

Ecologically sustainable land-use practices

For Rubber Plantations



2015

Rubber Plantations and their Importance in Natural Landscapes

*For over a century, farmers in South India have tapped natural rubber from the *Hevea brasiliensis* tree. As a core raw material for many industrial and domestic products such as tyres, sports goods and footwear, condoms, gloves, etc., current market demand for latex is uncertain. It is well known that production in many traditional rubber growing areas have reached a stable maxima in the recent years.*

Although rubber plantations are a major driver of the local economy and employ a large workforce, the large-scale conversion of a multi-species forest ecosystem to a simple monoculture ecosystem results in the loss and degradation of many ecological services. A large proportion of the rubber plantations in southern India are located in the biodiversity rich Western Ghats which is a major source for numerous rivers and streams that supply water to estates, human settlements and industries in the plains. In addition, these hotspots are home to several endemic and endangered flora and fauna, without the active participation and involvement of all stakeholders in their conservation Biodiversity and ecosystem services will be lost forever. Soil erosion and reduced soil fertility are other problems that could result from rubber monocultures. This directly impacts the production of rubber and also increases production costs. Also, without the agricultural security that comes from a diverse mix of species and crops, these monoculture plantations are vulnerable to market fluctuations, disease and other stressors -- ultimately threatening themselves.

Managing such landuses in an ecologically and sustainable way will not only protect the present and future livelihoods of plantation owners and workers who count on healthy and stable rubber yields, but also protect our natural treasures and resources.

Defining “Ecological Sustainability”

The Ecological Society of America’s definition for ecological sustainability is “the tendency of a system or process to be maintained or preserved over time without loss or decline.”

“To meet the challenge of sustaining ecological systems, an ecological perspective should be incorporated into land-use and land-management decisions. Specifying ecological principles and understanding their implications for land-use and land-management decisions are essential steps on the path toward ecologically based land use.”

Advantages of becoming ecologically sustainable

Any farming or agro-forestry system is dependent on natural resources including soil, water, animals, and plants. When one or many of these are destroyed or depleted, it results in a higher cost of production with an increase in the application of agrochemicals and a decrease in production.

An ecologically sustainable approach to agro-forestry

- Enhances environmental quality, maintains and often improves the natural resource base upon which the agricultural economy depends.
- Makes the most efficient use of non-renewable resources and on-farm resources and integrates, where appropriate, natural biological cycles and natural controls, thus reducing the cost for additional chemicals, and other inputs.

These in turn result in sustained economic viability of farm operations and an enhanced quality of life for farmers and society as a whole.



In this booklet, these ecologically sustainable practices are discussed in reference to rubber plantations. Research in rubber supports and highlights the advantages gained by adopting these practices

1. Crop diversity and inter-cropping



Crops such as banana (a), coffee (b), cocoa (c) and tea (d) can be successfully inter-cropped with rubber



<http://bannablogtea.blogspot.in/2012/09/mixed-plantations.html>

Increasing the diversity of crop in a production landscape has many benefits including,

- Increase in the diversity of predators feeding on pests
- Reduction in spread of disease and pest attack and is important especially for the small farm holders
- Helps improve soil fertility
- Better weed suppression
- Consequently, reduced use of chemical pesticides and fertilizers
- Provides an insurance against market vagaries, crop failure and climate change.

Advantages of intercropping with rubber

“improvement in cation exchange capacity (CEC) and organic carbon status was observed in banana and cover crop established areas. An increase in available phosphorus was noticed in all the systems and the availability of potassium increased significantly in banana area compared to other systems. The tappareability of rubber in 6.5 years was 43.75% in banana-intercropped areas. Growth of rubber was superior together with banana compared to other systems while in tapioca, pineapple and cover crop established areas, tappareability was 37.8, 17.02 and 37.8 % respectively. The study showed that among the three intercrops and cover crop, banana intercropping is good for improving growth of rubber followed by cover crop and tapioca.” (Elsie et al, 2012). In rubber monocultures, tappareability is 70% in seven years on an average in traditional areas

“High density intercropping of rubber offers a win-win scenario; rubber can be successfully integrated with traditional cropping systems to provide many benefits to smallholders including earlier and greater latex yield, an additional income from the intercrop and better security of subsidy payments and property rights. Indirect benefits to soil fertility and stability will also accrue from the introduction of trees to traditional annual and perennial cropping systems.” (Stirling et al, no date)

The benefits of increasing the biodiversity in an agricultural area include,

- Increase in the diversity of predators of pests
- Improves the micronutrient levels in soil
- Reduces spread of disease and pest attack
- Consequently, reduced use of chemical pesticides and fertilizers
- Often, higher overall productivity and stability than in monocultures
- Important for regulating and supporting many ecosystem services such as nutrient cycling, regulation of water flow and storage, regulation of soil movement and properties, pollination, among others
- Results in a more resilient system

