ERIA Discussion Paper Series

Carbon Footprint Labeling Activities in the East Asia Summit Region: Spillover Effects to Less Developed Countries[1]

Xunpeng SHI[*]
Economic Research Institute for ASEAN and East Asia (ERIA)

July 2010

Abstract: This paper discusses carbon footprint (CFP) labeling activities in the East Asia Summit (EAS) region with a focus on their spillover effects on less developed countries (LDCs). Due to increased and increasing economic integration, implementation of CFP labeling schemes in one country will have significant impact on others. The impact is particularly significant for LDCs in the EAS region because: the EAS production networks are highly integrated, which provide necessary condition for the spill-over effects to be generated; LDCs generally lack the capacity to measure and label CFP on their products; and exports from LDCs often produced by relatively small producers. However, the effective inclusion of LDCs in CFP labeling schemes may offer more and cost-effective opportunities for carbon emission reductions. The presence of spillover effects means that countries that are implementing CFP labeling schemes need to take stakeholders outside of their boundaries into consideration. The disadvantages of LDCs can be reduced by well designed CFP labeling schemes, by innovative solutions to low cost data collection and certification, and by technical transfer, training and capacity building.

***Keywords*:** Carbon Footprint; Carbon Label; Spillover Effect; East Asia Summit; Less Developed Countries

***JEL Classification*:** Q01; Q54; Q56

[1] The paper was presented at the International Workshop on Carbon Footprint of Products in East-Asia, Tokyo, on 13 February 2010. Author is grateful to Fukunari Kimura and Ponciano S. Intal for their comments and advice and to Mitsuo Matsumoto and Maria Anastasia for their contributions in the editing.

[*] Address: ERIA Annex Office, Sentral Senayan II 6 floor, Jl. Asia Afrika no. 8, Senayan, Jakarta Pusat 10270, Indonesia. Tel: +62 21 5797 4460, Fax: +62 2 5797 4464. Email address: xunpeng.shi@eria.org

1. Introduction

CFP labeling is being explored as a mechanism for greenhouse gas (GHG) emission reduction through informing both producers and consumers. In response to increasing awareness of environmental issues and climate change, many well-informed policy-makers, consumers and firms have a desire to reduce GHG emissions (Carbon Trust, 2009c). CFP labeling provides producers and customers with a tool to help them achieve the desired outcomes. CFP labeling schemes enables consumers make their shopping decisions according to the CFP of products. With CFP labels, or carbon labels, consumers can produce less GHG emissions by purchasing CFP-labeled low GHG emission products and services. Surveys in UK demonstrate that 67% consumers are more likely to buy a lower-carbon product and 44% would switch to a product with a low CFP even if the brand was not their first choice (Carbon Trust, 2009c). CFP labeling schemes create incentives for firms of different parts of the supply chain to reduce their emissions and encourage them to develop and adopt low carbon emission production technologies. Carbon labels can also suggest the most efficient way to using and disposing products (Carbon Trust, 2009c). One popular CFP labeling scheme is the Carbon Reduction Label (CRL), which was developed by the UK's Carbon Trust and was launched in March 2007.

The CFP labeling schemes not only bring environmental benefits, but also generate economic benefits for participating companies. At least three benefits have been reported (Carbon Trust, 2009c): achieving additional emission and cost savings; differentiating producers' and improving companies' corporate image and reputation. For example, improvement of energy and water efficiency, driven by the commitment to ongoing reductions required by CFP labeling, will lead to cost savings. Another example is that CFP labels enable businesses to demonstrate their commitment to managing and reducing carbon emissions and thus create a good business image.

CFP labeling, however, is not without opposition. One criticism compares CFP labels with nutritional labels, which have barely improved diet quality despite substantial costs (Loris, 2009). Another concern is that customers may not be persuaded to consider the CFP labels significantly, as demonstrated by a survey in Japan (McCurry,

2009). It is also suggested that less developed countries (LDCs) [2] may be disadvantaged in trade for reasons such as lack of capacity to measure and label CFP (Brenton *et al*., 2008, Edwards-Jones *et al*., 2009, Deere, 1999).

