FLORA

The situation of Mysore within the tropics, combined with an elevation which gives it a temperate climate, and its almost complete environment by lofty mountain chains, are features which contribute to the formation of a rich and varied flora.

The *forests*[1] of the country, which yield a considerable item towards its revenue, have been estimated to cover a total area of 2,975 square miles, exclusive of scrub jungle which grows on much of the waste land. They may be roughly divided into *evergreen* and *deciduous* forests; which again are distributed in three distinct forest belts, of very unequal width, and running north and south. These are the *evergreen belt*, the *dry belt*, and an intermediate one, combining some of the features of both, which may be called the *mixed belt.*

The *evergreen belt* of forests is confined to the west, and comprises the country in the Western Ghats and below them, extending from the north of Sagar taluq to the south of Manjarabad. Its greatest width, which is at its northern extremity, nowhere exceeds from 12 to 14 miles, and at some points is not more than six. The tree vegetation is magnificent. Many of the hills are covered to their summits with heavy forest, while the valleys and ravines produce trees which can scarcely be rivalled in India,—so luxuriant is their growth, so vast their height, so great their size. In some parts the undergrowth is dense, elsewhere the forest is open, and on all sides trees with clear stems to the first branch of from 80 to 100 feet meet the eye.

The following are some of the more valuable trees growing in this belt[2]:—

Artocarpus hirsuta ... Wild jack ... ... Heb-halasu, hesava[3]

Good shade for coffee. Yields the anjeli wood of commerce. Wood hard and durable when well seasoned, yellowish-brown, close-grained. Much used on the western coast for house and ship-building, furniture, and other purposes. Weight about 35 lbs. per cubic foot.

[1] Originally based chiefly upon the Forest Report for 1869–70, by Captain van Someren, Conservator of Forests.

[2] The third edition of "Forest Trees of Mysore and Coorg," by the same, edited by Mr. J. Cameron, may be referred to for fuller information; or Watts' "Dictionary of the Economic Products of India."

[3] In common use the Kannada name is put into the genitive case, followed by the word *mara*, tree. Hence *heb-halasina mara, hesavana mara: dúpada mara* would be more intelligible to a native than the bare name.

Calophyllum tomentosum Poon spar ... ... Kuve, bobbi

Yields poon spars, which fetch a good price, and are used for masts. Wood reddish and coarse-grained. Weight 48 lbs. per cubic foot.

Diospyros ebenum... ... Ebony ... ... Kare, mallali

Heartwood black, very hard, durable, and takes a fine polish. Weight about 80 lbs. per cubic foot. In great demand for cabinet work, turnery, inlaying, and musical instruments.

Erythroxylon monogynum Red cedar ... ... Devadaru, adavi goranti

Heartwood dark brown and fragrant; sometimes used as a substitute for sandal. From it is distilled a tar or oil used in Ceylon to preserve timber. Leaves and bark medicinal.

Garcinia morella ... ... Gamboge-tree ... ... Kankutake

The yellow pigment which exudes from an incision in the trunk is the true gamboge of commerce. Wood hard and mottled. Weight about 56 lbs. per cubic foot.

Lagerstrœmia flos-reginæ... ... ... Challa, maruva

Very handsome in blossom. Root, bark, leaves, and flowers used medicinally. Wood light red, strong, and very durable under water. Weight about 42 lbs. per cubic foot.

Soymida febrifuga ... Redwood ... ... Swámi mara

Bark used for tanning and as an inferior dye; is also a febrifuge. Heartwood very hard and close-grained, reddish-black, very durable, not attacked by white ants. Weight about 76 lbs. per cubic foot.

Vateria indica ... ... White dammar ... ... Dúpa

Magnificent tree. Yields the gum-resin known as white dammar or Piney resin, locally used as an incense and varnish. A fatty oil from the seeds is employed like tallow for making candles. Heartwood grey, tough, moderately hard, porous. Weight 41 lbs. per cubic foot. Not much in demand.

The *mixed belt* of forest extends the whole length of the Province, from the extreme north of Sorab taluq to Bandipur in the south of Gundlupet taluq. It is very unequal in width, varying at different points from 10 to 40 or 45 miles. It includes the greater number of the timber-producing State forests, large tracts of District forests, and much sandalwood. In it are the káns of Sorab and other portions of Nagar, the areca nut and cardamom gardens of western Mysore, the coffee plantations of Koppa and Manjarabad, and the rich rice-flats of Ságar, Nagar, Tirthahalli, Chikmagalur and Heggadadevankote. The division between this rich and productive belt and the far less useful strip to the west of it cannot be very easily defined. The presence of a number of fine *nandi* and blackwood trees, which grow abundantly and attain great size on the eastern confines of the evergreen belt, form a sufficiently clear line. The eastern limit may be taken to be a line which, commencing near Anavatti in the north, would run south-east to half-way between Shikarpur and Honnali; thence due south to Sakrebail, where

it turns due east till it reaches a point north of Lakvalli ; thence south, through Lakvalli and along the eastern crests of the Baba Budans to Vastara ; on through Pálya, and passing a few miles west of Arkalgúd and Peryapatna it turns south-east to Antarsante, and so by way of Kurnagal reaches Bandipur.

The tree vegetation varies considerably in the large extent of country comprised in this belt. All along the western confines, where it approaches the Ghats, trees proper to the evergreen forests occur frequently. The wild jack, the *dúpa*, the redwood and sometimes the poon are met with in varying quantities. But in the south portion of the belt, in the Mysore District, wild jack and poon are unknown. The following is a list of the more important trees found throughout this tract :—

Adina cordifolia ... ... Arasina tega

Wood yellow, moderately hard, even-grained. Seasons well, takes a good polish, and is durable, but liable to warp and crack. Weight 45 lbs. per cubic foot. Turns well, and specially used for small articles, such as combs, gunstocks, and ornamental boxes.

Albizzia lebbek ... ... Siris ... ... Bági

Heartwood dark brown ; takes a good polish, and fairly durable. Weight 50 lbs. per cubic foot. Its use for domestic purposes considered unlucky in many parts, but used for picture frames, oil-mills, etc. Leaves a good fodder for cattle. Flowers a cooling application for boils.

Albizzia odoratissima ... ... Bilvara

Heartwood rich brown, tough and strong ; seasons well, takes a good polish, and is durable when kept dry. Weight 50 lbs. per cubic foot. Used for wheels, oil-mills, and agricultural implements. Bark medicinal. One of the most valuable jungle trees for the use of the villagers.

Anogeissus latifolia ... ... Dindiga

Good fuel and charcoal tree. Sapwood yellow ; heartwood small, purplish-brown, tough, very hard. Weight about 65 lbs. per cubic foot. Splits in seasoning and must be kept dry to last. Gum used by calico printers for dyeing purposes ; green leaves employed for tanning.

Bombax malabaricum ... Silk-cotton ... ... Búruga

Wood soft, white, spongy, and, except under water, very perishable. Used to some extent for planking, packing cases, toys, floats, etc. A medicinal gum exudes from the trunk.

Chloroxylon swietenia ... Indian satin-wood ... Huragalu

Wood hard, yellow-mottled, and prettily veined, dark towards the centre ; has a fine satiny lustre, and is well adapted for delicate cabinet work, carpentry, and turnery. Weight 56 lbs. per cubic foot. Heartwood said to be black, heavy, and not easily burnt. The wood is also very durable under water. Used for beams, posts, boats, etc., and in Europe for backs of brushes, stethoscopes, and fancy articles.

Cordia myxa ... ... Solle

There are three local varieties—kádu solle, kempu solle, and solle kendal—differing

in size, form, and colour of the fruit. The last is the Sebasten of commerce (a name said to be derived from sag-pistán, Persian for dogs' nipples). It is very mucilaginous and demulcent; given for coughs and chest affections. Wood grey, soft, porous, seasons well, and is fairly strong; but soon attacked by insects. Used for agricultural implements, sugar-cane mills, boats, and fuel. Rope made from the bark, which is also medicinal.

Dalbergia latifolia ... ... Blackwood ... ... Biti

Valuable furniture wood, resembling rosewood. Heartwood dark purple and extremely hard, but somewhat brittle. Weight 55 lbs. per cubic foot. Used in Mysore city for articles inlaid with ivory, also elsewhere for cart-wheels, gun-carriages, etc. Shade tree for coffee.

Dalbergia paniculata ... ... Pachari

Wood greyish-white, soft, and perishable; very subject to attacks of insects. Weight about 42 lbs. per cubic foot when seasoned.

Dalbergia sissoo ... ... Sissoo ... ... Biridi

Wood very durable, seasons well, and highly esteemed for all purposes where strength and elasticity are required. Suitable for boats, carriages, etc.

Dillenia pentagyna ... ... Kóltega

Wood nicely marked, but heavy, coarse-grained, and difficult to season. Weight 50 lbs. per cubic foot.

Gmelina arborea ... ... Kúli

Wood cream to pale yellow, close-grained, strong, and does not warp or crack in seasoning. Weight about 30 lbs. per cubic foot. Much esteemed for furniture, carriages, and ornamental work of all kinds.

Grewia tiliæfolia ... ... Tadasalu

Wood light reddish-brown, compact, close-grained, durable, elastic, and easily worked. Valuable where strength and elasticity are required. Used in cart and carriage building, also for masts, oars, and shafts. Weight 35 lbs. per cubic foot. Fruit eaten.

Holoptelea integrifolia ... Entire-leaved elm ... Tapasi

Wood yellow or light brown, no heartwood, soft, open-grained, but strong. Weight 37 lbs. per cubic foot. Used for charcoal; also for country carts, and sometimes for carving.

Lagerstroemia lanceolata ... ... Nandi

Wood red, smooth, even-grained, elastic, tough, and of great transverse strength. Weight about 45 lbs. per cubic foot. Seasons well, and durable if preserved from moisture. But felled trees soon decay if left exposed in the forest. Used in Coorg for buildings; also used for furniture, carts, and mills.

Mallotus philippinensis ... ... Kunkuma

The powder from the ripe fruit forms the Kamala dye, also known in the south of India as Kapila. Wood only fit for fuel. Weight 48 lbs. per cubic foot.

Michelia champaca ... Champac... ... ... Sampige

A favourite tree of Hindu poetry, well known for the fragrance of its blossoms, which are worn in the hair, etc. Wood soft, seasons and polishes well. Very durable. Weight about 40 lbs. per cubic foot. Used for furniture, carriages, etc.

Phyllanthus emblica ... Emblic myrobalan ... Nelli

Wood mottled-reddish, hard and close-grained, warps and splits in seasoning.

Weight about 50 lbs. per cubic foot. Remarkable for its durability under water, which it also clears of impurities. For this purpose chips of it are thrown into wells or ponds. The bark is used for tanning. The fruit, resembling a gooseberry, is acid and astringent. Much used as an article of food, raw, preserved, or pickled.

Pterocarpus marsupium ... Indian kino ... ... Honne

Wood close-grained, reddish-brown, tough, strong, durable, seasons well, and takes a good polish. Weight 53 lbs. per cubic foot. Makes good furniture, and widely used for carts, window frames, agricultural implements, etc. Bark yields crimson gum, the true kino of commerce.

Schleichera trijuga ... Ceylon oak ... ... Ságade, chendala

Wood very hard, strong, durable, and takes a fine polish. Weight about 70 lbs. per cubic foot. Used for pestles, axles, teeth of harrows, screw rollers of mills. In the Central Provinces lac is produced on this tree, known as *kusuma* lac, the most highly prized of all. Bark and oil from the seeds medicinal; the latter said to be the original Macassar oil.

Stephegyne parvifolia ... ... Kadaga

Similar to Adina cordifolia, but not used much in the south of India.

Sterculia villosa ... ... Shi-anvige

Wood said to be firmly close-grained, suitable for building and furniture. Bags and ropes made of the fibrous bark.

Tectona grandis ... ... Teak[1] ... ... Tegu, tyága

The chief value of this well-known wood arises from its strength, added to its durability, due probably to the resinous matter in the pores, which resists the action of water. Weight varies in different localities, but approximately 45 lbs. per cubic foot when seasoned. Used in India for numerous purposes—construction, ship-building, sleepers, and furniture; in Europe for railway carriages, ships, and the backing of armour plates in ironclads.

Terminalia chebula ... Black myrobalan ... Alale, arale

The fruit is most valuable as a tan. The gall-nuts make excellent ink and dyes. Wood hard and fairly durable. Weight about 60 lbs. per cubic foot. Used for furniture, carts, and agricultural implements.

Terminalia paniculata ... ... Huluve, hunal

Timber of middling quality, especially when seasoned in water. Heartwood dark, hard, and fairly durable. Weight 47 lbs. per cubic foot. Used for the same purposes as Matti. Also for fuel, planking, and country carts. In the ground is liable to attacks of white ants.

Terminalia tomentosa ... ... Matti

Wood dark brown, with darker streaks, hard, but not very durable. Weight about 60 lbs. per cubic foot. Good fuel tree; leaves useful as manure for areca-nut gardens. Yields a gum said to be used as an incense and cosmetic. Bark used for tanning.

Vitex altissima ... ... Naviládi

Valuable wood; brownish-grey when seasoned. Weight 63 lbs. per cubic foot. Used, when procurable, for building and agricultural work.

[1] The finest teak in Mysore is found in the State forests of Lakvalli, Bisalvadi, Kákankóte, Begur, and Ainur Márigudi. The teak plantations in Mysore cover an area of about 4,000 acres.

Xylia dolabriformis ... Iron wood ... ... Jambe

Wood dark red or brown, very strong, hard, tough, and durable; not attacked by white ants. Weight 65 lbs. per cubic foot. Used for building and agricultural implements, also for the best charcoal.

The bamboo, scientifically reckoned a giant grass, abounds in the large forests, and is one of the most valuable products. The common species is Bambusa arundinacea, the spiny bamboo (*bidaru*). Dendrocalamus strictus is the "male bamboo" (*gandu bidaru*), a solid bamboo used for spear or lance staves, walking-sticks, &c. The largest bamboos, known as *ande bidaru*, are said to be found in the forests of the Mysore District. The periodical dying off of the bamboo after seeding is a well-known phenomenon. The seed, called bamboo rice, generally appears at a time of drought, when the crops have failed, and is eaten by the poorer classes. The uses of the bamboo are innumerable, and there is scarcely a domestic purpose to which it is not applied.

The following trees are also common in these forests :—

Acacia arabica ... ... Bábul ... ... Kari Jáli, gobli

Yields the Indian gum arabic. Wood pale red, turning darker on exposure, close-grained, tough, and very durable when seasoned in water. Weight about 54 lbs. per cubic foot. Much used for naves, spokes and felloes of wheels; also for rice-pounders, oil and sugar mills, agricultural implements, etc. Tan, dye, fibre, food, and medicine are obtained from the bark or pods.

Acacia leucophlœa... ... ... Bili Jáli, topal

Good fuel tree. Sapwood large; heartwood reddish-brown, tough, and easily seasoned. Weight about 55 lbs. per cubic foot. Bark used in distilling arrack. The young pods given to sheep supposed to improve the quality of the mutton. Gum, dye, fibre, and medicine are also obtained from this tree.

Ægle marmelos ... ... Bael ... ... Bilpatre

Greatly esteemed for the medicinal properties of root, bark, leaves, and fruit. The pulp of the latter a specific for dysentery and diarrhœa. Its shell or rind is made into snuff-boxes. Wood strongly scented when fresh cut, yellowish-white, hard, and durable. Weight about 50 lbs. per cubic foot. Seldom felled, as it is considered sacred, and the leaves indispensable for the worship of Siva.

Butea frondosa ... ... Muttaga

Whole tracts of country are gay with its gorgeous orange-crimson flowers at the beginning of the hot weather. The leaves are used as plates, and the branches for sacrificial purposes. A red gum called bastard kino obtained from the bark. From the flowers is prepared the red juice squirted about in the Holi festival. The seeds anthelmintic and a common remedy for horses. Wood of little value, but said to be durable under water. Weight 35 lbs. per cubic foot.

Eugenia jambolana ... Black plum, Jamoon ... Nerale

There are two varieties, caryophyllifolia (náyi nerale) and obtusifolia (jambu nerale). The latter, bearing larger fruit, is most abundant in the Malnád. Fruit, which has a very astringent taste, leaves, seeds, and bark medicinal, and the latter used for dyeing and tanning. Wood whitish, hard, tough, and durable in water. Weight 45 lbs. per cubic foot. Used for buildings and agricultural implements.

Feronia elephantum ... Wood-apple ... ... Bela, byála

The acid pulp of the fruit generally eaten, either raw or sometimes in the form of a jelly like black currant. Wood yellowish, close-grained, hard, and durable. Weight 50 lbs. per cubic foot. Used like the foregoing. The bark yields a white transparent gum resembling gum arabic.

Ficus bengalensis ... ... Banyan ... ... Ala

Good shade for coffee. Wood of little value, but durable under water, and therefore used for well frames. Weight about 37 lbs. per cubic foot. The wood of the aerial roots used for tent-poles, cart-yokes, etc. From the milk sap birdlime is made; it is also applied to sores and bruises. The young leaves are used for plates.

Ficus glomerata ... ... Country fig ... ... Atti

Uses similar to those of the above. Cattle eat the fruit greedily; it is also eaten by the poor in times of scarcity. The tree imparts moisture to the soil around its roots.

Ficus religiosa ... ... Peepul ... ... Arali, rági, asvattha

Wood of no value. Other uses similar to those of the above. A sacred tree, planted at the entrance of every village along with the margosa, to which it is married with the due ceremonies. Perambulations of the tree supposed to confer male issue and other blessings.

