A Study to Identify Environmental and Social Issues of Oil Palm Cultivation in Sri Lanka

Observations and Recommendations

Central Environmental Authority

Study Team

Dr. Priyani Senavirathne

Team Leader, (Deputy Director - Rubber Research Institute of Sri Lanka)

Dr. Gamini Hitinayake

(Senior Lecturer - Faculty of Agriculture, University of Peradeniya)

Dr. Nayani Arachige

(Principal Research Officer - Coconut Research Institute of Sri Lanka)

Mr. Ajith Silva

(Director- Land Resources, Ministry of Mahaweli Development and Environment)

Mr. Sampath Manthrinayake

(Director/Plantation Management Monitoring Division), Ministry of Plantation Industries

Dr. Prasad Dharmasena

(Director/ National Institute of Plantation Management)

Mr. A G D L Karunarathne

(Deputy Director-Natural Resources Management - Central Environmental Authority)

Mrs. Sukitha Ranasinghe

(Assistant Director- Pollution Control Division- Central Environmental Authority)

Coordination and Facilitation:

Research and Development Unit, Central Environmental Authority

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Contents

Abbreviations

CEA	-	Central Environmental Authority
CRISL	-	Coconut Research Institute of Sri Lanka
MEMD	-	Ministry of Mahaweli Development and Environment
MPI	-	Ministry of Plantation Industries
NEA	-	National Environment Act
NECBD	-	National Experts Committee on Biological Diversity
NIPM	-	National Institute of Plantation Management
NPQS	-	National Plant Quarantine Services
PA	-	Planters 'Association of Sri Lanka
RPCS	-	Regional Plantation Companies
RRISL	-	Rubber Research Institute of Sri Lanka
TRISL	-	Tea Research Institute of Sri Lanka
UOP-		University of Peradeniya

1. BACKGROUND INFORMATION

During the past few years the Central Environmental Authority (CEA) has received many public complaints related to oil palm cultivation. The number of such complaints is being increased due to escalating trend in converting rubber plantations into oil palm in Sri Lanka. However, the CEA was unable to find out justifiable reasons in this regard so far. Therefore, the CEA appointed a committee consisting of main stakeholders; Ministry of Plantation Industries (MPI), Coconut Research Institute of Sri Lanka (CRISL), Rubber Research Institute of Sri Lanka (RRISL), National Institute of Plantation Management (NIPM), University of Peradeniya (Faculty of Agriculture Ministry of Mahaweli Development and Environment) and the CEA in order to find out a suitable answer for the public concerns.

The following important facts and figures were revealed during the discussion.

- Policy decision has been taken in 2014 to expand oil palm cultivation considering the crop diversification programme in the lease agreement signed by the Ministry of Plantation Industries with the Regional Plantation Companies (RPC) subject to the following conditions. Maximum allowable extent is 20,000 ha in the marginal, abandoned lands and economically not viable lands (over 30 years old rubber) and only 20% of total land area of plantation can be converted to oil palm.
- Further, it was expected to save the foreign exchange for importation of edible oil to meet the deficit in the country. It was also expected to produce 80,000 MT of edible oil through the cultivation of said 20,000 ha of oil palm in Sri Lanka.
- The extent of oil palm cultivation under this scheme is about 9,413 ha by 2016.
- However, social and environmental concerns have not been taken into consideration when selecting oil palm under this crop diversification programme.
- Among the public complaints received by the CEA regarding the oil palm cultivation, depletion of the ground water is the main issue raised by the people in those areas. As a result of the public protest on establishing new cultivation, the District Coordinating Committees (DCC) of Galle, Kegalle and Kalutara have taken decisions to temporarily halt establishing new oil palm plantation in those districts.
- Research on cultivation, social and environmental impacts of oil palm have not been conducted locally.
- However, several long term research studies related to environment impact due to oil palm cultivation have been done in many other countries.

- Research conducted in Malaysia and Indonesiawhere the extents are 5.7 and 11.8 million ha respectively.(http://www.mpoc.org.my/pubs_view.aspx?id=5ab6aafb-7ce5-406a-b48e-64d1022b736b; https://www.indonesia-investments.com/business/commodities/palm-oil/item166? ; Accessed on 3-4-2018) on oil palm cultivations indicates some negative impacts environmentally and socially. Some research studies highlighted many environmental issues; soil compaction, high ground water usage, poor biodiversity, habitats fragmentation and etc.

Decisions Taken by the CEA

- To appoint a committee consisting of members from RRISL, CRISL, MPI, MMDE, UOP, NIPM and the CEA to identify and assess environmental and social impacts due to oil palm cultivation in Sri Lanka and prepare a report with recommendations.
- The CEA to draft the TOR and do coordination and facilitation works of the study

2. OBJECTIVES OF THE STUDY

Identify and assess social and environmental impacts due to oil palm cultivation and to come up with appropriate recommendations on future expansion of oil palm plantations in the country.

The members of the study team will be expected to:

(i) Review local and international literature/ published information, reports related to environmental and socio- economic impacts due to oil Palm cultivations.

(ii) Make a written submission of detailed information/clarifications/ recommendations for compilation of the final report.

(iii) Suggest short, medium and long term recommendations. These recommendations should support to take appropriate policy/ regulatory decisions to ensure the sustainable oil palm industry in the country.

(iv) Make field investigations/ surveys in affected areas and have meetings/ interviews or consultations with key stakeholders where necessary.

3. REPORTS SUBMITTED BY THE STUDY TEAM

3.1. REPORT BY MINISTRY OF PLANTATION INDUSTRIES

Background

Policy on a second edible oil

Coconut oil has a major role in the Sri Lankan culture to fulfill the requirement of the edible oil stock from the ancient times. However, with the increasing of the population and the decreasing of the coconut lands due to various reasons, the production of coconut oil was decreased. As the coconut nut is used for other means such as "*Pol Sambol*", "*Kiri Hod*i", '*Kiri Bath*" and etc. in our culture, and also the increase of the demand for desiccated coconut and other products in the international market, the amount of nuts used for the production of coconut oil has decreased up to 10% of the total production. By understanding the trend of decreasing coconut oil stock produced in Sri Lanka, the previous governments decided to introduce a second edible oil produced in Sri Lanka as import substitution policy to reduce the foreign currency out flow to import edible oil.

The first Oil Palm plantation was introduced in 1967 at Nakiyadeniya Estate, Galle District. As a result of the import substitution policy, Oil Palm was expanded up to about 9,000 ha until the year 2015. "In 2015, Sri Lanka's annual edible oil requirement stood at 160,000 Metric Tonnes (MT). Conversely, the country produces a total of just 53,000 MT of coconut oil and 18,000 MT of palm oil, leaving a deficit of 89,000 MT in the island's edible oil requirement,. Notably, this data actually excludes all other vegetable and plant based oils, meaning that the country's actual total requirement is even higher" (Nugawela, A., 2017). Accordingly, Sri Lanka spent Rs. 20.8 billion on oil and fat imports. (Nugawela, A. 2017).

Therefore, in 2016, the policy was established to limit the expansion of Oil Palm cultivation only up to 20,000 ha to meet the requirement of the half of the demand in the year 2015, in order not to disturb the coconut oil industry and to minimize the impacts on the other plantation industries by converting their lands to Oil Palm cultivation. RPCs were advised to use abandoned, marginal and unproductive lands to use for the cultivation of oil palm instead of converting productive lands. In this policy, it was allowed any investor to cultivate Oil Palm but the total was limited to 20,000 ha in the country. Considering the limited land extent of the Regional Plantation Companies (RPCs), each of them were given 20% of the total land area managed by the RPC, excluding the Oil Palm extent cultivated until February 2016. Also the cultivation of Oil Palm is limited to five administrative Districts; Kegalle, Ratnapura, Kalutara, Galle and Matara, compared to the agro – ecological conditions appropriate for the Oil Palm cultivation.

Reasons for selecting Oil Palm

Since 1967, Oil Palm is used only to produce oil in Sri Lanka. Therefore, it has an assurance that all the production of the Oil Palm cultivation is used for the oil production as they do not have any other means like coconut in our culture.

Land is limited in Sri Lanka. If the required 80,000 MT of oil was produced by using coconut, it needs around 80,000 ha while Oil Palm needs only 20,000 ha, as Oil Palm has four times land productivity than coconut. "In comparison, Oil Palm far outstrips any of its competitors, producing 59.4 million MT or 42.3% of the total global requirement for vegetable oil – using just 14.8 million hectares of land which is just 8.3% of all land across the globe used for cultivating crops for vegetable oil" (Nugawela,A.2017).

Cost of production (COP) of an edible oil is very important to consider its feasibility of the market. Comparing to other edible oil like coconut, cost of production is very much low in Oil Palm production. COP of Oil Palm is around Rs. 15 per kg of fresh fruit bunch (FFB) and COP of coconut is around Rs. 15 per nut. While coconut generates Rs. 175,000 per ha per annum, Oil Palm generates Rs. 514,000 per ha per annum(Nugawela,A.2017).

Potential of Oil Palm cultivation by RPCs

According to the import substitution policy, the potential of expanding oil palm cultivation by all RPCs given in the Table 1.1. According to the agro – climatic conditions appropriate for the Oil Palm cultivation, there is a limited number of RPCs having the potential of cultivating Oil Palm in the five administrative Districts.

