

Current Status and Sustainable Management of Bio-diversity in Nilmini Estate Private Ltd., Ihala Millawa, Morawaka

1. Introduction

This report presents an evaluation of the status of bio-diversity in the Nilmini Estate Private Ltd, Ihala Millawa, Morawaka, which is currently under the process of conversion into an organic tea production system. The estate management has applied for the organic certification from SGS Lanka (Pvt) Ltd in 2003. Accordingly, the facility has been placed under 3 year conversion audit by the SGS Lanka (Pvt) Ltd. and this report is aimed at fulfilling a Minor Corrective Action Requests (CAR) suggested in the 12 month conversion audit in 30 July 2004, wherein auditors specifically pointed out the 'lack of records on bio-diversity with respect to tree species in the organic estate'.

2. Method of Bio-Diversity Assessment

The method used in the bio-diversity assessment included following steps.

- 1) All floral species were identified and recorded by a Research Assistant (RA) through a field survey in the estate, particularly in cropped areas
- 2) Expert advise was sought whenever it found difficult to establish the correct identity of certain species
- 3) During the same period all species of fauna observed were recorded
- 4) Information were collected from the estate staff about the faunal species they have encountered in the premises
- 5) Historical information of the estate was collected from past documents and residents in the area

It should be noted here that wild patches and uncultivated areas have not been fully explored in the survey and RA has not visually observed all the fauna species reported here. Records on certain wild life species were based on evidence such as foot marks, reporting of villagers etc.

3. The Location and Macro Habitat

The Nilmini Estate Private Ltd. is located in Ihala Millawa village of Morawaka, Galle District in the Southern Province of Sri Lanka. Total extent of the Nilmini Estate is 38.8 ha (95.8 Ac). It lines the Dellawa Forest Reserve in its northern boundary and is bordered by two perennial streams in western and eastern boundaries known as 'Pelwadiya Dola' and "Horiya Dola", respectively. In the southern boundary of the estate is located the Ihala Millawa village. The topography of the land rises from the flat terrain in southern part to relatively steep area in the northern border.

Morawaka area is belonged to the south-western quarter of the wet zone of the country. Sri Lanka is a world bio-diversity hot spot and the South-western quarter is the most species rich area in the country. Besides, the specific location of the estate is in neighborhood of the Dellawa Forest Reserve, one of the few remaining patches of tropical humid wet evergreen forest (tropical rain forests) in the country. The Dellawa forest is connected to the world famous Sinharaja World Heritage site and is considered a part of the 'Sinharaja Adaviya (Range)' before it was fragmented in to

few patches due to human intervention. Hence, the Nilmini Estate is located in an ecological zone which is endowed with one of the richest bio-diversity regimes not only in Sri Lanka but in the world as well.

4. Present Land Use and Evolution of the Current Bio-diversity Regime

The present land use of the estate is consisted of about 16 ha (40 acs) of vegetative tea cultivation which led to fragmentation of natural forest vegetation in the land in to few patches of natural vegetation. These forest patches covers a total area of about ha. In addition, a small part (... ha) of the land is covered with open wetland too. These are the main components of present land use in the estate and rest of the land is allocated for buildings (bungalows, organic tea factory, labor quarters etc.), roads and other infrastructure needs.

Evidence indicates that the estate had undergone various changes in land use during the recent history which gave rise to the present bio-diversity regime in the land. Historically, this land was covered with rich natural vegetation in the area that had scarcely been disturbed by human interventions. Villagers from the surrounding areas later disturbed the natural vegetation for 'chena' cultivation. According to the documentary evidence, the land was first surveyed in 1935. The first major commercial land use in the estate was a rubber plantation started in 1930. Around 1968, rubber was replaced with a 'vegetative' tea cultivation which has been expanded in to around 16 ha (40 acs) of land. Despite these commercial involvements, a significant area which had earlier been disturbed for chena cultivation has grown in to forest vegetation with large tree species, again, thus helping to conserve and maintain a substantial bio-diversity regime inside the estate premises. In addition, some disturbed patches contain secondary vegetation that consists of number of shrub species with high diversity.