A rubber-based agroforestry system, as opposed to rubber monocultures is recommended as it would improve the micronutrient levels of the soils in the plantation. (Oku et al, 2012)

“Agricultural biodiversity has hitherto been valued almost exclusively as a source of traits that can be used in scientific breeding programs to improve the productivity of crop varieties and livestock breeds. We argue that it can make a far greater contribution to increased productivity. In particular, a wider deployment of agricultural biodiversity is an essential component in the sustainable delivery of a more secure food supply. Diversity of kingdoms, species and genepools can increase the productivity of farming systems in a range of growing conditions, and more diverse farming systems are also generally more resilient in the face of perturbations, thus enhancing food security. Diversity can maintain and increase soil fertility and mitigate the impact of pests and diseases. Diversity of diet, founded on diverse farming systems, delivers better nutrition and greater health, with additional benefits for human productivity and livelihoods. Agricultural biodiversity will also be absolutely essential to cope with the predicted impacts of climate change, not simply as a source of traits but as the underpinnings of more resilient farm ecosystems. Many of the benefits of agricultural biodiversity are manifested at different ecological and human scales, and cut across political divisions, requiring a cross-sectoral approach to reassess the role of agricultural biodiversity in sustainable and secure food production.” (Frison et al, 2011)



Dutch jewel - *Brachythemis contaminata*



Senegal golden dartlet - *Ischnura senegalensis*



Ground skimmer - *Diplocodes travialis*



Crimson rose - *Atrophaneura hector*



Red pierrot - *Talicada myseus*



Common map - *Cyrestis thyodamas*



Purple frog - *Nasikabatrachus sahyadrensis*



Malabar gliding frog - *Rhacophorus malabaricus*



False hour glass tree frog - *Polypedatus* sp.

2. Increasing biodiversity on the plantation

Wildlife and Rubber Plantations

In India, the southern Western Ghats is acknowledged as an area conducive for rubber cultivation, often referred to as the “traditional rubber growing areas”. This region is also known as a biodiversity hotspot housing several plant and animal species that are unique to this region, found nowhere else in the world and many that are found in very small numbers and are endangered. In this landscape, forests and rubber plantations and other human use areas form a mosaic of land uses.

Before the conversion of this area to rubber plantations and other uses, contiguous forest existed throughout the southern Western Ghats. With the advent of more intensive human activity over decades, this contiguity has been lost, resulting in wildlife using production landscapes more often to traverse between forest fragments. In some cases this has resulted in isolation of populations which, in the long term could be lost. This loss of contiguity also often results in conflict with humans, in addition to exposing the animals to danger such as road kills, pesticide poisoning from contaminated water sources near agricultural areas, high tension electricity lines, and illegal hunting .

Globally, there is an increase in demand for natural rubber. In India, there is a shortfall to meet our own demand and for export, thus providing an opportunity to expand the rubber industry to newer areas, within the Western Ghats and also in North East India. Such expansions to new areas often correspond with the loss of traditional land management practices and also in the loss of natural habitats. In the long run, it is well noted that intensive monoculture are ecologically unsustainable.

Given this continued and increasing pressure on wildlife habitats, loss of our natural resources is inevitable. The rubber is an important and responsible industry which has recently been looking towards long term sustainability. It is also one of the few agricultural crops that are least affected by wildlife. If this industry could consider ecologically sustainable practices, they would naturally promote a more wildlife friendly plantation and the benefits to both the industry and wildlife will be huge. In the case of larger plantations, such efforts automatically go towards their Corporate Social Responsibility, and reiterate their commitment towards the environment.

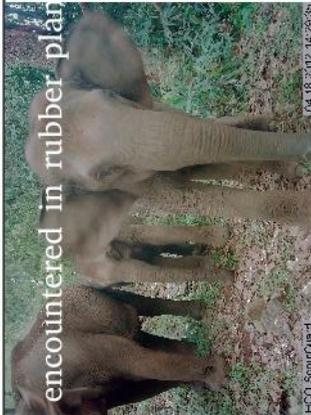
Wildlife refuges can often be created along streams and rivers, which not only protect the water source, but also act as a good vegetative cover for wildlife. Native vegetation as wind barriers in areas affected by high velocity winds also provide excellent habitat for local wildlife. In other areas smaller stretches of natural vegetation on underproductive lands can be established to link up forest patches. Again, this will contribute to increasing the biodiversity on the farm, bringing with it many important ecosystem services. Very often even narrow stretches of indigenous vegetation work well as refuges for wildlife.