Mangifera indica ... ... Mango ... ... Mávu

Well known for its delicious fruit throughout India. Wood used for minor works of carpentry, but does not stand exposure, and is liable to attacks of insects. Weight about 40 lbs. per cubic foot. Besides being eaten raw, the fruit is made into chatnis, pickles, and preserves. Medicinal properties are attributed to almost every part of the tree. The leaves, strung on a thread, are hung up as a sign of welcome at the lintel of doorways.

Phœnix farinifera ... ... Dwarf date ... ... Sanna ichalu

The leaves are used for thatch, and as fuel for potteries. The farinaceous pith of the stem seems not to be eaten here as in some other parts of India.

Phœnix sylvestris ... ... Wild date, Toddy palm[1] Ichalu.

From the juice is produced the toddy or arrack of the country; and a small proportion is boiled down for making jaggery and date-sugar. Good mats are made from the leaves.

Tamarindus indica... ... Tamarind ... ... Hunise

Most valued for its fruit, which is largely used in food and for making a cooling drink. The seeds are also roasted and eaten; and a size made from them is used by Kurubars as a dressing for kamblis or country-made blankets. Fruit, leaves, and seed are also medicinal. Heartwood very hard and durable, but difficult to work. Weight about 60 lbs. per cubic foot. Used for naves of wheels, rice-pounders, mallets, tent-pegs, oil and sugar mills, handles to tools, and so on.

The third or *dry belt* lies to the east of the mixed forest belt, and includes the far greater portion of the Province. The tree vegetation is much inferior to that immediately to the west, the change being in some parts gradual, in others very marked. The latter is especially per-

[1] The groves of this toddy palm, which is a Government monopoly, cover altogether an area of something like 30,000 acres in the Maidán parts of the State. The finest are in the Chitaldroog and Mysore Districts.

ceptible near the Baba Budan hills, which from their elevation arrest much of the rain which would otherwise pass to the east and north-east. The difference between the abundant vegetation of the Jágar valley to the west, and the scanty vegetation to the east, of the Kalhatti hills in the Baba Budans is remarkable.

Many of the trees found in the mixed belt are common to this third tract, but as a rule they are of smaller growth. This is specially noticeable in teak, which is only met with stunted, twisted and small; in some of the *combretaceæ*, and very marked in some of the *leguminosæ*.

Besides the different kinds of *ficus*, the mango, tamarind and jamun, the ippe (*bassia latifolia*) and jack (*artocarpus integrifolia*) grow well. The acacias of the preceding list, the wood-apple, bael-tree and pachari also thrive. The wild date (*phœnix sylvestris*) grows in the western part and the dwarf date (*phœnix farinifera*) in the centre and west. The custard-apple (*anona squamosa*) grows wild rather abundantly in the waste lands of the Sira taluq. Among others the more valuable and common trees are :—

Acacia catechu ... ... Kagli

Catechu (*káchu*) is obtained by boiling down a decoction from chips of the heartwood. It is not much made in Mysore, and is principally used for mastication and medicine. There are two kinds, dark and pale, of which the latter only is used for chewing. Heartwood dark red, hard, durable, seasons well, and takes a fine polish; not attacked by white ants. Weight about 70 lbs. per cubic foot. Much used for fuel and charcoal. Also for oil and sugar mills, bows, handles to arms, and for agricultural implements.

Alangium lamarckii ... ... Ankóle

Good for fuel and fences. Wood light yellow outside, dark brown in the centre, hard, even-grained, tough, and durable. A beautiful wood when well seasoned. Weight about 52 lbs. per cubic foot. Used for pestles, wooden bells, and other minor purposes. Fruit acid; nearly every part of the tree medicinal.

Anogeissus latifolia ... ... Dindiga

See above (p. 70).

Averrhoa carambola ... ... Kamaraka

Fruit eaten raw, also stewed, curried, and pickled. Wood light red, hard, and close-grained. Weight about 40 lbs. per cubic foot.

Buchanania latifolia ... ... Murkali

Well known for its edible seeds, in some places used as a substitute for almonds. Heartwood seasons well and sufficiently durable for protected work. Weight 36 lbs. per cubic foot. Bark can be used in tanning.

Dalbergia lanceolaria ... ... Hasar ganni

Wood whitish, heavy, weighing 62 lbs. per cubic foot, but not durable. Root, bark, and an oil from the seed, medicinal.

Diospyros tupru ... ... Tupra

Fruit eaten by cowherds. Leaves used for folding native cigarettes. The Mahrattis obtain from the root a coloured paste for caste marks.

Dolichandrone falcata ... ... Udi

A coarse dark fibre obtained from the inner bark. Heartwood hard enough for implements and village buildings.

Gardenia gummifera ... ... Bikke

The medicinal gum-resin, known in trade as *dikamali*, exudes from the extremities of the young shoots and buds; said to have an offensive smell. Wood white, very hard, might serve for box-wood.

Hardwickia binata ... ... Karáchi

One of the most durable timbers in India.[1] Heartwood abundant, close-grained, dark red tinged with purple, soft and easy to work when fresh cut, but afterwards becomes extremely hard. Weight unseasoned 80 lbs. per cubic foot; seasoned wood much lighter. Used for bridges, houses, and agricultural implements. Gum, tan, and fibre are also obtained from it. The young shoots and leaves very extensively used for fodder.

Ixora parviflora ... ... Torch-tree ... ... Gorivi, hennu gorivi

The branches are used as torches by travellers and postal runners. The flowers, pounded in milk, used as a remedy for whooping-cough. Wood, though small, said to be hard and even-grained. Weight about 60 lbs. per cubic foot. Well suited for turning.

Lagerstrœmia parviflora ... ... Chaunangi

Wood light grey, tinged with red, and darker towards the centre; straight-fibred, tough, elastic. Weight about 50 lbs. per cubic foot. Used for agricultural implements, and considered fairly durable. Fibre, tan, dye, and an edible gum obtained from the bark. The tasser silkworm feeds on the tree.

Morinda umbellata ... ... Maddi

From the root is obtained the yellow dye known as *Maddi banna*. Fruit said to be curried and eaten.

Pongamia glabra ... ... Indian beech ... ... Honge

Wood tough and light, weighing about 40 lbs. per cubic foot, white when cut but turning yellow on exposure, coarse-grained, fibrous, and not durable, but said to improve when seasoned in water. Large trunks used for the solid wheels of waddar carts. Oil from the seed is used for lamps and medicinally; also other parts of the tree for the cure of rheumatism and skin diseases. Leafy branches used as green manure for paddy fields. The flowers also used for manure to crops. Honge cake forms a manure to coffee.

Semecarpus anacardium ... Marking nut ... ... Géru

Wood of little value, as it cracks in seasoning. Weight 42 lbs. per cubic foot. The juice from the growing tree said to cause blisters when handled; is therefore ringed some time before felling. The fleshy cup on which the fruit rests is eaten. The juice of the fruit proper is used as medicine, also for varnish, and mixed with lime for marking linen. Oil from the seed is said to be made use of in taming wild elephants, and birdlime prepared from the fruit when green.

Shorea talura ... ... Lac-tree[2] ... ... Jalári

The lac insect is propagated on it, and besides lac, a kind of dammar is obtained from the tree. Wood yellowish, heavy, and durable, capable of taking a good polish, and used for building. Weight 54 lbs. per cubic foot.

[1] Mostly confined to the Tumkur and Chitaldroog Districts, and specially abundant in Bukkapátna, near Sira, and in Molkalmuru taluq.

[2] Most abundant in the Anekal and Closepet taluqs, and in the Nandidroog hills.

Stereospermum chelonoides ... ... Pádri

Wood said to be tremendously hard and almost indestructible under water. Sawyers object to saw it. Used for beams and posts.

Zizyphus jujuba ... ... Indian jujube, bér ... Yelachi

The fruit is better known in northern India. Wood hard, even-grained, tough and durable. Weight 58 lbs. per cubic foot. Bark very astringent and exudes a medicinal gum.

Zizyphus xylopyrus ... ... Challe

The fruit used as a dye for blackening leather. Wood hard and tough. Weight about 60 lbs. per cubic foot. Used for walking-sticks and torches.

Among shrubs and useful bushes are :—

Calotropis gigantea ... Madár, giant swallow-wort Yekka

The plant is filled with a milky sap which hardens on exposure to light, forming a kind of gutta percha, except that it is a conductor of electricity. Medicinal virtues are attributed to every part of the plant. The inner bark yields a bast fibre, which has been suggested as a material for making paper. The silk-cotton of the seed forms the Madár floss of commerce.

Cassia auriculata ... ... Tanner's bark ... ... Tangadi

The bark is one of the best Indian tans,[1] and the root bark is used for tempering iron with steel. Bark and seeds are also medicinal. Twigs used for native tooth-brushes.

Cassia fistula ... ... Indian laburnum ... Kakke

Wood small but durable, weighing 50 lbs. per cubic foot. Hard but brittle and apt to fracture. Used for paddy-grinders, posts, and agricultural implements. From the bark are obtained fibre, tannin, and gum. The fresh pulp of the fruit forms a purgative, and the dried leaves are laxative.

Jatropha curcas ... ... Physic nut ... ... Mara haralu

The young twigs are used as tooth-brushes, the milky juice being considered to strengthen the teeth and gums. The milk sap is a good styptic, and dried in the sun forms a reddish-brown substance like shell-lac. The external application of a decoction of the leaves will excite the secretion of milk. Commonly planted for fences, as cattle will not eat it.

The sandal-tree (*santalum album*), gandha, srigandha—a product principally of Mysore and a State monopoly, yielding the largest share of the forest revenue—is found all over the country, but grows very unequally in different parts. It is never met with in the evergreen belt or in heavy forests of the mixed belt, but is most abundant along the eastern skirts of the last-named tract; in the taluqs bordering on the Kaveri; and in those lying along the chain of hills which runs from Kankanhalli up to Madgiri. In the Chitaldroog and Kolar Districts it is very scarce.

[1] An analysis by Professor Hummel, of the Yorkshire College, Leeds, showed the bark to contain 20·5 per cent. of tannic acid.

The tree attains its greatest bulk and height in taluqs with a moderately heavy rain-fall, but the perfume of wood grown in such localities is not so strong as of that grown in more arid spots, especially where the soil is red and stony. It will thrive among rocks where the soil is good, and trees in such places though small are generally fuller of oil. The bark and sapwood have no smell, but the heartwood and roots are highly scented and rich in oil. The girth of a mature tree varies, according to circumstances, from 18 to 36 or, in exceptional cases, 40 inches. It attains maturity in about twenty-five years. The older the tree, the nearer the heartwood comes to the surface; while the bark becomes deeply wrinkled, is red underneath, and frequently bursts, disclosing in old specimens the absence of all sapwood. In colour and marking, four varieties of the wood are distinguished:—*bili*, white; *kempu*, red; *nága*, cobra; and *navilu*, peacock. The two latter command fancy prices: the names indicate the supposed resemblance of the marks, which are really "caused by the death of adventitious buds."

The heartwood is hard and heavy, weighing about 61 lbs. per cubic foot. The best parts are used for carving boxes, cabinets, desks, walking-sticks, and other useful and ornamental articles. The roots (which are the richest in oil) and the chips go to the still; while the Hindus who can afford it show their wealth and respect for their departed relatives by adding sticks of sandalwood to the funeral pile. The wood, either in powder or rubbed up into a paste, is used by all Brahmans in the pigments for making their caste marks. The oil forms the basis of many scents, and is sometimes used for disguising with its scent articles which, being really carved from common wood, are passed off as if made from the true sandal. The far greater portion of the wood sold yearly in Mysore is taken to Bombay, where it finds its way principally to China, France, and Germany.

Efforts for the propagation of sandal did not meet with much success some years ago, owing to the delicate nature of the young plant, and its exposure to the ravages of hares and deer. More recently the *lantana* shrub, which grows with the rankness of a weed, has been found to be an effectual nurse for the seedlings.

The following timber trees are also found in Mysore:—

* Acacia farnesiana ... ... Kastúri jáli, kastúri gobli

The yellow flower heads diffuse a pleasant odour, and are known as Cassia flowers in European perfumery. The plant is said to be obnoxious to snakes and vermin. Wood white, hard, and tough, but too small for general utility. Weight 49 lbs. per cubic foot. A gum like gum arabic is obtained from the stem. Bark and pods medicinal.

Acacia ferruginea ... ... Banni

Yields a good gum. Bark very astringent ; used in distilling arrack. Heartwood small in proportion, reddish-brown, very hard. Weight 70 lbs. per cubic foot. Little used on account of its being considered sacred.

Acacia sundra ... ... Kempu khaira

Little more than a variety of A. catechu. The branches are a darker brown, and the wood heavier and more durable. Weight when seasoned about 80 lbs. per cubic foot. Used for posts in house-building.

Aglaia roxburghiana ... ... Tottila

Fruit buff-coloured, eaten medicinally.

Albizzia amara ... ... Sujjalu

Good locomotive fuel. Heartwood purplish-brown, very hard and durable, of great transverse strength. Weight about 65 lbs. per cubic foot. Used for carts and agricultural implements. Seasoned limbs used for ploughs.

Albizzia stipulata ... ... Hotte bági

Good charcoal tree. Wood used for various purposes, but not very durable. Weight about 40 lbs. per cubic foot. The green leaves a fodder for cattle.

Alstonia scholaris ... ... Jantala

Bark and leaves medicinal : the former known out of India as Dita bark, containing the active principle Ditain, said to equal the best sulphate of quinine. Wood soft and light, of little value. Weight 28 lbs. per cubic foot. Used for schoolboys' writing-boards, whence the name scholaris.

Boswellia serrata, var. glabra ... ... Sámbráni

Wood inferior and only used for fuel or charcoal. The gum-resin is a bastard olibanum, much used as medicine, and as incense in the temples. The branches make good torches.

Careya arborea ... . Gauju, kavalu

Sapwood abundant, white ; heartwood red, dark in old trees, even-grained, and beautifully mottled. Weight about 50 lbs. per cubic foot. A durable and pretty wood, but not much used in Mysore except for wooden vessels and agricultural implements. Formerly used for the drums of sepoy corps. Bark astringent and yields a very strong fibre, employed as a slow match to ignite gunpowder, and for fuses of native matchlocks. Fruit and flowers medicinal.

Cedrela toona ... ... Indian mahogany, white cedar ... Gandagarige

Wood suitable for furniture and buildings. Said to be durable and not attacked by white ants. Weight about 33 lbs. per cubic foot. Red and yellow dyes obtained from the flowers. Bark medicinal.

Chickrassia tabularis ... Chittagong wood ... Dalmara

Wood beautifully marked, durable, fragrant, easily worked, and takes a good polish. Used especially for furniture and cabinet work. Weight 46 lbs. per cubic foot. Bark astringent. Red and yellow dyes obtained from the flowers.

Cochlospermum gossypium ... ... Arisina búruga

The fine floss from the seeds, also called silk-cotton, is used for stuffing pillows in hospitals in Europe, but locally considered to cause much heat. The gum from the trunk is used for tragacanth in northern India. Wood of no value ; weight about 17 lbs. per cubic foot.

Cordia obliqua ... ... Chadle

Very similar to C. myxa (p. 70) in character. Flowers larger, and plant more hairy.

Cordia rothii ... ... Nárvalli

A coarse fibre from the bark used for ropes. Wood said to be grey, compact, and hard.

Cratæva religiosa ... ... Nírvala

Wood soft and even-grained. Said to be used for drums, combs, and in turnery. Leaves and bark medicinal.

Diospyros embryopteris ... ... ? Kusharta

Fruit rich in tannic acid, but when ripe this disappears and it is eaten. Bark and an oil from the seed medicinal. Wood light brown and not of much value. Uses of the tree not much known in this part of India.

Guazuma tomentosa ... Bastard cedar ... ... Rudrákshi

Leaves and fruit much relished by cattle. Bark medicinal. Timber of old trees said to be durable, though light and apt to split. Weight 32 lbs. per cubic foot.

Hardwickia pinnata ... ... Yenne mara

An oil or oleo-resin obtained from deep incision into the heart of the tree resembles copaiva balsam in composition and properties, though not so transparent, and of a dark red colour. Sapwood large, heartwood brown. Weight 47 lbs. per cubic foot. Used for building in the parts where it grows.

Macaranga roxburghii ... ... Chenta kanni

A medicinal gum, reddish, and with the odour of turpentine, exudes from the young shoots and fruit. Said to be used for taking impressions of coins, etc., and for sizing paper. Wood soft and useless.

Machilus macrantha ... ... Chittu tandri

The properties of this tree are unknown.

Melia azadirachta ... ... Neem, margosa ... ... Bévu

Every part medicinal. Heartwood used for making idols. The wood is not attacked by insects, is hard, durable, and beautifully mottled. Weight about 50 lbs. per cubic foot. Suitable for cabinet work and carpentry. Neem oil, obtained from the seed, is used for killing insects. Leaves antiseptic, and in the native treatment of small-pox are placed under and around the patient at certain stages of the disease. The tree is considered sacred and planted with the peepul at the entrance of villages, the two being married with due ceremonies, the latter representing the female and the former the male.

Melia azedarach ... ... Persian lilac, bead-tree Turuka bévu, huchu bévu

Leaves much relished by sheep and goats. Wood nicely mottled and takes a good polish. Weight about 35 lbs. per cubic foot. Not used. The seeds generally worn as rosaries. The products of the tree resemble those of the neem, but seem to be more used in America than in India.