5. Species Composition of Bio-diversity Regime in the Estate

The survey has recorded the 120 flora species belonged to following categories.

- i. Trees
- ii. Shrubs
- iii. Wines
- iv. Grasses
- v. Aquatic plants

In addition, observed groups of species of fauna, namely; birds, mammals and amphibians also were recorded in the survey. Total number of fauna species recorded under the above categories is 23. While these records are not exhaustive, they reflect the richness of the species diversity in the estate to a certain extent. Complete lists of flora and fauna species recorded in the survey are presented in the appendix tables 01 and 02 respectively. Summary descriptions of species groups recorded under each category are given below. A more in-depth investigation covering year-round observation to identify migratory species also will be undertaken in the future.

5.1 Trees

A total of 51 tree species were reported. A majority of these species are located in non-plantation areas with primary and secondary patches of natural vegetation. A few of them are belonged to dominant genera (e.g. Dipterocarpus, Shorea) found in tropical rain forests in the surrounding area. In addition, a number of domesticated multi-purpose tree crops also are available. The other important category of tree species is introduced exotic species which are serving as wind breaks and shade trees. Unlike other tree species, these species are mainly located in cropped areas (tea). Some of the species belonged to natural, domesticated and exotic species are high valued timber (see appendix table 01 for their uses).

5.2 Shrubs

Forty three shrub species were recorded in the estate. While some of them are economically useful species cultivated by owners of the estate such as tea, coffee, minor export crops and fruit species, there are significant number of naturally grown species too, which are found mostly in secondary vegetation grown in disturbed patches of lands. Though many of them are considered as agricultural weeds some are having medicinal values. Some are used as vegetables while fruits of certain species are edible.

5.3 Wines

There are 09 species recorded in the survey, which can be categorized as wines. A majority of them are useful species as fruits, vegetables, green leaves, medicinal plants, yams or fruits. Some of them are used for roping purposes also. These species are found in all types of micro habitats in the estate premises.

5.4 Grasses and herbs

The survey has identified 14 species of grasses and herbs. While few of them are true grasses, a majority is consisted of broad leaf herbs. Although, many of them are considered as agricultural weeds, some are having medicinal values. Few of them are useful as edible green leaves too. As a category species it helps to achieve certain ecological services such as providing ground cover to minimize erosion, being useful in food chain for herbivorous species etc. Like wine species, grasses and herbs also are found throughout the estate premises, covering all types of micro habitats.

5.5 Aquatic Plants

This is the type of species least covered in the survey. Only three species have been recorded. The major aquatic habitats in the estate are represented by two streams flowing along the western and eastern borders of the estate. As aquatic habitats these are lotic in nature (flowing water) and some of the trees, shrubs, wines etc. recorded in the survey are found in banks of the streams. Given the relatively sloppy terrain in the estate, very limited space of lentic water (standing water) is available in the estate, naturally. However, the estate management has already taken steps to construct 5-6 pond of standing water and number of such areas will be increased in the future.

5.6 Species of Fauna

Observations have spotted 9 mammal species, 9 bird species, 1 amphibian species and 4 reptile species. These observations represent only a snap shot view of the existing situation and therefore provide a very conservative assessment of diversity of fauna in the estate.

6. Future Plans to Enhance the Bio-diversity

The master plan of the estate envisages undertaking following activities that can enhance the bio-diversity in the estate.