Implementation of CFP labeling schemes in the EAS region involves many issues for which additional study is valuable. The EAS region includes diverse countries in terms of development levels, institutional capacity, business size, energy resource endowment, and so on. Due to increased integration of product networks, implementation of CFP labeling in some EAS countries may have significant impact on others, in particular LDCs, firms of which lack capacity to participate in complex CFP labeling schemes. The participation of small and medium enterprises (SMEs) which often lack the capacity and resources to participate in the complex schemes is a more important issue in LDCs than in other countries because most exports from LDCs are produced by small firms and farms. If the implementation of CFP labeling fails to address this diversification and the regional integration, it may not only fail *per se*, but also widen development gaps and damage economic integration.

There are only a few discussions about the impact of CFP labeling on developing countries, including LDCs. Some discuss the impact of labeling CFP in developed countries on the exports of developing countries (Brenton *et al.*, 2008; Edwards-Jones *et al.*, 2009); some illustrate the impact by examining specific examples (Odhiambo and Sambu, 2009; Rural Economy and Land Use Programme, 2009; Williams, 2007); or more generally explore how the North and the South work together to reduce the total CFP (Cranston and Hammond, forthcoming). However, there is as yet no discussion and analysis about the impact of CFP labeling schemes on LDCs in the EAS region and the spillover effects have not been identified.

This paper will discuss the trans-boundary spillover impact and associated threats and opportunities from CFP labeling in some EAS countries on LDCs in the EAS region, and propose cooperation principles, frameworks and action plans to facilitate the adoption of CFP labeling, in line with the narrowing of development gaps and boosting regional integration. The summary of labeling CFP of products in the EAS region will

[2] Broadly, the concept of developing countries and LDCs are interchangeable. However, in the paper, to exclude China, a developing country with plans to introduce carbon labeling, the group of countries which are passive affected by carbon labels will be described as LDCs rather than developing countries.

be up-to-date and complementary to the literature; the spillover effect, which has not been identified elsewhere, highlights the trans-boundary impact of CFP labeling and could service as an instrument for national policy makers to analyze consequences beyond their boundaries; and the arguments for involving LDCs may spark debates in countries which adopt CFP labeling and contribute to regional development and integration.

After the introduction, this paper provides a brief overview of CFP labeling activities in the EAS region. Section 3 discusses the spillover effects and its impact on LDCs in the EAS region. The following section proposes actions and policy initiatives to address challenges facing, and opportunities for labeling CFP. Finally, concluding remarks are offered in Section 5.

2. Carbon Footprint Labeling Activities in the EAS Region

CFP labeling has been, or is being, implemented in developed EAS countries, such as Australia, Japan, South Korea and Thailand. China is planning to launch a low carbon intensive labeling project, but the starting date has not been specified. Other EAS members have made no tangible progress toward CFP labeling so far.

2.1. CFP Labeling Activities in Australia, Japan, South Korea and Thailand

Australia initiated its Carbon Reduction Label (CRL) scheme in 2009 and products with CRL are expected to appear from 2010 (Carbon Trust, 2009a). Planet Ark, Australia's CRL scheme implementer, targets 5 to 10 percent of supermarket goods carrying the label within five years (Environmental Leader, 2009). Companies that apply for the label will be assessed by a consultant approved by Planet Ark according to a measurement process laid out by the Carbon Label Company, a subsidy of Carbon Trust. Once a CFP has been calculated and confirmed, certification will be issued by the Carbon Label Company to ensure global consistency of the CRL.

Japan launched a three year national CFP pilot project in April 2009, which is dedicated to development of pilot product category rules, study of verification schemes and development of a data base (JEMAI, 2009). In October 2009, the first CFP label

was authorized for use. By 18th January 2010, 24 CFP labels had been authorized under the Japanese CFP Pilot Program (CFP Japan, 2009). The Japanese carbon labeling program will be formally launched in 2010 with the participation of 300 Japanese companies.

The South Korean CFP labeling system was launched in February 2009. It has two-phase certificates: a carbon footprint certificate (Step 1) and a low carbon product certificate (Step 2). The first step certificate will be issued to a producer which commits to reduce its CFP. It can be referred to as carbon emission baseline for the product. By the end of January 2010, 37 companies and 125 products had been certified with the first step certificate. The second step certificate, the Low Carbon Product Certificate, which is similar to Carbon Trust's CRL, certifies that those goods satisfy the minimum reduction, and is planned to be adopted by 2011. Korea plans to harmonize its existing scheme with the new international carbon labeling standard (ISO14067) to get recognition from eco-conscious shoppers overseas (Carbon Trust, 2009b).