Table 1.1 – Potential of expanding Oil Palm cultivation by all RPCs

However, RPC'S	Total Extent (ha)	Total oil palm Extent (ha) up to end of 2016	Total oil palm extent (ha) up to February 2016	Balance Cultivated Extent (ha)	Total Extent (ha) could be cultivated as per the policy	Remaining extent (ha) could be cultivated as per the policy
	(A)	(B)	(C)	(D) = (B) – (C)	(E)=(A) -(C)*20/100	(F) = (E) - (D)
Namunukula	8700	2127	2047	80	1330.6	1250.6
Agalawatte	7666	1312	1309	3	1271.4	1268.4
Elpitiya	6254	1579	1448	131	961.2	830.2
Watawala	9206	3279	3165	114	1208.2	1094.2
Kotagala	8012	526	526	0	1497.2	1497.2
Bogawanthalawa	11696	479	262	217	2286.8	2069.8
Horana	5556	108	106	2	1090	1088
Hapugasthenna	9359	0	0	0	1871.8	1871.8
Balangoda	8934	0	0	0	1786.8	1786.8
Kahawatte	9239	0	0	0	1847.8	1847.8
Malwatte Valley	7181	0	0	0	1436.2	1436.2
Maskeliya	7495	0	0	0	1499	1499
Thalawakele	5101	0	0	0	1020.2	1020.2
Kelani Valley	8951	0	0	0	1790.2	1790.2
Agarapathana	7597	0	0	0	1519.4	1519.4
Maturata	7679	0	0	0	1535.8	1535.8
Madolsima	5545	0	0	0	1109	1109
Kegalle	6960	0	0	0	1392	1392
Pussellawa	11611	0	0	0	2322.2	2322.2
Udapussellawa	4080	0	0	0	816	816

However, the cultivation of Oil Palm depends on many factors.

1. Government policy to limit the extent of Oil Palm at 20,000 ha
2. Agro – ecological conditions
3. Willingness and capacity of the RPC to invest on Oil Palm
4. Government policy on first come first serve basis

Table 1.2 – Potential of Oil Palm Cultivating each administrative District

RPC	Remaining Extent (ha) could be cultivated as per the policy (a)	Total Extent (ha) in each RPC in each potential administrative District excluding oil palm cultivation up to end 2015						Cultivated extant of oil palm in 2015 (Ha)	Cultivated extent in 5 districts other than oil palm in 2015 (b)	Excess (Deficit) extent (ha) [(b) - (a)]
		Kegalle	**Ratnapura**	**Kalutara**	**Galle**	**Matara**	**Total Extent**			
Naunukula	1,250.60			2999.19	1002.22	1637.61	5639.02	2047	3592.02	2,341.42
Agalawatta	1,268.40		3317.41	3358.02			6675.43	1309	5366.43	4,098.03
Elpitiya	830.20			149.25	3024.44		3173.69	1448	1725.69	895.49
Watawala	1,094.20				4081.25		4081.25	3165	916.25	(177.95)
Kotagala	1,497.20			4561.36			4561.36	526	4035.36	2,538.16
Bogawantalawa	2,069.80	5,195.88					5,195.88	262	4933.88	2,864.08
Horana	1,088.00			2566.15			2566.15	106	2460.15	1,372.15
Hapugasthenna	1,871.80		4483.59				4483.59	0	4483.59	2,611.79
Balangoda	1,786.80		5854.14				5854.14	0	5854.14	4,067.34
Kahawatte	1,847.80		5423.48				5423.48	0	5423.48	3,575.68
Malwatte Valley	1,436.20	2583.58					2583.58	0	2583.58	1,147.38
Maskeliya	1,499.00						0	0	0	(1,499.00)
Thalawakele	1,020.20				296.46	105.93	402.39	0	804.78	(215.42)
Kelani valley	1,790.20	5852.68					5852.68	0	5852.68	4,062.48
Agarapathana	1,519.40						0	0	0	(1,519.40)
Maturata	1,535.80					3278.72	3278.72	0	6557.44	5,021.64
Madolsima	1,109.00						0	0	0	(1,109.00)
Kegalle	1,392.00	5202.81					5202.81	0	5202.81	3,810.81
Pussellawa	2,322.20	587.5	1954.83				2542.33	0	2542.33	220.13
Udupussellawa	816.00						0	0	0	(816.00)
Total	**29,044.80**	**19422.45**	**21033.45**	**13633.97**	**8404.37**	**5022.26**	**67516.5**	**8863**	**62334.61**	

RPCs are given the right of crop diversification under the section 4(a) of the Indenture of Lease. Even though they exercise the right of diversification, RPCs have the social responsibility not to reduce the eco-system services provided by the estate to the society before the diversification.

Present approval procedure

The interested RPC apply for importation of pre-heated and germinated oil palm seeds from certified seed suppliers through an application form of the Ministry of Plantation Industries. The Ministry goes through all the details of the application which consists company profile, information on existing oil palm cultivations, the request for oil palm seeds, proposed oil palm planting plan of the company, information of total land extent and area intended for new planting of oil palm and a certification of fulfillment of statutory obligations. MPI checks whether they are eligible in line with the all conditions imposed through the approval of the Cabinet of Ministers. The field inspections are done when required. If a company is eligible, the Secretary of MPI grants the approval and directs the CRISL for further activities. National Plant Quarantine Services of the Ministry of Agriculture issues the seed importation permits to the CRISL (under the provisions of Plant Protection Act No. 35 of 1999).

Current status of Oil Palm cultivation in Sri Lanka

Oil palm cultivation was started in Sri Lanka in a 20 ha land in Nakiyadeniya, Galle in late 1960s. High profitability of oil palm compared to other cash crops, makes the expansion of extent up to 9,413 ha of land in Sri Lanka by 2016. Oil palm cultivation is mainly confined to RPCs and State Plantations which are in the wet zone of Sri Lanka.

Policies, laws and regulations

A decision has been taken by the Cabinet Committee on Economic Management on 14thJanuary, 2016 to expand the Oil Palm cultivation in Sri Lanka, subjected to the following conditions.

1. Expand oil palm cultivation up to a maximum of 20,000 ha.
2. Limit the expansion only in uncultivated lands, marginal lands, abandoned lands and cultivated lands which have completed the economic life span.
3. Grant permission for crop diversification up to a maximum extent not exceeding 20,000 ha among interested companies, who have fulfilled their statutory obligations to the government.
4. Limit the diversification with oil palm by Regional Plantation Companies to a maximum of 20 percent of the lands managed by each company, notwithstanding the existing extent of oil palm under each company.

3.2. REPORT OF THE COCONUT RESEARCH INSTITUTE OF SRI LANKA

Expansion of oil palm cultivation in Sri Lanka has raised serious concerns about its environmental and social impacts, in particular the depletion of water sources, indiscriminate disposal of oil palm fronds, empty fruit bunches and mill effluents, loss of job opportunities and other social benefits which were enjoyed by the neighboring villagers in the oil palm plantations. Otherwise they were mainly rubber plantations. However, the CRISL observes that these issues have not been scientifically validated. It is also noted that oil palm cultivation in Sri Lanka should be carried out in a more scientific manner by which the impacts of oil palm on the environment and society could be minimized. The CRISL strongly approves the policy of diversification of lands in the RPCs. Nevertheless, it is of the strong view that such diversifications should not be at the cost of any damage to the environment, society and any other important crop such as tea, rubber or coconut.

In view of maintaining a sustainable oil palm industry with no impacts on the environment and society, the CRISL has made the following guidelines.

Guidelines of the CRISL on sustainable cultivation of oil palm in Sri Lanka

a. Identification of suitable lands for oil palm

   Cultivation of oil palm should not be carried out for any reason, in or close proximity to water catchment areas. The cultivation of oil palm is not recommended in or close to high conserved areas such as natural forests and along the river banks or any other water channels, reservoirs etc.

   If oil palm is intended to be planted in hilly areas, the top of the hill should be left intact with the natural vegetation untouched.

   In general, agro ecological regions in the low country wet zone (WL_1, WL_2, WL_3 and WL_4) are suitable for oil palm plantations in Sri Lanka. Oil palm should be cultivated in areas with the following climatic conditions.

Table 3.2.1. Optimal climatic conditions for oil palm cultivation

Characteristic	Value
Mean annual rainfall (mm)	>2500
Dry months	<2
Mean annual temperature (^{0}C)	25
Mean annual max. temperature (^{0}C)	29
Mean annual min. temperature (^{0}C)	20
Slope (%)	<23

The RPCs should obtain the prior approval for the lands selected for oil palm cultivation from the Plantation Management Monitoring Division (PMMD) after a physical examination of these lands with the officers from the CRISL.

RPC's should have a management plan for soil and moisture conservation in the selected lands for oil palm cultivation. These plans should be publicly available.

b. Land preparation

It is strongly recommended to practice zero burning while land preparation in order to avoid emission of greenhouse gasses into the environment. It is also advisable to avoid total clearing of lands. During land preparation for planting oil palm in hilly areas, maximum excavation height should not exceed 5 feet in order to minimize the disturbances to the soil.

It is mandatory to practice soil conservation techniques such as contour bunds, stream bank protection, mulching, cover crops, etc. in oil palm plantations. Cover crops should be established as soon as the land preparation is completed.

c. Seed importation and seedling raising

The NPQS and the CRISL recommend importation of both pre-heated and sprouted seeds from the following seed sources only.

