

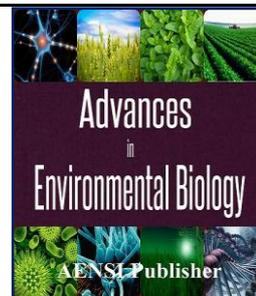


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### Social Life Cycle Assessment (SLCA) For Palm Oil Production in Malaysia

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#### ABSTRACT

**Background:** The study of Social Life Cycle Assessment (SLCA) is one of many researches that provide an overall view of potential social impacts, which are identified from the whole life cycle of the product. This SLCA study focuses on the processing of crude oil from the whole life cycle of palm oil products at Gua Musang, Kelantan, Malaysia. **This research involves two stakeholders i.e. workers and the local community. Objective:** The purpose of this research is to identify potential social impacts (midpoint impacts from workers and the local community) throughout the whole life cycle of palm oil production using the SLCA methodology. **Results:** The results reveal that, in regards to the social aspect, workers experience a high level of job satisfaction. For the local community, the satisfaction levels are different according to specific categories especially for those that do not have any major impact on the local community. In short, social significance remains a top priority and these workers and the local communities must give due attention to this issue. **Conclusion:** The overall social aspects derived from the SLCA for palm oil production has met the required criteria in terms of social significance for those who are in direct contact with this operation.

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### INTRODUCTION

Palm oil is known as the primary source of income for many farmers in Central and West Africa, Southeast Asia [1], as well as Central America [2]. It is generally used as cooking oil in the aforementioned countries. It is also exported to foreign countries as it can be used in many commercial foods and personal care products as well as in biofuel production. Oil palm produces up to 10 times more oil per unit of soybeans, rapeseeds or sunflowers. The oil palm fruit produces 38% vegetable oil equating to 5% of the world supply derived from vegetable oil factories. Oil palm factories are now under observation because there has been an increase in negative social and environmental impacts associated with their operation, including the loss of soil carbon sequestering forests. There are also concerns over displacement and disruption of human and animal populations attributed to rapid oil palm cultivation.[3] Thus, this SLCA study could be a feasible option that can be implemented to assess the social impacts generated throughout the life cycle of palm oil production.

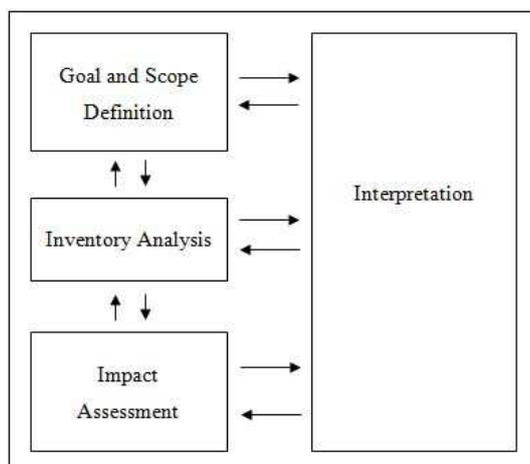
#### Methodology:

The SLCA study adapts the framework of a Life Cycle Assessment (LCA) study and is conducted based on the guidelines from ISO 14040 and ISO 14044 including goal and scope definition, inventory analysis (LCI), impact assessment (LCIA), and interpretation[1] [see Figure 1]. The goal of this study is to identify potential social impacts throughout the whole life cycle of palm oil production. This study was carried out at Gua Musang, Kelantan. The SLCA study is a gate-to-gate analysis involving oil palm plantation up to the factory process (crude palm oil) [see Figure 2].

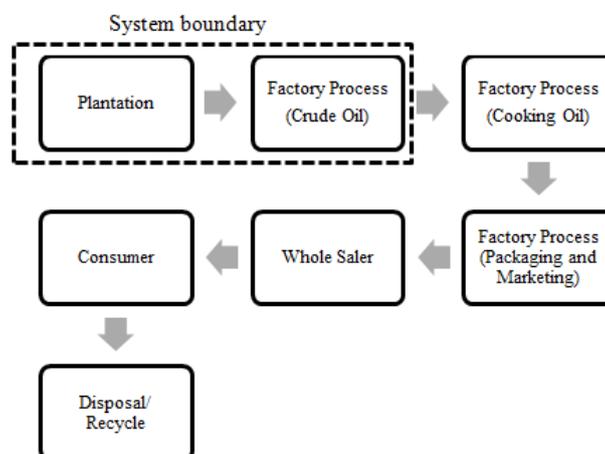
In order to obtain the potential social impacts in a system boundary, a survey instrument was used to obtain the related information from two stakeholders i.e. workers and the local community. In order to acquire information from these stakeholders, two sets of questionnaires were constructed based on a sub-category

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proposed by the book entitled “Guidelines for Social Life Cycle Assessment of Products” by UNEP 2009[4] where it also included 6 sub-categories for workers and 5 sub-categories for the local community (Table 1).