Some wildlife commonly



Sambar deer
PCC, Soudhagar P
DT: 28.2.14 8:03:55

encountered in rubber plantations



Elephant
PCC, Soudhagar P
GA: 18.2.2012 14:25:36

in the Western Ghats



Leopard
PCC, Soudhagar P
06.09.2012 10:24:28



Gaur
PCC, Soudhagar P
03.09.2012 18:22:32



Bonnet macaque
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Wild pig
PCC, Soudhagar P
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Indian giant squirrel
PCC, Soudhagar P
06.09.2012 10:24:28



Peacock
PCC, Soudhagar P
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Porcupine
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Draco
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3. Soil management to prevent erosion

Erosion, especially of the top soil is highly detrimental for agriculture as it results in:

- Reduction in water and nutrient holding capacity of soil
- Exposure of sub-soil leading to loss of nutrients
- Loss of newly planted crops
- Deposit of silt in low lying areas
- Siltation of waterways and storage and reduction of water quality

These lead to lower yields and higher production costs.

Research in Rubber shows:

“An attempt has been made to assess the vulnerability of rubber plantations to soil erosion as a result of heavy rainfall and runoff in Kozhenchery taluk of Pathanamthitta district of Kerala, India. Analysis has indicated that the major portion of rubber plantation (81%) is distributed on locations that have medium adaptability to rainfall variability and least (0.9%) on areas showing low adaptability. Spatial analysis of rubber distribution map with soil erodibility map has indicated that 60.5% of rubber area is distributed on land with highly erodible soil with moderate slope followed by 37% on less erodible soil with moderate slope. Maps highlighting the areas vulnerable to rainfall variability and soil erosion will serve as an ideal tool for planners, researcher and extension people to develop suitable strategies for enhancing NR production in India.” (Meti et al, 2011)

“On a 30-year basis, soil recovery differed significantly in the three regimes. The natural secondary forest regime had the highest comprehensive accumulation of about 92% and the shortest estimated recovery time (37–40 years). In contrast, the monoculture rubber plantation, despite constant fertilizer and management input, yielded the poorest recovery result of about 75% and the longest recovery time (95–100 years). From the perspective of soil recovery, this regime appears unsustainable. However, the ecological replanting using local rain forest trees and shrubs thereby to build forest structure complexity and diversity on the monoculture rubber plantation improved comprehensive accumulation ability of about 8% (from 75% to 83%) and shortened the recovery time (40 years). The results suggest that the corridor engineering by natural secondary forest regime or by ecological replanting of monoculture rubber plantation can serve as effective regimes for soil properties recovery”. (Lia et al, 2013)



Some practices that can be followed to prevent and reduce erosion include:

- Presence of ground cover; the amount that will be required will depend on the soil type, moisture, rainfall amounts, intensity and seasonality, and slope.
- Do not burn: Between crop cycles, if the plants are slashed, do not burn them. The cut plant material provides ground cover and on degradation adds organic matter to the soil. Burning leads to loss of ground cover, organic matter and nutrients resulting in soil degradation in the long term.
- In plantations, a drainage management plan should be worked out using natural flows based on slopes. This will include plans for drainage of excess run-off; identification of water logged areas and steep slopes; windbreak locations, etc.
- Remedy small scale eroded flow lines within production areas by placing check structures and prevent by profiling inter-row to ensure minimal erosion
- Trap sediments to prevent the loss of rich top soil from your property
- Never leave land fallow and with no ground cover especially during seasons when wind velocities and rainfall are high
- Maintain all natural permanent and semi-permanent flow lines
- Use terracing along contours on slopes and while replacing plants ensure not all plants are uprooted at the same time thus exposing the soil
- By increasing the crop diversity and biodiversity on your plantation, soil physical and chemical properties can be improved.

4. *Integrated Pest Management*

Integrated pest management (IPM) uses a combination of methods to control pests while reducing the dependence on chemicals, impact on human health, environment and non-target organisms. Eliminating all types of insects or entire populations of a pest is neither cost-effective, nor good for the environment, and is not a necessity. Farmers employing the IPM approach should closely monitor the pest problem and make use of the least toxic method to control the pest population. The advantages of an IPM approach include:

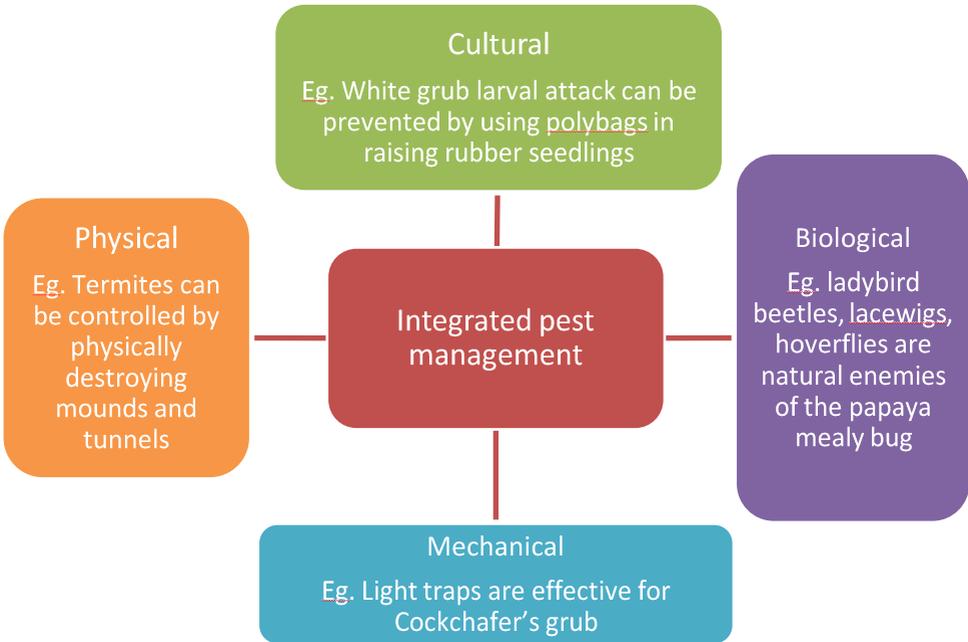
- Reduced use of chemicals benefits farm workers health and the health of the environment.
- Reduces pest- management costs
- Reduces the likelihood of pests developing chemical resistance.

The following methods are used in combination in an IPM:

- Crop rotation and using companion crops to deter crop-specific pests.
- Non-chemical pest controls such as sticky traps, and screens
- Biological control—using natural predator insects to reduce pests.
- In extreme situations some chemical control can be used keeping the following in mind:
 - Chemical should be highly absorbent with low solubility in water and with low half life, so its chances of entering the environment are reduced.
 - Chemical should have low toxicity. Care should be taken to ensure banned chemicals that have been identified as being extremely harmful to human health are not used.
 - Before using the chemical, ensure all related instructions are read and required training for application is completed.
 - Keep chemicals away from water sources when storing, and by avoiding spraying on windy days, and in proximity to water bodies.
 - Also, proper handling, cleaning and discarding of pesticide containers should be followed and ensure they are not reused

Common pests of rubber includes *Saissetia nigra* (Scale insect), *Ferrisiana virgata* (Mealy bug), *Odontotermes obesus* (Termites), *Holotrichia serrata*, *H. rufoflava*, *Anomala varians* (Cockchafer grub or white grub), Bark feeding caterpillars such as *Aetherastis circulate* and *Ptochoryctis Rosaria*, *Hemitarsonemus spp.* (mites), borer beetles, slugs and snails etc.

There is good scope for adopting integrated pest management to control root grubs. Control is achieved to some extent by natural predators such as wasps, vertebrate predators and fungal and bacterial pathogens. Black light traps have also been found to be useful in attracting adults and killing them. For mealy bugs and scale insects, given their sedentary nature, many natural enemies like parasites and predators and a fungal pathogen *Hypocreliia reineckiana* attack and keep them under control. (In: Jeyarathnam, 1992). Light traps can be used for attracting rubber beetles which although are not harmful to the rubber crop, can be inconvenient to humans. (In: Jeyarathnam, 1992)

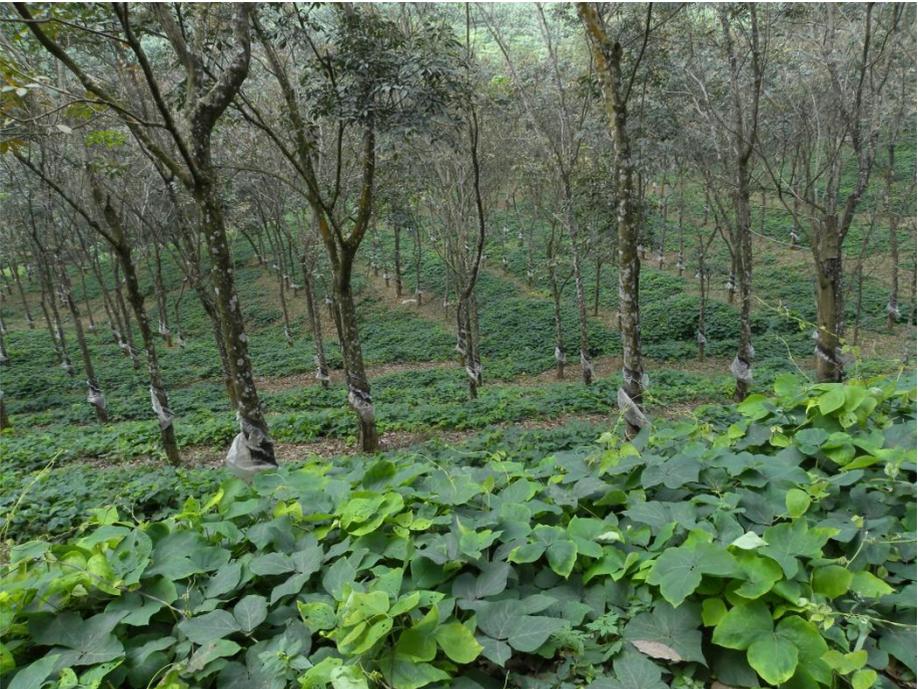


5. *Integrated Weed Management*

Similar to integrated pest management, weed management using methods that is harmless to humans, environment and non-target species is recommended. Methods that can be employed include:

1. Physical removal of weeds, especially the hardy weeds while retaining the soft weeds that could act as cover crops and contribute towards checking soil erosion
2. Use of cover crops and mulches: Controls weeds by shading and in some cases have allelopathic effects preventing the growth of the weeds
3. Irrigation management can be used to establish a flush of weeds that can then be (physically or otherwise) destroyed.

The use of herbicide in minimal quantities can be used, keeping in mind that the chemical should be changed frequently to prevent the weeds from becoming resistant to the chemical and plant species that are not weeds should not be affected.



Research in rubber shows:

The common weeds in rubber plantations include *Borreria sp.* (Button weed), *Chromolaena odorata* (Siam weed), *Lantana sp.* (Lantana), *Mimosa pudica* (Touch-me-not), *Clerodendron sp.*, *Mikania micrantha* (Mile-a-minute), *Sida sp.*, *Imperata cylindrica*, *Pennisetum sp.* (Napier grass), *Axonopus sp.* (Carpet grass), *Paspalum sp.*, *Digitaria sp.* (Tropical crab grass), *Cynodon dactylon* (Bermuda grass). In addition to manual weeding, cover crops can prevent and control weed growth. The commonly used cover crops in rubber plantations include *Pueraria phaseoloides* and *Mucuna bracteata*. The use of more species as cover crops has the advantages of reducing disease and pests in these and increasing the biodiversity in the plantation. The use of native species should be encouraged. Where cover crops are not established, it is also suggested that soft weeds are left in the plantation as these can act as soil binders and prevent erosion. Avoid removing weeds by application of chemicals just before rains as there is a chance of water sources becoming contaminated, and the absence of soil binders can result in the erosion of top soil.

“Hand weeding is a common practice in many countries. Hoes, machetes and bush knives are used for this purpose. Are and Folarin (1970) recommended slashing four times a year in cocoa plantations. Komolafe (1976) suggested a combination of slashing, ring weeding and mulching in Nigeria. Ojuederie et al. (1983) found slashing regimes in oil palm plantations increased bunch yield. Liggitt (1983) and Erasmus (1988) reviewed mechanical control methods in South Africa. Mechanical methods include labor intensive hand weeding, digging and uprooting and use of machinery such as brush cutters, mowers, tillers, plows and other tractor drawn equipments. Mechanical control provides short term control. Combinations of other methods such as cultural and chemical weed control programs have been found to be economical and effective.” (Muniappan and Marutani, 1991)

Agriculture is the largest user of the world's freshwater in most countries, accounting for nearly 2/3rd of total world consumption. Farming also affects water quality. While fertilisers improve crop growth, and pesticides protect crops, these chemicals often enter water sources such as groundwater, rivers and streams, ponds etc., damaging aquatic ecosystems.

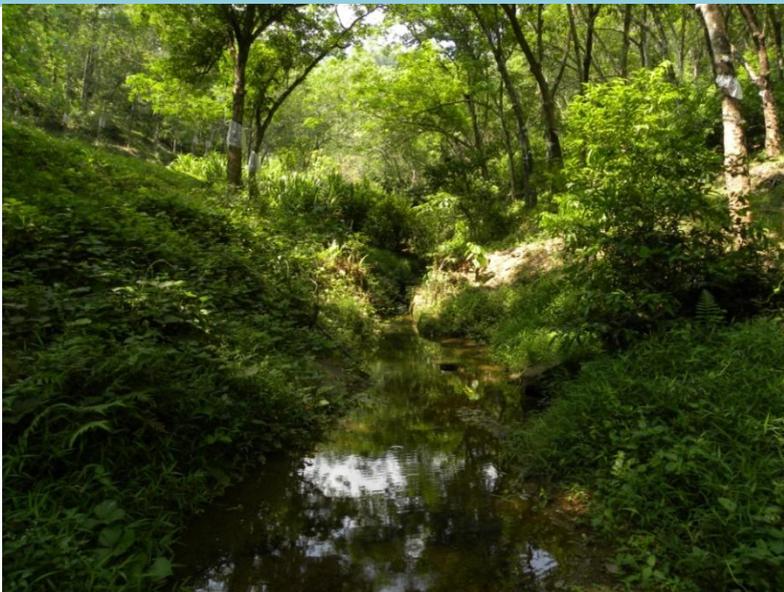
Scarcity of water is becoming more acute in recent times and the need for better water management is becoming increasingly urgent.