- i. Minimizing and complete phasing-out of the application of chemicals that can affect the bio-diversity in harmful manner
- ii. Intercropping of the main crop tea with coconut and pepper
- iii. Introduction of cover crops and live mulches such as Rotararia, Puraria, Vetivaria (Sevendara), Cymbopogon and Gothamala among tea plants and tea bushes and in open bare land patches
- iv. Cultivation of ¼ acre forest patches consisted of timber species Mahogany, Alastonia, Teak and Sapu
- v. Establishment windbreaks and shade trees of Accasia, Albesia and Gliricidia in tea blocks
- vi. Cultivation of Banana in bare land patches
- vii. Growing of Khomba in open places and roadsides and Bamboo along the stream edges
- viii. Establishment of 1 acre plot of medicinal plants
- ix. Increasing of the grass cover in areas with high soil erosion potential
- x. Utilization of soil fertility through addition of compost, green manure and bio gas manure

These activities can be expected to enhance and maintain the bio-diversity resources in the estate in sustainable manner while helping organic production activities also by providing plant nutrients and organic pesticides, reducing soil erosion and by managing pest and pathogens through natural enemies.

Appendix 01: Flora Species in the Nilmini Estate

Species	Common name (Sinhala)	Use/purpose	Degree of abundance ¹	Remarks	
Tree species					
1. <i>Samanea saman</i>	Mara	A shade tree with timber value	*	National tree of Sri Lanka	
2. <i>Cocos nucifera</i>	Pol	A multipurpose tree crop	**		
3. <i>Elaeocarpus serratus</i>	Veralu	A fruit tree	*		
4. <i>Mesua ferrea</i>	Na	A tree with cultural value	*		
5. <i>Artocarpus nobilis</i>	Wal Del	A tree with timber value	**		
6. <i>Anona couamost</i>	Anoda	A fruit tree with medicinal uses	*		
7. <i>Bambusa spp.</i>	Una	Useful for construction purposes	**		
8. <i>Psidium guava</i>	Pera	A fruit tree	*		
9. <i>Areca catechu</i>	Puwak	An economic crop	***		
10. <i>Caryota urens</i>	Kitul	Treacle and fermented products tree	**		
11. <i>Semecarpus gardneri</i>	Badulla	A tree with timber value	*		
12. <i>Mangifera indica</i>	Amba	A fruit tree	**		
13. <i>Michaelia nilagirica</i>	Sapu	A tree with timber/medicinal values	**		
14. <i>Alstonia scholaris</i>	Ruk Attana	A tree with medicinal value	**		
15. <i>Caralia brachiata</i>	Davata	A tree with timber value	**		
16. <i>Bridelia retusa</i>	Ketakela	A tree with timber value	*		
17. <i>Albizia lebbbeck</i>	Suriya Mara	A tree with timber value	*		
18. <i>Artocarpus heterophyllus</i>	Kos	A multipurpose tree crop with high timber value	**		
19. <i>Dipterocarpus zeylanicus</i>	Hora	A tree with timber value	***		An indigenous species
20. <i>Azadirachta indica</i>	Khomba	A tree with timber/medicinal values	*		
21. <i>Calophyllum inophyllum</i>	Domba	A tree with timber value	**		

¹ * - less than 10 trees

** - more than 10 less than 50 trees

*** - more than 50 trees

Appendix: Flora Species in the Nilmini Estate (contd..)