1. Applied Agricultural Resources SDN BHD, Malaysia
2. FELDA Agricultural Services SDN BHD, Malaysia
3. DAMI OPRS, Papua New Guinea
4. Siam Elite Palm, Krabi, Thailand

Prior to transplanting the seedlings in the 2nd stage nursery, officers from CRI and NPQS physically examine the seedlings to ascertain that they are free from any pest or disease. RPCs are not allowed to transplant seedlings in the 2nd stage nursery unless they receive written approval from the NPQS.

d. Planting

It is recommended to plant oil palm in single platforms whenever possible and this is especially advisable for lands with high slopes and very high rainfall. This is useful in maintaining the biodiversity of fauna and flora in oil palm plantations.

e. Fertilizer application

Site specific fertilizer applications based on soil and foliar nutrient analysis should be practiced in order to avoid excess use of fertilizers.

f. Weedicide and pesticide use

Spot applications of weedicides and pesticides are recommended to minimize any contamination of water sources by them. Whenever possible, non-chemical control methods (e.g. biological control, pheromone traps) should be used in pest management.

g. Reservations for human settlements

It is recommended to maintain a buffer zone of 15m along the human settlements including villages, schools, estate hospitals, crèche, religious places etc. in order to avoid damages to the humans and domestic animals due to the falling of harvested bunches.

h. Processing and by-product disposal

CEA will provide guidelines for safe disposal of by-products and energy generation. CRISL will assist the CEA in preparing guidelines.

3.3. REPORT OF THE RUBBER RESEARCH INSTITUTE OF SRI LANKA

Rubber Research Institute of Sri Lanka (RRISL) agrees on principal the concept of biodiversity for the sustainable plantation industry in the country. Also, RRISL has a responsibility to advise the Government authorities for the sustainability of the rubber industry, as there are a large number of people depend on it directly and indirectly, while contributing to the GDP significantly.

Rubber Industry in Sri Lanka has proven its long term positive social and environmental impacts over the period of 142 years of its existence. Contribution to the ever depleting forest cover is an immense use of rubber plantations more than anything else. The economical sustainability however, mainly depends on the rubber price, which is beyond the control of farmer or the planter.

Unfortunately, in Sri Lanka adoption of RRISL recommended agronomic practices, is far below the expected levels, and mainly due to this reason, the productivity levels are very poor; most of the time less than half. If this issue can be addressed properly, the cost of production (COP) will be low and accordingly even the prevailing low rubber price is sufficient to generate profit from rubber fields. Sri Lanka has had about 200,000 Ha of rubber cultivation far back in 1970s which has been decreased up to 134,000 Ha as per the latest statistics, mainly due to urbanization programmes. But, the annual production of rubber is maintained at a reasonable level, due to planting of high yielding clones and adopting improved cultivation practices.

As about 80% of rubber production in the country, except some specialized rubber types, is locally value added the country needs a significant quantity of rubber at least for the survival of the existing local rubber manufacturers. Importing rubber has already made the local market situation worse. It appears to be very difficult to monitor and control the quality and quantity of importations.

Therefore, as a government institution it is the responsibility of the RRISL to highlight the following facts for the consideration.

a) Sri Lanka needs the rubber industry and the country is benefited environmentally, socially and economically through it.
b) A rubber tree requires on average less than 500 g of inorganic fertilizer per year and that is about $1/10^{th}$ of the fertilizer required by an oil palm tree and even for 500 rubber trees in one hectare, it is $1/4^{th}$ of the fertilizer per hectare per year with compared to oil palm.
c) Majority of the 9413 Ha. of oil palm cultivation in the country is diversified from rubber. Further, diversification of rubber lands should be stopped, as further reduction from the current 134000 Ha. of rubber will negatively affect the rubber industry altogether. There is a

minimum rubber production required by the local industries or otherwise they will have to move out to other countries where the rubber production is high.

d) Productivity improvement is the only way out for sustainable rubber industry and it is the responsibility of all parties including policy makers to rescue the rubber industry in Sri Lanka.

e) Neglected and poorly managed rubber fields should not be used for comparison with well managed oil palm fields. PMMD of the MPI should monitor the management of rubber plantations as well.

f) Though it is only the rubber plantations which are under threat now, other plantation crops may face the same situation in the years to come, unless all plantation industries are given the same competitiveness to survive. At present, oil palm industry is blessed with an import tax of Rs.135.00 per kilogram and no other industry will be able to make comparable profits with this artificial local market. If this fact is to support the coconut growers, the policy makers should impose a better mechanism to support the coconut growers rather than sacrificing the environmental friendly rubber industry.

g) Imposing regulations for the expansion of oil palm cultivation will only be a written remedy in a developing country like Sri Lanka as evident by the violations done already such as damaging catchment areas and ineffective effluent treatment plants.

Environment and socio economic impact due to oil palm cultivation

- Oil palm plantations have expanded rapidly in recent decades. This large-scale land-use change has had great ecological, economic, and social impacts on both the areas converted to oil palm and their surroundings.
- Runoff and sedimentation, leaching of nutrients from fertilizer, pesticides and other agrochemicals and effluent discharge are potential factors that could affect water quality and can be significant impacts of oil palm cultivation.
- Recent research findings in other countries reveal that oil palm cultivation has some negative environmental impacts such as loss of bio-diversity, sedimentation, soil compaction, ground water scarcity and river pollution etc. Therefore, it is vital that the environmental conditions be thoroughly analyzed prior to expand the oil palm cultivation in the country.
- Qualitative research identified agricultural expertise, lack of flexibility in labour requirements, availability of seedlings and investment costs are the major constraints to cultivate oil palm.
- Although oil palm cultivation is said to be a strong driver of economic development in countries like Indonesia, providing jobs and income to millions of people, it is strongly denigrated for its environmental impacts. Many media and NGOs accuse oil palm plantation

development in SouthEast Asia for triggering deforestation, loss of biodiversity, peat land degradation and high greenhouse gas (GHG) emissions.

Effects of plantation age

The C content and the bulk density of soil under rubber were independent on the plantation age (data not shown). In contrast, the C content in soil under oil palm plantations decreased and the bulk density increased significantly with the age. The C content in the top 5 cm (Ah horizon) of well-drained clay or loam Acrisols from eight plots in two tropical forest units in Jambi province ranged from 5.3 to 9% (Guillaume *et al.,* 2016). The majority of plantations had about half or less of the topsoil C content under these well-drained forest (3.7% for intensive rubber, 3.5% for extensive rubber and 2.2% for oil palm). On the other hand, 19% of oil palm plantations and 3% of intensive rubber plantations had a C content higher than the range found under well-drained forest (Guillaume *et al,* 2016).

In some of the studies, transpiration was quite high, i.e. higher`` than values reported for some tropical rainforests. There may be a potential trade-off between water use and management intensity of oil palm plantations. Total evapo-transpirational water fluxes from a two and a 12 year-old oil palm plantations were also relatively high, i.e. other water fluxes besides transpiration (e.g. from the soil) contributed substantially and variably to evapotranspiration.

Evapotranspiration rates derived from the eddy covariance technique in a 12-year-old oil palm plantation in Jambi (PTPN6) were 4.7 ± 0.1 mm day-1 (three sunny days, mean ± SE;). On the same days (and in the same plantation, PTPN6), transpiration by the oil palms as derived from sap flux measurements was estimated to be 2.5 ± 0.1 mm day-1; the remaining 47% of evapotranspiration are likely the sum of transpiration by other plants, e.g. ground vegetation or trunk epiphytes, and evaporation, e.g., from the soil (Röll, 2015).

Cultivation practices, agrochemical usage, replanting intervals with comparing other plantation crops (rubber, coconut)

The use of agrochemicals, such as fertilizers and pesticides, might represent a potential risk for the sustainability of aquatic ecosystem and oil palm growers usually apply large amounts of commercial fertilizer hydrological functions when agricultural practices are not optimized. In particular, and thus are among the largest consumers of mineral fertilizers in South East Asia.

Oil palms are the most productive between three and seven years of age. As the tree becomes older the requirement of fertilizer becomes higher but after 15 years the trees produce little oil, and are replaced.

Pesticides, including herbicides, are commonly used in oil palm plantations, despite their adverse impacts on human beings and the environment. As rainfall is high in the oil palm cultivating areas, herbicides can be easily washed into streams and rivers that are used as the water source for all household needs including drinking water in villages and contaminating fishing grounds.

Additionally, the processing plants have serious effects on water quality because of the large amounts of waste that they discharge: for every ton of palm oil, some 2.5 tons of effluents are produced. This frequently leads to the contamination of rivers and streams becausethe legal requirements for waste treatment are ignored.

In addition, these monoculture plantations provoke erosive processes, because their establishment involves the clearing of land formerly covered by forests, which leaves the soil totally exposed to heavy tropical rains. These erosive processes affect local rivers and streams as a result of contamination and sedimentation, with negative impacts on both the aquatic species that live in them and the local populations who depend on them as a source of water and food.

Production, economic value and labour requirement per unit area

The use of external inputs also differs significantly between the two tree crops, rubber and oil palm. Expenditures for oil palm production are almost four times higher than those for rubber. On average, oil palm farmers spend IDR 2.5 million per ha and year, while rubber farmers spend IDR 0.7 million per ha and year. These higher total expenditures are mainly driven by higher fertilizer and herbicide use. Fertilizer is applied on 81% and herbicides are used on 83% of all oil palm plots. For rubber plots, fertilizer and herbicides are applied on 27% and 47% of the plots, respectively (Schwarze *et al*, 2015).

Environmental impacts including ground water resources (different age classes)

Soil

The top soil properties (C and N contents, C stocks, C/N ratio, bulk density) in 207 oil palm and rubber plantations in the Jambi province of Sumatra were determined beside trees, inside rows and inter-rows. Soils under oil palms were on average more degraded than under rubber, showing lower C content and stocks, lower N and higher bulk density. While soil properties were homogenous under rubber, two opposite trends were observed under oil palm plantations: the majority of soils had C content <2.2% (Schwarze *et al*, 2015).