The following are some best practices suggested:

1. When irrigation is required for a crop, ensure proper planning, including timing of watering the crops, ensure quantity of water dispersed to the crops is not in excess, maintain a log book for water use to understand long term uses and requirements. Also ensure there are no leaks in the pipes. Reduce water use wherever possible, for example, a drip or sprinkler irrigation system could disperse water to the crops more efficiently while reducing the required quantity.
2. Ensure water sources are not contaminated with fertilizers and other chemicals used on the farm. The quality of water should be maintained.
3. Use waste traps to ensure discharge of solids into water bodies is prevented
4. All aquatic ecosystems should be protected and conserved within the farm.
5. Maintain native vegetation along stream courses

Vegetation cover reduces loss of water through evaporation, and any water sources should have sufficient green cover to ensure losses are minimal.

“Runoff and erosion are substantial and seriously limit crop production in the traditional rubber growing tracts in India. The conservation practices commonly adopted in rubber plantations are contour terracing, construction of stone-pitched retaining walls (edakayyalas), cover cropping and digging of conservation pits. The effect of conservation pits on soil and moisture conservation and growth and yield of rubber was evaluated in a field experiment in a mature rubber plantation in the central region of the traditional rubber rowing tract in India. The treatments comprised of combinations of conservation pits taken at the rate of 150, and 250 per hectare and two methods of fertilizer application viz., placement in pits and broadcasting. Plots without pits and fertilizer served as control. The experimental field was well drained with an average gradient of 14 per cent. Yield of rubber was significantly influenced by the presence of pits. Yield enhanced by 18% in the plots with 250 pits ha⁻¹. The girth increment also showed a positive trend and the highest girth increment was recorded in the plots with 250 pits. The soil moisture content differed distinctly with respect to different treatments. Soil moisture storage estimated up to a depth of one meter was distinctly higher in the plots with 20 pits per ha indicating the contribution of pits towards ground water recharge. A higher leaf water potential was maintained in the plots with pits. Growth and yield were not significantly influenced by different methods of fertilizer application.”(Sherin et al. 2008).



7. Use of alternate energy

Alternate or renewable energy sources are important to reduce our dependence on and conserve the available non-renewable natural resources such as coal, oil and natural gas, and in reducing the pollutants and green house gases that are emitted from these fossil fuels. They lead to cleaner environment and improved public health while being a more resilient and reliable form of energy. Common alternate energy sources include solar, and wind.



<http://cleantechline.com/2011/06/28/hybrid-wind-solar-power-generators-for-homes-businesses/>

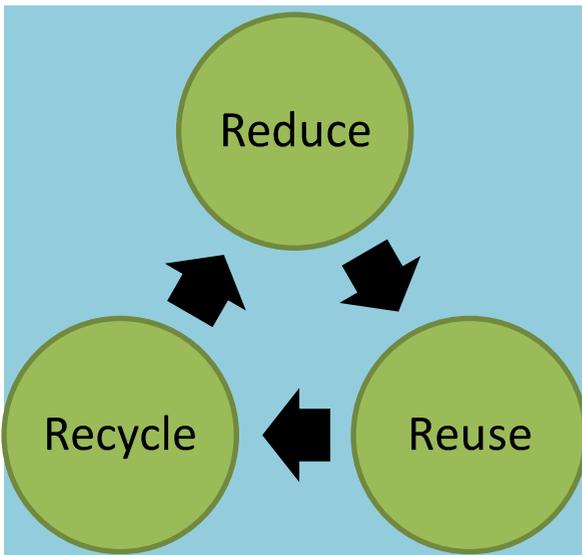


Rubber plantations could use solar energy to power their offices, factories, workers living quarters, and lighting in production areas. In areas of high wind velocities, the possibility of using wind power as a source of electricity should be explored. Also, when replacing or constructing new buildings and factories, plantations should consider energy efficient designs.



8. Waste management

- Reduce, Reuse and Recycle, the three R's of waste management should be followed wherever possible.
- Open disposal of waste should not be allowed.
- Segregation of waste at source should be encouraged and separate waste dumps for different types of wastes should be located and constructed in a manner where it has minimal environmental impact.
- Appropriate and safe method to dispose off these wastes should be put in place. For example, organic waste can be composted.