Species	Common name (Sinhala)	Use purpose	Degree of abundance	Remarks
22. <i>Tectona grandis</i>	Tekka	A tree with high timber value	**	An indigenous species
23. <i>Garcinia quaesita</i>	Goraka	Fruit is used as an essence/medicine	*	
24. <i>Citrus acida</i>	Dehi	Fruit is used as an essence/medicine	**	
25. <i>Nephelium lappaceum</i>	Rambutan	A fruit tree	*	
26. <i>Persea gratissima</i>	Ali geta pera	A fruit tree	*	
27. <i>Spondias pinnata</i>	Embarella	A fruit/vegetable tree	*	
28. <i>Pterocarpus marsupium</i>	Gammalu	A tree with timber value	*	
29. <i>Berrya cordifolia</i>	Halmilla	A tree with high timber value	*	
30. <i>Pericopsis mooniana</i>	Nedun	A tree with timber value	*	
31. <i>Artocarpus integrifolia</i>	Kos	A multipurpose tree crop with high timber value	**	
32. <i>Palaquium grande</i>	Kiri Hembiliya	A Tree grown in aquatic habitats	*	
33. <i>Shorea worthingtonii</i>	Beraliya	A tree with timber/medicinal values	*	
34. <i>Anisophyllea cinnamomoides</i>	Weli Piyenna	A tree with timber value	*	
35. <i>Bhesa ceylanica</i>	Pelan	A useful wood type for constructions	*	
36. <i>Chaetocarpus castanocarpus</i>	Hedawaka	A useful wood type for constructions	**	
37. <i>Dillenia triquetra</i>	Diyapara		*	
38. <i>Gyneros walla</i>	Walla Patta	A tree with timber/medicinal values	*	
39. <i>Adbutilon indicum</i>	Wal Anoda	A tree with medicinal value	*	
40. <i>Syzygium aromaticum</i>	Karabu	An export crop (essence)	**	

Appendix: Flora Species in the Nilmini Estate (contd..)

Species	Common name (Sinhala)	Use purpose	Degree of abundance	Remarks
41. <i>Ficus benghalensis</i>	Nuga	A tree with cultural/medicinal values	*	
42. <i>Hevea brasiliensis</i>	Rubber	An export crop (industrial uses)	***	
43. <i>Votex altissima</i>	Milla	A tree with timber value	***	
44. <i>Dillenia retusa</i>	Godapara	A tree with timber value	**	
45. <i>Mangifera zeylanica</i>	Etamba	A fruit and timber tree	**	
46. <i>Gliricidia sepium</i>	Ginisiriya	A multiple use tree	***	
47. <i>Tamaindus indica</i>	Siyambala	Fruit is used as an essence/medicine	*	
48. <i>Alstonia macrophylla</i>	Attoniya/Hawari nuga	A tree with timber value	***	
49. <i>Glycosmis pentophylla</i>	Dodam	A fruit tree	**	
50. <i>Carica papaya</i>	Pepol	A fruit tree	*	
51. <i>Sesbania grandiflora</i>	Katuru murunga	A tree with edible green leaves and flowers	*	
Shrubs				
52. <i>Cassia alata</i>	EthTora	A shrub with medicinal uses	*	
53. <i>Thitonia diversifolia</i>	Wal Sooriyakantha		**	
54. <i>Pandanus spp.</i>	Wetakeyya	A shrub used to produce artifacts	*	
55. <i>Ixora jucunda</i>	Rat mal	A flower with ornamental uses	*	
56. <i>Cinnamomum zeylanicum</i>	Kurundu	An export crop (essence)	***	
57. <i>Cyclea burmanni</i>	Kehipittan	A shrub with medicinal uses	**	
58. <i>Pogostemon heyneanus</i>	Kollam kola	A shrub with medicinal uses	**	

Appendix: Flora Species in the Nilmini Estate (contd..)