There are many waste products that are generated by the oil palm processing mills. The most common one is the empty fruit bunch. The empty bunch is a solid waste product of the oil palm milling process and has a high moisture content of approximately 55-65% and high silica content, from 25% of the total palm fruit bunch. The treated empty bunches are mechanically crushed and de-oiled in the process but are rich in major nutrients and contained reasonable amounts of trace elements (Irina *et*

al, 2012). They have a value when returned to the field to be applied as mulch for the enrichment of soil. However, it was noted that over application of the effluent must be avoided as it may result in anaerobic conditions in the soil by formation of an impervious cast of organic matter on the soil surface.

Air emission from the oil palm mills are from the boilers and incinerators, and are mainly gases with particles such as tar and soot droplets of 20-100 microns and a dust load of about 3000 to 4000mg/NM. Incomplete combustion of the boiler and incinerator produces dark smoke resulting from burning a mixture of solid waste fuels such as shells and sometimes empty bunches (Merten *et al,* 2016).

Case studies

Oil palm plantations generally have reduced ecosystem functioning compared to forests: 11 out of 14 ecosystem functions show a net decrease in level of function. Some functions show decreases with potentially irreversible global impacts (e.g. reductions in gas and climate regulation, habitat and nursery functions, genetic resources, medicinal resources, and information functions (Dislich *et al*, 2016).

The tropical forests which are eliminated to make way for these plantations are the habitat for an enormously diverse range of species. Studies in Malaysia and Indonesia have shown that between 80 per cent and 100 per cent of the species of fauna inhabiting tropical rainforests cannot survive in oil palm monocultures (Dislich *et al*, 2016).Those few species that do manage to adapt often become "pests" since, having lost their normal food supply, they begin to make a meal of the young palm plants, causing serious harm to the plantations. This in turn necessitates the application of pest "control" methods which include chemical pesticides, causing further damage to biodiversity as well as to fresh water supplies and the health of local populations.

Social perspectives on changes in water availability

As a case reported by Merten et al (2016), stated the perception of the villagers as first describe people's assessments of environmental changes that they observed during their time in Bungku.

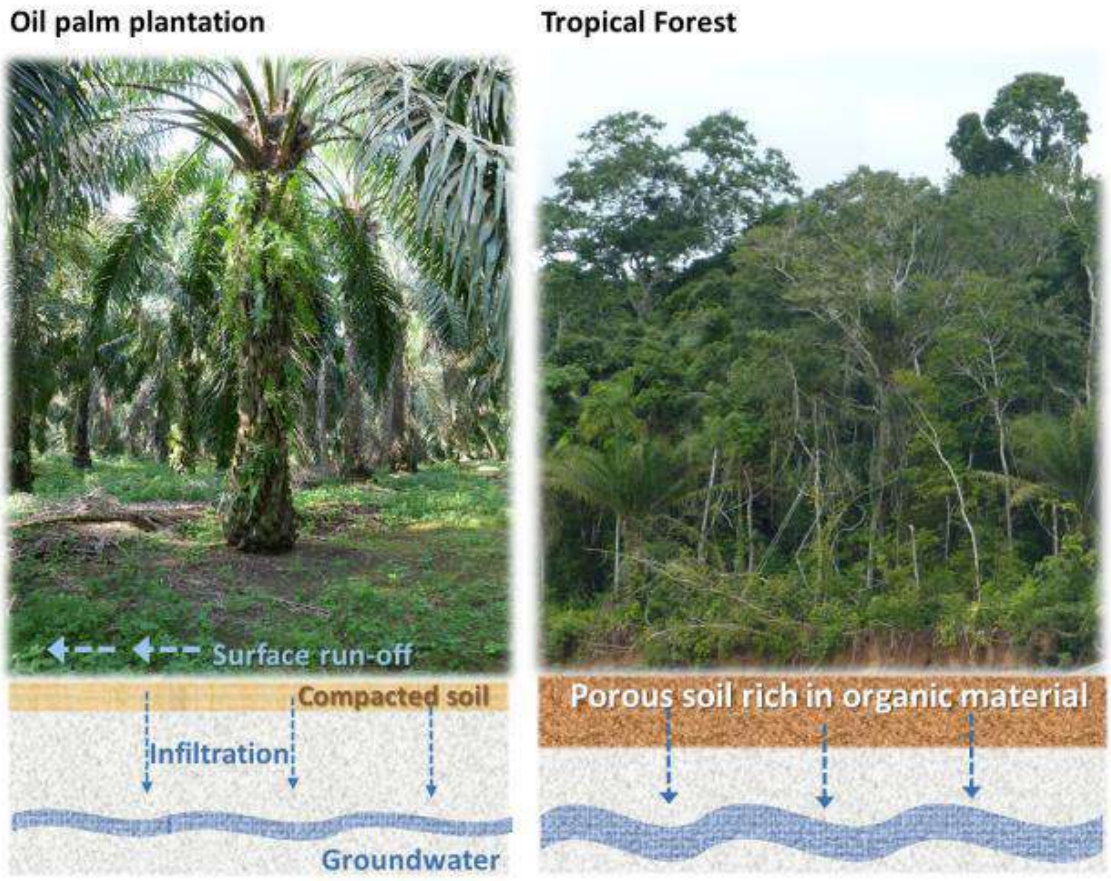
- On the drying of surface and subsurface waters "Before when people didn't open much of the forest yet there was still water in the river and it still flowed after one month of drought. But since people opened the forest and plant oil palms the water in the river gets less. It doesn't flow anymore."
- When there was still a lot of forest around Bungku even during a drought of two months, we still had water in our wells. But now there is no forest anymore, there is oil palm."

- Before there were not so many oil palms. That's why we still had enough water. Because oil palm needs a lot of water, while rubber can keep the water."
- The negative thing about oil palm is that it is a plant that needs a lot of water. That's why, if we plant oil palm near swamp areas, after some time the swamp will run dry."
- On the increasing pollution of local water resources "Did you observe any changes in the water quality?" "Yes, it changed. A lot! Before the water was not that dark, but now it looks like it contains mud. Before there was not that much mud in the water."
- "After rainfall the water in the well becomes turbid. But after some days without rain the water quality gets better again."
- "The problem comes from the people themselves. The habit of the people here is that if there is no rain for some weeks then they start to go fishing. But they use toxics. And another reason is that the people who live near a river take a shower and wash their dishes in the river. And sometimes they also throw the garbage in the river."
- The people now have a problem with the water. The water quality of the river is not good anymore. But they still use it for washing and showering since there is no clean water anymore."
- On increasing local temperatures "When I came to Bungku in 1991 the temperature was different. There was still a lot of forest and the temperature was not as hot as today."
- "If we are standing under an oil palm and afterwards under a rubber tree and we compare it, then the temperature feels very hot under the oil palm trees."

Summary

- Water shortages were reported to occur more often since oil palm cultivation has become the dominant land use and large-scale deforestation has taken place.
- As reported by Marten et al (2016), that palm oil expansions can cause soil and water resources to degrade.
- Current discussions about the ecological impacts of expanding palm oil production focus on how it destroys primary forest, increases greenhouse gas (GHG) emissions and reduces biodiversity.
- Little attention has been paid to concerns that oil palm plantations severely impact local water resources and increase flood risks.
- Measurements of eco-hydrological processes and observations of Indonesian farmers indicate that large-scale oil palm monoculture has long term negative consequences for smallholder farming systems and the water supplies of rural communities (Dislich *et al*, 2016).

- Many studies have shown that current practices of oil palm cultivation increase drought and flood risks and seriously degrade local water resources creating a major challenge for future rural water supplies.
- The rural population of Jambi Province perceives the oil palm as a “water and nutrient greedy” crop. In qualitative interviews, rural households reported that since the land was converted to oil palm plantations, groundwater reservoirs and surface waters have been drying up more quickly.
- Despite the fact that oil palms are usually cultivated in tropical regions with only short dry seasons and at least 1500 mm annual rainfall, where irrigation is unnecessary, water shortages have become a problem. Water scarcity in such areas is a relatively recent phenomenon.
- Groundwater wells used for domestic water consumption are drying up and forcing villagers to collect water from distant rivers or to purchase bottled water. Since oil palm began to be cultivated extensively, small streams run dry more often in the dry season, fertilization the irrigation of paddy rice, Indonesia’s main staple crop.
- Informants reported that floods are more frequent during the rainy season, and occur sooner after rainfall events than in the past, when forests and rubber plantations covered the area. Floods during the rainy season cause failures of crops that are not adapted to inundation. Oil palms can withstand short periods of flooding, but when fertilization and harvesting activities are disrupted, productivity drops.
- Oil palm transpiration is high – higher than for crops like rubber – but the main differences and problems come from soil degradation. Forest conversion exposes bare soil to heavy tropical rainfall, which typically causes significant soil erosion. Frequent harvesting activities on oil palm plantations and the removal of ground vegetation leads to further soil compaction. Because rainfall cannot infiltrate compacted soil, it tends to run off the surface instead of recharging groundwater reservoirs (Figure 3.3.1).