Melia dubia ... ... Giant neem ... ... Heb bévu

Wood soft and light, weighing about 25 lbs. per cubic foot. Used by planters for buildings. Not easily attacked by white ants. The dried fruit, resembling a date, is a remedy for colic.

Meliosma arnottiana ... ... Massivala

Wood used for poles and agricultural implements: also, apparently, for building purposes.

Moringa pterygosperma ... Horse-radish ... ... Nugge

Also, from the form of the flower, known as the drumstick-tree. The fleshy root is a perfect substitute for horse-radish. The Ben oil of commerce, valued as a lubricant by watchmakers, is obtained from the seed, but is seldom made in India, owing to the fruit being saleable as a vegetable, and the seed therefore not being allowed to mature. Nearly every part considered medicinal.

Ochrocarpus longifolius ... ... Surgi

The dried flower-buds, known in commerce as támra nágakésari, yield a dye for silk. The flowers are used for decoration in temples and on the person. Wood used for local building. Hard, red, close and even-grained. Weight 55 lbs. per cubic foot.

Odina wodier ... ... Udi, simti

Wood of little value and liable to attacks of insects. Weight about 55 lbs. per cubic foot. Bark and gum medicinal. Cattle fond of the green leaves.

Pœciloneuron indicum ... ... Ballagi

Wood very hard and heavy. Not much used except for rice-pounders, agricultural implements, and perhaps walking-sticks.

Polyalthia cerasoides ... ... Sanna hesare

Wood olive-grey, moderately hard, close-grained. Weight 52 lbs. per cubic foot. Much used for carpentry in the Bombay country, but not here.

Prosopis spicigera ... ... ? Perumbe

Good fuel tree, especially for locomotives. Sapwood large and perishable; heartwood extremely hard but not durable. Weight 58 lbs. per cubic foot.

Sapindus trifoliatus ... Soap-nut ... ... Kugati, antavala

The nut commonly used for washing clothes. Flannels may be washed with it without shrinking. Root, bark, fruit, and oil from the seed medicinal. Wood hard, yellow, cross-grained, and not very durable. Weight about 64 lbs. per cubic foot. Occasionally used for carts, but more commonly as handles for axes and similar tools, and for combs.

Saraca indica ... ... Asoka

A sacred tree, grown in gardens and near temples for its beautiful flowers, which are a rich orange, changing to dull red. Used also medicinally. The tree is supposed to be a protector of chastity. Sita, the wife of Ráma, when carried off by Rávana, took refuge in a grove of asoka trees.

Sterculia guttata ... ... ? Jén-katalu

Bark ash-coloured and very fibrous, used on the Western Coast for making cordage and rough articles of clothing.

Strychnos potatorum ... Clearing-nut tree ... Chillu

The ripened seeds are used for clearing muddy water. A paste of the same removes the pain from the sting of a centipede. Often felled for fuel.

Thespesia populnea ... Portia, tulip-tree ... Huvvarasi

Formerly much planted as an avenue tree, but does not attain perfection so far inland. When raised from seed the timber is free from knots, straight, even-grained, and tough: suitable for carriages and work requiring lightness and pliability. Bark, fruit, and heartwood medicinal.

Wrightia tinctoria ... ... Beppále, Hále

Wood highly valued by native turners on account of its ivory-white colour. Used for the celebrated Channapatna toys and for wooden idols. The leaves, which turn black when dry, afford a kind of indigo, called in Mysore *pala* indigo.

Of *fruit trees* grown in native gardens, the following are the more important. Most of them are too well known to need description :—

Anacardium occidentale	Cashew-nut	Geru
Anona reticulata	Bullock's heart	Rám phal
,, squamosa	Custard apple	Sita phal
Artocarpus integrifolia	Jack	Halasina mara
Averrhoa carambola	Carambola	Kamarak
Carica papaya	Papay	Perangi
Citrus aurantium	Orange	Kittale
,, decumana	Pumelo	Sakóte
,, medica	Citron	Mádala
,, ,, var. acida	Lime	Nimbe
,, ,, ,, limetta ...	Sweet lime	Gaja nimbe
,, ,, ,, limonum ...	Lemon	Herile
Cocos nucifera	Cocoa-nut palm	Tengina mara
Eriobotrya japonica	Loquat	Lakóte
Eugenia jambos	Rose apple	Pan nerale
Ficus carica	Fig	Anjura
Mangifera indica	Mango	Mávina mara
Musa sapientum	Plantain	Bále
Phyllanthus distichus	Star-gooseberry	Kiri nelli
,, emblica	Emblic myrobalan ...	Nelli
Psidium guyava	Guava	Shépe
Punica granatum	Pomegranate	Dálimbe
Pyrus malus	Apple	Sévu
Vitis vinifera	Vine	Drákshi

The *cashew nut* proper is eaten roasted, and used in native sweetmeats. It yields an oil equal to oil of almonds. From the shell are obtained a black caustic oil, known as cardol, a good preventive of white ants, and anacardic acid, having rubefacient properties. A weak spirit may also be distilled from its juice. Gum obtained from the bark is obnoxious to insect pests. Juice from incisions in the bark forms an indelible marking ink. *Jack fruit* is a favourite article of food among the natives. It is enormous in size and weight, commonly about 20 inches long, and 6 or 8 inches in diameter, weighing 30 to 40 lbs., and grows from the trunk or main limbs with a short stout stalk. The *papay fruit*, something like a small melon, is eaten by all classes, and also pickled. Its juice yields papaine, said to be superior to animal pepsin in its peptonising powers. Meat suspended under the tree becomes tender. The seeds are universally believed to be an effectual emmenagogue and abortive.

The best *oranges* are imported, and are the produce of Sátghur near Vellore, or of the Sherveroy Hills, &c. The loose-jacket orange is obtained from Coorg. Of *cocoa-nuts* a rare variety is produced at Honnavalli in Túmkúr District, which, on account of the delicious sweet flavour of its milk, is called Ganga-páni, or water of the Ganges.

The dried kernel of cocoa-nuts, called *kobari*, is a great article of export from the central parts of Mysore.[1]

Of *mangoes* there are many varieties, bearing the following names:—*gól káyi* (the most common, roundish), *bádámi* (almond-shaped), *rasapuri* (reddish pulp), *jirige* (has the scent of cummin seed), *pich káyi* (small kind), *kari káyi* (black fibres in the skin), *giṇi múti* or *giṇi mávu* (shape of a parrot's beak), *gunge mávu* (generally has a bee in the stone), *sakkare* or *shi mávu* (sweet kind), *chit káyi* (small kind), *huḷi mávu* (used only for pickle). The cultivated kinds, which are propagated by inarching or grafting by approach, have the following names:—amíni, bádámi, Chittúr, dil-pasand, Malgova, nílam, Peter-pasand, puttu, rasapuri, Salem, sandarsha. The formation of graft mango plantations has greatly extended during recent years.

Plantains are very plentiful and a favourite article of diet. The most esteemed are *rasa báḷe* and *rája rasa báḷe* (with a yellow custard-like pulp), *puṭṭa báḷe* or *puṭṭa sugandha báḷe* (a small sweet plantain, the Guindy plantain), *madhuranga*, *gujja*, *china*, and *gúlúr báḷe* (all butter plantains), *jénu báḷe* (honey plantain), *rája báḷe* (royal plantain), *chandra báḷe* (red plantain), *sakaláti báḷe* (red and cottony), *pachcha báḷe* (green when ripe), *hávu báḷe* (long and slender), *yelakki báḷe*, *arisina báḷe*, *áne báḷe* (a very large kind), *kaḷyáni báḷe* (very large and coarse), *búdi báḷe* (greyish, used only for cooking), *káḍu báḷe* (the wild plantain).

Guavas, of which there are three or four varieties, white and red, are very plentiful. The grafted kinds are superior. A delicious jelly, closely resembling red currant, is made from the common kind by Europeans.

The *grapes*, though sweet, are small, owing probably to want of attention in thinning out the clusters. Both green and purple varieties are grown. Those from the neighbourhood of Seringapatam are the most highly esteemed. Of imported varieties, fourteen are named in Mr. Cameron's catalogue as in local cultivation. Efforts are being made to extend viticulture. *Apples* are cultivated principally in Bangalore for the European market, and grow to great perfection. The different varieties are distinguished by numbers indicating the order in which they were introduced.

The following are names of *vegetables* of which the leaves are used by natives in curries and stews. Some of these vegetables are cultivated, while others grow wild. The leaves only are used in curries or boiled with chillies to be eaten along with rice.

Æschynomene grandiflora	Agase soppu
Achyranthes lanata	Biḷi súli ,,
,, muricata	Akvi goraji
,, triandra	Ponnaganti soppu

[1] Further particulars regarding cocoa-nuts will be found under "Cultivation."

Amarantus campestris		Kírakasále soppu
,, candidus		Bili ,,
,, gangeticus		Dantu ,,
,, inamœnus		Harive ,,
,, mangostanus		Chilki soppu
,, oleraceus	Country greens	Soppu
,, viridis		Daggali soppu
Arum esculentum		Kesave ,,
Basella rubra and alba and var.	Indian spinach	Dodda basali
Boerhaavia diffusa	Hogweed	Bilavarga
Brassica alba	White mustard	Bili sásive soppu
Canthium parviflorum		Káre gida
Cassia tora		Gundu tagasi
Chenopodium viride	Goosefoot	Sakótti soppu
Cleome pentaphylla		Narobeda
Convolvulus esculentus		Tutti soppu
Corchorus olitorius	Jew's mallow	Kotna goraji
Coriandrum sativum	Coriander	Cottambari soppu
Hibiscus cannabinus	Deccan hemp	Pundi, pundrika
,, sabdariffa	Rozelle	Kempu ,,
Hyperanthera moringa	Horse-radish	Nugge soppu
Leucas aspera		Tumbe ,,
Marsilea quadrifolia		Chitigina ,,
Mollugo stricta		Parpátaka soppu
Portulaca oleracea		Dodda gora
,, quadrifida	Indian purslane	Huli bachcheli
Trianthema decandra		Galija
,, monogyna		Nuchchu govi
Trigonella fœnum græcum	Fenugreek	Mente soppu

The *fruits* and *seeds* of the following trees and plants are also used in curries. Fruits introduced into curries are generally unripe; when ripe they are unfit for the purpose.

Æschynomene grandiflora		Agase káyi
Artocarpus integrifolia	Jack fruit	Halsina ,,
Bryonia umbellata		Tonde ,,
Capparis zeylanica		Totli ,,
Cucurbita alba	Pumpkin	Dodda kumbala káyi
,, lagenaria	Bottle gourd	Dodda sóre káyi
Cucumis acutangulus		Híre káyi
,, pentandra		Tuppa híre káyi
,, species		Huli saute ,,
,, utillatissimus	Country cucumber	Saute káyi
Dolichos lablab		Man avare
,, ,, var.		Bili man avare
,, minimus		Ghatt avare
,, spicatus	Cow gram	Dodda man avare
,, suratu		Budame káyi
Hibiscus esculentus		Bende káyi
Hyperanthera moringa	Moringa fruit	Nugge ,,
Momordica charantia		Hágal ,,
,, dioica		Gid hágalu

Momordica operculata		
Musa sapientum	Plantain	Bále hannu
Solanum melongena	Brinjal	Badane káyi
,, trilobatum		Kákamunchi káyi
,, varietas		Molalu badane
Trichosanthes cucumerina		Kiri podla káyi
,, nervifolia		Podla káyi
,, palmata		Avagude hannu
Trigonella tetrapetala		Góri káyi

A few names may be added of plants the *roots* of which are used in curries. Of these the country or sweet potato grows here to great perfection.

Arum campanulatus	Arum	Churna gaḍḍe
,, colocasia		Kesave ,,
Convolvulus batatas	Sweet potato	Genasu ,,
Daucus carota	Carrot	Gájina ,,
Dioscorea sativa	Yam	Heg-genasu gaḍḍe
Raphanus sativus	Radish	Mullangi ,,

The Catalogue, which here follows, of plants in the Lal Bagh or Government Botanical Gardens at Bangalore, compiled by Mr. J. Cameron, F.L.S., the Superintendent, will serve to show the capabilities of the climate and the attention bestowed on horticulture :—

Dicotyledons.

Ranunculaceæ.

Clematis, 5[1] ... Virgin's bower
Naravelia, 1
Thalictrum, 1 ... Meadow rue
Delphinium, 2 Larkspur
Nigella, 2 ... ... Fennel flower
Aquilegia, 2 ... Columbine

Several species of Clematis grow wild in Mysore.

Dilleniaceæ.

Delima, 1
Dillenia, 3
Candollea, 1

Several Dillenia are elegant trees for scenic planting.

Magnoliaceæ.

Magnolia, 3
Michelia, 2 Champaka Sampige

The fragrant Champaka is a favourite flower of Indian poetry.

Anonaceæ.

Uvaria, 2
Artabotrys, 1
Polyalthia, 2
Anona, 5 Custard apple Síta phal
Miliusa, 1
Saccopetalum, 1

The custard apple and bullock's heart (Ráma phal) are abundant in many parts.

Menispermaceæ.

Tinospora, 1
Anamista, 1
Cocculus, 1

Berberideæ.

Berberis, 1
Nandina, 1

Himalayan plants almost impossible to cultivate here.

Nymphæaceæ.

Nymphœa, 3 Waterlily... Távare
Nelumbium, 1 Lotus ... Kamala
Victoria, 1 ... Amazon lily

Lotus and waterlilies are common in tanks or sacred ponds all over the country.

Papaveraceæ.

Papaver, 5 ... Poppy ... Gasagase
Argemone, 1

The cultivation of poppy for opium is prohibited.

[1] These figures show the number of species under each genus.

Fumariaceæ.

Fumaria, 1 ... ... Fumitory

Cruciferæ.

Matthiola, 2 ... Stock
Cheiranthus, 1 Wallflower
Nasturtium, 3... Watercress
Cardamine, 1 ... Cuckoo flower
Malcolmia, 1 ... Virginian stock
Coronopus, 1
Erysimum, 2
Brassica, 7 ... Turnip
Cabbage Mudde kósu
Mustard Sásiva
Capsella, 1 ... Shepherd's purse
Lepidium, 1 ... Garden cress
Iberis, 1 ... Candytuft
Raphanus, 1 ... Radish Mullangi

The European vegetables of this order are fully established in the market gardens.

Capparideæ.

Cleome, 6
Gynandropsis, 1
Cratœva, 1 ... ... Caper-tree
Cadaba, 1
Capparis, 6

Resedaceæ.

Reseda, 1 ... ... Mignonette

Violaceæ.

Viola, 2 ... ... Violet, Pansy
Ionidium, 1

Bixineæ.

Cochlospermum, 1
Bixa, 2 ... Annatto ... Rangumále
Flacourtia, 3
Gynocardia, 1
Hydnocarpus, 1

Pittosporeæ.

Pittosporum, 4
Billardiera, 1
Bursaria, 1
Hymenosporum, 1
Sollya, 1

Polygaleæ.

Polygala, 3

Caryophylleæ.

Dianthus, 5... ... Pink
Saponaria, 1 ... Soapwort
Silene, 4 ... ... Catchfly
Lychnis, 2 ... ... Campion
Cerastium, 2 ... Chickweed
Stellaria, 1
Polycarpœa, 2

Various strains of pinks do well at Bangalore

Portulaceæ.

Portulaca, 4
Calandrinia, 1

Tamariscineæ.

Tamarix, 1

Hypericineæ.

Hypericum mysorense St. John's wort

Common at Nandidroog

Guttiferæ.

Garcinia, 4
Ochrocarpus, 1
Calophyllum, 2 Pinnay Surahonne oil tree
Poon tree Kúve, Bobbi
Mesua, 1... ... ... Nágasampige
Pœciloneuron, 1... ... Ballagi
Clusia, 1

From the Ballagi tree walking-sticks are made.

Ternstræmiaceæ.

Camellia, 2... ... Tea shrub

Dipterocarpeæ.

Shorea, 2 ... Lac tree ... Jálári
Sal tree
Hopea, 2
Vateria, 1 ... Indian Copal tree Dhúpada mara

Malvaceæ.

Althæa, 2 ... Hollyhock Dodda bindige
Lavatera, 1
Malva, 3 ... . Sanna bindige
Malvastrum, 2
Sida, 7
Abutilon, 6 ... ... Tutti
Malachra, 1
Urena, 2
Pavonia, 2
Decaschistia, 2
Hibiscus, 23... Shoe-flower Dásála
Rozelle ... Kempu pundrike
Paritium, 1
Thespesia, 2

Gossypium, 5 Cotton ... Arale
Kydia, 1
Adansonia, 1 Baobab
Bombax, 1 ... ... Kempu búruga
Eriodendron, 1 ... ... Bili búruga
Lagunaria, 1
Durio, 1 ... Durian

Under *Abutilon* 12 garden varieties are enumerated. Under *Gossypium* the cottons known as Hinginghaut, Dacca, Berar, Upland Georgian, and China are varieties of *herbaceum*; those known as Barbadoes, Bourbon, New Orleans, and Sea-Island are from *barbadense*.

Sterculiaceæ.

Sterculia, 8
Cola, 1
Heritiera, 2
Kleinhovia, 1
Helicteres, 2... Indian Screw-tree ... Yedamuri
Pterospermum, 1
Eriolæna, 1
Pentapetes, 1
Melhania, 2
Dombeya, 1
Melochia, 1
Waltheria, 1
Abroma, 1
Guazuma, 1 ... Bastard cedar ... Rudrákshi
Theobroma, 1 Chocolate-tree

Tiliaceæ.