**Fig. 1:** LCA Framework



**Fig. 2:** System boundary for the SLCA research

#### *Research Instrument:*

The two sets of survey questionnaires containing in total 55 items for workers and 42 items for the local community are designed based on six sections as showed in Table 2 and Table 3. Then, all data collected from the questionnaire survey is analysed descriptively after which the analysed data is used to support the expected outcomes. Questionnaires were assessed based on validity and reliability tests before they were distributed in the actual study. Dual languages, Malay and English, were employed in the questionnaires so that the respondents could better understand and answer them.

#### *Sampling Techniques:*

The population of the local community is made up of about 1,500 people. A total number of 200 workers and 306 local communities were selected as samples for this study by referring to the mathematic formulation/equation produced by Krejcie and Morgan (1970). Stratified and systematic sampling techniques were used to distribute the designed questionnaires to the local communities.

#### *Pilot study:*

The questionnaires were developed via a content validity process. This ensures that the number of items in each category is sufficient to represent each category. Some of the opinions and assessments from the experts were also used for content validity. A total of 31 respondents were selected as subjects for the pilot study (10% of the actual sample size). The internal consistency reliability for the pilot study using Alpha Cronbach's value for workers and the local community is 0.723 and 0.764, respectively. In other words, the survey questionnaires are confirmed to have a high reliability because its Alpha Cronbach value is greater than 0.65.

**Table 1:** A stakeholder category and sub-category

STAKEHOLDERS	SUB - CATEGORIES	
Worker	1.	Safe and healthy living conditions
	2.	Fair salary
	3.	Working hours
	4.	Equal opportunities/ discrimination
	5.	Health and Safety
	6.	Social benefits and social security
Local Community	1.	Cultural heritage
	2.	Safe and healthy living conditions
	3.	Respects indigenous rights
	4.	Community engagement
	5.	Local employment

**Table 2:** Expected outcomes of the questionnaire sections (Workers)

Section (s)	No. of item	Description (s)
Section A- Demographic	12	To identify socio-demographic profiles of respondents
Section B- Job Satisfaction	15	To access respondents' perception on Job satisfaction
Section C- Perception on Salary	4	To access respondents' perception on Salary
Section D- Perception on Discrimination	6	To access respondents' perception on Discrimination
Section E- Perception on Health and safety	12	To access respondents' perception on Health and Safety
Section F – Perception on Social Rewards and Social Security Workers	6	To access respondents' perception of social rewards and social security workers

**Table 3** Expected outcomes of the questionnaire sections (Local Community)

Section (s)	No. of item	Description (s)
Section A- Demographic	11	To identify socio-demographic profiles of respondents
Section B- Health and Safety	13	To access respondents' perception on Health and Safety
Section C- Perception on Culture and heritage	5	To access respondents' perception on Culture and heritage
Section D- Perception on Indigenous rights	7	To access respondents' perception on Indigenous rights
Section E- Perception on Local Community involvement	3	To access respondents' perception on Local Community involvement
Section F – Perception on Job opportunity	3	To access respondents' perception on Job opportunity

## RESULTS AND DISCUSSION

### *Regarding the Result for Workers:*

Six sub-categories were assessed to show the potential impacts of safe and healthy living conditions, fair salary, working hours, equal opportunities/discrimination, health and safety, social benefits and social security on the worker, as well as their perception of Employee Health and Safety. These are all included in the five sections of the questionnaire.

The questionnaire has two measurement scales: 3 sections are nominally scaled (perception on job satisfaction in factory, perception on salary/wage workers and perception on opportunities/discrimination against employees) and 2 sections follow an ordinal scale (perception on social rewards and social security workers received). The survey was done to determine the worker's perception towards issues at their workplace.

Overall, most of the workers agreed that their job in the factory was satisfactory (Table 4). 100% of the workers were satisfied with the salary given by their employers (Table 5). All the workers agreed that the factory managers did not practice any discrimination against them (Table 6). More than 96% of the workers had a positive perception of the social rewards and social security that they received. Additionally, 100% of the workers agreed with the Employee Health and Safety practices in the factory (Table 8).