Appropriate and safe method to dispose off wastes should be put in place



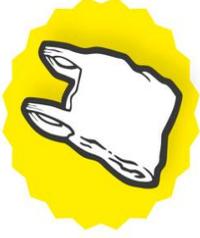
Organic

Left over food, Fruit peels, Leaves & twigs, Floor sweepings, Biscuits, Flowers, Soil & sand, Hair



Paper

White paper, Note books & covers, Small pieces of paper, Newspaper, Coloured paper, Cardboard, Chart paper, Tetra Paks, Paper cups



Plastic

Plastic bags, Juice, soft drink & water bottles, Milk packets, Pens & refills, Scales, Glue sticks & bottles, Paint pallets & bowls, Broken sharpeners, Broken dusters



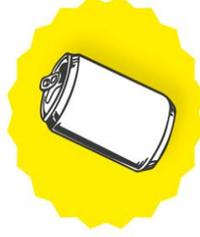
Mixed

Dirty or wet waste, Food packaging, Sweet, chocolate & biscuit wrappers, Pencil shavings, Erasers, Crayons, Thermocol, Broken shoes & slippers, Cloth



Glass

Glass jars, Dettol Bottles, Pipettes, Test tubes, Lab bottles, Drinking glasses, Ink bottles



Metal

Aluminium foil cans, Paper clips, Thumb tacks, Metal bottle caps, Metal accessories, Broken hole punchers, Broken staplers



E-waste

Printer cartridges, Mouse, Computer monitors, Laptops, Mobile phones



Sanitary

Used tissue paper, Soiled toilet paper, Sanitary pads, Diapers

International Standards and Certification

Environmental or eco-certification is a form of environmental regulation where a company voluntarily complies with a set of standards set by a certification service. Usually, a logo is attached to each certification which can be applied to the products from a certified farm. Eco-certification is viewed as a form of *Corporate Social Responsibility* where the company takes pro-active steps to prevent, reduce or negate any disturbance to the environment as a result of its activities. Several of the standards also include principles covering social aspects, thus certifying the company as being environmentally and socially responsible. Many of the sustainable practices discussed here are often included in these standards.

How can Environmental – Certification help Rubber Growers?

With customers increasingly concerned about the sustainability of the products they buy, companies demand higher environmental and social standards from their suppliers, and are often willing to pay a premium to suppliers who meet higher standards. Third-party certification gives recognition to the plantation as being environmentally and socially responsible. While also improving management operations and enhancing the prestige of the plantation, access to premium markets is a possibility.

The benefits of eco-certifying a plantation includes:

1. The major benefit is to the environment via sustainable practices used in these plantations, which is beneficial in long term
2. The entity going in for certification benefits by being recognised by their competitors, consumers and other stakeholders for their environmentally appropriate and socially beneficial practices.

Currently there are some disadvantages to certification

1. Cost of complying with the standards could be high
2. Market may not be readily available for green products, and until such market linkages are established small farmers/companies do not find it lucrative/economically viable to move down the path of eco-certification

*Two certification standards relevant to rubber plantations include the **Rainforest Alliance Sustainable Agriculture Network** and the **Forest Stewardship Council**. Each of these is governed by ten principles which are detailed next. More recently the International Rubber Study Group has started the **Sustainable Natural Rubber Initiative** under which they list a set of environmental and social criteria for rubber companies to*



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http://www.wwf.org.uk/what_we_do/forests/what_wood_you_choose/local_authorities/

Sustainable Agriculture Network (SAN) Standards

Ten guiding principles form the basis of SAN's standard. The latest and entire document can be accessed from the website <http://sanstandards.org>.

The ten principles are:

1. Management System

A system for managing social and environmental systems on the farm should be put in place and shared with the auditors to confirm the farm's compliance with SAN standard and the local legal requirements.

2. Ecosystem Conservation

Existing ecosystems in the farm should be conserved and steps to restore critical ecological areas within the farm should be taken.

3. Wildlife Protection

Wildlife, especially endangered species and their habitats on the farm should be identified, protected and monitored proactively.

4. Water Conservation

The farm should conserve water by keeping track of water sources and consumption and upgrade practices and machinery and use newer more efficient technology to achieve this. They should take necessary steps to prevent contamination of water sources in and around the farm and must monitor water quality, acquire required permits for use of water and treat waste water from the farm.

5. Working Conditions

Working conditions including salaries, benefits, work schedules, etc., for all employees, as defined by such international bodies as the United Nations and the International Labour Organization and local laws should be followed.

6. Occupational Health

Certified farms must have safety programs to reduce the risk of accidents and occupational hazards to health. Workers should be trained in safety measures — especially regarding the use of agrochemicals.

They should be provided with necessary protective gear. All infrastructures, machinery and other equipment should be maintained and in good condition and should not pose any danger to human health.

7. Community Relations

Certified farms are required to play an active role in local development by way of employment, training, public work etc. They are required to inform about their activities and plans and consult with interested neighbours on possible impacts of their farm activities on the surroundings

8. Integrated Crop Management

An integrated crop management system should be adopted. The use of chemical products that are known to be dangerous to people and the environment should be stopped. The farm should monitor pests, use biological or mechanical alternatives to pesticides where possible. If agrochemicals are deemed required, the safest chemical available along with safeguards for protection of human health and environment could be used.