Berrya, 1
Grewia, 9 ... ... Bútále, Tadasalu
Triumfetta, 3
Corchorus, 4 Jute plant
Elæocarpus, 2

The genus Grewia is well represented in the reserved jungles of Mysore, where some of the climbing species form dense thickets for the preservation of wild animals. The jute plant is found only rarely in local cultivation.

Lineæ.

Linum, 2 ... Flax plant
Rienwardtia, 1
Erythroxylon, 2 Bastard sandal Devadáru

Cocaine is the active principle of the leaf of *E. coca*.

Malpighiaceæ.

Malpighia, 3
Hiptage, 2
Aspidopterys, 1
Banisteria, 1
Stigmatophyllum, 1

Zygophylleæ.

Tribulus, 2 ... ... Sanna neggilu
Guaiacum, 1
Melianthus, 1

The herb *sanna neggilu* is well known for its medicinal properties. The introduced tree, *G. officinale*, yields the valuable wood known as *lignum vitæ*.

Geraniaceæ.

Pelargonium, 3 Garden geranium
Oxalis, 4 ... Wood sorrel
Biophytum, 2
Averrhoa, 2 ... ... Komarak, Bilimbi
Impatiens, 7
Tropœolum, 3
Hydrocera, 1

Rutaceæ.

Ruta, 1 ... Common rue ... Hávu-nan-jina gida
Zanthoxylum, 2
Toddalia, 1 ... ... Kádu menasu
Glycosmis, 1
Murraya, 2 ... China box Angáraka
Curry-leaf tree Kari bevu
Clausena, 2
Triphasia, 1
Limonia, 2
Atalantia, 2
Citrus, 6 ... Citron ... Mádavála
Lemon ... Herale
Lime ... Nimbe
Orange ... Kittale
Pummelo ... Sakotti
Feronia, 1 ... Wood-apple Bélada mara
Ægle, 1 ... Bael-tree .... Bilvapatre
Calodendrum, 1

The fœtid herb *R. graveolens* is said to be obnoxious to snakes, and is often cultivated near dwellings on that account.

Simarubeæ.

Ailantus, 1
Balanites, 1 ... ... Ingalíka
Quassia, 1 ... Quassia shrub

Ochnaceæ.

Ochna, 2

Burseraceæ.

Boswellia, 2 ... ... Sámbráni
Garuga, 1
Balsamodendron, 2
Protium, 1
Bursera, 1
Filicium, 1

Meliaceæ.

Naregamia, 1
Melia, 3 ... Neem-tree... Bevu
Cipadessa, 1
Walsura, 1
Soymida, 1 ... ... Svámi
Chickrassia, 1 Chittagong wood
Cedrela, 1 ... White cedar Noge
Chleroxylon, 1 Satin wood Huragalu
Swietenia, 2 ... Mahogany

Olacineæ.

Ximenia, 1
Olax, 1
Opilia, 1

Ilicineæ.

Ilex, 2

Europe holly does not succeed at Bangalore, but the Chinese species is not a bad substitute.

Celastrineæ.

Euonymus, 3
Celastrus, 1 ... ... Kangondi
Gymnosporia, 2 ... ... Tandrasi
Elæodendron, 1 ... ... Mukkarive

Rhamneæ.

Ventilago, 1 ... ... Popli
Zizyphus, 4 ... Bhere fruit Yelachi
Rhamnus, 2
Scutia, 1 ... ... Kurudi
Colubrina, 1

The root bark of Popli affords a good orange dye.

Ampelideæ.

Vitis, 12 ... Grape vine Drákshigida
Leea, 1
Ampelopsis, 1 Virginia creeper

Of the varieties of grape in local cultivation 16 are named.

Sapindaceæ.

Cardiospermum, 1
Allophylus, 1
Sapindus ... Soap-nut-tree ... Kúgati
Nephelium, 3 Litchi
Dodonæa, 1
Melianthus, 1
Paullinia, 1

Anacardiaceæ.

Rhus mysorensis Native sumach
Pistacia, 1
Mangifera, 2... Mango ... Mávu
Anacardium, 1 Cashew-nut Turuka
Geru mara
Buchanania, 1
Odina, 1
Semecarpus, 1 Marking-nut Geru mara
Spondias, 3 ... Hog-plum ... Amate
Schinus, 1 ... Bastard pepper

Moringeæ.

Moringa, 1 ... Horse-radish-tree Nugge

Leguminosæ.

(Papilionaceæ)

Genista, 1 ... Spanish broom
Rothia, 1
Heylandia, 1
Crotalaria, 19 ... ... Sanabu
Trifolium, 2 ... Clover
Trigonella, 1... Fenugreek Mentya
Medicago, 4 ... Lucerne
Cyamopsis, 1
Lupinus, 5
Indigofera, 9 Indigo ... Nili gida
Mundulea, 1
Tephrosia, 6
Sesbania, 5 ... ... Jinangi
Hedysarum, 1
Zornia, 1
Stylosanthes, 1
Æschynomene, 2
Ormocarpum, 1
Eleiotis, 1
Pseudarthria, 1
Uraria, 1
Lowria, 1
Alysicarpus, 2
Desmodium, 8 Sensitive plant

Abrus, 1 ...	Wild liquorice	Guraganji
Cicer, 1 ...	Bengal gram	Kadale
Vicia, 2 ...	Bean	
Ervum, 1 ...	Lentil	
Arachis, 1 ...	Ground-nut	Nela kadale
Lathyrus, 1 ...	Sweet pea	
Pisum, 2 ...	Garden pea	
Glycine, 2 ...	... ...	Kád-avare
Teramnus, 1		
Mucuna, 4 ...	Cowitch	
Erythrina, 8 ...	Indian coral	Varjipe
Galactia, 1		
Butea, 2 ...	Pulas kino	Muttuga
Canavalia, 3	Sword bean	
Phaseolus, 8 ...	Kidney bean	Hurali kayi
	Green gram	Hesaru
Vigna, 1 ...	... ...	Alasandi
Pachyrhizus, 1		
Clitoria, 4		
Dolichos, 3 ...	Cow gram...	Avare
	Horse gram	Hurali
Psophocarpus, 1		
Atylosia, 3		
Cajanus, 1 ...	Dholl ...	Togari
Cylista, 1		
Rhynchosia, 6		
Flemingia, 2		
Dalbergia, 8 ...	Rosewood...	Biridi
Pterocarpus, 2	Kino ...	Honne
Pongamia, 1 ...	Indian beech	Honge
Derris, 2		
Sophora, 2		
Virgilia, 1		
Goodia, 1		
Templetonia, 1		
Swainsonia, 1		
Myrospermum, 2	Myroxylon	
Viminaria, 1		
Clianthus, 2		
Robinia, 1		
Cartanospermum, 1		
Brownea, 2		
(Cæsalpiniæ)		
Cæsalpinia, 10	Sappanwood	
	Mysore thorn	Kurudu gajjige
Peltophorum, 1		
Mezoneurum, 1		
Pterolobium, 2		
Poinciana, 2...	Gold-mohur tree	
Parkinsonia, 1	Jerusalem thorn	
Wagatea, 1		
Gleditschia, 1	Honey locust	
Cassia, 17 ...	Indian laburnum	Kakke
	Tanner's cassia	Tangadi
Hardwickia, 1	... ...	Karachi
Saraca, 1 ...	Asoka ...	Asoka
Amherstia, 1		
Tamarindus, 2	Tamarind ...	Hunise
Hymenœa, 1...	Locust-tree	
Humboldtia, 1		
Bauhinia, 13...	Camel's foot	Kanchi-vála
Hæmatoxylon, 1	Logwood	
Colvillea, 1		
Ceratonia, 1		
Louchocarpus, 1		
(Mimoseæ)		
Neptunia, 1		
Adenanthera, 1	Redwood[1] ...	Manjatti
Prosopis, 2		
Dichrostachys, 1		
Parkia, 1		
Desmanthus, 1		
Leucæna, 1		
Mimosa, 2		
Acrocarpus, 1	Shingle-tree	Haulige
Acacia, 18 ...	Babool ...	Jáli Mugali Kaggali
	Soap-nut ...	Sige gida
Albizzia, 5 ...	... ...	Bage Sujjalu
Pithecolobium, 3	Rain-tree	
	Korakapulli	Sime hunise

The shingle-tree is considered by many planters to be one of the best trees for coffee shade. The Australian wattles have not succeeded well at Bangalore, but the indigenous *Jális* are common everywhere.

[1] The scarlet seeds, each supposed to equal 4 grains exactly, used by goldsmiths and others as weights. Also worn as necklaces. The paste from the heartwood applied by Brahmans to the forehead after bathing.

Rosaceæ.

Prunus, 4 ... Peach, Plum
Spiræa, 1
Rubus, 3 ... Raspberry
Fragaria, 1 ... Strawberry
Poterium, 1
Rosa, 17 ... Rose ... Gulábi
Eriobotrya, 1 Loquat ... Lakkoti
Pyrus, 2 ... Apple, Pear Sévu

Of roses 258 varieties are named as cultivated in Bangalore.

Saxifragaceæ.

Saxifraga, 1
Vahlia, 1
Hydrangea, 1

Crassulaceæ.

Tillæa, 1
Bryophyllum, 1
Kalanchoe, 4
Cotyledon, 4
Sedum, 1
Echeveria, 1

Droseraceæ.

Drosera, 1 ... ... Indian Sundew

Haloragæ.

Myriophyllum, 1

Combretaceæ.

Terminalia, 9 Myrobalan Táre, Arale káyi
Anogeissus, 1 ... ... Dindiga
Combretum, 5
Poivrea, 1
Quisqualis, 1 Rangoon creeper

Myrtaceæ.

Melaleuca, 2
Tristania, 2
Callistemon, 2
Eucalyptus, 15 Gum tree
Myrtus, 1 ... Myrtle
Psidium, 4 ... Guava ... Chépe
Eugenia, 7 ... Rose-apple Pannerale
Jamoon ... Náyi nerale
Barringtonia, 1
Careya, 1
Couroupita, 1

Melastomaceæ.

Osbeckia, 2
Melastoma, 1 Indian rhododendron
Sonerila, 1
Heterotrichum, 1
Memecylon, 3

Lythraceæ.

Ammannia, 5
Lawsonia, 1 ... Henna ... Goranti
Lagerstrœmia, 4 ... ... Nandi
Punica, 3 ... Pomegranate Dálimbe
Lafœnsia, 1
Heimia, 1
Cuphea, 2

Onagraceæ.

Jussiæa, 2
Ludwigia, 1
Clarkia, 2
Godetta, 4
Œnothera, 2
Fuchsia, 3
Napa, 1 ... Water chestnut

Passifloreæ.

Passiflora, 12... Passion-flower
Tacsonia, 3
Modecca, 1
Carica, 1 ... Papay ... Parangi

Cucurbitaceæ.

Trichosanthes, 3 Snake gourd Padavalu
Lagenaria, 1 ... Bottle gourd Sore
Luffa, 4
Benincassa, 1
Momordica, 3
Cucumis, 3 ... Melon ... Kekkarike
Cucumber ... Savute
Citrullus, 2 ... Colocynth
Water melon Karbuj
Cephalandra, 1
Cucurbita, 3 ... Gourd ... Kumbala
Bryonia, 1
Mukia, 1
Zehneria, 1
Rhynucarpa, 1
Zanonia, 1

Begoniaceæ.

Begonia, 27

Cactæ.

Opuntia, 5 ... Prickly pear Pápás kattáli
Cochineal plant
Melocactus, 2
Cereus, 9 ... Night-flowering cactus
Echinocactus, 1
Epiphyllum, 2
Pereskia, 1

Ficoideæ.

Trianthema, 3
Orygia, 1
Mollugo, 4
Tetragonia, 1
Mesembryanthemum, 1 Ice plant

Umbelliferæ.

Hydrocotyle, 2 Indian pennywort
Apium, 2 ... Celery, parsley
Carum, 4 ... Caraway
Bishop's ... Omu weed
Pimpinella, 2
Fœniculum, 1
Polyzygus, 1
Anthriscus, 1 Chervil
Pencedanum, 1 Dill
Coriandrum, 1 Coriander ... Kottumbari
Cuminum, 1 ... Cummin seed Jirige
Daucus, 1 ... Carrot ... Gájina gadde
Partinaca, 1 ... Parsnip
Arracacia, 1
Heracleum, 1

Araliaceæ.

Aralia, 8 ... Rice-paper plant
Panax, 9
Heptapleurum, 1
Brassæia, 2
Hedera, 1 ... Ivy

Many varieties of Panax are cultivated in gardens for their foliage.

Cornaceæ.

Alangium, 1 ... ... Ankole
Cornus, 1
Benthamia, 1

Caprifoliaceæ.

Lonicera, 2 ... Woodbine

Rubiaceæ.

Sarcocephalus, 1
Anthocephalus, 1
Adina, 1 ... ... Báchanige
Stephegyne, 1 ... ... Kadaga
Nauclea, 1 ... ... Yettaka
Wendlandia, 2
Hedyotis, 1
Oldenlandia, 3
Mussænda, 1
Webera, 1 ... ... Pápati
Randia, 2 ... ... Mangáre
Gardenia, 4
Knoxia, 1
Canthium, 2 ... ... Káre
Vangueria, 1
Ixora, 7 ... Torch-tree... Gorivi
Pavetta, 1
Coffea, 2 ... Coffee ... Kápi
Morinda, 2
Psychotria, 1
Spermacoce, 1
Rubia, 2 ... Madder
Pentas, 1
Hamelia, 1
Cinchona, 4
Rondeletia, 1
Manettia, 1
Catesbæa, 1
Hoffmania, 1

Dipsaceæ.

Dipsacus, 1 ... Fuller's teazel
Scabiosa, 4

Compositæ.

Centratherum, 1
Vernonia, 5 ... Speedwell
Elephantopus, 1
Adenostemma, 1
Ageratum, 2
Solidago, 1
Eupatorium, 2
Dichrocephala, 1
Grangea, 1
Brachycome, 2
Aster, 3
Callistephus, 1
Erigeron, 1
Conyza, 1
Blumea, 6
Laggera, 1
Pluchea, 2
Sphæranthus, 3 ... Múdugattina soppu
Bodukadale soppu

Often mixed with stored grain to preserve the latter from the attacks of insects.

Filago, 1
Anaphelis, 1
Gnaphalium, 2
Helichrysum, 2 Everlasting
Vicoa, 1
Lagascea, 1

Xanthium, 1
Siegesbeckia, 1
Eclipta, 1 ... ... Garugalu soppu
Blainvillea, 1
Wadelia, 1
Spilanthus, 3... ... ... Muguli
Guizotia, 1 ... Foolish oil-plant ... Huchchellu
Bidens, 1 ... Bur marigold
Achillea, 1 ... Milfoil
Chrysanthemum, 4 ... ... Sevantige
Cotula, 1
Artemisia, 3 ... Wormwood
Gynura, 1
Emilia, 1
Notonia, 1
Seneico, 4 ... ... Kadu gobli
Calendula, 1... Marigold
Echinops, 1
Tricholepis, 2
Centaurea, 4... Cornflower
Carthamus, 1 Safflower ... Kusumba
Dicoma, 1 ... ... Sanni
Cichorium, 2 Succory, Endive
Taraxacum, 1 Dandelion
Lactuca, 2 ... Lettuce
Sonchus, 1 ... Sow thistle
Farfugium, 3
Flauria, 1
Zinnia, 4
Argyranthemum, 1
Cosmos, 1
Cacalia, 1
Gaillardia, 3
Gazania, 1 ... Treasure flower
Helenium, 1
Tagetes, 3 ... African and French marigold
Calliopsis, 4
Bellis, 2 ... Daisy
Cineraria, 1
Sanvitalia, 1
Pyrethrum, 3 Feverfew
Cynara, 1 ... Globe artichoke
Dahlia, 1
Helianthus, 4 Sunflower ... Súrya kánti Jerusalem artichoke
Polymnia, 1
Vittadenia, 1 Australian daisy
Verbesina, 1

Campanulaceæ.

Pratia, 1
Lobelia, 11
Cephalostigma, 2
Wahlenbergia, 1
Sphenoclea, 1
Campanula, 5 ... Harebell
Trachelium, 1 ... Throatwort

Plumbaginaceæ.

Plumbago, 3... Leadwort ... Chitramúla

Primulaceæ.

Primula, 1 ... ... Primrose
Anagallis, 1 ... Pimpernel
Cyclamen, 1 ... Sow bread

Myrsineæ.

Mæsa, 1
Embelia, 1
Ardisia, 4
Jacquinia, 3

Sapotaceæ.

Chrysophyllum, 1 Star-apple
Sideroxylon, 1 ... Iron wood
Bassia, 2 ... Mahwa ... Ippe
Mimusops, 2 ... ... Pagadi
Achras, 1 ... Sapod illa

Ebenaceæ.

Diospyros, 6... Ebony ... Bale

Oleaceæ.

Jasminum, 15 Jasmine ... Mallige
Nycthanthes, 1 ... ... Párijáta
Olea, 2 ... Olive
Ligustrum, 1... Indian privet
Myxopyrum, 1
Noronhia, 1

Salvadoraceæ.

Azima, 1 ... ... Bili uppi

Apocynaceæ.