Thailand has two types of carbon labels: a CRL and a CFP label. Unlike those in South Korea, they are not in sequence, but in the relationship of partial and whole in terms of life cycle of products. The CRL certifies those products that have lowered their carbon emissions during the production process, not the whole life cycle. In order to get the CRL, at least one of the following three criteria should be fulfilled by the producer (TGO, 2009b): 1) the GHG emissions have declined by 10 percent in the most recent year compared to its 2002 level; 2) at least 95 per cent of electricity supplied to manufacture the product is generated on-site from biomass residues or industrial waste; and 3) the product has been manufactured using less carbon-intensive technology compared to others in the same industry. The second type of carbon label, the CFP label, is similar to the Carbon Trust's CRL. This label is planned to be printed mainly on goods exported to the US and EU markets. 25 products were allowed to apply to the first commitment period of CFP label which took place from April to October 2009. To encourage producers to participate in the CFP labeling scheme, the Thai government pays for consultancy to help producers to conduct life cycle assessment (LCA) studies and get carbon labels. By 25 December 2009, 16 products were granted the CFP label (TGO, 2009a).

2.2. Activities Related to CFP Labeling in China and New Zealand

The carbon labeling system in China is still being developed. China's Ministry of Environmental Protection has signed a contract on 15 October 2009 to cooperate with German environmental bodies in certifying low carbon-intensive products. The certification and labeling would be voluntary for Chinese manufacturers and the products targeted would be mostly daily necessities. Products could be labeled as "low carbon intensive products" if their carbon "imprint" meets the standards. However, the standards have yet to be set and the exact date for starting certification has not been finalized (Cao, 2009; Xinhua, 2009). The Carbon Trust's CRL, however, has an indirect presence in China through its collaboration with multinational companies such as Coca Cola and PepsiCo (Environmental Leader, 2009).

New Zealand, although a developed member in the EAS region, has not announced a schedule for starting CFP labeling, but has contributed to development of the CFP measurement methodology. The New Zealand Greenhouse Gas Footprinting Strategy for the Land-Based Primary Sectors was developed at the end of 2007. However, its main goal is not to label CFP, but to make sure New Zealand's primary industries will have fair markets with creditable carbon labels (The Ministry of Agriculture and Forestry of New Zealand, 2009), through participation in the development of international methodologies. New Zealand has been working to facilitate the development of product category rules (PCRs) in ISO 14025:2009. It has published a methodology report on CFP measurement for dairy products across their complete supply chains (Standards New Zealand, 2009).

2.3. Sectional Comments

All existing or planned CFP labeling schemes in the EAS region share the following core requirements: manufacturers must prove that they have measured a product's CFP from production to disposal, using internationally recognized methodology; manufacturers have to commit to reducing their CFP on a year-by-year basis if they want to continue to carry the label; and one common motivation is to increase the competitiveness of their nation's products in the world. Table 1 presents a brief summary of carbon labeling initiatives in the EAS region.

Table 1. Summary of Carbon Labeling Initiatives in the EAS Region

Country	Labels	Starting time	Carbon Trust Involvement	Remarks
Australia	Carbon Reduction Label	2010	Yes	Exactly same as the CT's CRL
China	low carbon-intensive products	Not yet decided	No	Expected to be unique
Japan	Carbon Footprint of Products	2010	No	Similar to the CT's CRL
South Korea	carbon footprint certificate (Step 1)	2009	No	Being referred to as carbon emission baseline
	low carbon product certificate (Step 2)	2011	Yes	Will be exactly same as the CT's CRL
Thailand	Carbon Reduction Label	2009	No	Not life-cycle; focus on manufacturing process
	CFP label	2009	No	Similar to the CT's CRL

Note: CT: Carbon Trust, UK
Sources: A summary of Section 2.1 and 2.2.

The methodology developed by the UK's Carbon Trust has been adopted in Australia and South Korea. Both countries use the Carbon Trust as a partner in developing their CFP labeling schemes. The Japanese scheme is not a part of the Carbon Trust scheme, but its ideas are similar to those of the Carbon Trust. Unlike similar labels already in use elsewhere, the Japanese labels will go further by providing detailed breakdowns of each product's CFP (McCurry, 2009).

