

PLANTS USED IN THE INDIGENOUS SYSTEM OF MEDICINE IN SRI LANKA- (DAWATAGOLLA FOREST PLANTATION)

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INTRODUCTION

The indigenous system is very popular in the Asian countries such as China, Nepal, India, Sri Lanka etc and it has a long history. In Sri Lanka, it is believed that an advanced system of healing existed during the legendary Ravana period which has laid down historical records since Aryan periods. But, the real practices were firmly rooted with the introduction of Buddhism-third century B.C. King Buddhadasa (398-426 A.D.) was an outstanding physician and a surgeon at that time. During the Polonnaruwa period, the traditional system of medicine reached new era under King Parakramabahu-I (1153 -1186 A.D.). During the Dambadeniya period, the indigenous system of medicines prospered specially in the hands of Buddhist monks, since Buddhism recognises the treatment of the sick and the wounded as a virtue. With the introduction of western medicine, the traditional system of medicine was drastically declined to its lowest ebb. However, treatment of skeletal fractures, eye diseases, boils and carbuncles, snake bites and mental diseases remained under the preservation of a few dedicated medical men (Vedamahaththayas) who passed down these practices from generation to generation. General public still have a bearing, dependence and reliance on Ayurveda traditional medicine system. The Sinhala society consults a physician and offers to him a sheaf of betel leaves, sometimes with a small present. Since his profession is one of prestigious and honourable, they have been greatly respected by the society. Therefore, the profession is passed down the family line as a legacy. After independence in 1948, when ethnic cultures staged a come-back, there was naturally renaissance in Ayurvedic medicinal practice. Once more the state elevated it to the level of Alternative Medicine, re-established hospitals and clinics in every province of the island. Further, the training institutes were established and upgrade the village physician as an approved professional.

METHODOLOGY

Considering contemporary needs of the indigenous medicine, it was decided to select Dawatagolla Forest Plantation (DFP) as the study area. It is situated at Alawwa in the Kurunegala District with the extent of 30 hectares (ha) containing mainly with Jack (*Artocarpus intergrifolia*) and Mahogany (*Swietenia macrophylla*), divided into Jak

Working Circle (JWC) and Timber Working circle (TWC). Further, the DFP is consisted of many flora species including medicinal plants which are spreaded over the forest. This study is designed with the prime objectives of identifying the existing medicinal plants, their uses and to prepare a plan to safeguard the medicinal plants in a sustainable manner. In this connection, the data were collected specially through a field study, household questionnaire survey, informal interviews and discussions with individuals (*Vethamahathyas* who make the Sinhala medicinal treatment-*Vethakam*) and 03 forest range officers of the area. The stratified random sampling technique was used to collect the field information pertaining to the medicinal plants. The prior to start the field study, the six sample plots were selected randomly and each plot has an area of 625m². Thereafter, the identification of medicinal plants had been carried out based on the on-forest and off-forest study.

The many medicinal plants were identified and listed during the time of on-forest study with the help of forest range officers. Some medicinal plants and indigenous species could not be identified in the field. Therefore, specimens of such species were taken for off-forest study and its Sinhala name and uses were identified with the help of *Vethamahathyas*. Further, the scientific names and plants details were driven referring the related secondary sources.

Secondary data also were used for the study. Analyzing the data about medicinal plants and identified the plants' Latin name, compositions and its uses. Thereafter, it was organized according to the alphabetical order.

POTENTIAL OF MEDICINAL PLANTS IN THE DFP

The DFP is situated at Alawwa Divisional Secrateriate (D.S.) division in the Kurunegala District. It is situated closed to the Alawwa-Giriulla road, approximately 2 km from Alawwa town. It belongs to three Grama Niladari divisions, namely Alawwa south, Meerigeliya and Paramaulla. It was located in between 7^o, 19`-70, 24` N latitude 80^o, 20`- 80^o, 25` E longitude. The plantation is spreaded from north to south hilly topography and elevation ranges from 300 m to 550 m above sea level (Survey Department, 1988). It lies within the intermediate low land tropical moist semi evergreen forest where the annual rainfall is about 1500-2500 mm yr⁻¹ and monthly average temperature is 25^oC to 28^oC. The soil types are red yellow podzolic (well-drained, moderately fine textured) and its properties are reddish to yellowish brown in colour (Survey Department, 1988).

