

Social Performance of Workers in Sugarcane Bio-refinery Complex

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Abstract: This contribution evaluates social effects on workers of the sugarcane bio-refinery complex. Social life cycle assessment was used to assess the social performances along the life cycle of the complex. The system boundary covers raw material acquisition and production processes of products generated in the complex. These products include sugarcane, sugar, electricity and ethanol. The social subcategories assessed are wage satisfaction, employment generation and working conditions. The functional unit for this study is 1,000 tonnes of sugarcane consumed in the processes. The results show that sugarcane production sector generates highest number of employment but has poorest health and safety protection. Wages paid in sugarcane production are lower than other sectors. However, wage satisfaction of workers in sugarcane farms is not too different from other sectors like sugar factory that pay higher wages. This study provides important information for government policy making and corporate social responsibility of the industry.

Keywords: Social sustainability; Sugarcane; Bio-energy; Social LCA; S-LCA; Thailand.

1. Introduction

Sustainability is an important issue in all sectors including the sugar industry which is one of the key economic sectors of Thailand. The country is the second global largest sugar exporter after Brazil. In 2015, Thailand shared over 12 percent of total global sugar export value [1]. The sugar industry produces both food and fuel products, i.e. sugar, electricity and ethanol. The sugarcane bio-refinery complex includes sugarcane cultivation, sugar milling, bagasse fuelled power production and molasses based ethanol production. Sustainability issues of these sub-sectors in the sugarcane bio-refinery complex are of interest.

Life cycle thinking is a well-known concept used to consider sustainability along the life cycle stages of a product/service. This concept helps to prevent problem shifting from one to other stages. To consider the sustainability comprehensively, environmental, economic and social aspects were suggested to be addressed [2]. Life cycle approaches like life cycle assessment (LCA), life cycle costing (LCC) and social life cycle assessment (S-LCA) are techniques used to assess the environmental, economic and social performances of a product/service along its life cycle. These approaches are promoted to be used in the Life Cycle Sustainability Assessment (LCSA) [3].

LCA and LCC are found to be used for assessing the sugar industry in a number of studies. Among the life cycle approaches mentioned, S-LCA is the newest and not yet widely used in the sugar industry. A previous study of the authors used S-LCA to assess social performances in sugar industry [4]. However, the previous study only looked at social performances of limited sugarcane products. This study uses S-LCA to assess the social performances of wider products in the sugarcane bio-refinery complex; i.e. sugarcane, sugar, electricity and ethanol. Moreover, it was found from the previous study that "workers" is the stakeholder group that has greater social effects compared to other groups such as local community, consumers and value chain actors. Therefore, this study focuses on social performances on workers of the sugarcane bio-refinery complex.

2. Material and methods

The S-LCA study was conducted following the guidelines for S-LCA of products of UNEP/SETAC (2009) [5]. The system boundary includes sugarcane cultivation, sugar,

electricity and ethanol production. The functional set for this study was 1,000 tonnes of sugarcane processed in the complex. Data were collected by face-to face interviews with 538 workers in sugarcane farms, sugar mills, power and ethanol plants in northeastern and central regions of Thailand as these two areas are the largest sugarcane producers in the nation.

Social subcategories assessed were wage satisfaction, employment generation and working conditions such as working hours, freedom of association and collective bargaining, absence of forced labor, absence of discrimination, supply of protective equipment and accident rate. These subcategories were selected from the international standards related to sugar and bio-energy products such as Bonsucro (2014), Roundtable on Sustainable Biomaterials (2010) and Global Bioenergy Partnership (2011) [6-8]. It is noted that inclusion of subcategories in this study were based on their data availability.

The indicator used for each subcategory is shown in Table 1. Employment generation is expressed as number of full time equivalent (FTE) jobs per year. This was calculated using working hours of workers in each sector when processing 1,000 tonnes of sugarcane in their production. The calculation was done based on 1 FTE job is equal 2,080 working hours. Daily wages were calculated in Thai baht (THB), the currency of Thailand. To ease the comparison, all other subcategories (such as wage satisfaction, working conditions i.e. working hours, freedom of association and collective bargaining, absence of forced labor, absence of discrimination, supply of protective equipment and accident rate) were expressed as percentage of workers reporting that they were treated in a proper way, based on the standard for each social subcategory.