Source: https://www.die-gdi.de/uploads/media/BP_1.2017.pdf

Figure 3.3.1. Frequent harvesting activities on oil palm plantations and the removal of ground vegetation leads to further soil compaction

- Furthermore, downstream erosion increases sediment loads in rivers, reducing water quality and making rivers shallower, thereby increasing flood risks. Besides degrading soil, oil palms may stress local water cycles more than other local crops. While other cash crops such as rubber trees reduce water consumption during the dry season by partial leaf-shedding, oil palms consume more water at a relatively stable rate throughout the year. This is likely to exacerbate water shortages in oil
- However, as it has been convinced, the cultivation of oil palm is bringing with it a series of negative impacts affecting people and the environment wherever it is established.
- Despite all this, proponents insist on presenting oil palm plantations as the solution to all the social ills of the region in which they wish to establish them, declaring that they will generate employment, wealth, infrastructure, educational opportunities etc., in an effort to gain the support of local people.

3.4. REPORT BY MINISTRY OF MAHAWELI DEVELOPMENT AND ENVIRONMENT

According to the TOR given by the Technical committee on Identification of Environmental and Social Impacts of Oil Palm Cultivation in Sri Lanka, the Ministry of Mahaweli Development and Environment obtained the observation and recommendation from National Experts Committee on Biological Diversity (NECBD).

05th Session of the National NECBD was held on 22nd September 2017 at 9.30 a.m. at the Conference Hall of "Sobadam Piyasa", Ministry of Mahaweli Development & Environment.

3.5.1. Observations and Recommendations of National Experts Committee on Biological Diversity

Following observations &recommendations were made by the experts regarding the impact on biodiversity due to the change of land use by Oil Palm Cultivation:

1. It was advised by the committee that the agencies responsible for the introduction and proliferation of the oil palm cultivation should convene a special meeting with the relevant decision-makers and to use scientific data including research publications, other information and experience in Malaysia before recommending any opinion in converting rubber plantations to oil palm.

2. Loss of Biodiversity in areas covered by oil palms and also that some species such as snakes have increased their populations. In addition the soil has dried up in these areas as well.

3. Expert Committee was also on the view of encouraging planting coconut in the marginal lands other than the oil Palm.

3.5. SOME IMPORTANT FACTS ABOUT OIL PALM PLANTATIONS

Dr. Gamini Hitinayake

Senior Lecturer, Faculty of Agriculture, University of Peradeniya

Some important facts about oil palm plantations are summarized below. They are based on the observations made during a visit to oil palm plantations in Malyasia, Personal communications with Dr. Then Kek Hoe, Felda Global Ventures (FGV), Research & Development and a review seminar done by the Sri Lanka Association of the Advancement of Science (SLAAS) in 2002:

1. Results of Lysimeter studies conducted at Jerantut, Eastern Malaysia (Hitinayake, 2016)

Lysimeter studies conducted for 40 years (1976-2016) by the PPP Tun Razak (Government Research Station) in the oil palm plantation owned by Federal Land Development Authority (FELDAR), Malaysia at Jerantut (Eastern Malaysia) have recorded following evapotranspiration (ET) data:

	Normal weather	Drought	Monsoonal period
Young palm (mm)	4.5-5.5	5.5-6.00	3.0-3.5
Mature palm (mm)	5.5-6.5	7.00-8.00	3.0-3.5
Equivalent (liters)	300-440	370-540	200-236

ET on average: Normal days: 400 lit per day; During *El-nino:* 500-600 lit per day

Comparison of climate parameters: Jerantut, Malaysia and Low country wet zone of Sri Lanka

Climate in Jerantut: Months with the largest precipitation are December, November, January with 1220 mm precipitation. Most precipitation occurs in December with an average precipitation 537 mm. The annual amount of precipitation in Kuantan is 2730 mm. The average annual temperature is 31℃ in Kuantan. The warmest month of the year is May, with an average temperature: 33℃. Usually January is the coldest month in Kuantan, with average temperature 29℃. The difference between the hottest month: May and the coldest month: January is: 4℃. The difference between the highest precipitation (December: 537mm) and the lowest precipitation (July: 136mm) is 401mm.

Climate in low country wet zone in Sri Lanka (Nakiyadeniya is located in the WL2):

AER	WL1a	WL1b	WL2a	WL2b	WL3
Avg. RF (mm)	3200	2800	2400	2200	1700

Source: Punyawardena, 2008

Dry period: January-mid March (Rainfall: January - 70mm, February-60mm)

Dr. C.R. Panabokke (Balasuriya, 2002) states that:

"The two main considerations for oil palm are rainfall and seasonality pattern (length of dry period). None of them are ideal in Sri Lanka as compared Malaysia. The AER WL2 is preferred to WL1 because of the higher amount of sunshine experienced in WL2. Nakiyadeniya is located in the WL2. The extent of WL2 is much less than WL1. Hence less scope for further expansion here.

2. Review done by the Sri Lanka Association of the Advancement of Science (SLAAS) in 2002 with the participation of scientists from CRI & RRI and also from other institutes as the resources persons (including Dr. Parakrama Waidyanatha, Dr. Jayantha Gunathilake, Dr. Thilakaratne, Dr. CR Panabokke) revealed following about oil palm plantations when compared to rubber plantations (Balasuriya, 2002):

1. Length of Juvenile phase: Rubber-5.5-6 years; Oil palm-2.5-3 years
2. Income from two crops: Financial returns from oil palm in Sri Lanka may be about 8-10 times when compared to rubber
3. Fertilizer use / requirement with oil palm is 8-10 times more when compared to rubber
4. Nutrient outflow is 10 times more when compared to rubber
5. Evapotranspiration is 3 times more with oil palm when compared to rubber
6. Soil erosion also will be high in oil palm when compared to rubber
7. Treatment of effluent and disposal of biomass will be problematic with oil palm
8. Oil palm will have many negative impacts on biodiversity including vertebrate diversity
9. Rubber wood will be an important raw material for many industries in Sri Lanka
10. Oil palm will have a negative impact on industries & employment in general

3. **Felda Global Ventures, the third largest oil palm estate operator in the world is planning to diversify part of their (450,000 ha) oil palm plantations to Coconut (Personal communication: Dr. Then Kek Hoe, Felda Global Ventures, Research & Development) due to following reasons:**

- Coconut is more profitable than oil palm in the Malaysian context: Yields are getting low with successive rotations and hence their companies are moving to Indonesia seeking new land.
- Labour requirement is less with coconut when compared to oil palm
- Coconut is disease free: It is alarming to note that Ganoderma Basal Stem Rot (BSR) is fast becoming a major threat to oil palm cultivation and palm oil production in Malaysia. Present in more than 50 percent of the oil palm plantations in Peninsular Malaysia. Without treatment, more than 80 percent of the affected plants may die by the time they reach less than halfway through their life span. The losses can amount to a reduction of 25 percent to 45 percent yield in fresh fruit bunches. There is currently no effective measure to eliminate it. Ganoderma fungus is reported in some coconut plantations in Sri Lanka. According to Malaysian sources coconut is resistant to Ganoderma when compared to oil palm.

References:

Balasuriya, A. (2002). Oil Palm in Sri Lanka. A Review Based on the Seminar and Panel Discussion, Held at the Auditorium of the SLAAS, Colombo 07 on 04th April, 2002.

Hoe, T.K. (2016). Felda Global Ventures, Research & Development. Personal communication.

Hitinayake, G. (2016). Based on the visit to Federal Land Development Authority (FELDAR), Jerantut, Malaysia.

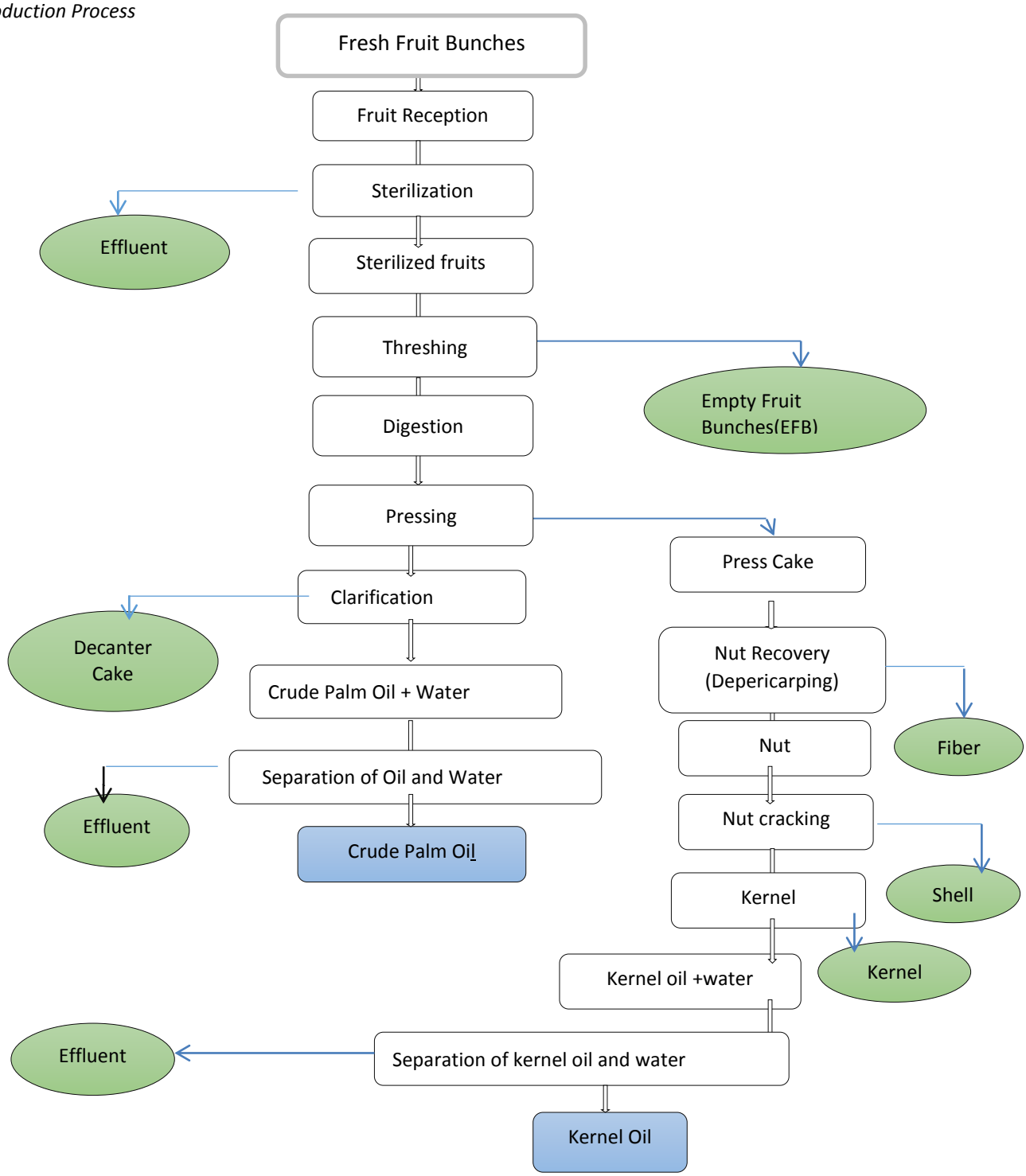
Punyawardena, B.V.R. (2008). Rainfall and agro-ecological regions of Sri Lanka. Natural Resource Management Center, Department of Agriculture. 129p.