**Table 4:** Factory Workers' Perception on Job Satisfaction

No	Statement	Yes	No
1.	Suitability of job interests and abilities.	100%	-
2.	Always passionate and able to perform the tasks.	100%	-
3.	Workload is commensurate with their abilities and job title.	100%	-
4.	Instructions of the supervisor / manager is clear and easy to understand.	100%	-
5.	The Supervisor / Manager always provides feedback and guidance on the work done.	88%	12%
6.	The Supervisor / Manager has the skills to make good decisions.	93%	7%
7.	Division of labour by the supervisor / manager is just.	93%	7%
8.	The Supervisor / Manager is willing to accept suggestions / opinions of subordinates and it is always encouraged.	88%	12%

9.	Worker has a good relationship with the supervisor / Manager.	100%	-
10.	Worker has a good relationship with other staff.	100%	-
11.	Co-workers always offer help and encouragement.	100%	-
12.	Employees are given the freedom to do a job.	91%	9%
13.	Employees do their work with dedication / sincerity / happiness.	100%	-
14.	Given the opportunity to do different tasks from time to time to highlight their potential.	100%	-
15.	Given the opportunity to attend appropriate training programs to improve their individual performance.	93%	7%

**Table 5:** Perception of Salary/ Wage

No	Statement	Yes	No
1.	Payment of salaries / wages are based on the appointed day.	100%	-
2.	Received salary is commensurate with work done.	100%	-
3.	Salaries obtained are sufficient and at the rate set by the government / the factory, [according to position].	100%	-
4.	Factories have trouble paying wages in accordance with a predetermined date.	-	100%

**Table 6** Perception on Opportunity/ Discrimination against Employees

No	Statement	Yes	No
1.	Discrimination/Bias towards colleagues	-	100%
2.	Discrimination/Bias towards Women Workers	-	100%
3.	Discrimination/Bias in terms of Job Difference	-	100%
4.	Discrimination/Bias among Local Employees	-	100%
5.	Discrimination/Bias in terms of Acceptance Salary	-	100%
6.	Discrimination/Bias in terms of Job Distribution	-	100%

**Table7:** Perception on Social Rewards and Social Security Workers Received

No	Statement	Likert Scale (Percent)				
		SNA	NA	N	A	SA
1.	Fair promotion policies and the ability to complete a task.	-	-	4%	28%	68%
2.	Employee benefits provided as per the Law [Maternity Leave, Sick Leave, Annual Leave, Public Holidays, SOCSO, EPF].	-	-	-	33%	67%
3.	Employee Awards Incentive Grant and other recognition are based on individual performance and excellence.	-	-	-	33%	67%
4.	The Supervisor/Manager acknowledges and appreciates the good work done by the workers.	-	-	-	33%	67%
5.	Worker is satisfied with factory management services.	-	-	-	33%	67%
6.	Employees are always treated well by the factory management.	-	-	-	33%	67%

**Table 8** Perception on Employee Health and Safety

No	Statement	Likert Scale (Percent)				
		SNA	NA	N	A	SA
1.	The factory management is concerned about the safety and health of workers at the factory.	-	-	-	33%	67%
2.	The factory management provides security equipment at the factory.	-	-	-	32%	68%
3.	The factory management provides safety and health equipment at the workplace.	-	-	-	32%	68%
4.	The factory management has ensured that every process and task is done safely.	-	-	-	32%	68%
5.	Each employee is alert of the health and safety issues in the workplace.	-	-	-	32%	68%
6.	Each employee is given training on workplace safety.	-	-	-	32%	68%
7.	Workers are given training on safety when entering the workplace.	-	-	-	33%	67%
8.	The factory management has procedures in place in regard to factory safety risks for each activity.	-	-	-	32%	68%
9.	Employees always refer to the procedure security risk at work.	-	-	-	32%	68%
10.	The factory management takes seriously the health and safety complaints made by workers.	-	-	-	32%	68%
11.	Employees always report incidents that happen at work.	-	-	-	32%	68%
12.	Workers' health and safety are the first priority for the factory management.	-	-	-	32%	68%

*Regarding the Result for the Local Community:*

Based on the assessment of the local community, five sub-categories i.e. cultural heritage, safe and healthy living conditions, respect of indigenous rights, community engagement, and local employment, were assessed to determine their impact on the local community.

The questionnaire has two types of measurement scales: three sections (local residents' perception on safety and health, perception on culture and heritage, and their perception on indigenous rights) follow the nominal scale and the other two sections (local residents' perception on local community involvement and their perception towards job opportunities) follow the ordinal scale.