Species	Common name (Sinhala)	Use purpose	Degree of abundance	Remarks
59. <i>Eriocavion zeylanicumkorn</i>	Kokmota	A shrub with medicinal uses	*	
60. <i>Camelia thea</i>	Tea	An export crop (beverage)	***	
61. <i>Coffea arabica</i>	Kopi	A beverage crop	*	
62. <i>Cymbopogon nadius</i>	Pengiri	A shrub used for essential oils	***	
63. <i>Piper nigrum</i>	Gam miris	An export crop (essence)	***	
64. <i>Zingiber officinale</i>	Inguru	A shrub with medicinal uses	**	
65. <i>Curcuma longa</i>	Kaha	A shrub with medicinal/essence uses	**	
66. <i>Murraya keenigi</i>	Karapincha	A shrub with medicinal/essence uses	*	
67. <i>Capsicum juncea</i>	Miris	A fruit used for cooking	*	
68. <i>Vernonia cineria</i>	Monara kudumbiya	A weed	***	
69. <i>Pagiantha dichotoma</i>	Divi kaduru	A poisonous shrub	*	
70. <i>Nepenthus distillatoria</i>	Bandura	A carnivorous flora	**	
71. <i>Scolopia acuminata</i>	Katu kenda	A thorny shrub	**	
72. <i>Quassia India</i>	Samadara	A shrub with insecticidal uses	*	
73. <i>Saccharum officinarum</i>	Uk	Shrub used for sugar production	*	
74. <i>Musa spp.</i>	Kesel	A fruit species	***	
75. <i>Achyranthes aspera</i>	Karal sabo	A weed	***	
76. <i>Cyperus rotundus</i>	Kalandudru	A weed	***	
77. <i>Croton laccifer</i>	Keppitiya	A cover crop/ medicinal pant	**	
78. <i>Clerodendrum infortunatum</i>	Pitta	A weed	*	

Appendix: Flora Species in the Nilmini Estate (contd..)

Species	Common name (Sinhala)	Use purpose	Degree of abundance	Remarks
79. <i>Kalanchoe pinnata</i>	Akkapana	An arid shrub / weed	**	
80. <i>Urena lobata</i>	Epala	A weed	***	
81. <i>Imperata cylindrical</i>	Iluk	A weed. Used for thatching material	***	
82. <i>Impomoea asarifolia</i>	Ela bim tamburu	A weed	***	
83. <i>Chromolaeha odorala</i>	Podi singho maran	A weed	***	
84. <i>Melostoma malabanthrica</i>	Maha bovititiya	A shrub with medicinal uses	***	
85. <i>Mussanda frondosa</i>	Mussenda	A shrub with ornamental uses	**	
86. <i>Manihot utilissima</i>	Magnokka/Miyokka	An edible root tuber species	**	
87. <i>Alzssicarpus vaginatis</i>	Aswenna	A shrub with medicinal uses	*	
88. <i>Heliotropium indicum</i>	Eth sonda	A shrub with medicinal uses	*	
89. <i>Vetiveria zizanooides</i>	Sevendara	A shrub used for soil conservation	***	
90. <i>Smilax zeylanica</i>	Kabarosa	A shrub with medicinal uses	***	
91. <i>Solanum melongena</i>	Wam batu	A vegetable (fruit)	**	
92. <i>Lasia spinosa</i>	Kohila	A fibrous vegetable	**	
93. <i>Raphanus sativus</i>	Rabu	A vegetable (tuber)	**	
94. <i>Amaranthus oleraceus</i>	Tampala	A green leaf vegetable	**	
Wines				
95. <i>Coscinium fenestratum</i>	Weniwel	A woody wine with medicinal value	**	
96. <i>Merremia umbellate</i>	Madu wel	A weed. Used for roping purposes	***	

Appendix: Flora Species in the Nilmini Estate (contd..)

Species	Common name (Sinhala)	Use purpose	Degree of abundance	Remarks
97. <i>Crdiospermum halicacabum</i>	Wel penela	A wine with medicinal uses	*	
98. <i>Passiflora edulis</i>	Wel dodam	A wine with delicious fruit	**	
99. <i>Vigna seaquipedolis</i>	Polon Me	A vegetable (fruit)	**	
100. <i>Momordia charantia</i>	Karawila	A vegetable with bitter taste (fruit)	*	
101. <i>Ipomoea batatas</i>	Batala	An edible tuber with sweet taste	**	
102. <i>Alternanthera sessilis</i>	Mugunuwenna	A green leaf vegetable	***	
103. <i>Centella asiatica</i>	Gotu kola	A green leaf vegetable	***	
Grasses and herbs				
104. <i>Desmodium triflorum</i>	Heen undu piyaliya	A food for herbivorous animals	***	
105. <i>Ipomoea aquatica</i>	Kan kun	A green leaf vegetable	***	
106. <i>Fimbristylis dichotoma</i>	Kuda metta	A weed	***	
107. <i>Mimosa pudica</i>	Nidikumba	A thorny legume	***	
108. <i>Chrysopogon aciculatus</i>	Tuttiri	A weed	***	
109. <i>Axonopus compresses</i>	Potu tana	A weed	***	
110. <i>Stachytarpheta indica</i>	Balu nakuta	A weed	***	
111. <i>Eleusine indica</i>	Bela tana	A weed	***	
112. <i>Emilia souchifolia</i>	Kadu pahara	A food for herbivorous animals	**	
113. <i>Acalypta indica</i>	Kuppameniya	A herb eaten by animals	**	