DFP was a natural forest earlier and it was replaced by Mahogany and Jack forest plantation in 1930 with the purpose of obtaining timber yield. Since then, it is managed by the Forest Department. Thereafter, human/forest relationship was increased and surrounding inhabitants used DFP to fulfill their day to day needs. Due to such human activities, more medicinal and rare species were destroyed. However, the existing few numbers of species should be conserved with the participation of surrounding communities and relevant stakeholders.

The DFP consists of many medicinal plants such as Ankenda (*Acronychia pedunculata*), Amu kaha (*Curcuma domestica*), Beli (*Aegle marmelos*), Davul Kurundu (*Neolitsea involucrata*), Elabatu (*Solanum surattense*), Gedumba (*Trema orientalis*), Goraka

(*Garcinia cambogia*),Kurundu (*Cinnamomum verum*), Madatiya (*Adenanthera pavonina*) Nelli (*Phyllanthus emblica*), Siyambala (*Tamarindus indica*), Yakinaran (*Atalantia ceylanica*) etc. These plants are largely used by surrounding inhabitants for traditional medicinal needs. Accordingly, DFP provides plants used for the treatment

of various diseases such as skeletal fractures, dislocation of bones, sprains in the muscles, muscular pains and contusions in the limbs of the body. Further, these plants are used for various therapeutical practices, to prepare plasters (Pattuwa) and herbs in semi-roasted form (Melluma), fomentation of warm medicinal packs and message with medicated oil (Thaila) etc. Thus, various medicaments are prepared by the *Vethamahathyas* himself and these indigenous knowledge of medicinal plants has been passed through generations. The below list (Table:1) of medicinal plants which were collected from the DFP, used for treatment of various diseases has been compiled, utilizing available local literature, after having discussions with several indigenous physicians / *Vethamahathyas* and forest rang officers.

TABLE: 01 IDENTIFICATION OF MEDICINAL PLANTS IN THE DFP

<i>Sinhala / Local name</i>	<i>Botanical / Latin name</i>	<i>Compositions</i>	<i>Uses</i>
<i>Ankenda</i>	<i>Acronychia pedunculata</i>	<i>The leaves of this tree contained an aromatic oil.</i>	<i>The bark is used for externally on swellings, fractures, sores and ulcers and taken internally as a purgative.</i>
<i>Beli</i>	<i>Aegle marmelos</i>	<i>The leaves of this tree contain the alkaloids, aegelenine, aegelin, skimmianine. The wood contains dictamine and the bark-fagarine. The fruit pulp is marmelosin. The fresh leaves on distillation yield a faint yellowish green volatile oil with a peculiar aromatic odour and slightly bitter taste.</i>	<i>The dried pulp of the unripe fruit given along with other ingredients for dysentery, piles, dyspepsia, jaundice, scrofula, indigestion and chronic fever. The root/ bark is used in the form of a decoction for intermittent fever, hypochondria, melancholia and palpitation of the heart. It checks diarrhoea and gastric troubles in children. The fresh juice of the leaves is given for jaundice and anasarca. The ripe fruit is a laxative and prevents the growth of piles.</i>
<i>Bakmi</i>	<i>Nauclea orientalis</i>	<i>The leaves and barks of this tree contain alkaloids</i>	<i>The leaves are applied on boils and tumours. The bark is anti- pyretic, vulnerary and anti-diarrheic. It is a cure for toothache.</i>
<i>Bangwel-geta</i>	<i>Coscinium fenestratum</i>	<i>The stem and root of this climber contain the alkaloids, berberin, jatrorrhizine and palmatine.</i>	<i>The wood is a bitter tonic and a decoction of it is used as a remedy for, or to prevent, tetanus. the root has antiseptic properties</i>
<i>Bukinda /Walkinda</i>	<i>Tinospora malabarica</i>	<i>The leaves and stem contain tonic properties.</i>	<i>The leaves and stems are used in the treatment of chronic rheumatism and whole plant is used as fumigant for piles and ulcerated wounds. Medicated baths prepared with it are given to patients suffering from liver complaints.</i>
<i>Bu- kobbe</i>	<i>Allophylus cobbe</i>	<i>The seed of this plant contains an unidentified</i>	<i>This plant is an emenagogue. The astringent root is employed to check</i>