Carissa, 4 ... ... Korinda
Ranwolfia, 1
Cerbera, 1
Kopsia, 1 ...
Vinca, 3 ... Periwinkle Kási ganagalu
Plumiera, 3 ... Pagoda-tree Deva ganagalu
Alstonia, 2 ... ... Jantala
Holarrhena, 1
Tabernæmontana, 3... ... Nandi batlu

Vallaris, 1 ... ... Bugadi
Wrightia, 2 ... Ivory wood Beppále
Nerium, 3 ... Oleander ... Ganagalu
Beaumontia, 2
Thevetia, 1 ... Exile tree
Allamanda, 4
Ichnocarpus, 1
Roupellia, 1
Dipladenia, 1
Echites, 2
Landolphia, 3
Rhyncospermum, 1
Adenum, 1

Asclepiadaceæ.

Hemidesmus, 1 Bastard sarsaparilla Sugandhi
Cryptolepis, 2
Cryptostegia, 1
Secamone, 1... ... ... Síranige
Oxystelma, 1
Calotropis, 3... Mudar ... Yekke
Asclepias, 1 ... Swallowwort
Dæmia, 1 ... ... Juttuve
Cynanchum, 2.
Sarcostemma, 1 ... ... Hambu kalli
Gymnema, 1
Pergularia, 1
Stephanotis, 1
Tylophora, 4
Hoya, 5 ... Waxflower
Leptadenia, 1
Brachystelma, 1
Ceropegia, 5
Gomphocarpus, 1
Caralluma, 2
Boucerosia, 2

Loganiaceæ.

Mitrasacme, 1
Buddleia, 1
Fagræa, 1
Strychnos, 2... Nux vomica Nanjina koradu

Gentianaceæ.

Exacum, 2
Hoppea, 2
Erythræa, 1
Canscora, 2
Limnanthemum, 2

Polemoniaceæ.

Phlox, 3
Cobæa, 1

Hydrophyllaceæ.

Wigandia, 1
Hydrolea, 1
Nemophila, 1

Borragineæ.

Cordia, 4 .. .. Tapasi
Ehretia, 5
Coldenia, 1
Heliotropium, 3 Heliotrope
Trichodesma, 3
Anchusa, 1 ... Alkanet
Myosotis, 2 ... Forget-me-not
Symphytum, 1 Prickly comfrey
Borago, 1 ... Borage
Cynoglossum, 1

Convolvulaceæ.

Erycibe, 1
Rivea, 2
Argyreia, 6 ... Elephant creeper ... Samudrapála balli
Lettsomia, 2
Ipomæa, 23 ... Moonflower creeper Morning glory
Hewittia, 1
Convolvulus, 5 Scammony
Exogonium, 1 Jalap
Jacquemontia, 1
Evolvulus, 1
Porana, 1
Cuscuta, 1

Solanaceæ.

Solanum, 14... Nightshade Káchi
Brinjal, egg-plant Badane
Potato ... Urala gadde
Cyphomandra, 1
Lycopersicum, 1 Tomato
Physalis, 2 ... Cape gooseberry
Capsicum, 5... Chilli ... Menasu
Withania, 1
Nicandra, 1
Datura, 5 ... Thorn-apple Ummatti
Brugmansia, 1 Trumpet flower
Hyoscyamus, 1 Henbane
Petunia, 3
Habrothamnus, 1
Nicotiana ... Tobacco ... Hoge soppu

Scrophularineæ.

Verbascum, 1 ... Mullein
Celsia, 1.
Linaria, 2 ... ... Toad-flax

Antirrhinum, 1 ... Snap-dragon
Mimulus, 3... ... Monkey flower
Limnophyla, 2
Herpestis, 1
Torenia, 2 ... ... Sispara creeper
Vandellia, 4
Ilysanthes, 2
Veronica, 1... ... Speedwell
Striga, 1
Rhamphicarpa, 1
Sopubia, 2
Maurandia, 3
Penstemon, 5
Angelonia, 2
Browallia, 2
Lophospermum, 1
Collinsia, 2
Calceolaria, 1 ... Slipperwort
Paulownia, 1
Russellia, 2
Brunfelsia, 1
Franciscea, 2
Sanchezia, 2

Calceolaria is not successfully cultivated at Bangalore.

Orobanchaceæ.

Æginetia, 2
Orobanche, 2

Lentibulariaceæ.

Utricularia, 2

Gesneraceæ.

Æschynanthus, 2
Klugia, 1
Gesnera, 6
Achimenes, 3
Gloxinia, 4
Streptocarpus, 1

Bignoniaceæ.

Millingtonia, 1 Indian cork-tree Biratu
Oroxylum, 1
Bignonia, 3 ... Trumpet-flower
Tecoma, 7
Dolichandrone, 1
Spathodea, 1
Heteropluragma, 1
Stereospermum, 4 ... ... Pádar
Amphilophium, 1
Catalpa, 1
Crescentia, 1 Calabash-tree
Kigelia, 1

The *spathodea*, when in flower, is one of the handsomest trees in our parks and gardens.

Pedaliaceæ.

Pedalium, 1
Sesamum, 2 ... Gingelli ... Olle yellu
Martynia, 2

Acanthaceæ.

Thunbergia, 11
Nelsonia, 1
Hygrophila, 2
Calophanes, 1
Ruellia, 3
Phaylopsis, 1
Dædalacanthus, 2
Hemigraphis, 1
Strobilanthes, 8
Blepharis, 2
Acanthus, 1
Barleria, 9
Crossandra, 1
Asystasia, 2
Eranthemum, 10
Andrographis, 2 ... ... Nela vembu
Gymnostachyum, 1
Lepidagathis, 2 ... ... Gantu kálu
Justicia, 8
Adhatoda, 1
Rhinacanthus, 1
Ecbolium, 1
Graptophyllum, 3
Rungia, 2
Dicliptera, 2
Peristrophe, 3
Cyrtanthera, 2
Aphalandra, 1
Meyenia, 2
Fittonia, 2

Verbenaceæ.

Lantana, 2
Lippia, 1 ... ... Kere hippali
Stachyturpheta, 2 Bastard Vervain
Priva, 1 ... ... Sirantu
Verbena, 4
Callicarpa, 1
Tectona, 2 ... Teak-tree ... Tégada mara
Premna, 1 ... ... Nárave
Gmelina, 2 ... ... Kúli
Vitex, 4 ... Chaste-tree Nekkilu

Clerodendron, 13
Holmskioldia, 1
Petrea, 1
Duranta, 2
Aloysia, 1 ... Lemon-scented verbena
Citharexylum, 1

Lantana is very entensively used for hedges.

Labiatæ.

Ocymum, 5 ... Sweet baril Tulasi
Orthosiphon, 2
Plectranthus, 2
Coleus, 4 ... Indian borage ... Dodda patri

Garden varieties of *coleus* are much prized as foliage plants.

Anisochilus, 2
Lavendula, 2 Lavender
Pogostemon, 2 ... Pachche tene
Dysophylla, 1
Perilla, 1
Mentha, 2 ... Peppermint Pudina
Origanum, 2... Marjorum
Thymus, 1 ... Thyme
Hyssopus, 1 ... Hyssop
Melissa, 1 ... Balm
Salvia, 8 ... Sage Karpúra gida
Marrubium, 1 Horehound
Anisomeles, 2 ... Mangamàri
Stachys, 1 ... Woundwort
Leonorus, 1 ... Motherwort
Leucas, 5 ... ... Tumbe
Leonotis, 1
Gomphostemma, 1
Rosmarinus, 1 Rosemary

Plantagineæ.

Plantago, 1 ... ... Sirapotli

Nyctagineæ.

Boerhaavia, 4 ... Hogweed
Pisonia, 1 ... ... Lettuce-tree
Mirabilis, 1 ... Marvel of Peru, Four o'clock plant
Bougainvillea, 3

The last grow and flower profusely at Bangalore.

Amarantaceæ.

Deeringia, 1
Celosia, 3 ... Cockscomb
Allmania, 1
Digera, 1
Amarantus, 12. ... ... Dantu
Pupalia, 2 ... ... Antu purule
Ærua, 3
Achyranthus, 3 ... ... Uttaráni
Alternanthera, 3

Extensively used as edgings for garden paths.

Gomphrena, 2 Globe amaranth
Iresine, 4

Chenopodiaceæ.

Chenopodium, 2 Goosefoot
Beta, 1 ... Beet
Spinacia, 1 ... Spinach ... Basale
Atriplex, 3 ... Orache
Basella, 1 ... ... Báyi Basali

Phytolaccaceæ.

Rivina, 1

Polygonaceæ.

Polygonum, 7 ... ... Síranige soppu
Fagopyrum, 1 Buckwheat
Rheum, 1 ... Rhubarb
Emex, 1
Rumex, 2 ... ... Sukke soppu
Coccoloba, 1
Antigonon, 1

Nepenthaceæ.

Nepenthes, 1... Pitcher plant

Aristolochiaceæ.

Aristolochia, 5

Piperaceæ.

Piper, 6 ... Pepper ... Menasu
Betel leaf ... Vílyad-ele
Peperomia, 4

Myristiceæ.

Myristica, 3 ... Nutmeg-tree Jáji káyi

Lauraceæ.

Cinnamomum, 2 Cinnamon Lavanga patte, Dalchini
Machilus, 1 ... ... Chittu tándri
Alseodaphne, 1
Litsæa, 1
Persea, 1 ... Alligator Pear
Hernandia, 2

Proteaceæ.

Helicia, 1
Macadamia, 1 Australian nut-tree
Grevillea, 2 ... Silver oak
Hakea, 3

Elæagnaceæ.

Elæagnus, 2 ... ... Hejjála

Loranthaceæ.

Loranthus, 4... ... ... Badanike

Old mango-trees in Mysore are much infested by these mistletoes.

Santalaceæ.

Santalum, 1 ... Sandalwood Srígandha

The most valuable tree in Mysore.

Euphorbiaceæ.

Euphorbia, 10 Milk hedge Kalli
Buxus, 1
Bridelia, 1. ... ... Gurige
Phyllanthus ... Gooseberry-... Nelli tree
Glochidion, 1
Flueggia, 1
Breynia, 1 ... ... Súli
Putranjiva, 1
Antiderma, 1
Jatropha, 7 ... Physic-nut
Manihot, 1 ... Ceara rubber Tapioca
Aleurites, 1 ... Belgaum walnut
Croton, 1 ... Croton oil ... Jápála plant

Of so-called garden crotons, which properly belong to the genus *Codiæum*, 122 varieties are named as cultivated at Bangalore.

Givotia, 1
Codiæum, 1
Chrozophora, 1
Acalypha, 7 ... ... Kuppi
Trewia, 1.
Mallotus, 1 ... Kamala dye Kunkumada mara
Ricinus, 2 ... Castor-oil ... Haralu plant
Gelonium, 1
Tragia, 1
Dalechampia, 1
Sapium, 2 ... Tallow-tree
Excoecaria, 1
Baloghia, 1
Poinsettia, 2... Sand box-tree
Hura, 1
Anda, 1
Hevea, 2 ... Para rubber
Xylophylla, 1
Pedilanthus, 2
Synadenium, 1

Urticeæ.

Celtis, 1 ... ... Bendu
Trema, 1 ... Charcoal-tree ... Gorklu
Humulus, 1 ... Hop
Cannibis, 1 ... Hemp ... Bangi soppu

Cultivation prohibited in Mysore.

Streblus, 1 ... ... Mitli
Broussonetia, 1 Paper mulberry
Morus, 5 ... Mulberry Reshme gida, Kambali gida
Dorstenia, 1
Ficus, 25 ... Banyan Alada mara, Goni mara
Pipal Asvatha, arali mara
Basuri mara
Country fig Atti mara

Goni mara (*F. mysorensis*) is the largest species in the Mysore country. Specimens are not unusual with trunk 30 feet circumference, and head 140 feet diameter. The Java fig (*F. Benjamina*) and Moreton Bay chestnut (*F. macrophylla*) are highly ornamental trees.

Artocarpus, 4 Jack-tree ... Halasina mara
Urtica, 1 ... Nilgiri nettle
Fleurya, 1
Girardinia, 1
Pilea, 1
Bœhmeria, 3... Rhea Fibre or Grass-cloth plant
Pouzolzia, 1
Debregeasia, 1

Platanaceæ.

Platanus, 1 ... Oriental plane

Casuarineæ.

Casuarina, 7 ... ... Kesarike

C. equisetifolia is very extensively cultivated as a fuel-tree.

Cupuliferæ.

Quercus, 1 ... Oak

Will hardly grow here

Salicaceæ.

Salix, 2 ... Willow ... Niravanji

Ceratophylleæ.

Ceratophyllum, 1

Gymnospermæ.

Coniferæ.

Cupressus, 7 ... Cypress
Juniperus, 1 ... Juniper
Podocarpus, 2
Dammara, 2 ... New Zealand pine
Pinus, 2 ... ... Cheer pine
Frenela, 2 ... ... Tasmanian pine
Araucaria, 4 ... Pines
Abies, 2 ... ... Spruce
Wellingtonia, 1 ... Mammoth-tree
Cryptomeria, 1
Thuja, 1 ... ... Arbor vitæ
Retinospara, 3

Cycadaceæ.

Cycas, 5
Macrozamia. 1
Encephalartus, 1

Monocotyledons.

Hydrocharideæ.

Hydrilla, 1
Lagarosiphon, 1
Vallisneria, 1
Blyxa, 1
Ottelia, 1

Orchideæ.

Dendrobium, 37
Bulbophyllum, 2
Eria, 3
Phajus, 3
Coelogyne, 7
Pholidota, 2
Calanthe, 2
Arundina, 1
Cymbidium, 3
Eulophia, 1
Cyrtopera, 1
Phalænopsis, 2
Ærides, 5
Vanda, 6
Saccolabium, 6
Vanilla, 2
Cultivated at Bangalore for its fruit.
Pogonia, 1
Habenaria, 1
Cypripedium, 4 ... Lady's slipper
Angræcum, 1
Bletia, 1
Oncidium, 1
A number of orchids are still undetermined.

Scitamineæ.

(Zingiberaceæ.)

Alpinia, 5
Zingiber, 2 ... Ginger ... Sonti
Costus, 2
Kæmpferia, 2 Indian crocus
Hedychium, 4 Garland flower
Curcuma, 4 ... Turmeric ... Arisina gida
Amomum, 1
Elettaria, 2 ... Cardamom Yelakki

(Marantaceæ.)

Maranta, 21
Canna, 10 ... Indian shot

(Musaceæ.)

Musa, 5 ... Plantain ... Bále gida
Of *M. paradisiaca* 15 varieties are named as in local cultivation.
Heliconia, 2
Strelitzia, 1
Ravenala, 1 ... Travellers' tree

Iridaceæ.

Gladiolus, 5 ... Corn flag
Iris, 3 ... ... Fleur-de-lis
Tigridia, 1 ... ... Tiger flower
Pardanthus, 1 ... Leopard flower
Antholyza, 1.

Amaryllideæ.

Crinum, 7
Pancratium, 1
Nerine, 1 ... Guernsey lily
Amaryllis, 5 ... Mexican lily
Eucharis, 2 ... Amazon lily
Zephyranthes, 3 American crocus
Curculigo, 2
Cyrtanthus, 1
Hæmanthus, 3 Blood flower
Doryanthes, 1
Agave, 6 ... American aloe Kattáli
Fourcroya, 4

Bromeliaceæ.

Æchmea, 2
Ananassa, 2 ... Pine apple Ananás
Billbergia, 1
Tillandsia, 2
Pitcairnia, 2
Bromelia, 1

Dioscoreaceæ.

Dioscorea, 8 Yam

Smilaceæ.

Smilax, 3 ... Sarsaparilla

Philesiaceæ.

Lapageria, 2

Liliaceæ.

Lilium, 5 ... Lily

Succeed indifferently at Bangalore.

Gloriosa, 1 ... ... Karadi kannina gida

Agapanthus, 2 African blue lily
Hemerocallis, 1 Day lily
Anthericum, 2 St. Bruno's lily
Tulipa, 2 ... Tulip
Polianthes, 2
Ornithogalum, 1 Star of Bethlehem
Sanseveira, 3 Bow-string hemp Manju
Allium, 5 ... Onion ... Irulli
Garlic ... Bellulli
Asparagus, 4 ... ... Majjige
Aspidistra, 3
Dracæna, 20... Dragon's blood

Very useful for decorative purposes.

Phormium, 2 New Zealand flax
Aloe, 3 ... Hedge aloe
Yucca, 5 ... Adam's needle
Eustrephus, 1

Pontederiaceæ.

Monochoria, 2

Commelynageæ.

Cyanotis, 2
Commelyna, 4
Aneilemma, 1
Nadescantia, 4

Palmaceæ.

Areca, 7 ... Areca-nut ... Adike
Arenga, 1 ... Sugar palm
Borassus, 1 ... Palmyra palm Tále
Caryota, 4 ... Sago palm Bagani
Chamærops, 3
Cocos, 2 ... Cocoa-nut... Tengina mara

Several distinct varieties are cultivated.

Corypha, 2 ... Fan palm
Phœnix, 9 ... Date palm... Karjúra
Toddy palm Ichalu
Sabal, 2 ... Palmetto
Seaforthia, 1
Livistona, 2
Licuala, 2
Calamus, 6 ... Rattan-cane palm
Elæis, 1
Oreodoxa, 1
Kentia, 1
Thrinax, 3
Rhapis, 1 ... Ground rattan
Hyophorbe, 1
Dictyosperma, 1
Dypsis, 1
Wallichia, 1

Alismaceæ.

Sagittaria, 1

Pandanaceæ.

Pandanus, 4 ... Screw pine Gedige

Typhaceæ.

Typha, 2 ... Elephant grass ... Jambu hullu

Aroideæ.