China's proposed low carbon-intensive product labels are different from those carbon labels in Australia, Japan, South Korea and Thailand. It is a qualitative label showing the low carbon-intensive character of products, rather quantitative assessment of CFP. However, the Chinese low carbon labeling scheme shares the same intentions as the Carbon Trust's CRL, that is, encouraging manufacturers to develop low carbon-intensive products and letting consumers make informed choices (Xinhua, 2009). Two distinct characteristics show China may want to develop its own unique scheme: first, it uses the word "imprint" instead of the popular phase "footprint"; and second, it chose a Germany partner, not the British Carbon Trust. This strategy may increase the difficulty of its implementation as its estimation methodology has to be accepted by the global community. However, once the methodology is accepted, the Chinese may offer an

additional instrument to label CFP.

Korea has split the usual CFP labeling process into two steps. The first step certificate is relatively easy to reach and thus could give producers more opportunities and time to do preparation and encourage more producers to participate in carbon labeling schemes. The second step certificate is the Carbon Trust's CRL, which has not been granted for producers yet.

Thailand's so-called CRL is different from others in that it is not based on a LCA. The Thai CRL only indicates the level of GHG emission reductions attainable during the manufacturing process, not the amount of carbon emission during the life-cycle of the product. The Thai CFP label, however, is similar to the Carbon Trust's CRL.

Other EAS members have no concrete plan to implement CFP labeling. The ASEAN countries, except Thailand, have not started to implement CFP labeling schemes. Malaysia has conducted some LCA studies, but nationally a CFP labeling plan has not emerged. Indonesia's focus on mitigating climate change is reforestation through projects such as Reduced Emissions from Deforestation and Degradation (REDD), rather than carbon labeling (Satriastanti and Haryanto, 2009).

3. Spillover Effects of CFP Labeling in the EAS Region

3.1. Life-cycle Analysis, Integrated Production Networks and Spillover Effects

The spillover impact of CFP labeling on LDCs in the EAS region is generated by two interrelated factors: the LCA and integrated production networks. CFP labels display the CFP, or total GHG emissions, of a product or service throughout their entire life cycle, from sourcing raw materials, through to manufacture, distribution, use and disposal (Carbon Trust, 2009c). Since the LCA is a 'cradle to grave' approach, CFP labeling needs information about CFP in each step of the supply chain involved in moving a product from supplier to customer. The integration of production networks, or supply chains, when viewed from a different perspective, and trade in the current world, makes CFP labeling requirements in end use countries spill over to other countries along supply chains. Since supply chains often extend beyond national boundaries, labeling GHG emissions in the end-use countries needs to evaluate emissions at steps happened

overseas. The transmitted requirements of CFP labeling from end user countries to other countries involved in the production networks are the spillover effects of CFP labeling.

In a globalized world, with increasing implementation of carbon labeling, spillover effects will become more and more important and complicated. In many countries, in particular developed countries, some parts of goods and services have an increasing trend of being produced outside of their countries. For example, General Motors has operations in 34 countries and sells vehicles in 200 countries (General Motors Website, 2009). Moreover, a significant number of products consumed by developed nations are produced in developing countries that are not subject to mandatory domestic or international GHG emission regulations. For example, one study shows that one-third of China's carbon dioxide emissions were generated as a result of manufacturing exported goods in 2005 (Weber *et al*., 2008). In such a globalized world where supply chains grow longer and ever more complex with inputs being produced in a large number of countries, the calculation of CFP of products is becoming increasingly difficult (Brenton *et al*., 2008).

Arguably, this complexity leads to the dominance of agricultural supply chains in the CFP labeling literature as many foods are subject to little processing and pass through relatively simple supply chains; non-agriculture products that have been measured for their CFP include transport fuels and forestry products, where again the supply chains are relatively straightforward (Brenton *et al*., 2008). In this initial stage of CFP labeling on agricultural goods, spillover effects may not be very complicated, but it could disproportionately fall on agriculture resource abundant countries. For example, the Japanese CRL scheme may have more impact on its agriculture goods suppliers like Indonesia, Malaysia and New Zealand, than on other EAS countries.

However, carbon labeling may be also implemented for products with complex supply chains, such as industrial products. In that case, the spillover effects will be much more complicated and significant.

3.2. Spillover Effects in the EAS Region

The spillover effects in the EAS region are significant and real. The introduction of CFP labeling in some EAS countries will have significant spill-over effects on other

EAS countries for three reasons: most EAS countries are now part of regional production networks; EAS countries are diverse and LDCs are lagging behind in CFP labeling due to capacity constraints; and producers in LDCs are often in small size.