Local community safety is seen as something that is not conducive for existing factories. This is proven by the fact that more than half of the local community agreed with the statements corresponding to item 4 and item 5 in Table 9. Perception on culture and heritage also showed a higher percentage of agreement. For example, 98% agreed that the construction of the factory has eliminated the existence of cultural heritage and endangers the surrounding area while only 2% of respondents disagreed with this statement (Table 10). Overall, 100% of the local community felt that the indigenous community was entitled to their own rights (Table 11). More than 54% of the local community agreed with the perception of the local community. For example, 85% of respondents agreed that manufacturing always involves the local community with their activities (Table 12). 91% of respondents agreed that the factory hires local workers based on the perception of opportunities for local residents (Table 13).

**Table 9** Perception on Safety and Health for Local Residents

No	Statement	Yes	No
1.	This area is a safe place to stay.	100%	-
2.	There is a high level of concern for people leaving the house without a family member in charge.	97%	3%
3.	Criminal activity exists in this area.	98%	2%
4.	Crime occurs very frequently in this area.	52%	48%
5.	Police regularly patrol the residential areas to control crime.	52%	48%
6.	Every time a crime occurs, the police will take immediate action against the criminals involved.	94%	6%
7.	Family members have health problems as a result of living near the factory.	8%	92%
8.	Pollution from factories affects the health of your family.	5%	95%
9.	You have a method of avoiding exposure to pollution discharged from the factory.	10%	90%
10.	Family members are infected with disease as a result of pollution from the factory.	12%	88%
11.	The factory provides methods to prevent the local population from being contaminated.	40%	60%
12.	The infected will be referred to the hospital.	99%	1%
13.	Villagers often work together to keep their area clean.	100%	-

**Table 10** Perception on Culture and Heritage

No	Statement	Yes	No
1.	Construction of the factory eliminates the existence of cultural heritage and endangers the surrounding area.	2%	98%
2.	Construction of the factory is a cornerstone of the existence of cultural heritage and the local area.	6%	94%
3.	Parties help factory conservation and cultural heritage in the local area.	51%	49%
4.	Cultural heritage is not adversely affected as a result of mixing cultural authenticity that comes from the development process.	52%	48%
5.	Culture and heritage has become almost non-existent because no one is interested in this cause.	2%	98%

**Table 11:** Perception on Indigenous Rights

No	Statement	Yes	No
1.	Development	100%	-
2.	Social, political, economic	100%	-
3.	Economy	100%	-
4.	Arts and Culture	100%	-
5.	Religion/belief	100%	-
6.	Environmental	100%	-
7.	Traditional medicine	100%	-

**Table 12:** Perception on Local Community Involvement

No	Statement	Likert Scale (Percent)				
		SNA	NA	N	A	SA
1.	The manufacturing factory is always doing activities that involve the local community.	-	-	15%	65%	20%
2.	The factory management are friendly with the locals.	-	-	18%	36%	46%
3.	The manufacturing factory allocates funds for the community to organise their activities.	18%	19%	9%	46%	8%

**Table 13:** Perception on Job Opportunities for Local Residents

No	Statement	Likert Scale (Percent)				
		SNA	NA	N	A	SA
1.	The manufacturing factory hires local workers.	-	-	9%	80%	11%
2.	The local residents have problems filling in job vacancies for the factory.	-	4%	51%	38%	7%
3.	Local residents are given the advantage of selecting their working position in the factory.	-	2%	47%	45%	6%

**Conclusion:**

The overall social aspects derived from the SLCA for palm oil production has met the required criteria in terms of social significance for those who are in direct contact with this operation. However, there are some social aspects that need to be improved upon such as job satisfaction. Maintaining a good record in terms of relationship with employees, particularly for the social worker, is also required. At the same time, the factory should begin to move forward in establishing a good relationship with the local people because they are the ones who are directly affected by the factory since their residences are near the place where it operates. This study can be used to improve social aspects specifically for palm oil production processes. The results of this study will be provided to relevant factories coupled with recommendations for best manufacturing practices, which are specifically aimed at reducing the negative social impacts of oil palm production. Nevertheless, this study only focuses on two life cycle phases (plantation and processing), which do not represent the whole life cycle of palm oil production. Research still needs to be done for the rest of the phases to get the overall potential social impacts especially in regard to the other two important processes in palm oil production i.e. the cooking oil and packaging processes.

**ACKNOWLEDGEMENT**

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