		<i>alkaloid</i>	<i>diarrhoea. All parts of the plant are used for preparation of medicinal oils for use on fractures.</i>
<i>Dodan –kaha</i>	<i>Memecylon capitellatum</i>	<i>The leaves and bark contain aromatic oil.</i>	<i>The leaves and barks of this plant are used for the preparation of medicinal oils applied on ulcers and as a fomentation on swellings.</i>
<i>Diyamitta</i>	<i>Cissampelos pareira</i>	<i>The roots of the plant contain the alkaloids bebeerines, cissampeline, hyatine, hyatinine, isochondodrine and sepeerine; quercitol, an acidic volatile oil, sterol, a yellow bitter principle and resin.</i>	<i>The leaves are used as an antiscabious remedy and in the treatment of abscesses, ulcers and wounds. a decoction of the roots is a febrifuge, diuretic, lithotriptic and a pectoral remedy. It is a good emetic and purgative. It is also used in the treatment of chronic cystitis, nephritic colic, nephritis, vesicular calculus, fever, diarrhoea and urinary and venereal diseases. it is an antiseptic for the bladder and used for chronic inflammation of the urinary passage. the root is also sued as a fish poison.</i>
<i>Embul dodan</i>	<i>Citrus aurantium</i>	<i>The oil distilled from the flowers of this tree contains limonene, geraniol and methyl anthranilate. The rind of the fruit yields a volutile oil, a gum –resin fixed oil and limonene and three glucosides hesperidin, isohesperidin, urantiamarin pentamethoxy flovone, auranetin and tannin. The juice of the fruit contains mucilage, sugar, citric acid and inorganic salts, while the leaf has ascorbic acid and stachydrine.</i>	<i>The mature fruit is used with pepper and rock salt as a throat swab on inflamed glands and tonsils to draw out phlegm. The juice mixed with suger of borassus flabellifer and sugarcane juice is given is given for chronic cough.</i>
<i>Gas nidikumba</i>	<i>Biophytun reinward</i>	<i>The leaves are contain alkaloids</i>	<i>The leaves of this herb are diuretic and expectorant. The ground leaves are applied to wounds and bruises. A decoction of the herb is given for hypertension. A decoction of the leaves is given for asthma, phthisis and snake bite Poisoning, while a decoction of the root is drunk for gonorrhoea and stone in the bladder. The powdered seed mixed with cow ghee is applied on abscesses to promote suppuration.</i>
<i>Hintambala</i>	<i>Carmona microphylla</i>	<i>The bark of this plant contains a glucoside</i>	<i>The root of this plant is used for cachexia and syphilis and as an antidote for vegetable poisons. a decoction of the leaves is used to cure</i>

			<i>diarrhoea accompanied with discharge of blood and also for cough.</i>
<i>Goraka</i>	<i>Garcinia cambogia</i>	<i>The fruit contains the alkaloids</i>	<i>The dried rind of the fruit of this tree is astringent, antiseptic and is useful in decoction for washing ulcers and as a gargle in weak and spongy gums. Internally, it acts as a stomachic and is used in anorexia and chronic dyspepsia. The dried rind is of the employed for flavouring curries.</i>
<i>Karapincha</i>	<i>Murraya koenigii</i>	<i>The fruit of this plant yields oil and the leaves contain a glucoside called Koenigin.</i>	<i>The leaves bark and roots are tonic stomachache. The leaves with other ingredients are roasted, made into a powder and given for constipation, abdominal colic and diarrhea. The boiled leaves are given for hiccough and hoarseness. The juice of the fresh leaves is also given for diarrhoea and dysentery. The bruised leaves are applied externally on eruptions. The leaf of this plant is the familiar "Curry – leaf" used for flavouring soaps, vegetables and meat dishes.</i>
<i>Keppetiya</i>	<i>Croton laccifer</i>	<i>A continuous waxy incrustation formed by the secretions of certain spices of scale insects (Tachardia lacca) living on the tender branches of the shrub.</i>	<i>Sucking juice from them forms the lack of commerce much used for lacquer work in Sri Lanka. It is used medicinally in the preparation of medicinal oils and pills used in the treatment of fever, colds, dysentery and lung diseases. The root is used for preparation of pills given for chronic fevers. The juice of the bark and leaves is used as a styptic and on skin disease. The leaves are used for paddy fields and betel vines as they are supposed to control certain soil borne pests and disease.</i>
<i>Kohomba</i>	<i>Azadirachta indica</i>	<i>The leaf of this tree contains the alkaloid paraisine, the bark margosine and the fruit azaridine. The oil extracted from the seed contains margosic acid and a bitter principle.</i>	<i>A strong decoction of the fresh leaves has antiseptic properties and is used for washing hounds ulcers and as a bath for patients recovering from chickenpox and childbirth. It is a useful insecticide as well. The gummy exudation from the trunk is useful in chronic cases of leprosy and other skin diseases. Useful oil is extracted from the seed. It is a local remedy for chronic skin diseases and ulcers preventing the formation of maggots and dislodging them if they are already present. It is used externally for rheumatism and taken internally by pregnant women and patients suffering from syphilis, leprosy and</i>