3. Results and discussion

Table 1 shows the social performances of the different sectors in the sugarcane bio-refinery complex.

It was found that sugarcane cultivation has greatest positive social performance on employment. Nevertheless, it also has high risk on health and safety. Wage range in sugarcane production is the lowest. The minimum wage paid reported by workers in sugarcane farms was lower than the national minimum regulated wage (300 THB). However, it is interesting in the cases of workers in sugarcane farms and sugar mills that wage rate and wage satisfaction are not always related.

Table 1 Social performances of sugarcane bio-refinery complex per 1,000 tonnes of sugarcane processed.

Indicators	Production sector			
	Sugarcane	Sugar	Electricity	Ethanol
FTE job/1,000t cane*yr	7.2	0.039	0.015	0.015
daily wage range (THB/day)	200-350*	at least 300	at least 300	at least 300
% workers satisfied with wage	44	46	100	100
% workers having regulated working hours	100	100	100	100
% workers having regulated days off	^	100	100	100
% workers having regulated overtime payment	^	100	100	100
% workers having freedom of association and collective bargaining	100	100	100	100
% workers not being forced to work	99	100	100	100
% workers being treated equally in work place	100	100	100	100
% workers having protective equipment at work place	51	98	100	100
% workers not having accident in the past year	77	70	97	92

*for only work hired on daily basis; ^not analysed

All sectors in sugarcane bio-refinery complex show positive social performance on working hours. Every worker interviewed reported that their usual working hours were not exceeding the regulated working hours (48 hours per week). Regarding days off agreement, overtime payment, freedom of association and collective bargaining, absence of forced labor, absence of discrimination, all sectors show positive performance on these issues, except that 1 percent of workers in the sugarcane farms reported being forced to work. Though it is a very small number, this should be addressed as this is an important issue. For this matter, more information on forced labor incidents is required in the future study for reasonable interpretation.

The results of days off agreement and overtime payment of workers in sugarcane production are not reported here because of difficulty in getting data. The nature of works in sugarcane production differs from other sectors. Most jobs in the sugarcane farms are temporary and not contracted; while jobs in other sectors such as sugar factory, power and ethanol plants are permanent. Temporary workers in sugarcane farms were not limited for their numbers of days off by the employers. However, they were paid on daily basis and were not provided with social benefits.

Regarding overtime payment issue, all the workers in sugarcane farms interviewed in this study reported that they received overtime payment. However, the payment was flexible and not paid on the same basis as in other production sectors. In the sugar factory, power plant and ethanol refinery, overtime payment of workers was on hourly basis. In sugarcane farms, the overtime payments were flexible depending on both the farm owners and the workers. Therefore, the result of this issue for sugarcane sector is not reported in Table 1 because it is not comparable with that of other production sectors in the sugarcane bio-refinery complex.

The electricity and ethanol production sectors show positive performance on supply of protective equipment and accident rate. All workers in the power plants and the ethanol refinery reported that they were provided with protective equipment and their annual accident rates were quite low. However, when looking at the sugarcane and sugar production sectors, these two indicators are not aligned. The sugar mills studied had relatively good performance on supply of protective equipment, while the sugarcane production sector has negative performance on this issue. However, the annual accident rates of these two sectors were not too different. This indicates that the health and safety aspect of both the sugarcane and sugar production sectors require urgent attention. It is noted that these two sectors have different requirements for protective equipment and jobs in these sectors are of different natures.

4. Conclusions

S-LCA was used to assess the social performances of the

sugarcane bio-refinery complex which includes sugarcane production, sugar, electricity and ethanol production. Sugarcane production sector has both high positive and negative social performances. This sector has highest employment rate comparing to other sectors. Wage range in sugarcane production is lower than the regulated wages and wages paid in other sectors. However, wage satisfaction of workers in sugarcane farms is not too different from that of sugar production sector. The results from this study suggest that low wages (in sugarcane production), health and safety issues (in both the sugarcane and sugar production sectors) should be addressed to increase the social sustainability of the sugarcane bio-refinery complex.

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