3.6. REPORT BY CENTRAL ENVIRONMENTAL AUTHORITY ON PALM OIL PROCESSING INDUSTRY IN SRI LANKA

Palm Oil Processing Industry

Palm oil is extracted from oil palm fruits. The fruit bunch is cut when it is ripe. The harvested fruit bunches are sent to the processing plants by trucks for the extraction of Palm Oil.

Production Process



The arriving fruit, usually in trucks, is dumped into a FFB (Fresh Fruit Bunch) hopper. It is then transferred to fruit cages. The cages are then moved into a sterilizer.

Sterilization

The fruits are heated with steam at pressure for about two hours. This cooking process softens the fruits, enables the separation of the fruit from bunches and stops the enzyme reaction that cause the increase of FFA (Free fatty acids) in the fruits.

Threshing

In the next stage the fruit cages are tipped and conveyed to a threshing machine. This machine is a rotary drum of about 2 meters in diameter. The drum rotates and bunches get lifted up and dropped when they reach the top of the drum. This action helps the detachment of fruits from the bunches and the separated fruitlets fall through the slots of the drum to a conveyor below.

Digestion

Digestion is the process of releasing the palm oil in the fruit through the rupture or breaking down of the oil-bearing cells. The digester commonly used consists of a steam-heated cylindrical vessel fitted with a central rotating shaft carrying a number of beater (stirring) arms. Through the action of the rotating beater arms the fruit is pounded. Pounding or digesting the fruit at high temperature, helps to reduce the viscosity of the oil, destroys the fruits' outer covering (exocarp) and completes the disruption of the oil cells already begun in the sterilization phase.

Pressing

The fruits are conveyed to a digester which mashes up the fruitlets so that when the mash is pressed in a screw press, the oil is extracted efficiently. The output from the screw press is crude palm oil and press cake. The extracted oil is mixed with fruit particles, water, sand and dirt. The press cake consists of palm fibre and nuts. The press cake is then transferred to the depericarper for further processing. The crude oil is first screened with a vibrating screen to remove the course fibres and other dirt and it is then pumped to the clarification station for further processing.

Clarification

The oil is pumped to a heated vertical tank where the separation of oil from the sludge (mixture of water and dirt) takes place by gravity. The oil is skimmed from the top and the remaining dirt removed in a purifier. The heated clean oil is the passed to a vacuum chamber for the removal of the remaining moisture. The oil is then pumped to storage tanks for sale as crude palm oil.

Press cake processing

The press cake is conveyed in a conveyor that assists the breakup ofthe cake to a depericarper. The depericarper is a square box that with a strong suction. The air removes the fibres and transports them to a cyclone. The fibre from the cyclone is sent to the boiler for burning as fuel for the generation of

steam. The nuts being heavier drop to the bottom of the depericarper and are cleaned in a rotary drum and transported to a silo for intermediate storage.

Nut Processing

The nuts from the nut silo are first cracked in a nut cracker. The cracked mixture which consists of kernels and shell is processed to separate the shells and kernels. This is done in air columns and by a water bath in a hydro-cyclone. The kernel is used to extract kernel oil.

Water Requirement in the Production Process

In the palm oil production process, water is required for the steam generation, oil clarification, cleaning and domestic requirements. The quantity of water required is determined by the processing capacity of the mill, for example 10 tons per hour mill will require 10 cubic meters of water per hour.

Table. 3.6.1. Waste Generation during the Production Process

Pollution type	Type of Waste	Quantity as a percentage (by weight)
Solid Waste	Empty Fruit Bunches	**22%**
	Fibers	**13.5%**
	Shells	**5.5%**
	Decanter cake	**29%**
	Kernel cake	**2%**
Wastewater	Generated from sterilization and clarification	**38%**
Noise	Generate during the mill operation.	
Steam	Generate during the sterilization and digester process.	
Other	Bottom ash	
	Fly ash	

Power Generation

In a palm oil mill all the electricity required for processing can be generated from the waste products of the palm fruits. The diesel generators are only required for start-up and shut down of processing in a well operated palm oil mill.

The fibre from the fruits after pressing and shell from cracked nuts are sent to the boiler for burning as fuel. The steam generated by the boiler is used to drive a steam turbine which is coupled to an alternator to generate electricity.

Effluent Treatment

The palm oil process uses water to separate the oil from sludge and solids in a tank. After the removal of oil, the wastewater (effluent) is discharged from the mill.

This effluent is brown slurry and contains 4 -5% particles of vegetable matter, 0.5 – 1% residual oil and water with high concentration of organic nitrogen.

The effluent needs to be treated because the vegetable matter in the liquid will decompose and during the decomposition process, the vegetable matter will use oxygen in the water. Therefore before the discharge of the effluent to a water source, let the decomposing process take place by keeping the effluent in ponds and let bacteria decompose the vegetable matter in the waste water.

Table 3.6.2. Raw Effluent Quality

Parameter	Raw Effluent Quality
PH	4.4 - 4.6
BOD_5	10,000 -12,000 mg/l
COD	120,000 – 108,800 mg/l
TSS	11,500 mg/l
Oil & Grease	1,685- 3,395 mg/l

Source: Raw effluent Analytical Report No.6665006987 dated 01.04.2015 of AEN Oil Palm (PVT)Ltd by SGS Lanka (Pvt) Ltd

Palm Oil Processing Industries in Sri Lanka

There are two palm oil processing industries in Sri Lanka.

1. Palm oil Processing Factory Managed by Watawala Plantations PLC. is located at Nakiyadeniya. The mill commissioned in 1980 as a small scale industry and in 1992 expanded its capacity to process 15,000 fresh fruits bunches per hour.

2. AEN Palm Oil Processing (Pvt.) Ltd. is a joint venture of Agalawatta Plantations PLC, Elpitiya Plantations PLC & Namunukula Plantations PLC. The factory is located at Mohamaddi Estate, Baduraliya which has the processing capacity of 10,000 fresh fruits bunches per hour. This is a Boar of Investment approved project and the produce is exported to India. The mill was commissioned in January 2007.

Table 3.6.3. Two palm oil processing industries in Sri Lanka

	Nakiyadeniya Palm oil Processing Factory	AEN Palm Oil Processing (Pvt.) Ltd
Production Capacity/hr	15,000 fresh fruits bunches(15MT)	10,000 fresh fruits bunches(10 MT)
Working hrs	13 hrs/day	08hrs/day
FFB Process/day	About 180 MT	About 200 MT
Daily Production Crude Palm Oil Palm Kernel Oil	About 42 MT	About 55 MT
	About 4.2 MT	About 4.5 MT
Water Requirement Processing Washing Domestic	110 m^3/day	50 m^3/day
	03 m^3/day	03 m^3/day
	02 m^3/day	0.5 m^3/day
Water Discharge	75 – 80 m^3/day	100 m^3/day
Effluent Treatment	Treatment Plant Available*	Treatment Plant Available**
Final Discharge	Oil Palm Cultivation	Dispose via Madampitiya Pump Station.
Solid Waste EFB Fibre Nut Shell Press Cake	About 18-20 MT/day	About 40 MT/day
	About 18 MT/day	About 34 MT/day
	About 10 MT/day	About 8 MT/day
	About 4 MT/day	About 3 MT/day
In-plant Energy Generation	2500 kwh	300 kwh
Expected Expansions	-	Expect to expand the capacity up to 20 MT/hr within 2 yrs.

*Effluent treatment at the Palm oil Processing Factory at Nakiyadeniya is carried out through a ponding system which is comprised of a series of anaerobic, facultative, and algae (aerobic) integrated with a bio gas generating plant.

**Available treatment plant at the AEN Palm Oil Processing (Pvt.) Ltd. is abandoned and utilized as temporary storage tanks to take over the wastewater to Madampitiya pumping station. Installation of new system for zero waste water discharge is in progress but efficiency to meet CEA standards shall be reported from the test run.

Note: Processing Capacity of 2 Existing Processing Plants in Sri Lanka is 25MT/hr.