			<i>chronic malarial fevers. A decoction of the root bark along with other ingredients is given for typhoid fever. Juice of the fresh leaves is given with rock salt for intestinal worms and with honey for jaundice and skin disease. The oil is given with garlic and ginger after childbirth.</i>
<i>Kotikan-bevila</i>	<i>Sida alba</i>	<i>The entire plant contains alkaloids</i>	<i>The leaves are beneficial in case of gonorrhoea, gleet and scalding urine, while a decoction of the root is used as a demulcent for irritability of the bladder and for gonorrhoea. the root also acts as a diaphoretic.</i>
<i>Kudumiris (Forest paper)</i>	<i>Toddlia asiatica</i>	<i>The leaves of this plant yield a volatile oil with citronellal and linalool while the roots / bark contains the alkaloids toddaline, toddalinine ; lactone resin, fixed oil and a glucoside, diosmin. The stem / bark yeild three coumarins aculeatin and aculeatin hidiate.</i>	<i>The root bark is reputed as an anti malarial remedy; through clinical tests with alcoholic extracts have not shown positive results. An infusion of it is a stimulating tonic, particularly after malaria. A poultice of the leaf is applied to caries teeth for relief from toothache. The root is also used for malaria, intermittent fever, diarrhoea, cholera, rheumatism and syphilis.</i>
<i>Kurundu</i>	<i>Cinnamomum zeylanicum</i>	<i>The chief constituent of cinnamon is the essential oil which consists of cinnamic aldehyde with variable proportions of hydrocarbons. The bark contains besides the oil, sugar, mannite, , starch, mucilage and tannic acid. The oil is useful in the perfume and flavouring industries. The oil from the roots contains camphor, eucalyptol and safrol. The seeds contain fat.</i>	<i>The bark of this tree is used for dyspepsia, flatulence, diarrhoea, dysentery, vomiting, bronchitis, gangrene of the lungs and phthisis. The oil is a rubefacient and is a useful application for acute and chronic rheumatism. Cinnamon is also given for cramps of the stomach, toothache and used in massive doses in the treatment of cancer.</i>
<i>Kos</i>	<i>Artocarpus heterophyllus</i>	<i>The fruit of the tree contains a high carbohydrate content but is deficient in calcium and iron. The seeds are rich in starch. The wood contains morin and a crystalline compound, cyanomaclurin which has been found tonic contain the phloroglucinol group probably isomeric with catechins and piperonal, an essential oil. The pulp of the fruit is rich in vitamin C.</i>	<i>The fruit is eaten in various forms. The rich yellow flesh (aril) surrounding the seeds is sweet and aromatic when ripe and eaten raw. Before the arils ripen, they are boiled with the seeds and eaten with scraped coconut as a meal. The seeds are roasted and made into sweet meats. The latex makes an excellent cement for cracked pots especially those use for carrying water. The young fruits are curried or prepared into pickles. The leaves are used in skin an</i>