Firstly, countries in the East Asia are now more integrated with one another than before. Due to trade specialization and economic integration, supply chains in the EAS region are often spread among many countries. EAS, in particular East Asia and ASEAN, has become more integrated than the past, in part through production networks resulting from trade fragmentation (Kimura, F, 2009). The dominance of machinery that typically requires many parts and components and the significant differences in levels of development and factor prices among the East Asian economies that allows for profitable fragmentation of production make the regional production networks in East Asia arguably the most complex and articulated (Kimura, F, 2009). The share of intra-ASEAN + 3, or ASEAN plus China, Japan and South Korea, trade to the total international trade of the region increased from 29.41 per cent in 1990 to 33.11 per cent in 1998 and to 37.53 per cent in 2008 (ADB, 2010). Australia and New Zealand are also fitted into the East Asian production networks as major suppliers of agricultural and natural resources. Such close integration demonstrates that the spillover effects are indeed a big issue in the EAS region.

Secondly, LDCs in the EAS region will lag behind in the introduction of CFP labeling because effective participation in carbon labeled trade will require the necessary measurement and certification mechanisms that are often lacking in LDCs *(*Brenton *et al*., 2008). Most EAS members are developing countries with little capacity to fulfill the carbon labeling requirements if they are requested to do so. Therefore, CFP labeling has been, and will likely be, implemented only in developed countries for reasons such as government leadership, consumer demand and producer capacity. The EAS countries that have CFP labeling activities (Australia, Japan, South Korea and Thailand) are all developed countries.

Lastly, most firms in developing countries in Asia, such as firms in CLMV countries, are small and lacking the capacity and resources to participate in complex CFP labeling schemes. For SMEs in LDCs, measurement costs for carbon labeling are critical. SMEs are relatively more disadvantaged than larger enterprises, which can absorb the extra costs incurred by CFP labeling more easily. If the costs of certification

lead to the exclusion of low-emission producers from developed country markets the labeling scheme would be undermined (Brenton *et al*., 2008).

The spillover effects are real and could emerge soon. While existing carbon labeling activities have been voluntary, the mandatory requirement of CFP labeling is not impossible. One survey shows that more than 70 percent of Europeans want CRL to become a mandatory requirement for all imported goods (The GALLUP Organization, 2009). Since one common motivation of CFP labeling is to increase the competitiveness of products in global markets, it is of the interest of those CFP labeling countries to apply restrictions, and sooner rather than later. The EC Commission has proposed a series of "Sustainable Biofuel Certificates" on 10 June 2010 (European Commission, 2010). The certificates include mandatory requirements for measuring the CFPs of all types of biofuels, including those imported into the EU. The certificates require that biofuels must deliver substantial reductions in GHG emissions[3] in the whole life cycle and should not come from forests, wetlands and nature protection areas. It also clearly mentioned that the palm oil produced from a land converted from a forest will not meet the sustainability requirements. These certificates create two challenges to EAS palm oil exporters, Indonesia and Malaysia: labeling of life-cycle GHG emissions; and proof of the characteristic of land.

Even if the government does not formally require CFP labels on imported goods, the business sector could informally implement CFP labeling and restrict exports. For example, the mandatory requirements for biofuel have caused problems for biofuel exporting EAS nations, primarily Indonesia and Malaysia as the world's top two exporters of palm oil, because palm oil has not been deemed to be eligible as a renewable energy, leading to consumer boycotts (Lim, 2009). Since East Asia has large potential for biomass resources production and consumption, CFP labeling of biomass fuels is of great interest to this region.

3.3. Threats and Opportunities in the Spillover Effects

The spillover effects of carbon labeling may have negative impact on LDCs, but may also offer opportunities for both developed countries and LDCs. One serious

[3] Compared to fossil fuels, the minimum GHS savings delivered by Biofuels is 35% initially, 50% in 2017 and 60%, for biofuels from new plants in 2018.

concern from LDCs is the possibility of being disadvantaged in trade and in participation in production networks. The prominent threat is that LDCs are likely suffered from non-trade barriers caused by the spillover effect of CFP labeling implemented in developed countries. If CFP labeling becomes a compulsory requirement for products sold in one country, exporting countries, many of which are LDCs, have to implement CFP labeling schemes passively; if they fail to do so, their products may be blocked from the markets. In that case, CFP labeling will become a new type of non-tariff barrier. Therefore, CFP labeling schemes in developed countries may be suspicious to these LDCs because of the possibility of CFP labeling being used as a trade protection measure. This concern has been publicly raised in China (Cao, 2009). However, if CFP labeling becomes this kind of instrument, they may not able to be accepted by developing countries and CFP labels' role in reducing emissions will be undermined.