Appendix: Flora Species in the Nilmini Estate (contd..)

Species	Common name (Sinhala)	Use purpose	Degree of abundance	Remarks
114. <i>Leucas zeylanica</i>	Geta thumba	A herb with medicinal uses	***	
115. <i>Commelina benghalensis</i>	Gira pala	A weed	***	
116. <i>Osmimum indicum</i>	Madurutala	A herb with insecticidal qualities	**	
117. <i>Hygroryza aristata</i>	Gojiri	Grain used as animal food	***	
Aquatic Plants				
118. <i>Cissampelos pareira</i>	Diya mitta	Aquatic plant with medicinal uses	***	
119. <i>Monochoria indica</i>	Diya habarala	An aquatic species	***	
120. <i>Selaginella spp.</i>	Selaginella		***	

Appendix 02: Fauna Species in the Nilmini Estate

Species	Common name (Sinhala)	Major features	Degree of abundance	Remarks
Birds				
1. <i>Copsychus soularis</i>	Polkichcha	Small black/white bird (20 cm)	**	
2. <i>Psitacula calthropae</i>	Sri Lanka alu girava	A parrot with red beak (30 cm)	**	
3. <i>Turdoides affinis</i>	Demalichcha	Grey/brown bird. Yellow beak (25 cm)	***	
4. <i>Centropus chlororhynchus</i>	Lanka bata eti kukula	Wild fowl lives among bamboo and reeds	**	
5. <i>Turdoides rufescens</i>	Ratu demalichcha		*	
6. <i>Megalaima flavifrons</i>	Ran munath kottoruwa		*	
7. <i>Accipiter trivirgatus</i>	Silu ukussa		**	
8. <i>Caryocollaptes lucidus</i>	Mukalan kerala		*	
9. <i>Sturus senex</i>	Hisa sudu minah		*	
Mammalians				
10. <i>Bandicota indica</i>	Uru meeyah		*	
11. <i>Lutra lutra</i>	Diya balla		*	
12. <i>Herpestes vitticollis</i>	Mugatiya		**	
13. <i>Ratufa macroura melanocura</i>	Dandu lena		*	
14. <i>Sus scrofa cristatus</i>	Wal oora		**	
15. <i>Lepus nigricollis singhala</i>	Hawa	A herbivorous mammal	**	
16. <i>Fuhambulus palmarum</i>	Lena		***	
17. <i>Ratus....</i>	Meeyah		***	
18. <i>Pipistrellus ceylonicus</i>	Kiri wavula	A bat species. Nocturnal.	***	

Appendix 02: Fauna Species in the Nilmini Estate (contd..)

Species	Common name (Sinhala)	Major features	Degree of abundance	Remarks
Amphibians				
<i>19. Bufo melanostictus</i>	Katu gemba		*	
Reptiles				
<i>20. Trimerasurus trigonocephalus</i>	Pala polanga		*	
<i>21. Aspidura drummandhayi</i>	Le medilla		*	
<i>22. Calotes calotes</i>	Kola katussa		*	
<i>23. Xenochrophis asperrimus</i>	Diya naya		*	