Acorus, 2 ... Sweet flag
Calla, 1 ... Arum lily
Aglaonema, 3
Alocasia, 18
Amorphophallus, 3
Anthurium, 13
Arisæma, 2 ... Snake lily
Arum, 2 ... Lords and ladies
Caladium, 46

Grow to great perfection in Bangalore.

Dieffenbachia, 12
Philodendron, 5
Pothos, 5
Syngonium, 3
Curmeria, 1

Pistiaceæ.

Pistia, 1 ... Water soldier
Lemna, 1 ... Duckweed

Eriocauloneæ.

Eriocaulon, 2

Cyperaceæ.

Cyperus, 18 ... ... Jambu hullu
Timbristylis, 6 ... Sabbasige hullu
Isolepis, 3 ... ... Usumani hullu
Scirpus, 1 Club-rush Hommugali hullu
Courtoisia, 1
Tuirena, 2 ... ... Petlugori hullu
Kyllingia, 1 ... Anantagonde hullu

Gramineæ.

Triticum, 1	Wheat	Godhi
Oryza, 1	Rice	Nellu

There are specimens of 108 varieties in the Bangalore Museum.

Zea, 1	Maize Indian corn	Jola
Euchlæna	Teosinte	
Paspalum, 2		Sanna tapri hullu
Panicum, 21	Little millet	Baragu
	Italian millet	Navane
		Sáme
		Háraka
Pencillaria, 1	Spiked millet	Sajje
Setaria, 4		Korle hullu
Saccharum, 2	Sugar-cane	Kabbu
Andropogon, 5	Lemon grass	Nese hullu
		Lavanchi hullu
		Kási hullu
	Kuskus grass	Ganjalu garika hullu
Sorghum	Great millet	Bili jola
Cymbopogon, 1		Dodda kási hullu
Chrysopogon, 2		
Coix, 1	Job's tears	
Apluda, 1		
Anatherium, 1		
Aristida, 4	Broom grass	Hanchi hullu
Cynodon, 1	Hariáli, or doub grass	Garike hullu

The best Indian grass for making hay.

Chloris, 1		
Microchlon, 1		
Lappago, 1		
Isachne, 1		
Sporobolus, 2	Fox-tail grass	
Oplismenus, 4		
Manisurus, 1		
Batratherum, 1		
Trachys, 1		
Dactyloctenium, 1	Buffalo-head grass	
Leptochloa, 2		
Perotis, 1		
Eragrostis, 11		
Leersia, 1		
Chamæraphis, 1		
Imperata, 1		
Gymnothrix, 1	Nose hullu	
Spodiopogon, 1		
Heteropogon, 1		
Elytrophorus, 1		
Anthisteria, 1		
Hemarthria, 1		
Arundinella, 2		
Eleusine, 2	Rági	Rági

The staple grain of Mysore.

Avena, 1	Oat grass	
Briza, 1	Quaking grass	
Dactylis, 1	Cock's-foot grass	
Lolium, 1	Darnel rye grass	
Heleochloa, 1		Jandu hullu

(Bambusaceæ.)

Dendrocalamus, 1		
Arundinaria, 2		
Bambusa, 5	Bamboo	Bidiru
Beesha, 2	Quill bamboo	

Cryptogams.

Filices.

Acrostichum, 8	
Actinopteris, 1	
Adiantum, 32	Maiden-hair fern
Alsophila, 1	Tree fern
Anemia, 1	
Angiopteris, 1	
Aspidium, 4	Wood fern
Asplenium, 20	Spleenwort
Athyrium, 1	Lady fern
Blechnum, 4	Hard fern
Ceropteris, 1	
Cheilanthus, 3	
Cyrtomium, 2	
Davallia, 5	
Doodia, 1	
Drynaria, 1	
Gleichenia, 1	
Goniopteris, 1	
Gymnogramma, 3	Golden fern Silver fern
Hemionitis, 1	
Hemitalia, 1	
Hypolepis, 1	
Lastrea, 3	
Lindsæa, 1	
Lomaria, 1	
Lygodium 2	Climbing fern

Nephrodium, 17
Nephrolepis, 8
Niphobolus, 1
Onychium, 2
Ophioglossum, 1
Osmunda, 1 ... Royal fern
Pellæa, 2
Pleopeltis, 1
Polybotrya, 1
Polypodium, 12
Pteris, 15
Sagenia, 1
Scolopendrium, 1

Lycopodiaceæ.

Lycopodium, 2 ... Club-moss
Selaginella, 13

Of *grasses* indigenous to Mysore, the following is a descriptive list of those fit for stacking[1] :—

Garike.—A kind of *hariáli*, grows to about 3 feet, a good nourishing grass, grows almost anywhere, but is best in light soil and with moderate moisture (Cynodon dactylon).

Ganjalu Garike.—A kind of *hariáli*, very valuable for all purposes, and said to increase the milk-giving powers of cows; makes very good hay. Grows in light soil with moderate moisture (Andropogon Bladhii).

Hanchi.—A coarse common grass, grows in any sort of place, it runs much to stalk, and is not very nourishing because of the hardness of the stalk; there are two kinds, one coarser than the other (Aristida cærulescens).

Kardá.—(Spear grass.) Good when young, but dries up into sticks in the hot weather; very common all over the country (Andropogon pertusus).

Darbhe.—A rushy kind of grass, grows in swamps and jheels, has a feathery flower, and its seeds fly. It grows to about 4 feet in height. Cattle only eat it when young; it makes indifferent hay (Eragrostis cynosuroides).

Phára or *Máni.*—A very valuable grass, good for every kind of cattle, grows anywhere, but best on black cotton soil; attains the height of about 1 foot, and throws up a long flowering stalk.

Uppála.—A rushy kind of grass in jheels and swamps, height about 4 feet, nourishing and liked by cattle. Makes indifferent hay.

Sunti.—Grows in jheels, paddy fields and swamps, very good grass, makes good hay, reaches about 3 feet in height (Panicum repens).

Node.—A long rushy grass, grows only in damp jungles, acts as a purge on cattle, good for hide-bound beasts.

Solali.—Found in jheels, and grows to about 3 feet, makes indifferent hay. When young it is liked by, and good for, cattle, but its chief value is from the small grasses which are always found growing round the bottom of its stem.

Marahullu.—A good grass, grows to about 3 feet, is of a nourishing nature, requires a good deal of moisture.

The following are not good for stacking; they grow mixed together, *gondyada* or *chenlágam*, *bhímam*, *biduru-yele*, *yenuamatti*, *bili-hullu*, *timmattakam*, *naribála*, *akki-hullu*, *hiré*.

There are also certain plants or herbs which are of great use to cattle; the best of these is called *purtanipuli*, which has seeds like burrs, with a thick-jointed sappy stem; grows along the ground, is very good for milch cattle.

[1] From a memorandum by Colonel Boddam. The botanical name has been added where it could be identified.

CROPS AND CULTIVATION[1]

Cultivated lands are usually classed as dry, *kushki;* wet, *tari;* and garden, *tóṭa* or *bágáyat.* In the first are raised crops which do not require irrigation, *pair-áramba:* the wet crops are those dependent for their growth entirely on irrigation, *nír-áramba:* the products of garden cultivation are fruits or drugs requiring a moist situation with an abundant supply of water. Gardens are of four kinds: *tarkári tóṭa,* vegetable gardens; *tengina* or *aḍike tóṭa,* cocoa-nut or areca-nut plantations; *yele tóṭa,* betel leaf plantations; and *húvina tóṭa,* flower gardens. The agricultural seasons are two, and the produce is called *Kártika fasal* or *Vais'ákha fasal* according to the time of ripening.[2] In the Mysore District the seasons are named *káru* and *hainu.* In parts of the Malnád the former has the name *kóḍu.*

But the farmer's calendar is regulated by the rains that fall under each of the *nakshatras* or lunar asterisms, after which they are called. The following are the names, with the generally corresponding months:—

Nakshatra.	*Lunar Month.*		*Solar Month.*	
As'vini	Chaitra			
Bharani	... ...	April ...	Mesha ...	Aries
Krittika	Vais'ákha			
Rohini	... ...	May ...	Vrishabha	Taurus
Mrigas'ira	Jyeshṭha			
Árdra	... ...	June ...	Mithuna ...	Gemini
Punarvasu	Áshāḍha			
Pushya	... ...	July ...	Karkátaka	Cancer
As'lesha				
Magha	S'rávana			
Pubba	... ...	August ...	Simha ...	Leo
Uttara	Bhádrapada			
Hasta	... ..	September	Kanya ...	Virgo
Chitta	As'vija			
Sváti	... ...	October ...	Tula ...	Libra
Vis'ákha	Kártika			
Anurádha	... ...	November	Vris'chika	Scorpio
Jyeshṭha				
Múla	Márgas'ira			
Púrvāshāḍha ...	... ...	December	Dhanus ...	Sagittarius
Uttarāshāḍha ...	Pushya			
S'ravana	... ...	January ...	Makara ...	Capricornus

[1] Buchanan's full and accurate accounts have been freely used in describing the modes of cultivation.

[2] *Kártika* falls in October—November; *Vais'ákha* in April—May.

Nakshatra.	*Lunar Month.*		*Solar Month.*	
Dhanishṭha... ...	Mágha			
S'atabhisha... ...	... ..	February...	Kumbha ...	Aquarius
Púrvabhádra ...	Phálguna			
Uttarabhádra ...	... ..	March ...	Mína ...	Pisces
Revati				

Bharani rain is considered to prognosticate good seasons throughout the year. This is expressed in the Telugu proverb *Bharani vaste dharani paṇḍudu*—if Bharani come, the earth will bring forth. The rains from Mrigas'ira to As'lesha are the sowing time, for food grains in the earlier part, and horse-gram in the later. Sváti and Vis'ákha rains mark the close of the rainy season. Anurádha to Múla is the reaping time, when only dew falls. At this season the future rains are supposed to be engendered in the womb of the clouds. Sugar-cane is planted in Púrvabhádra and Uttarabhádra.

The absolute dependence of all classes on the *panchánga* or almanac is thus explained by Buchanan:—"Although, in common reckoning, the day begins at sunrise, yet this is by no means the case in the *chandramánam* almanac. Some days last only a few hours, and others continue for almost double the natural length; so that no one, without consulting the Panchángadava or almanac-keeper, knows when he is to perform the ceremonies of religion. What increases the difficulty is, that some days are doubled, and some days altogether omitted, in order to bring some feasts, celebrated on certain days of the month, to happen at a proper time of the moon, and also in order to cut off six superfluous days, which twelve months of thirty days would give more than a year of twelve lunations. Every thirtieth month one intercalary moon is added, in order to remove the difference between the lunar and solar years. As the former is the only one in use, and is varying continually, none of the farmers, without consulting the Panchángadava, knows the season for performing the operations of agriculture. These Panchángadavas are poor ignorant Brahmans, who get almanacs from some one skilled in astronomy. This person marks the days, which correspond with the times in the solar year, that usually produce changes in the weather, and states them to be under the influence of such and such conjunctions of stars, male, female, and neuter; and everyone knows the tendency of these conjunctions to produce certain changes in the weather."

The following is a list of the most generally cultivated productions of the soil :—

Dry Crops.

Cereals.

Eleusine corocana, *Gærtn.* ...	Rági	Rági.
Panicum frumentaceum, *Roxb.* ...	Little millet	Sáme, sáve.

Panicum italicum, *Linn.*	Italian millet ...	Navaṇe.
,, miliaceum, *Linn.* ...	Common millet	Baragu.
,, semiverticillatum ...	... ...	Háraka.
Pennisetum typhoideum, *Rich.* ...	Spiked millet	Sajje.
Sorghum vulgare, *Pers.*	Great millet ...	Joḷa.
	Pulses.	
Cajanus indicus, *Spreng.*	Pigeon pea, doll	Togari, tovari.
Cicer arietinum, *Linn.*	Bengal gram, chick pea	Kaḍale.
Dolichos biflorus, *Linn.*	Horse gram, kulti ...	Huraḷi.
,, lablab, *Linn.*	Cow gram	Avare.
Lens esculenta, *Mænch.*	Lentil	Channangi.
Phaseolus mungo, *Linn.*	Green gram	Hesaru.
,, ,, var. radiatus, *Linn.*	Black gram	Uddu.
Vigna catiang, *Endl.*	... ...	Alsandi, taḍugaṇi.
	Oil seeds.	
Guizotia abyssinica, *Cass.* ...	Foolish oil plant ...	Huchchelḷu, rámtil.
Ricinus communis, *Linn.* ...	Castor oil	Haraḷu.
	Wild ,, ...	Káḍ-, doḍ-, or mara-haraḷu.
Sesamum indicum, *D.C.*	Gingelli, sesame ...	Woḷḷelḷu, achchelḷu.
	Miscellaneous.	
Brassica nigra, *Koch.*	Mustard	Sásive.
Crotolarea juncea, *Linn.* ...	Indian hemp	Saṇabu.
Gossypium herbaceum, *Linn.* ...	Cotton	Araḷe.
Hibiscus cannabinus, *Linn.* ...	Dekhan hemp	Puṇḍi.
Nicotiana tabacum, *Linn.* ...	Tobacco	Hoge soppu.
	Wet Crops.	
Oryza sativa, *Linn.* ...	Rice	Bhatta, nellu.
Saccharum officinarum, *Linn.* ...	Sugar-cane	Kabbu.
	Garden Crops.	
Allium cepa, *Linn.*	Onion	Níruḷḷi.
,, sativum, *Linn.*	Garlic	Beḷḷuḷḷi.
Arachis hypogæa, *Linn.*	Ground-nut	... Kaḷḷekáyi, nela kaḍale.
Capsicum annuum, *Linn.* ...	Chilly	Meṇsina káyi.
Carum copticum, *Benth.*	Bishop's weed	Oma.
Carthamus tinctorius, *Linn.* ...	Safflower	Kusumba.
Coriandrum sativum, *Linn.* ...	Coriander	Kottambari.
Cuminum cyminum, *Linn.* ...	Cummin seed	Jírige.
Curcuma longa, *Roxb.*	Turmeric	Arisina.
Trigonella fœnum græcum, *Linn.*	Fenugreek ...	Mentya.
Zingiber officinale, *Rosc.*	Ginger	Sunṭi.
	Miscellaneous.	
Areca catechu, *Linn.*	Areca-nut	Aḍike.
Cocos nucifera, *Linn.*	Cocoa-nut	... Tengina káyi.
Coffea arabica, *Linn.*	Coffee ...	... Búndu, kápi.
Elettaria cardamomum, *Maton.* ...	Cardamom	Yélakki.
Morus indica, *Linn.*	Mulberry	Uppu nerle, kambaḷi giḍa.
Musa sapientum, *Linn.*	Plantain	Báḷe.

Piper betle, *Linn.*	Betel vine	Víḷed-ele.
,, nigrum, *Linn.*	Black pepper	Meṇasu.
Triticum sativum, *Lamk.* ...	Wheat	Gódhi.

The total area taken up for cultivation in 1891–2 is stated at 5,685,160 acres, of which 4,601,729, or 80·9 per cent., were for dry cultivation; 697,419, or 12·2 per cent., for wet cultivation; 234,955, or 4·1 per cent., for garden cultivation; and 148,834, or 2·6 per cent., for coffee. The approximate area actually under crops from 1870, so far as figures are available from the Annual Reports, may be gathered from the following statement, expressed in millions of acres:—

1870 ... 5·15	1876 ... 5·53	1882 ... 4·51	1887 ... 5·24
1871 ... 4·91	1877 ... 4·38	1883 ... 4·65	1888 ... 5·28
1872 ... 5·26	1878 ... 4·39	1884 ... 4·47	1889 ... 5·53
1873 ... 5·20	1879 ... 3·99	1885 ... 4·88	1890 ... 5·60
1874 ... 5·22	1880 ... 4·28	1886 ... 5·10	1891 ... 5·68
1875 ... 5·02	1881 ... 4·35		

In 1865 the acreage seems to have been 3·14 millions, so that cultivation has increased 80 per cent. in twenty-seven years since. But part of the increase may, no doubt, be attributed to more accurate measurement, resulting from the progress of the Revenue Survey. In the first series the highest point was reached apparently in 1876, just before the great famine; but the crops of that year perished, and it was thirteen years before cultivation spread to the same extent again. Adopting intervals of five years, the percentage of approximate acres returned as under various crops was as follows:—

	Crops.	1871.	1876.	1881.	1886.	1891.
Dry ...	Rági	66·04	84·	75·11	73·4	45·9
	Other Food Grains ...					28·6
	Oil Seeds	2·1	2·2	3·06	4·5	4·1
	Cotton	·78	·09	—	·87	·71
	Tobacco	·4	·21	—	·92	·2
	Wheat	·25	·1	·4	·36	·06
Wet ...	Rice	24·5	8·	12·73	13·3	12·7
	Sugar-cane	·45	·2	—	·72	·62
	Mulberry	·28	·2	—	·2	·24
Garden	Cocoa-nut and Areca-nut	— 1·	2·3	3·1	2·7	2·8
	Vegetables	1·9	·5	—	·66	1·1
	Coffee	2·3	2·1	3·2	2·1	2·6

The most important fluctuation exhibited by these figures is an apparent relinquishment of rice cultivation in favour of the cultivation of rági and associated food grains, and of oil seeds. This movement, which took place in the years 1871 to 1873, is not specially noticed in the Reports. But it appears to have been coincident with a change of policy whereby the control of irrigation channels and tanks was transferred from the Revenue officers to the Public Works Department, with the view of their being systematically repaired, the necessity for which had long been recognized, and brought up to a good standard of safety. The former frequent waste of water was now checked, and steps were taken to enforce the responsibilities of the cultivators in regard to the maintenance of the restored irrigation tanks. Moreover, as the new Revenue Survey approached the rice districts, it was now realized that all occupied lands were liable to pay the assessment, whether cultivated or not. Hence perhaps a reduction in the area of wet cultivation which the statistics disclose, the actual area under rice having dropped from 1·32 million acres before 1871 to little over half a million in the subsequent year. Another explanation may be found in the following statement from the Report for 1871–2:—"The fall in the value of produce has been attended by considerable relinquishments of land, chiefly on the part of speculators, who appear to have taken up land wherever it could be obtained during the period of high prices, and who, doubtless, in many instances have found it no longer worth retaining."