9. Soil Conservation

Long-term improvement of soils by taking steps such as prevention of erosion, base fertilizer use on crop requirements and soil characteristics, using organic matter to enrich soil and using vegetative ground cover and mechanical weeding to reduce agrochemical use whenever possible.

10. Integrated Waste Management

The three R's of waste management, namely, reduce, recycle and reuse, are followed by everyone on the farm. Waste management should include segregation, treatment and disposal in ways that have minimal environmental and health impacts.

Forest Stewardship Council (FSC)
Standard for certification of timber and non-timber
forest products from Forest Managements

The FSC standards are based on the following 10 principles. An interim standards document with focus on India has been made available on the Rainforest Alliance Website at https://ra.secure.force.com/SWPubDocs/PublicFiles?folder=Interim_Standards . This document gives all details of the standard.

The standards are based on the following ten principles:

1. Compliance with Laws and FSC Principles

Forest management shall respect all applicable laws of the country in which they occur, and international treaties and agreements to which the country is a signatory, and comply with all FSC Principles and Criteria.

2. Tenure and Use Rights & Responsibilities

Long-term tenure and use rights to the land and forest resources shall be clearly defined, documented and legally established.

3. Indigenous Peoples' Rights

The legal and customary rights of indigenous people to own, use and manage their lands, territories, and resources shall be recognised and respected.

4. Community Relations and Workers' Rights

Forest management operations shall maintain or enhance the long-term social and economic well being of forest workers and local communities.

5. Benefits from the Forest

Forest management operations shall encourage the efficient use of the forest's multiple products and services to ensure economic viability and a wide range of environmental and social benefits.

6. Environmental Impact

Forest management shall conserve biological diversity and its associated values, water resources, soils, and unique and fragile ecosystems and landscapes, and, by so doing, maintain the ecological functions and the integrity of the forest.

7. Management Plan

A management plan appropriate to the scale and intensity of the operations shall be written, implemented, and kept up to date. The long-term objectives of management, and the means of achieving them, shall be clearly stated.

8. Monitoring and Assessment

Monitoring shall be conducted appropriate to the scale and intensity of forest management to assess the condition of the forest, yields of forest products, chain of custody, management activities and their social and environmental impacts.

9. Maintenance of High Conservation Value Forests

Management activities in high conservation value forests shall maintain or enhance the attributes, which define such forests. Decisions regarding high conservation value forests shall always be considered in the context of a precautionary approach.

10. Plantations

Plantations shall be planned and managed in accordance with Principles and Criteria 1 - 9, and Principle 10 and its Criteria. While plantations can provide an array of social and economic benefits, and can contribute to satisfying the world's needs for forest products, they should complement the management of, reduce pressures on, and promote the restoration and conservation of natural forests.

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FERAL Eco-agriculture Website

<http://www.feralindia.org/ecoag>

FERAL hosts a site on eco-agriculture focusing on rubber. The website also gives more information on eco-certification. This booklet is available for free download from the website.

Other Useful Websites

United States Department of Agriculture: Alternative farming systems information centre: <http://www.nal.usda.gov/afsic/pubs/agnic/susag.shtml>

The Rainforest Alliance: <http://www.rainforest-alliance.org/>

Forest Stewardship Council (FSC): <https://ic.fsc.org/>

Sustainable Agriculture Network: <http://sanstandards.org/sitio/>

Rubber Board of India: <http://www.rubberboard.org.in>

International Rubber Study Group: <http://www.rubberstudy.com/>

Sustainable Natural Rubber Initiative: <http://snr-i.org/>

Eco-agriculture India: <http://ecoagriculture.in>

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About Us

FERAL is a non-profit trust formed in 1997. We are a team working on various aspects of applied research on ecological and environmental issues. Our key areas of work include wildlife conservation, ecological restoration, natural resource management and capacity building in these areas. Our mandate or mission is to provide a base and support for young researchers to follow their ecological research interests; to impart training in ecological research, field survey techniques and tools; to apply ecological research to solve issues in natural resource management, conservation and advocacy. <http://www.feralindia.org>

The Rainforest Alliance is a not-for-profit organisation with a mission to conserve biodiversity and ensure sustainable livelihoods by transforming land-use practices, business practices and consumer behavior. <http://www.rainforest-alliance.org>

Critical Ecosystems Partnership Fund (CEPF) is a joint program of l'Agence Française de Développement, Conservation International, the Global Environment Facility, the Government of Japan, the MacArthur Foundation and the World Bank. A fundamental goal is to ensure civil society is engaged in biodiversity conservation. <http://www.cepf.net/Pages/default.aspx>

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Notes