Second obvious threat is that LDCs are likely to be disadvantaged by the collection of CFP data. In the case of a trans-boundary supply chain, CFP data may not be available in some steps overseas. The efforts to obtain those data include either through capacity building or analogic calculations. The calculation of data, such as emissions from land use, is sometimes flexible[4] (Brenton *et al*., 2008) and thus could be manipulated in favor of certain groups. Since developed counties dominate the development of methodology, developing countries may be discriminated against if: the labeling schemes reflect local technologies or interests and tend to exclude "acceptable products" produced with different processes in overseas locations; the CFPs of products are calculated using parameters inferred from data in the importing country and which may overestimate the emissions in the country of production (Deere, 1999).

These possible discriminations are likely to have a heavy impact on developing countries, including LDCs, where production processes tend to differ from those in developed countries (Brenton *et al*., 2008). For example, the figures quoted may declare GHG emissions caused by clearing native forest for agriculture in developing countries, while crops from Europe seldom include these, because the land was cleared

[4] The issue is not only how to measure the emissions from land use changes, but also a decision on how long this 'one-off' increase in emissions should be spread over and how these emissions should be represented: identical across all units of the product concerned or exclusively to units that come from the converted land.

long ago. Meanwhile, additional carbon sequestered in soil under trees and bush crops commonly grown in developing countries is seldom calculated in the CFP labeling process (Rural Economy and Land Use Programme, 2009).

The most commonly referred to guidance documents for quantification and communication of GHG are quite different in terms of the coverage of GHGs numbering, stages of the life, default values and conversion factors, reporting of final data, and so on (Sagisaka, 2008). It was argued that European Union Renewable Energy Directive has assigned a much lower GHG emissions savings value (19 per cent) to palm oil and thus disqualifies the commodity as a biodiesel (Cheam, 2010). The different approach will be a burden to the biofuel industry when required to show compliance to reporting the GHG profile according to the specifications adopted by a particular country.

Another threat is caused by the possible size bias in the system. Exports from LDCs are typically produced by relatively small firms and tiny farms which will find it difficult to participate in complex carbon labeling schemes. Any size bias of measurement costs in the carbon labeling schemes will weaken the competitiveness of SMEs, and may damage LDCs overall (Brenton *et al*., 2008). A similar example is that this kind of size bias in complying with the GlobalGAP standard initiated mainly by some UK and Dutch retailers, is likely a key reason for the marginalization of small farmers from horticultural export (Brenton *et al*., 2008).

Nevertheless, the impact of CFP labeling on LDCs can be reduced if the labeling countries and LDCs have different production capacity (Edwards-Jones *et al*., 2009). For example, exports of tropical goods from ASEAN countries may not be seriously affected by carbon labeling in Japan because they are unlikely to be substituted by the Japanese domestic products.

The carbon labeling could also potentially bring benefits to LDCs in the EAS region. Given their favorable climate and the use of technologies that are typically less carbon intensive, their participation can create more and likely cost-effective opportunities to reduce carbon emissions in the products' overall life cycles. LDCs in EAS are likely to have an advantage in terms of carbon emissions in competing with energy-intensive protected production in richer northern countries, such as horticultural production under glass or in polytunnels. LDCs in the EAS region generally use technologies and sources

of energy that result in relatively low carbon emissions. Furthermore, fertilizers tend to be used much less intensively in countries with lower incomes and production is less mechanized[5] (Brenton *et al*., 2008). This low energy intensity in manufacturing, and associated low carbon intensity, together with the favorable tropical climate and abundant hydroelectricity and renewable energy resources[6], gives the CFP of products from these LDCs many advantages over developed nations. By estimating the CFP of cut roses supplied to the UK market, Williams (2007) found that the roses produced in Kenya incurred significantly lower emissions than those produced in the Netherlands, even after emissions from air transport are considered. The reason is that the energy used in Kenyan greenhouses was generated from geothermal energy, while in the Netherlands energy were derived from fossil fuels (Brenton *et al*., 2008).

For CFP labeling implemented countries, the involvement of LDCs may offer a cost-effective way to reduce GHG emissions. Research has found that producing vegetables in a greenhouse produces nearly 20 times more carbon than those produced under the sun in Africa and South America, which are airlifted to Europe (Odhiambo and Sambu, 2009). One expectation of CFP labeling is that they help companies to build closer links with their suppliers in identifying cost-saving opportunities along their supply chains (Carbon Trust, 2009c). By shifting their supply chains, producers in developed countries can reduce costs while fulfilling their commitments to emission reductions.