The following figures, taken from the returns for 1891–2, are instructive as showing the Districts in which the cultivation of particular products is most extensive. Mysore and Bangalore grow the most rági, followed by Túmkúr, Hassan, and Kolar, in this order. Chitaldroog and Mysore have the largest area under other dry grains and oil seeds. Chitaldroog is pre-eminently the cotton district, and also takes the principal lead in the limited area under wheat. Mysore produces the most tobacco. Shimoga is the chief rice district, the cultivation being to a great extent dependent on the rains alone: Mysore follows, with its splendid system of irrigation channels: Kadur and Hassan come next, partaking of the character of both. Shimoga, Kolar, and Hassan are the principal sugar-cane districts. Mulberry cultivation, for the nourishment of silkworms, is confined entirely to Mysore and the eastern districts. Túmkúr stands first in cocoa-nut and areca-nut gardens, especially the former, followed by Hassan, Mysore and Shimoga, which last excels in areca-nut. Kolar cultivates the largest extent of vegetables, while Bangalore and Túmkúr come next, a good way after. Kadur and Hassan are almost exclusively the coffee districts.

District.	Number of Acres Cultivated with—											
	Rági.	Other Food Grains.	Oil Seeds.	Cotton.	Tobacco.	Wheat.	Rice.	Sugar-cane.	Mulberry.	Cocoa-nut and Areca-nut.	Vege-tables.	Coffee.
Bangalore ...	449,986	23,440	10,944	—	1,235	2	42,062	2,169	3,616	8,183	11,514	—
Kolar ...	256,009	66,947	11,508	—	826	69	40,476	7,492	1,751	1,709	27,032	15
Túmkúr ...	308,427	175,187	28,308	4.188	1,541	43	28,805	961	1,316	38,725	7,048	—
Mysore ...	538,178	359,914	60,385	1,216	5,179	32	107,860	4,809	5,564	22,666	2,615	—
Hassan ...	294,494	76,747	33,797	166	1,551	67	93,215	7,043		24,791	2,905	51,935
Shimoga ...	161,504	155,937	10,999	1,633	489	525	199,705	7,920	—	21,375	2,398	707
Kadur ...	115,364	89,551	11,701	976	530	692	96,339	765	—	18,582	267	77,383
Chitaldroog	176,461	485,756	39,702	27,755	1,060	1,589	26,656	774	—	5,850	3,960	—
Total ...	2,300,425	1,433,479	207,344	35,934	12,411	3,019	635,118	31,933	12,247	141,881	57,739	130,040

Rági—(the *marwa* or *mandwa* of northern India) is by far the most important of any crop raised on dry fields and supplies all the lower ranks with their common diet. It is reckoned the most wholesome and invigorating food for labouring people.[1] Three kinds are distinguished of it, which, however, are only varieties; the *kari* or black, *kempu* or red, and *hullupare*. All are equally productive, but the third when nearly ripe is very apt to shake the seed. In some places all three are sown intermixed in the same field, but in others more attention is paid to the quality of the grain. The black is considered in some parts to be simply grain that has got wet when it is threshing.

The principal varieties in the eastern districts are the *giḍḍa rági* and *doḍḍa rági*. The former ripens in four months, and the latter in four and a half; and the latter is esteemed both the best in quality, and the most productive; but when the rain sets in late, as it requires less time to ripen, the giḍḍa is preferable. In the Mysore District the giḍḍa rági is called *kár rági*, and somewhat different. There are three kinds of *kár rági*: the *balaga*, or straight-spiked rági, which is always sown separately from the others; the *bili modgala*, or white rági with incurved spikes; and the *kari modgala*, or incurved black rági: the two latter are sometimes kept separate, and sometimes sown intermixed. The cultivation for all the three is quite the same and the value of the different kinds is equal; but the produce of the *kari modgala* is rather the greatest.

"The whole world," says Wilks, "does not, perhaps, exhibit a cleaner system of husbandry than that of the cultivation of rági in the home fields of Mysore. On the first shower of rain after harvest the home fields are again turned up with the plough,[2] and this operation, as showers occur, is repeated six successive times during the dry season, at once destroying the weeds and opening the ground to the influence

[1] The following is the composition of rági grain according to Professor Church in *Food Grains of India*:—

	In 100 parts Husked	Whole	In 1 lb.
Water	13·2 ...	12·5 ...	2 oz 0 grains
Albuminoids ...	7·3 ...	5·9 ...	0 ,, 413 ,,
Starch	73·2 ...	74·6 ...	11 ,, 409 ,,
Oil	1·5 ...	0·8 ...	0 ,, 56 ,,
Fibre	2·5 ...	3·6 ...	0 ,, 252 ,,
Ash	2·3 ...	2·6 ...	0 ,, 182 ,,

The nutrient ratio is here 1:13, the nutrient value 84. The percentage of phosphoric acid in the whole grain is about 0·4.

[2] This is the practice in the Mysore District, but in the eastern districts the fields are left untouched after harvest, with the stubble standing, until the early rains of the following spring.

of the sun, the decomposition of water and air, and the formation of new compounds. The manure of the village, which is carefully and skilfully prepared, is then spread out on the land, and incorporated with it by a seventh ploughing, and a harrowing with an instrument nearly resembling a large rake, drawn by oxen and guided by a boy: when the field is completely pulverized, a drill plough, of admirable and simple contrivance, performs the operation of sowing twelve rows at once by means of twelve hollow bamboos at the lower end, piercing a transverse beam at equal intervals and united at the top in a wooden bowl, which receives the seed and feeds the twelve drills: a pole at right angles with this beam (introduced between two oxen) is connected with the yoke; the bamboos project below about three inches beyond the transverse beam, being jointed at their insertion for the purpose of giving a true direction to the projecting parts, which being cut diagonally at the end, serve, when the machine is put in motion, at once to make the little furrow and introduce the seed: a flat board, placed edgewise and annexed to the machine, closes the process; levelling the furrows and covering the seed. If the crop threatens to be too early or too luxuriant, it is fed down with sheep. Two operations of a weeding plough of very simple construction, at proper intervals of time, loosens the earth about the roots and destroys the weeds; and afterwards during the growth of the crop, at least three hand weedings are applied. This laborious process rewards the husbandman in good seasons with a crop of eighty fold from the best land. The period between seed-time and harvest is five months. There is another kind of rági which requires but three months. It is sown at a different season in worse ground, and requires different treatment."

In some parts, as near Seringapatam, the ground having been prepared in the same way, the rági is sown broad-cast, and covered by the plough. The field is then smoothed with the *halive*, which is a harrow or rather a large rake drawn by two bullocks. Then, if sheep are to be had, a flock of them is repeatedly driven over the field, which is supposed to enable it to retain the moisture; and for this purpose bullocks are used when sheep cannot be procured. Next day single furrows are drawn throughout the field at the relative distance of six feet. In these are dropped the seeds of either *avare* or *tovari*, which are never cultivated by themselves; nor is *rági* ever cultivated without being mixed with drills of these leguminous plants. The seed of the avare or tovari is covered by the foot of the person who drops it into the furrow. Fifteen days afterwards the *kunte* or bullock-hoe is drawn all over the field, which destroys every young plant that it touches, and brings the remainder into regular rows. On the thirty-fifth day the

kunte is drawn again, at right angles to its former direction. On the forty-fifth day it is sometimes drawn again; but when the two former ones have sufficiently thinned the young corn, the third hoeing is not necessary. At the end of the second month, the weeds should be removed by the small iron instrument called *ujari*. According to the quantity of rain, the rági ripens in from three to four months. The avare and tovari do not ripen till the seventh month. The reason of sowing these plants along with the rági seems to be that the rains frequently fail, and then the ragi dies altogether, or at least the crop is very scanty; but in that case the leguminous plants resist the drought and are ripened by the dews, which are strong in autumn. When the rági succeeds, the leguminous plants are oppressed by it and produce only a small return; but when the rági fails, they spread wonderfully and give a very considerable return.

In other places, as in Kolar, where the seed is sown by the drill-plough, *kúrige*; behind the kúrige is tied the implement called *sudike*, into which is put the seed of the avare or tovari; by this method, for every twelve drills of rági there is one drill of pulse. After the field has been sown, it is harrowed with the bullock-rake called *halive*, and then smoothed with a bunch of thorns, which is drawn by a bullock and pressed down by a large stone. Here sheep are only used to trample the rági fields when there is a scarcity of rain. The bullock-hoe called *kunte* is used on the fifteenth and eighteenth days after sowing. On the twenty-sixth day the harrowing is repeated. On the thirty-second the field is cleared from weeds with the implement called *oravari*. In four months the rági ripens and in five the pulses.

In the west, about Periyapatna, in very rich soils, nothing is put in drills along with rági; but immediately after that grain has been cut, a second crop of *kaḍale* is sown, which does not injure the ground. Sometimes a second crop of *sáme* or of *huchchellu* is taken; but these exhaust the soil much. When rain does not come at the proper season, the rági fields are sown with *huraḷi*, *kaḍale*, *huchchellu*, or *kari-sáme*. The two leguminous plants do not injure the soil; but the huchchellu and sáme render the succeeding crop of rági very poor.

In Shimoga the rági seed, mixed with dung, is placed very thin with the hand in furrows drawn at the distance of about seven inches throughout the field, a small quantity being dropped at about every ten inches. In every seventh furrow are put the seeds of *avare*, *tovari*, and *pundi* intermixed, or of *uddu* by itself.

Rági is reaped by the sickle, and the straw is cut within four inches of the ground. For three days the handfuls are left on the field; and then, without being bound up in sheaves, are stacked, and the whole is

well thatched. At any convenient time within three months it is opened, dried two days in the sun, and then trodden out by oxen. The seed, having been thoroughly dried in the sun, is preserved in straw *múḍe*. The remainder is put into pits, or *hagevu*; where, if care has been taken to dig the pit in dry soil, it will keep in perfect preservation for ten years.

Rági is always ground into flour, as wanted, by means of a hand-mill called *bísa-gallu*. In this operation it loses nothing by measure. The flour is dressed in various ways. The most common are, a kind of pudding called *hiṭṭu*, and two kinds of cakes called *roṭṭi* and *dóshe*, both of which are fried in oil. For all kinds of cattle, the rági straw is reckoned superior to that of rice.[1]

[1] The following is an estimate by Dr. Forbes Watson of the food-value of rági and other Indian grains, taken from Mr. Elliot's book (*Experiences of a Planter*).

"The position of rági as food, when compared with some of the other Indian cereals, appears from the following table:—

Name of the Grain	Wheat	Bajree (*Penicillaria spicata*)	Jowaree (*Sorghum vulgare*)	Rice (*Oryza sativa*)	Rági (*Eleusine corocana*)
Number of analyzed samples	9	3	2	9	7
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Moisture	12·00	12·00	12·00	12·00	12·00
Nitrogenous matter					
Gluten, albumen, &c. ...	13·42	10·27	9·38	7·40	6·53
Cellulose or woody fibre	2·69	1·49	2·23	·39	3 36
Carbonous matter					
Starch, gum, &c. ...	68·81	71·01	72·68	78·97	74·44
Fat or oil	1·15	3·27	2·04	·57	1·17
Oxide of iron	·019	·026	·018	·008	064
Potassa	·214	·405	·207	·066	·534
Soda	·392	·132	·135	·082	·019
Lime	·068	·064	·094	·026	·617
Magnesia	·241	·239	·260	·103	·163
Chlorine	·059	·058	·016	·016	·048
Phosphoric acid ...	·817	·678	·856	·287	·595
Sulphuric acid	·154	·105	·108	·080	·110
Silica	·029	·375	·088	·092	·334

The order according to which these cereals are arranged is determined by the amount of nitrogenous matter they contain. Wheat stands pre-eminent, followed by bajree and jowaree [or sajje and jola], whilst rice and rági occupy the lowest position. It will be observed that, in order to avoid the perturbations in the natural order which may arise from a varying amount of moisture in the grains, all the analyses have been reduced to a common moisture of twelve per cent., which is that to which all grains more or less approach. The numbers inserted in the table are, therefore, true comparative numbers.

The rágis grown at different places seem to show almost a greater latitude in composition than most of the other grains. Among the seven samples analyzed the amount of nitrogenous matter varies between 5·49 and 9·24 per cent., so that, although

Tôṭa or *ṇâṭ ṛági* is not the same with that cultivated on dry grounds, although in the sense adopted by botanists it is not specifically different; but the seed which is raised on dry fields will not thrive in gardens; nor will that which is raised in gardens thrive without irrigation. Garden rági is always transplanted, and hence it is called *náṭi*. The following is the process followed in the Kolar District. For the seedling bed, dig the ground in Pushya (Dec.—Jan.) and give it a little dung. Divide it into squares, and let it have some more manure. Then sow the seed very thick; cover it with dung, and give it water, which must be repeated once in three days. The ground into which it is to be transplanted, is in Pushya ploughed five times, and must be dunged and divided into squares with proper channels. About the beginning of Mágha, or end of January, water the seedlings well, and pull them up by the roots: tie them in bundles, and put them in water. Then reduce to mud the ground into which they are to be transplanted, and place the young rági in it, with four inches distance between each plant. Next day water, and every third day for a month this must be repeated. Then weed with a small

the average is inferior to the rice, there are samples which may be richer in nitrogen than most of the rices. Still, this is only one aspect of the question. The amount of nitrogen is too often looked upon as the only exponent of the nutritive value. This is a very circumscribed view of the extremely complicated and many-sided problem of nutrition. Each of the normal components of the human body can become of paramount importance under certain conditions. The oxide of iron in the ash of the grains amounts only to some tenths of a per cent.; but still the regular supply even of this small quantity is essential for the proper performance of the vital functions, as it is indispensable in the formation of the blood-corpuscles. A dearth of iron would, therefore, be just as fatal as a want of the nitrogenous, or carbonous, or other principal constituent of food. In judging, therefore, of the relative value of an article of food, the amounts of nitrogen and carbon cannot be relied on as the sole guide. The mineral constituents must be taken into account. At the time when I published my first analyses of rági, these extended only to the organic compounds of the grain, and the position which I then assigned to it—guided only by the percentage of nitrogen—has been borne out by the subsequent analyses. Since then, however, a detailed examination of the ash has been made, which yielded some remarkable conclusions. The rági seems to be uncommonly rich in certain important mineral constituents. The amount of phosphoric acid in rági is only lower by one-fourth than that in wheat, and it is more than twice as high as in rice. It contains eight times as much iron, and eight times as much potassa as rice, and, indeed, more of potassa than any of the other grains. It is, likewise, exceptionally rich in lime. The ash, composed, as it chiefly is, of the most important elements, amounts on the average to 2½ per cent. in rági, as compared with 0·760 per cent. contained in rice. It is therefore possible, if not indeed probable, that the large amount and favourable composition of the rági ash may more than counterbalance its inferiority in nitrogen, so that although, according to the nutritive standard hitherto in use, it must be put below rice, rági may still be, on the whole, a food satisfying by itself more completely the numerous exigencies of an article of human diet than rice."

hoe, and water once in four days. It ripens in three months from the time when the seed was sown; and in a middling crop produces twenty fold. It is only sown on the ground at times when no other crop could be procured, as the expense of cultivation nearly equals the value of the crop. Another kind of nát rági cultivated in Sira as a Vais'ákha crop is called *tripati.*

Avare—is never cultivated alone, but always with rági, as described above. When ripe, the legumes are nearly dry. The plant having been cut and for one day exposed to the sun, is beaten with a stick to separate the seed. That which is designed for seed is preserved in *múḍes*; while that for consumption is kept in pots, and is used in curries. The straw is eaten by all kinds of cattle except horses.[1]

Togari (or **Tovari**)—is also cultivated only with rági, as described above. It is cut when almost dry, then put up in heaps, and on the day after it is opened to dry in the sun. The grain is beaten out with a stick; and that intended for sowing must be preserved in a straw *múḍe*. It is used in curry. After the seed has been threshed, cattle eat the husks of the legume. The straw is used for fuel. A larger variety, called *turuka togari*, is produced by garden cultivation.[2]

The best soil for the cultivation of these three articles is the black soil, or *ere bhúmi*; which yields a crop of rági every year, and even without manure will give a considerable return; but when it can be procured, dung is always given. After a crop of *jóḷa*, rági does not thrive; but jóḷa succeeds after a crop of rági. The next best soil for rági, and the one most commonly used, is the *kebbe* or red soil. In this also it is sometimes cultivated without dung; but it requires to be manured at least once in two or three years. In *maraḷu*, or sandy, and *dare* soils, it every year requires dung.

Jola—next to rági is the most considerable dry crop. In the south it is often sown for fodder; for, when the crop is not uncommonly good,

[1] The following is Professor Church's analysis of avare beans :—

	In 100 parts		In 1 lb	
	Husked	With husk	oz	grs
Water	12·1 ...	12·1 ...	1	410
Albuminoids	24·4 ...	22·4 ...	3	255
Starch	57·8 ...	54·2 ...	8	294
Oil	1·5 ...	1·4 ...	0	98
Fibre	1·2 ...	6·5 ...	1	17
Ash	3·0 ...	3·4 ...	0	238

The nutrient ratio deduced is 1 : 2·5 ; the nutrient value 80.