			<i>antiasthmatic. The milky juice mixed with vinegar is applied on swellings and abscesses. The starch from the seeds is given in bilious colic and the roasted seeds have an aphrodisiacal action. The heartwood is an excellent timber and a dye extracted from it is used for dyeing robes of Buddhist priests. An infusion of the mature leaves and bark is given for stones in the bladder and for diabetes.</i>
<i>Mahakaramba</i>	<i>Carissa carandas</i>	<i>The bark contains an alkaloid. The roots contain traces of a volatile oil, salicylic acid and an alkaloid.</i>	<i>The leaves are used for diarrhoea, earache, soreness of the mouth and throat and syphilitic pains. a decoction of the leaves is often used at the commencement of remittent fevers. the root has a reputation of being a bitter stomachic and used as a remedy for itch along with other ingredients. the ripe fruit possesses antiscorbutic properties.</i>
<i>Muna mal</i>	<i>Mimusops elengi</i>	<i>The bark and flowers of this tree contain an alkaloid, while the barks has in addition a tannin and a saponin. the seeds contain a toxic principle and a saponin, mimusops -saponin. The leaves do not contain saponin.</i>	<i>A decoction of the bark of this tree is used as a gargle for disease of the gums and teeth and taken internally for discharges of the mucous membranes of the bladder and urethra. It is useful for treating fever and is supposed to increase fertility in women. A long with the flowers. It is given in diarrhoea. The young fruit in decoction is used as gargle for treating sprue and is chewed for strengthening gums. The pulp of the ripe fruit cures chronic treating sprue and is chewed for strengthening gums. The pulp of the ripe fruit cures chronic dysentery.</i>
<i>Nelli</i>	<i>Phyllanthus emblica</i>	<i>The fruit/bark/leaves/seed used very often and the fruit contains juice which is rich in vitamin C.</i>	<i>The pericarp of the fruit is often used in decoctions along with other ingredients and externally on boils with cow ghee to promote suppuration. The root, bark and fruit are astringent. The unripe fruit is cooling, laxative and diuretic. Exudation from incisions on the fruit is applied externally on inflammation of the eye. The juice of the bark with honey and turmeric is given for gonorrhoea. An infusion of the leaves with fenugreek seed is given for chronic diarrhoea. The fruit is rich in vitamin C. A decoction of the fruit with stems of <i>Tinospora cordifolia</i> is a well known remedy for various urinary diseases. The expressed juice of the fruit along with other ingredients is used to cure</i>

			<i>haemorrhage , anaemia, colic, acute leprosy, fits, insanity, jaundice, cough, hiccough, indigestion, dyspepsia, asthma and other diseases.</i>
<i>Puwak</i>	<i>Areca catechu</i>	<i>The seed of this palm contains the alkaloids arecaidine, arecaine arecolidine, arecoline, guvacine and isoguvacine. The leaves and stems also contain an alkaloid, while the entire plant has norarecaidine. Beside these, the nut contains tannin, gum and gallic acid.</i>	<i>The dried nut is stimulant, astringent and antispasmodic. It is a powerful sialagogue and stimulates the secretion of sweat. It is used as a masticatory , dentifrice and vermifuge. The powdered nut is effective in expelling tape worms from human beings and also combating roundworms. Further, the grated nut is applied externally on ulcers while the dried unripe nuts along with other ingredients are taken to destroy abdominal worms. The fruit with opium for diarrhoea and the root for diseases of the liver.</i>
<i>Rath mal</i>	<i>Ixora coccinea</i>	<i>The root of this shrub contains aromatic oil, acrid oil, tannin, fatty acids and a white crystalline substance. The flowers contain colouring matter, an astringent principle, wax and a yellow colouring matter related to quercitrin.</i>	<i>A decoction of the roots is given for dysentery and as a sedative for hiccoughs, nausea, loss of appetite, fever and gonorrhoea. The flowers and bark are used on reddened eyes and eruption in children. A decoction of the flowers is given for haemoptysis, catarrhal bronchitis and dysmenorrhoea.</i>
<i>Eepatta / Ruk - anguna</i>	<i>Alangium salviifolium</i>	<i>Contains the alkaloid akharkantine, the seed alamarckine, root / bark alanginine, alangiums A and B and ankoline, and the bark lamarckine and bases.</i>	<i>The leaves are used as a poultice to relieve rheumatic pains while the root bark is used in piles and as an anthelmintic and purgative. the stem bark is bitter and is used for the treatment of skin diseases and pyrexia. it is a suitable substitute for Ipecacuanha. Both bark and root are used as an antidote for cobra bite poisoning.</i>
<i>Sapu</i>	<i>Michelia champaca</i>	<i>The leaves, stems, fruits and seeds of this tree contain an unnamed alkaloid. Bark contains a volatile oil, fixed oil resin, tannin, mucilage, starch and sugar. The volatile brown oil from the bark contains cineol, isoeugenol, benzoic acid, benzyl alcohol, benzaldehyde and p-cresolmethyl ether. The flowers, seeds and bark contain a bitter aromatic principle.</i>	<i>The leaves are applied to indolent swellings and the leaf juice is taken to relieve colic. The bark is used in the treatment of low intermittent fevers. The root bark is an emmenagogue and purgative. The flowers are a stimulant, carminative, demulcent and diuretic. An infusion of the flower is recommended for dyspepsia and fevers. The macerated flowers are excellent for cephalalgia, ophthalmic, rheumatism, vertigo and gout. The oil from the seeds relieves flatulence when rubbed on the abdomen. The flower yields Champaka oil which is</i>