4. Discussions and Policy Implications

The method of design and implementation of the CFP labeling plays a critical role in shaping its impact on developing world. The CFP labeling schemes need to be comprehensive in order to capture many opportunities for emission reductions along a supply chain, including energy saving and conservation. Improvement of energy efficiency has succeeded, and will continue to succeed, in delivering valuable carbon emission reduction and cost savings for business (Carbon Trust, 2006). For all countries,

[5] Livestock rather than machines are often used for a number of agricultural tasks.
[6] To give a few examples, Myanmar, Laos and Cambodia are rich in hydro and biomass energy; and Indonesia is rich in geothermal energy.

whether they are more or less developed, energy efficiency should be continuously improved. ERIA's ongoing study tentatively shows that, if all current action plans can be fulfilled, EAS countries could achieve near 20 percent reduction in energy consumption by the year 2030[7] (Kimura, S, 2009). The focus on fertilization and energy could also bring cost savings, which should be of interest to LDCs. Additionally, footprints should include capital inputs, exclusion of which can comparatively disadvantage developing country producers which are more likely use human labor instead of machines (Edwards-Jones *et al*., 2009).

Since LDCs have important roles and interests in CFP labeling implemented outside their boundaries, their interests must be properly reflected in the design and implementation of CFP labeling schemes. By raising LDCs' interest in participation and reducing their resistance, the involvement of LDCs in CFP labeling will create a great deal of cost-effective opportunities to reduce emissions, while boosting development of LDCs and facilitating regional integration (ISO 9001 Quality Manual, 2009). One successful example is the Roundtable on Sustainable Palm Oil. It has considerable developing country participation and is addressing the concerns of small developing country producers (Brenton *et al*., 2008). Unfortunately, LDCs have been very poorly represented in the standard-setting processes so far, which is very likely due to lacking the technical capacity and resources needed to participate in standard development (Brenton *et al*., 2008).

A proper CFP labeling scheme needs to address potential discrimination against LDCs in the way that information is gathered. The CFP labeling countries should recognize the capacity constraints of LDCs in participating in carbon labeled trade, and ensure that opportunities for exports are not seriously damaged. The mechanisms for CFP labeling should not disadvantage the developing world with data collection and verification requirements. Data should be transparent, giving detailed information about how they were gathered. Data should also be openly accessible, for example, publicly available on central websites (Edwards-Jones *et al*., 2009).

Low cost approaches to obtaining data and certification should be promoted to

[7] The saving is not calculated as a 'maximum effort' but is instead based on current plans by member governments. Many other potential EEC policies and technological options, such as the uptake of highly efficient thermal power generation technology, Integrated Gasification Combined Cycle, have not been incorporated.

ensure that SMEs, both in developed and developing countries, can afford to participate in such schemes (Brenton *et al*., 2008). The potential for LDCs to exploit the relative emission efficiencies that they possess is dependent on their ability to measure and verify emissions in a cost effective way. Innovative solutions to provide low cost data collection and certification are critical to eliminate the disadvantages of small size (Brenton *et al*., 2008).

Technical assistance and technology transfer to the LDCs can reduce the severity of the spillover effect. The level of interest from SMEs could be increased if those SMEs are more confident, or more able to get help from authorities, institutes or NGOs. Implementation of CFP labeling schemes will become easier and more cost effective as more trained consultancies, accredited certifiers, software and databases become available to meet growing demand (Carbon Trust, 2009c). Environmental sustainability could be aided by the transfer of best practice energy technologies from the richer to poorer countries, both of which will benefit (Cranston and Hammond, forthcoming). Through direct support for SMEs, or indirectly support for some intermediary institutes, and technology transfer, the capacity building will increase the capacity of producers in LDCs, mainly SMEs, to meet the requirements of CFP labeling and thus increase the feasibility of CFP labeling in the integrated region.

Building capacity and providing affordable and transparent data to SMEs is a necessary step in CFP labeling countries, and also is a core element to involve LDCs into CFP labeling schemes. Training and support in accurately recording inputs and yields should be available to SMEs, so that those SMEs will not be at a disadvantage when they compete with well-resourced large-scale enterprises (Edwards-Jones *et al*., 2009). It is also important to build the capacity of institutes, such as Malaysia's SIRIM, in LDCs to support SMEs. SIRIM, as a government owned non-profit service provider of technology, quality and conformity assessment, has helped SMEs improve their global competitiveness through various technological, innovative and quality solutions (Sim, 2008).