Current Land area of the Oil Palm Cultivation is 9410 ha.

Expected expansion of the Oil Palm Cultivation is 20000 ha.

Total Plant capacity for 20000 Ha is approximately 50 MT/hr.

Therefore balance requirement of the Processing Plant capacity is 25 MT.

Observations - Palm Oil Processing

- In both plants, waste fibre and nut shells are used as boiler fuel for energy generation. Then air pollution aspects shall be monitored closely.
- As this is a seasonal fruit, maximum capacity of both plants achieve during the period of June, July and Augustonly. Therefore seasonality also may affect the efficiency of effluent treatment plant, so precautionary measures shall be taken to maintain appropriate food: microbe ration constantly.
- Concentration of pollutants in the raw effluent is extremely high and a comprehensive effluent treatment plant is necessary. Need high level of monitoring.
- Generation of sludge from processing and effluent treatment plant and its quantity is extremely high and having oil contents and slow microbial reaction and decomposition rate. Therefore sludge management also difficult and can practice co-composting with other waste or thermal drying.
- In order to consider the future expansion of the existing factories proper effluent system with adequate capacity shall be adopted.
- In order to cater the crop produce in the 20000 ha of Palm Oil Plantation, with the capacity of 50MT/hr is required to operate 12hrs/day for 25 days per month. Therefore another oil palm processing plant/ plants with the total capacity of 25MT/hr can be accommodated.
- This type of industry is classified as extremely high polluting; therefore extra care shall be taken while selecting location for industry considering the availability of receiving water body and potential to contaminate the groundwater and the vicinity of surroundings whether highly residential/ residential or sparse.
- Final discharge after adequate treatment could be utilized for irrigation of oil palm cultivation (Malaysian and Indonesian Experience)

3.7. COMMUNITY SURVEY DONE BY THE CENTRAL ENVIRONMENTAL AUTHORITY

As per the decision taken at the meeting the CEA conducted a survey to identify and assess social and environmental impacts due to oil palm cultivation in areas where public complaints have been received.

Identification of socio-ecological issues (Study based on a questionnaire survey)

- Dates of the field visit survey: 21/9/2017 and 11/10/2017
- Districts covered: Kalutara, Galleand Kegalle

The people live nearby the oil palm plantations were interviewed to collect information for the questionnaire. Most of them are inhibitors for 60- 70 years in the area except for some new comers who lived there for 2-8 years. Vital information have been provided by the inhibitors in their 50-70 years of age. The map showing the areas of the survey carried out is shown in figure 1.

Public comments identified through the survey

A. Depletion of Water

General views are common with regard to availability and depletion of water resources, economical sustainability and environment. The community depends on the ground water for their water requirement. They pointed out that, not like those days of 15- 20 years back, many of the wells run dry faster during the dry season. Also they have to dig 6-7 feet more for water, whereas 4 feet was enough earlier. According to them, some small water streams of “Ela” were completely dried after the conversion of rubber to oil palm. Nevertheless nobody has noticed depletion of quality in water.

B. The Sludge

The sludge generated during the palm oil processing is dumped at the plantation premises causing bad odor and impacting the environment by polluting the down streams finally the paddy fields and humans living nearby. Increase of flies is another menace faced by the community due to the open dumping of sludge.

C. Increase of Serpents

There has been an increase of serpents (Cobra, Russell’s viper, Krait and Hump nosed viper) with the conversion of rubber to oil palm with respect to the earlier days. They saythat the reptiles breed and live under the piles of fronds of oil palm which takes some time (5-6months) to decay. Even the base of the frond attached to the tree is an ideal habitat for reptiles.

D. Physical Damages

People said that the oil palm harvesters are employed without providing protective gloves, boots or helmets and therefore the falling bunches could cause physical injuries. Any damage caused by the toxic spines in the fronds seems to require hospitalized treatments.

E. Socio-economic issues

Many of the villagers depend on rubber plantations for their day to day life. They have used branches of the rubber trees as firewood and some income have been generated by selling them and *Gotukola*, which grows under the rubber canopy. Plantation of oil palm has destructed their livelihood activities completely and they have to buy firewood at high price, which cannot be afforded by many.

Some harvesters of oil palm said that they have to work in the plantations for 2-3 hours only (8am-10 am) and they generate an income of around Rs 30,000 per month while doing some other work in the rest of the day generating an extra income. However, some workers in the plantations mentioned that, they prefer to work in rubber plantations. There are villagers who provide transportation (tractors) of the harvest to the factory and earn considerable amount income.

F. Low undergrowth

They complained that the undergrowth in oil palm is poor with compared to rubber cultivation. This was observed during the field visit, except for common fern, crotalaria and some wild plant species.

G. Natural Regeneration in wetlands

Some villagers said that the seeds of oil palm that are naturally transported by streams grow in their lands and when mature, it is difficult to remove them. High nutrition uptake and water usage of oil palm has caused poor quality harvest in other crops such as Goraka (*Garzinia* sp).

The survey team also observed naturally grown oil palm plants of different age classes along the stream banks and road sides which have suppressed the natural vegetation.

People claimed that they have been benefitted from these government lands and now only the planters are benefitted. According to the villagers, their lifestyle combined with the surrounding environment is completely disturbed by this plantation.

Finally it can be concluded that diversification of rubber into oil palm has affected the lifestyle of the local community.

H. Other related issues

Some people highlighted that oil palm fruit is toxic to the dogs and it causessomeskin diseases among the dogs by eating the fruit, which leads to the death. People have observed certainly species (insects) with some unpleasant odor in oil palm cultivated areas.

It appears that many of the villages in Deraniyagala area are not aware of the impact of oil palm on environment but, workers in rubber plantations protest against the oil palm cultivation.

I. High Soil erosion

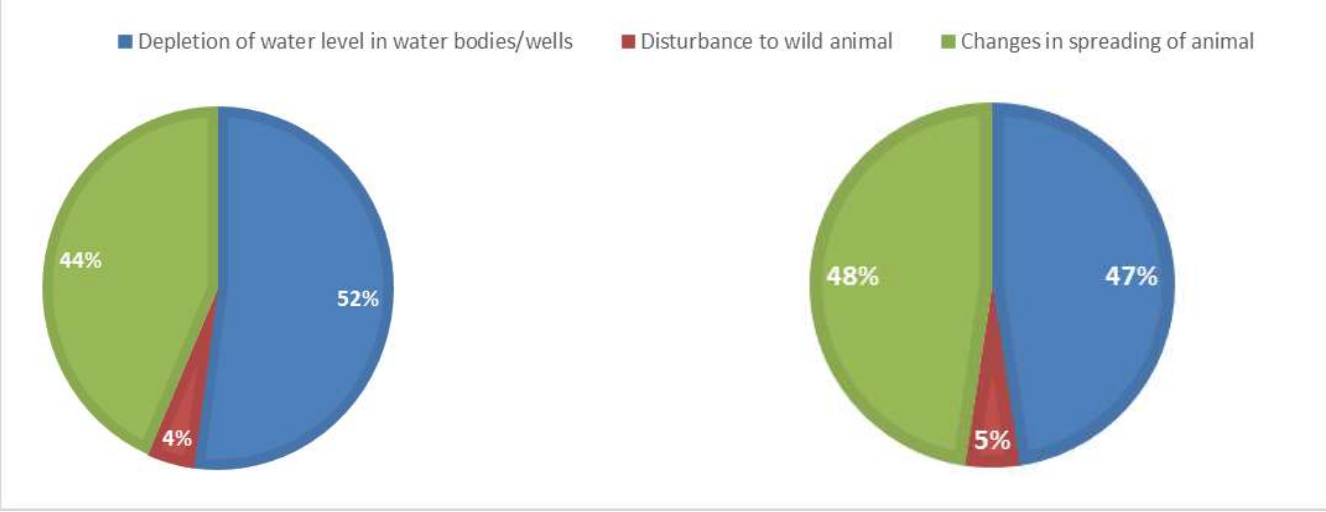
Soil erosion is very high during the platform preparation which will lead landslidesin rainy season. Soil exposurein oil palm plantations is significantly higher than the rubber. Also the base soil exposure is

significantly high in oil palm generally and maximized by the undergrowth free zone (around 2m) maintained for easy harvesting.

Figure. 3.7.1. The oil palm plantation showing low undergrowth and pillingof removed fronds throughout the plantations

Figure. 3.7.2. Naturally regenerated oil palm trees invaded the either sides of water stream, depressing the native vegetation.

Figure. 3.7.3. (a) Newly established oil palm plantation in either sides of the waterfall. (b) Platform preparation for planting oil palm trees leads soil erosion in sloppy lands, potential for landslides (Deraniyagala).



Kalutara District **Galle District**

Figure 3.7.1. Opinions of the surveyed group on different social and environmental impacts of oil palm cultivation in Kalutara and Galle districts.

** Above all comments/ information were obtained from villages live around the oil palm cultivated areas inKalutara, Galle and Kegalle district.

4. TAXES IMPOSED ON EDIBLE OIL IMPORTS

The tariff on imported coconut oil and other edible oils was changed into a Special Commodity Levy with effect from 13 January 2012. It has continued this year as well. Virgin coconut oil and other substitute oils namely soya bean, palm oil, sun flower seed, safflower, cotton seed were included under Special Commodity Levy (Act. no 48/2007). The present levy for palm oil importation is Rs. 110/= for crude oil, Rs. 115/= for Olein and Rs. 135/= for refined oil per kilogram.