			<i>used as a perfume.</i>
<i>Siyambala</i>	<i>Tamarindus indica</i>	<i>The pulp of the fruit contains citric, tartaric, oxalic, malic and succinic acids, bitartrate of potash, suger and pectin while the seeds contain albuminoids, fats, tannin carbohydrates, and much mucilaginous material tannin.</i>	<i>The leaves ground into a paste with lime juice and heatwood of Acacia chundra wild are applied on boils to prevent suppuration and inflammatory swellings. A decoction of the leaves is used as a formentation on boils and abscesses. The testa of the seed mascerated with vinegar or lime juice is applied on the face to prevent formation of pimples. Internally, the leaves and pulp act as cholagogue laxatives and are often used in congestion and hemorrhoids. The ripe fruit is regarded as a refrigerant digestive, carminative and laxative. The powdered seed is given internally as a remedy for jaundice. It is externally applied on eye disease and ulcers. The pulp of ripe fruit is largely used as an ingredient in curries and chutneys. The heartwood is very durable and used in furniture- making as it takes on a good polish.</i>
<i>Walangasal / Wal-embilla</i>	<i>Embelia ribes</i>	<i>The plant contains embelin</i>	<i>The fruit is a carminative, stomachic and beneficial against intestinal worms, dyspepsia and skin diseases. It is especially effective against tapeworms. The dried berries are used along with other ingredients for treatment of tumours, calculi, fistula, piles, cough, enlarged spleen, abdominal dropsy and preventing effects of old age. A decoction of the roasted fruit is a household remedy for worms and gripe in children, while the powdered fruit with bees' honey is given to prevent worm trouble.</i>
<i>Wal -Karapincha</i>	<i>Micromelum ceylanicum</i>	<i>The name and stems of this tree contain an unnamed alkaloid</i>	<i>This plant is used as a substitute for <i>Murraya koenigii</i> Spreng., medicinally. it is recommended for phthisis and chest troubles. The root is chewed with betel leaves for coughs. The boiled roots are applied as a poultice for ague.</i>
<i>Welangiriya</i>	<i>Paramignya monophylla</i>	<i>The root of this plant contains calcium oxalate.</i>	<i>The root is used as an alternative tonic. the bruised leaves are applied externally on snake –bite wounds. this plant is fed to cattle suffering from haematuria or flux of blood from the abdomen.</i>

CONCLUSION AND RECOMMENDATION

The demands of the majority of the residents around the DFP (257 families) as well as in Sri Lanka for medicinal plants have been met by indiscriminate harvesting of spontaneous flora including those in forests. As a result, many plants species have become extinct and some have been identified as endangered. It is therefore, necessary that systematic cultivation of medicinal plants be introduced in order to conserve the threatened species. Thus, cultivation and processing should be started simultaneously. The mature plants of DFP should be removed using the sustainable harvesting techniques to protect existing medicinal plants forever. In this regard, following recommendations are suggested.

- It is compulsory to carryout detailed study on existing flora diversity and its necessity towards the multiple-use of forest management under an extensive program.
- Forest gaps / patches of DFP should be regenerated with multipurpose medicinal species like beli (*Aegle marmelos*), goraka (*Garcinia cambogia*), karapincha (*Murraya koenigii*), kohomba (*Azadirachta indica*), kurundu (*Cinnamomum verum*), munamal (*Mimusops elengi*), nelli (*Phyllanthus emblica*), welangiriya (*Capparis horrida*) etc. and it should be managed with an integrated management plan.
- Economically valuable and environmentally sound physical conditions of DFP must be utilized to increase the species richness.
- Regeneration of species should be carried out in the available forest gaps / patches of the DFP.

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