Specific to biomass energy, to protect EAS' interests in developing biomass energy, a good strategy is to formulate East Asia's own methodology of estimating sustainability. Once this methodology is recognized by the global community, it would be easier to justify the renewable characteristic of products from the EAS region. Since 2007 ERIA

has been trying to provide a platform for EAS member countries to investigate and recommend the most appropriate assessment methodology for the sustainability of the Bioenergy industry in the region (Sagisaka, 2008). This project needs to be advanced further to serve as a practical instrument to access the environmental, social and economic merits of bio-energy development.

CFP labeling and CRL could be implemented in LDCs in parts of production chains and/or in a few cases such as land conversion, use of fertilization and energy consumption. The difficulty in implementing LCA in LDCs does not prevent LDCs from focusing on parts of the production chains. The first step certificate used by South Korea could be introduced in LDCs to label firms with intention to reduce carbon emissions. This step could be voluntary and last a few years so firms could build their capacity. In agricultural products, the Chinese system for CFP labeling could be implemented in the production stage; for manufactured goods, the Chinese scheme and the Thailand CRL could be used. Partial life cycle assessment in these schemes could help LDCs to build their capacity, meet potential requirements for trade, and reduce costs.

Because CFP labeling is largely a national policy, the spillover effect may be omitted or undervalued by national policy makers. Therefore, it is necessary to involve stakeholder countries in an appropriate framework. Existing institutional cooperative frameworks, such as regular meetings of EAS ministers for environment, energy and trade, can be used to discuss the spillover effects. If necessary, the EAS itself could discuss these issues. However, in order for these issues to be put on the table, there needs to be increased awareness among all EAS countries.

5. Conclusion

CFP labeling schemes are being introduced in EAS countries such as Australia, Japan, South Korea and Thailand. A carbon labeling scheme is also being considered in China. Other EAS countries, mostly less developed members, have not and are unlikely to adopt any CFP labeling scheme in the near future.

The impact of CFP labeling on LDCs is significant and real for reasons such as

integrated production networks, methodology discrimination, capacity constraints, and compulsory requirement of CFP labeling in importing countries. The dominance of agricultural products in the current carbon labeling schemes does not undermine the importance of the spillover effects.

The presence of spillover effects means that CFP labeling schemes have to be considered beyond national boundaries. Given the increasing integration of the EAS region, and the ambitious goal of building a regional community, the spillover effects may create barriers to narrowing development gaps and to the progress toward further integration when implementing CFP labeling in any developed EAS country. While East Asia is highly integrated and the EAS is working toward a common community, the concerns from LDCs should not be overlooked by national policy makers.

The involvement of LDCs is necessary to facilitate EAS regional integration and will also be beneficial in reducing life cycle emissions cost effectively. The effective inclusion of LDCs in labeling schemes may offer important and cost-efficient opportunities for carbon emission reductions in all countries due to their favorable climactic conditions and their current use of low energy intensive production techniques. On the other hand, excluding LDCs will cause problems for carbon labeling, and more seriously, may result in resistance from them and thus damage regional development and integration.

To involve LDCs in the CFP labeling schemes, work needs to be done from the beginning to the end to ensure the schemes are transparent. LDCs should be properly represented in debates on, and design of, carbon labeling schemes. In particular, data collection should take circumstances of LDCs and SMEs into consideration. Cost-effective, simple and transparent methodologies for measuring CFP are crucial and practical because small producers in LDCs are involved through supply chains.

Training and other support for to SMEs in LDCs will facilitate the implementation of CFP labeling in developed countries and have benefits in terms of regional development and integration.

LDCs that experience difficulties in conducting LCA labeling schemes could implement analogous CFP labeling schemes to build capacity and realize economic benefits. Such schemes could include the measurement of emissions in a few parts of supply chains, or labeling producers that are willing to commit to reduce emissions.

A word of caution is that the role of CFP labels in environmental decision should be limited although it is a useful instrument to combat with climate change because CFP itself could lead to misleading result. For example, CFP itself implies that recycling paper should be stopped because recycled paper often has a higher carbon footprint than virgin paper which has a carbon footprint close to ‘zero’ (Carbon Trust, 2006).

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