN30 Total environmental protection expenditures and investments by type (GRI, 2011)
SOCIO-ECONOMIC	Land tenure/ access and displacement	- Amount of raw material sourced outside of Italy in percentage - Percentage of land – total and by land-use type – used for new bioenergy production where: a legal instrument or domestic authority establishes title and procedures for change of title and it is followed up (GBEP, 2011)
	Employment, wages and labour conditions	- LA1 Total workforce by employment type, employment contract, and region, broken down by gender (GRI, 2011) - LA2 Total number and rate of new employee hired and employee turnover by age group, gender, and region (GRI, 2011) - Incidences of occupational injury, illness and fatalities in the production of bioenergy in relation to comparable sectors (GBEP, 2011)
	Social sustainability (cross-cutting)	- SO1 Percentage of operations with implemented local community engagement, impact assessments, and development programs (GRI, 2011) - SO9 Operations with significant potential or actual negative impacts on local communities (GRI, 2011) - EC1 Direct economic value generated and distributed, including revenues, operating costs, employee compensation, donations and other community investments, retained earnings, and payments to capital providers and governments (GRI, 2011)

	Objectives	Indicators
GOVERNANCE	Compliance	Mainly applicable to the Information disclosed at Member State Level but still: - EN28 Monetary value of significant fines and total number of non-monetary sanctions for noncompliance with - Any other issues of compliance with laws and regulations
	Participation and transparency	Mainly applicable to the Information disclosed at Member State Level but still: - Providing sustainable information's. - EC4 Significant financial assistance received from government (GRI, 2011) - SO6 Total value of financial and in-kind contributions to political parties, politicians, and related institutions by country (GRI, 2011) - SO5 Public policy positions and participation in public policy development and lobbying (GRI, 2011)
FOOD	Food availability	Mainly applicable to the Information disclosed at Member State Level only: - Reporting on availability of foodstuffs at affordable prices (FAO, 2010)
	Food access	Mainly applicable to the Information disclosed at Member State Level only: - Corrective actions taken if evidence shows that if there is a significant impact on food prices (FAO, 2010) - Changes of commodity and land prices associated with increased use of biomass (FAO, 2010)

Source: Own analysis drawing on Directive 2009/28/EC (2009), BEFSCI (FAO, 2010), GBEP (2011), GRI (2011)

Fig. 3 - The two sides of bionergy coins

Source: F. Casciotti (2012)

In this framework the objectives are based on the Directive 2009/28/EC of the European Union (European Commission, 2009) as categorised by Bioenergy and Food Security Criteria and Indicators (BEFSCI) (FAO, 2010). Some of the objectives information required by the European Union is national / regional level information rather than from individual companies, which is mentioned in the framework (Governance, Food section). For other objectives than those, the appropriate indicators are suggested mainly using Global Bioenergy Partnership (GBEP, 2011), Global Reporting Initiative (GRI, 2011) and Bioenergy and Food Security Criteria and Indicators – BEFSCI (FAO, 2010). The information to be disclosed can be quantitative or even qualitative sometimes because "qualitative tools, such as narratives used to describe an organization's social and environmental impacts form a critical part of sustainability accounting" (Lamberton, 2005, p. 14).

This framework can help to understand the real operative situation of the companies in this sector from different points of view, providing a balanced representation of the sustainability performance with positive and negative impacts. In future, through proper social and environmental information, the evaluation of the companies' positive and negative externalities could be better estimated. Indeed, such externalities, if quantified, could be considered in order to recalculate the principal economic indicators using an operating profit corrected by those externalities to disclose the real sustainable results of the companies. For example, ratios which represent the

performance in term of economic and financial results as ROE (return on equity), ROI (return on investment), ROS (return on sales), ROA (return on assets) or EVA (economic value added) could be recalculated with a sustainable operating profit given by adding the positive externalities and subtracting the negative externalities to /from the operating profit outcome of the financial statement[4].

6. Conclusions

Bioenergy is a significant source of energy for Italy and can play a major role in Italy's drive for increasing domestic energy production and reducing green house gas emissions. At the same time bioenergy can create negative impacts on the environment and society and betray its moral value, if it is not properly managed. This could result in rendering the notion of 'sustainable bioenergy' as an illusion rather than a reality, as is depicted in *Figure 3*, which shows the two (positive and negative) sides of bioenergy. Hence, it is important to understand these harmful effects in order to avoid a detrimental process which damages the community and expropriates wealth economically, socially and environmentally. This demands proper accounting for sustainability in the bioenergy sector, because only when the right information is disclosed by companies involved in bioenergy is it possible to understand the real value added by it. These disclosures can play a significant and legitimate role in responding to the questions of sustainability put forward by the society.

The empirical analysis ascertains the gap in reporting of information about wider sustainability, in the financial statement and in other voluntary documents of the small and medium bioenergy enterprises. These organizations nevertheless account for a huge share of the bioenergy business in Italy and negligence of the overall impact can cause serious damage to the environment and society in long run. The disclosure should integrate different points of view and different exigencies such as the view of the entrepreneurs, controlling shareholders, subjects who use the services provided by such companies, community and of the collectivity in general. It is necessary to have information about the policy of the company and facts that it is not destroying the environment and society. An accounting framework reporting the sustainability of bioenergy has been suggested with due consideration of the limitations of the SME's and the minimum necessary information.

The Directive 2009/28/EC of the European Union on renewable energy has been considered as the basic regulatory requirement for this framework and the indicators are recommended mostly from the Food Security Criteria and Indicators, Global Bioenergy Partnership and the Global Reporting Initiative. The EU regulation has four main themes namely environment, socio-economic, governance and food security. While most of the indicators for the objectives are selected with the consideration of practical applicability and relevance in addressing the objective, some of the objectives are wider in scope and require information disclosure at regional or national level.

This framework provides a suitable starting point for organisations to report on sustainability on a voluntary basis. However further research is require to compose a comprehensible list of data requirements for these indicators, to develop measurement techniques for them, to build up

[4] By such changes, a new formulation of these ratios is possible: SROE (sustainable return on equity), SROI (sustainable return on investment), SROS (sustainable return on sales), SROA (sustainable return on assets) or SEVA (sustainable economic value added).

a strategy for their practical application and to study their implications, all of which are identified as research gaps in this field during the study.

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