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**SHADE VS. NON-SHADE PRACTICE
IN COFFEE CULTIVATIONS IN INDIA**

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ENVIRONMENTAL ASPECTS OF COFFEE CULTIVATION

COFFEE AREA - STATEWISE
(IN HECTARES)

SL. NO.	STATE	ARABICA	%	ROBUSTA	%	TOTAL	% TO INDIA
1.	KARNATAKA	51,867	59	63,458	41	155,325	53.11
2.	KERALA	4,166	5	78,182	95	82,348	28.16
3.	TAMILNADU	27,270	83	5,508	17	32,778	11.20
4.	OTHERS	20,188	92	1,828	8	22,016	7.53
	ALL INDIA	143,491	49	148,976	51	292,467	100.00

The average production is around 200,000 MT per annum and 60% of the same is exported contributing substantial amount to the national exchequer. State wise coffee production in India during 1995-96 is as follows.

COFFEE PRODUCTION - STATE WISE
(In Tonnes)

SL.NO.	STATE	ARABICA	%	ROBUSTA	%	TOTAL	% to INDIA
I	KARNATAKA	86,600	55	72,300	45	158,900	71.3
II	KERALA	1,900	4	43,100	96	45,000	20.2
III	TAMILNADU	13,200	75	4,300	25	17,500	7.8
IV	OTHERS	1,550	97	50	3	1,600	0.7
	ALL INDIA	103,250	46	119,750	54	223,000	100.0

Use of shade trees in Indian system of coffee growing

Coffee is cultivated under shade as well as without shade depending upon environmental conditions of various countries. Arabica coffee is basically shade loving plant the optimum temperature requirement ranges from 15-24°C. At temperature beyond 25°C the photosynthesis is reduced. Leaf rust incidence becomes more severe under increasing temperature and is often a limiting factor for coffee production especially in the lower altitude. The effect of un-favourable climatic factors can be moderated by the provision of shade trees. Under South Indian conditions the arabica coffee has to be cultivated under shade for sustained production.

Robusta coffee in its natural habitat, grows under other trees. The shade of more dense forest restricts its flowering and fruiting. Basically, it is medium sun loving plant. Light of high intensity slows down the process of photosynthetic

Table-1: SHADE TREES COMMONLY GROWN IN SOUTH INDIAN COFFEE ESTATES

BOTANICAL NAME	SL. NO.
Albizia lebbek	1.
Albizia moluccana	2.
Albizia odoratissima	3.
Albizia stipulata	4.
Albizia sumatrana	5.
Artocarpus integrifolia	6.
Bischofia javanica	7.
Cedrelia toona	8.
Chloroxylon swietenia	9.
Dalbergia latifolia	10.
Erythrina lithosperma	11.
Ficus glomerata	12.
Ficus infectoria	13.
Ficus nervosa	14.
Ficus retusa	15.
Ficus retusa var. mitida	16.
Ficus tsiela	17.
Ficus tsiela	18.
Grevillea robusta	19.
Mesua edulis	20.
Pterocarpus marsupium	21.
Spondias mangifera	22.
Stenocarpum tetragonum	23.
Syzestium jambolana	24.

In India permanent shade trees are generally planted 12-14 m apart. The trees have to be regulated in such a way that in course of time they have their canopy at a height of about 10-14 m above coffee. The most popular permanent shade trees belong to the Indian fig and legume families are *Ficus glomerata*, *Ficus retusa*, *Ficus nervosa*, *Ficus tsiela*, *Ficus tsiela* are among the figs and *Albizia stipulata*, *A. lebbek*, *A. moluccana* and *A. sumatrana* among the legumes. Shade trees commonly grown in South Indian Coffee Estates are given in the following table-1. *Grevillea robusta* and *Erythrina lithosperma* are the most commonly used temporary shade trees which are planted to establish young coffee. These trees are regulated during south west monsoon and post monsoon periods.

As coffee is grown on slopes of hill ranges with wider variations in rain-fall pattern, soil erosion is a serious problem in these areas especially in new clearings and exposed conditions. Several soil conservation methods have been recommended like contour planting, cultivation of cover crops, benchterraces, cradle pits etc.

activity by closing their stomata. However, in India *Robusta* is cultivated with minimum shade under irrigation system for high productivity.

High temperature, radiation prolonged dry weather and inadequate blossom shower will contribute for production of "star flowers" which adversely affect the yield of coffee. However, this problem has also been attributed to genetic factors.

Coffee is primarily grown as a silvi-horticultural crop under shade tree cover for optimal performance in India. It is trained to single stem system and grown under mixed canopy of shade trees (both leguminous and non-leguminous/deciduous/non-deciduous trees). The main criteria for a shade tree is, it should be deep rooting not exerting competition with coffee for moisture and nutrients.

The advantages of growing coffee under shade trees are:

- a) It provides micro-climate for coffee through regulation of light intensity and temperature in hotter conditions.
- b) Maximum total dry matter production in coffee has been observed under shade (30%) with optimum light requirement of 1356 micro einstine. The rate of photosynthesis will be retarded in full day light.
- c) Shade helps in controlling over-bearing and die-back in arabica coffee under south Indian conditions.
- d) It offers protection from wind and hail damage and low night temperature and cold effect.
- e) Litter fall from trees provide mulch which improves organic matter status of soil and improve water and nutrient holding capacity.
- f) Prevention of impact of rainfall and soil erosion achieved. Water infiltration rate is increased in soil.
- g) Shade tree loppings and litter fall contribute around 10 tonnes of dry matter which will contribute about 100 kg. Nitrogen, 35 kg. Phosphorus and 45 kg. potassium per ha. per annum. Thus shade trees effectively recycle the nutrients from sub soil and adds on to the fertility of the soil. They create environmentally friendly condition for developments of macro/micro flora and fauna, preserve the land fertility for future use and sustain the productivity for longer time.
- h) Shade trees will be of economic importance in small and big grower sector with reference to wood value and as fuel.
- i) Under mixed cropping system shade trees provide strands for pepper vines which provide additional revenue.
- j) Systematically planted and grown shade trees in coffee plantations with chosen species is a better forestry than the natural forestry.

(k) The cultural practices adopted in coffee cultivation has not affected adversely the ecological conditions of Western and Eastern Ghats. But it has contributed positively towards conservation of environmental systems.

The disadvantages of shade trees are:

a) Under dry conditions the shade trees may compete with coffee for soil moisture.

b) Some of the shade trees are alternate hosts to some of the coffee pest and diseases.

c) High maintenance cost of shade trees as they require periodical pruning and thinning. Falling of branches cause damage to coffee.

d) Cropping potential of coffee under shade is limited and yield responses to fertiliser is also limited.

Thus from the above it could be observed that the advantages of use of shade trees in coffee will out weigh the disadvantages.