5. FACTS REVEALED DURING THE STUDY ON

1. Threats on the existence of all traditional plantation crops, which are proven to be environmentally and socially friendly. Rubber, tea & coconut plantations. If the current trend is proceed, the remaining rubber plantations will be converted for oil pam plantations in future.
2. Expansion of the oil palm cultivation without identifying environmental suitability of such land.
3. High water consumption by oil palm trees. Oil palm is highly effect on the ground water due to high evapotranspiration rate (500 to 600 liters / plant/ day) in during the drought condition and normal day the average is 400liters. (International Case studies)
4. Experiencing early drying of wells and water streams during the dry season around oil palm cultivated areas. (international research , Public complaints)
5. Frequent floods in oil palm grown areas due to poor rain water absorption causing run off in oil palm cultivations. Water absorption is poor due to soil compaction. (International research)
6. Soil erosion is comparatively high in oil palm in sloppy areas. That will be triggered by the preparation of platforms in sloppy areas and soil exposure due to land clearing around the plants (plantations maintaining the clear under cover around the plants for harvesting). Soil rehabilitation is cost effective of oil palm plantations because it will take much longer years than rubber plantations.
7. Natural regeneration of oil palm seeds resulting spreading oil palm into other areas. The study team observed many wetlands (along the stream banks) and uplands were invaded by the naturally regenerated oil palm plants.
8. Loss of Biodiversity in areas covered by oil palms while some species such as snakes have increased their populations. The biodiversity in oil palm plantations is lower than the rubber plantations.(international literature & National Experts Committee on Biological Diversity)
9. High agro-chemical usage for crop protection Application of heavy doses of inorganic fertilizer. This is 8-10 times higher an amount per hectare of rubber. (SLAAS – 2002)
10. Palm Oil processing industry generates high load of pollutants of which 75% of the yield by weight disposed as waste. The effluent contains higher levels of organic matter including oil. Therefore to treat the effluent complying the CEA standards needs costly and high tech

effluent treatment plants. At present both the treatment plants at the two processing facilities are not properly functioning.

11. No timber value for the tree trunks compared to the rubber and coconut
12. There will be a massive threat in future on clearing of forest lands to cultivate oil palm as well as in home gardens too
13. Uncertain sustainability of oil palm industry as the current high profit is due to the import tax. The profitability of palm oil is due to the artificial value created by high importation tax (130/kg).
14. The current trends experience by other oil palm growers such as (Malaysia) High cost of production, low yields in the second rotations, occurrence of certain, Diseases and health issues of palm oil (Inter-national studies).
15. The world trend is currently goes towards the coconut plantations and it must be promoted to established coconut plantation in all possible agro ecological regions in Sri lanka

6. RECOMMENDATIONS

1 Establishment of new plantations, expansion of existing plantations and re-plantation of oil palm should be discontinued in Sri Lanka.

2 Importation of viable oil palm seeds should be banned with immediate effect under the export and import control Act and other relevant regulations.

3 Cultivation of viable oil palm seeds imported under the approval of the Plantation Ministry so far should be only allowed in areas identified over a Strategic Environmental Assessment (SEA) study.

4 District level monitoring committee should be established under the chairmanship of the District Secretary to assess the present status of the already established oil palm plantations.

The monitoring committee should be consisted of representatives from Ministry of Plantation Industry , relevant Division Secretariat, CEA, Department of Agriculture , NBRO , relevant Grama Niladharies and representation of any other institution, depending on the need.

5 Oil Palm Cultivation already done in fragile and environmentally unsuitable land areas should be rehabilitated with suitable tree spp soon under the guidance of the district monitoring committee.

6 Precautionary measures should be adopted to stop natural regeneration of oil palm seeds within and adjacent areas of oil palm plantations and such regenerated plants should be destroyed with immediate effect by the relevant plantation companies.

7 An Environmental Management Plan (EMP) should be prepared and implemented by the Plantation Companies for their Oil Palm plantations separately. This EMP should be reviewed and approved by a committee headed by the Ministry of Plantation prior to implementation. This approved plan should be made available to the district monitoring committee.

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Annexure 01

Oil palm & forestry extent and share from the total extent up to 31.12.2016

RPCC & State Agency	Oil Palm		Forestry	
	Extent	Share from the total Extent %	Extent	Share from the total Extent %
1. Hapugastenna	0	0.00	2,306	25.60
2. Watawala	3,279	35.34	1,058	11.41
3. Balangoda		0.00	2,686	27.75
4. Kahawatte		0.00	2,615	30.10
5. Bogawantalawa	479	4.12	1,331	11.45
6. Malwatte Valley		0.00	2	0.03
7. Maskeliya		0.00	1,525	20.42
8. Agalawatte	1,312	17.40	886	11.75
9. Talawakelle		0.00	644	12.63
10. Kelani Valley		0.00	1,261	14.11
11. Horana	108	2.19	555	11.26
12. Agarapatana		0.00	1,025	13.27
13. Maturata		0.00	847	12.05
14. Elpitiya	1,579	26.73	835	14.13
15. Madulsima		0.00	1,590	28.38
16. Kegalle		0.00	277	3.98
17.Pussellawa		0.00	1,631	18.91
18.Kotagala	526	6.57	921	11.50
19.Namunukula	2,127	26.41	1,089	13.52
20.Udapussellawa		0.00	710	16.57
	9,410	6.12	23,794	15.49
Chilaw PI Ltd		0.00	17	0.36
Kurunegala PI Ltd		0.00		0.00
Elkaduwa PI Ltd		0.00	189	7.33
JEDB		0.00	1,783	27.37
SLSPC	0	0.00	0	0.00
TRI		0.00		0.00
RRI	0	0.00	3	0.84
	0	0.00	1,992	8.55
Total	9,410	5.32	25,786	14.57

Annexure 02

Extent cultivated in RPCC and state plantations by 2016

RPCC & State Agency	*Tea*	*Rubber*	*Coconut*	*Oil Palm*	*Forestry*	*Other Crops*	*Total*
	2016	*2016*	*2016*	*2016*	*2016*	*2016*	*2016*
1. Hapugastenna	4,085	2,284	17	0	2,306	316	9,008
2. Watawala	4,440	395	10	3,279	1,058	95	9,277
3. Balangoda	4,182	2,554	60		2,686	199	9,681
4. Kahawatte	3,577	2,277	37		2,615	182	8,688
5. Bogawantalawa	3,746	5,462	469	479	1,331	133	11,620
6. Malwatte Valley	4,834	2,312	33		2	0	7,181
7. Maskeliya	5,774	120	0		1,525	51	7,470
8. Agalawatte	1,455	3,787	9	1,312	886	92	7,541
9. Talawakelle	4,159	251			644	47	5,101
10. Kelani Valley	3,448	4,228	0		1,261	0	8,937
11. Horana	2,086	2,060	54	108	555	65	4,928
12. Agarapatana	6,583	104			1,025	13	7,725
13. Maturata	4,757	598	125		847	704	7,031
14. Elpitiya	2,161	1,249	25	1,579	835	59	5,908
15. Madulsima	3,788	140			1,590	84	5,602
16. Kegalle	1,316	4,807	455		277	105	6,960
17.Pussellawa	2,324	4,560	111		1,631	0	8,626
18.Kotagala	2,540	3,658	0	526	921	367	8,012
19.Namunukula	2,338	2,074	282	2,127	1,089	144	8,055
20.Udapussellawa	3,298	80	165		710	33	4,286
	70,891	43,000	1,852	9,410	23,794	2,689	153,652
Chilaw PI Ltd		0	3,824		17	897	4,738
Kurunegala PI Ltd		244	4,042			616	4,902
Elkaduwa PI Ltd	1,206	276	343		189	563	2,577
JEDB	3,822	748	101		1,783	61	6,515
SLSPC	3,918	73	0	0	0	0	3,991
TRI	212	14	4			0	230
RRI	6	342	0	0	3	5	356
	9,164	1,697	8,314	0	1,992	2,142	23,309
Total	80,055	44,697	10,166	9,410	25,786	4,830	176,961

Annexure 03

TERMS OF REFERENCE TOR FOR THE STUDY TEAM

Ministry of Plantation Industries and National Institute of Plantation Management

- Current status of Oil Palm/Rubber cultivation in Sri Lanka
- Policies, laws and regulations
- Distribution of oil palm cultivation
- Present approval procedures
- Seed importation data and availability in nurseries
- Crop diversification programme
- Issues/ problems, views of the public and plantation sector
- Socio - economic Impacts
- Economic analysis (including import taxes)
- Survey on complains (within 2 weeks)

Coconut Research Institute and Rubber Research Institute

- Suitable climatic conditions and areas of the country
- Crop physiology including water use efficiency in different age classes, crop behavior during drought period and etc.
- Cultivation practices, agrochemical usage, replanting intervals with comparing other plantation crops (rubber, coconut)
- Production, economic value and labour requirement per unit area
- Environmental impacts including ground water resources (different age classes)

Ministry of Mahaweli Development & Environment and Central Environmental Authority

- Public complaints on Oil Palm Plantations
- Impacts on biodiversity due to the changes of land uses – (to obtain comment from National Expert Committee on Biodiversity).
- Status of Land use policy/ soil conservation act/ National Environment Act (NEA)
- Rules and regulations for establishment of oil palm cultivation and factories
- Product processing and pollution control aspect
- Potential capacity of existing oil palm factories
- Anticipated impact from existing oil palm factories
- Additional factory requirement and expected pollution load and impact on ground water quality

Dr. Gamini Hitinayake – Faculty of Agriculture, University of Peradeniya

- To identify the local and international research findings of oil palm plantations related to the environmental and social issues