[2] According to the same authority 1 lb of the pea would contain 1 oz 361 grains of water, 3 oz 208 grains of albuminoids, and 9 oz 11 grains of starch. The nutrient ratio would be about 1 : 3 ; the nutrient value 80.

the grain is no object. It is cut and given to the cattle at a time when rági straw is not to be procured. Previously to being given to cattle, however, it must be dried, as the green straw is found to be very pernicious. There are two kinds of *jóḷa*; the white (*bili*) and red (*kempu*). When they are intended to be cut for the grain, these are sown separately; as the red kind ripens in three months, while four are required to ripen the white jóḷa. A red rági soil is preferred for it, and crops of rági and jóḷa are generally taken alternately, the crop of rági having an extraordinary allowance of dung. The jóḷa requires less rain than the rági, and admits of a second crop of *hurali* being taken after it; and thus, in the course of two years, there are on the same ground three crops.

The jóḷa is both made into flour for puddings and cakes, and is boiled whole to eat with curry, like rice. It is a good grain; but at the utmost does not keep above two years.

The *jóḷa* that is cultivated on dry field in Madgiri is of three kinds: *agara*, *kempu*, and *hasaru*. They are all, probably, mere varieties. The best soil for them is a black clay; and the next, the same mixed with sand. For rági these soils are of a poor quality; but on the same dry field jóḷa and rági may be alternately cultivated without injuring either. In Vais'ákha, or the second month after the vernal equinox, plough four times. After the next rain sow the seed. It is sown either broad-cast or by dropping it in the furrow after the plough. Smooth the field by drawing a plank over it. It requires neither weeding nor manure. For fodder its straw is inferior to that of rági, but superior to that of rice. *Agara* jóḷa ripens in $4\frac{1}{2}$ months, *kempu* and *hasaru* in four months. Their produce is rather less in the order they are mentioned.

Towards Harihar the jóḷa crop is always accompanied by one or more of the following articles: *avare*, *togari*, *hasaru*, *madiki*, *hurali*, and *alasandi*. These being intended chiefly for family use, a portion of each is wanted, and every man puts in his jóḷa field a drill or two of each kind. Jóḷa thrives on black clay, but is also sown on the red earth, and even sometimes on the stony soil. In Chaitra the field is hoed with a *heg-kunte*, which requires from six to eight oxen to draw it; for this is the month following the vernal equinox, when the soil is very dry and hard. In the following month the field is ploughed once, and then manured. In the month preceding the summer solstice, the seed is sown after a rain by means of the drill; while the rows of the accompanying grains are put in by means of the *sudike*, which is tied to the drill. The field is then smoothed with the *bólu kunte*, a hoe drawn by oxen, of lighter make than the *heg-kunte*. On the twentieth

day the field is weeded with the *ede kunte*, and on the twenty-eighth day this is repeated. In five months the jóḷa ripens, without further trouble.[1]

In the north of the Túmkúr District a few fields of watered land are entirely allotted for the cultivation of *bili jóḷa*. The soil of these is a rich black mould, but does not require much water. Only one crop a year is taken. The produce is great, not only as an immense increase on the seed sown, but as affording a great deal of food. The following is the mode of cultivation :—Begin to plough in Vais'ákha and in the course of seven months plough eight or nine times. Then manure with dung, mud from the bottom of tanks, and leaves of the *honge*; and if there be no rain, water the field before sowing. Previous to being planted, the seed must have been soaked in water. A man then draws furrows with a plough, and another places the seed in the furrows at the distance of four or five inches. By the next furrow it is covered. The field is then smoothed by drawing over it a plank, on one end of which a man stands, and by this means that forms a low ridge. Thus throughout the field, at the distance of six feet, which is the length of the plank, parallel rows of ridges are produced. The intermediate spaces are divided into oblong plots by forming with the hand ridges which at every eight or twelve cubits distance cross the others at right angles. At the same time the areas of the plots are exactly levelled. The waterings, after the first month, must be given once in twelve or fourteen days. In some villages the farmers weed the *jóḷa* when it is six weeks old; in others they do not take this trouble. Some people around every field of *jóḷa* plant a row of *kusumba* seeds, and the prickly nature of that plant keeps away cattle.

Bili jóḷa is sometimes sown in place of the Vais'ákha crop of rice. This must be followed by a Karttika crop of rági, as after it the produce of rice would be very small. The jóḷa also thrives best after a Karttika crop of rági. *Agara jóḷa* is also sometimes seen in place of the Vais'ákha crop on rice ground. It ripens in four months.

Save.—There are three kinds of *sáve* cultivated in the east: *hari*,

[1] The nutrient ratio of *jóḷa* is given by Professor Church as 1 : 8¼, and the nutrient value as 86. It contains, he tells us, ·86 per cent. of phosphoric acid and ·21 per cent. of potash. The following is his analysis of the grain :—

	In 100 parts	In 1 lb
Water	12·5 ...	2 oz 0 gr
Albuminoids	9·3 ...	1 ,, 214 ,,
Starch	72·3 ...	11 ,, 248 ,,
Oil	2·0 ...	0 ,, 140 ,,
Fibre	2·2 ...	0 ,, 154 ,,
Ash	1·7 ...	0 ,, 119 ,,

kari, and *hál* or *bili*. They are never intermixed, and the cultivation of the first kind differs from that of the other two. For *hari sáve* plough three times in the same manner as for rági. If there be any to spare, give the field dung, sow broad-cast, and harrow with the bullock-rake. In three months the grain ripens without farther trouble; when it is cut down, stacked on the field for six days, and then trodden out. It keeps best in the store-house, and is never made into flour. Cattle eat the straw without injury, but it is inferior to the straw of either rági or rice. For the other two kinds, plough three times in the course of Ashádha (June—July); then, after the first good rain, sow broad-cast, plough in the seed, and harrow. They do not necessarily require dung; but if any can be spared, they will grow the better for it. When ripe, which happens also in three months, they are managed as the other kind is. The seed and produce of all are nearly the same.

In Madgiri the best soil for sáme is considered to be the red or ash-coloured, containing a good deal of sand, which is common on high places. Without much manure, this ground does not bear constant cropping. After resting a year or more, it is first cultivated for *hurali* and next season for sáme. If manure can be procured, a crop of rági is taken, and then it has another fallow. Dung being a scarce article, in place of the rági a second crop of sáme is taken; but it is a bad one. If the fallow has been long, and high bushes have grown up, after burning these, the crop of hurali will be great, and two or three good crops of sáme will follow. When good rági soil has for a year or more been waste, and is to be brought again into cultivation, the first crop ought to be sáme; for rági thrives very ill on land that is not constantly cultivated. In this case, the sáme gives a great quantity of straw, but little grain. When the rains have failed, so that the rági has not been sown, or when, in consequence of drought, it has died, should the end of the season be favourable, a crop of sáme is taken from the fields that are usually cultivated with rági. This crop also runs to straw, and the following crop of rági requires more dung than usual. In the course of thirty days, any time between the middle of April and middle of July, plough three or four times. Then after a good rain, or one which makes the water run on the surface of the ground, harrow with the rake drawn by oxen, and sow the sáme seed with the drill, putting in with the *sudike* rows of the pulses called *hurali* or *togari*. In four months, without farther trouble, it ripens.

The sáme in Sira is of three kinds: *bili*, *kari*, and *maliga* or *mujika*. The cultivation for the three kinds is the same, but the seeds are always kept separate. The soil that agrees with them is the *maralu*, and *dare*, or poor sandy and stony lands. This soil, if it were dunged, would

every year produce a crop of sáme; but, as that can seldom be spared, the sáme is always succeeded by a crop of hurali, which restores the ground; and alternate crops of these grains may be continued, without any fallow, or without injury to the soil. *Biḷi sáme* ripens in $3\frac{1}{2}$ and *kari* in four months; the *maliga* requires only three months, and is therefore preferred when the rains begin late; but it gives little straw, and therefore in favourable seasons the others are more eligible. Sáme straw is here reckoned better fodder than that of rice; and, when mixed with the husks of hurali or togari, is preferred even to that of rági. Except in case of necessity, jóḷa straw is never used.

Sáve in the south is never sown on the *ere* or black clay, and rarely on the *kebbe*, or red soil; the two worst qualities of land being considered as sufficiently good for such a crop. In the spring the field is ploughed five times. At the commencement of the heavy rains it is sown broad-cast, and the seed is covered by a ploughing. Even in the worst soil, there is no absolute necessity for dung; but when any can be spared, the crop will doubtless be benefited by manure. It ripens without further care in three months, is cut close to the ground, and gathered into stacks. Five or six days afterwards it is spread on a threshing-floor, and the grain is trampled out by oxen. That intended for sowing is dried in the sun, and tied up in straw *múdes*. The remainder is preserved in *kanajas*. It is sometimes boiled whole, like rice; at others, ground into flour for cakes. All kinds of cattle eat the straw, which is also esteemed the best for stuffing pack-saddles.[1]

Navane.—There are two varieties cultivated in the Mysore District; the one called *giḍḍa*, or short; and the other *jótu*, or long; and *doḍḍa*, or great. Unless a quantity of dung can be spared, it is never sown on the two worst soils. On the two best soils it requires no manure, and does not injure the succeeding crop of rági. In the spring, plough six times. When the heavy rains commence, sow, and plough in the seed. It requires neither weeding nor hoeing, and ripens in three months. Cut it close to the ground, and stack it for eight days; then spread it to the sun for a day, and on the next tread out the grain with oxen. The seed for sowing must be well dried in the sun, and preserved in a *múde*. The remainder is kept in a *kanaja*. It is made into flour for hiṭṭu or pudding, and is also frequently boiled whole, like rice. The straw is used for fodder, but is not good. The *jótu navaṇe* is sometimes put in drills with rági, in place of the avare or togari.

Toward Madgiri the navane is of three kinds, *bili*, which is cultivated

[1] The following analysis of the grain (with husk) is given by Professor Church:—In 100 parts there are contained, water 12·0; albuminoids, 8·4; starch, 72·5; oil, 3·0; fibre, 2·2; ash 1·9. The nutrient ratio is 1 : 9·5, and the nutrient value 88.

on watered land; *kempu*, which is cultivated in palm gardens; and *mobu*, which is cultivated in dry field. It is sometimes sown along with cotton, but it is also cultivated separately. It grows on both rági and jóḷa ground, and does not injure the succeeding crop of either. In the course of twenty or thirty days, any time in Jyéshtha, Ashádha, or Srávana, the third, fourth, and fifth months after the vernal equinox, plough four times. If dung can be obtained, it ought to be put on after the first ploughing. With the next rain, harrow with the rake drawn by oxen, sow broad-cast, and harrow again. The straw is reckoned next in quality to that of rági; but the grain, in the opinion of the natives, is inferior.

The navane cultivated on dry field in Sira is that called *biḷi*, and is raised either on the two poorer soils, or on a black mould that has been prepared for it by a crop of the pulse called *hesaru*. It is considered as exhausting to the ground; but this is obviated by ploughing up the field immediately after the navane has been cut, thus exposing the soil to the air. In the two months following the vernal equinox, plough four times. With the next good rain, harrow with the rake drawn by oxen, and sow the seed with the drill; putting navane in the *kurige*, and the pulse called avare in the *sudike*. In three months it ripens without farther trouble. For cattle, the straw is better than that of rice.

Baragu—is of two kinds; white and black. A sandy soil of any kind agrees with this corn, which is also valuable as requiring very little rain. The straw is better fodder than that of rice. In the second month after the vernal equinox, plough three times. After the next rain, in the following month, either sow with the drill, and harrow with the rake drawn by oxen, or sow broad-cast, and plough in the seed. In three months it ripens without farther trouble, and in a favourable season produces sixteen seeds.

There is only one kind cultivated in Kolar. After the heavy rains have ceased, plough twice, and without manure sow broad-cast, and plough in the seed. Without any farther trouble it ripens in two months and a half, is cut down close by the ground, stacked for one or two days, and then trodden out. The grain is kept in store-houses, and preserves well for two years. It is boiled entire, like rice. The straw is only used for fuel. A good crop produces twelve seeds, a middling one, eight. It requires a rich black clay.[1]

Haraka—as it is found to injure the succeeding crop of rági, is never in the south cultivated on the best soil, and rarely on that of the

[1] The following is given by Professor Church as the chemical composition of the grain:—In 100 parts there are, water, 12·0; albuminoids, 12·6; starch, 69·4; oil, 3·6; fibre, 1·0; ash 1·4. The nutrient ratio is 1 : 6, and the nutrient value 89.

second quality. It is commonly followed by a crop of horse gram, and is seldom allowed any manure. In the spring plough five times. The dung, if any be given, must be put on before the last ploughing. When the heavy rains commence, sow broad-cast, and plough in the seed: next day form drills of togari in the same manner as with rági. When the sprouts are a span high, hoe with the *kunte*, once longitudinally and once across the field. Next weed with the *ujare*. It ripens in six months; and having been cut down near the root, is stacked for six days. It is then trodden out by cattle. The seed reserved for sowing must be well dried in the sun. The remainder is preserved in the *kanaja*, but does not keep long. It is both boiled like rice, and made into flour for dressing as hiṭṭu, or pudding. The straw is eaten by every kind of cattle; but, of all the fodders used here, this is reckoned the worst.

The following is the process of cultivation in the east. At the commencement of the rains, plough three times in the course of a few days. As soon as the heavy rains begin, sow the seed broad-cast, and cover it by a third ploughing. It requires no manure, and here the pulse called togari is never sown with háraka. At the end of a month weed it with the implement called *woravári*. It requires six months to ripen, and is cut near the root, stacked on the field for five or six days, and then dried in the sun, and trodden out. The grain is commonly preserved in pits, and does not keep longer than one year. It is never made into flour. The straw is bad forage, and is used chiefly for manure. The produce in a good crop is twenty-fold; in a middling crop fifteen-fold.

Háraka at Madgiri is sown in low soft places, where, in the rainy season, water is found near the surface. The soil is of different kinds. In Vais'ákha, Jyéshtha and Ashádha, or three months following the middle of April, plough three times in the course of thirty days. After the next rain that happens, harrow with the rake drawn by oxen, sow broad-cast, and then repeat the harrowing. It ripens in six months without farther trouble. As fodder for cattle, the straw is reckoned equal to that of rági, or of hurali. The produce in a good crop is forty-fold.

Alsandi.—Of this grain there is but one kind, and it is cultivated in the south only as a *kár* crop, which is performed exactly in the same manner with that of the *kár uddu*. The green pods, and ripe grain, are both made into curries, by frying them in oil with tamarinds, turmeric, onions, capsicum, and salt. Horses eat the grain; but the straw is only useful as manure.[1]

[1] According to Professor Church 100 parts of the husked bean contain—water, 12·5 parts; albuminoids, 24·1; starch, 56·8; oil, 1·3; fibre, 1·8; and ash, 3·5, of which 1·0 consists of phosphoric acid.

Hurali or *horse-gram* is of two kinds, black and white or red; both are sown intermixed. The worst qualities of soil are those commonly used for this grain in the east; and on the same fields, sáme, háraka and huchcheḷḷu are cultivated, without one crop injuring the other, or without a rotation being considered as of the smallest benefit. For horse-gram plough twice, in the course of a few days, any time in Kártika. Then after a shower sow broad-cast; or, if none happen, steep the seed for three hours in water. Plough in the seed. It has no manure, and in three months ripens without farther trouble. Cut it down early in the morning, stack it for one day, and then dry it five days in the sun. Tread it out, and clean it with a fan. It preserves best in a store-house, but does not keep longer than one year. The forage is here reckoned inferior to rági straw. The produce in a good crop is fifteen-fold; and in a middling one ten-fold.

In the south the two varieties, the red and the black, are always sown intermixed. In the last half of Srávana, plough three times. Sow broad-cast with the first rain of Bhádrapada. It requires no manure, and the seed is covered by a fourth ploughing. In three months it ripens without farther trouble, and is then pulled up by the roots, and stacked for eight days: after which it is spread in the sun to dry, and next day is trodden out by oxen. The seed for sowing must be well dried in the sun, and preserved in *múdes*; the remainder is kept in pots, or in the *kanaja*. It is used for human food, either dressed as curry, or parched; but the chief consumption of it is for cattle, both horses and bullocks. The straw is an excellent fodder, and is preferred even to that of rági. It is generally sown on the two worst soils, in fields that are never used for anything else; but it also follows as a second crop after jóḷa; or, when from want of rain the crop of rági has failed, the field is ploughed up and sown with horse-gram. In this case, the next crop of rági will be very poor, unless it be allowed a great quantity of manure. In places where the red and black horse-grams are kept separate, the black kind is sown from twelve to twenty days later than the other.

The only kind cultivated towards the north-east is the white. Except after *kár eḷḷu*, or upon new ground, it never succeeds. The longer the ground has been waste, especially if it has been overgrown with small bushes of the *tangadi*, or *bandári* (*cassia auriculata* and *dodonea viscosa*), so much the better for *huraḷi*. It grows best upon ash-coloured soil, and next to that prefers a red soil, in which there is much sand. In Srávana, burn the bushes; and either then, or in the course of the next month, plough once. After the next good rain sow the seed broad-cast, and plough the field across the former furrows.

The *hurali* at Sira is black and white mixed. It grows better on stony than on sandy soils; and gives the greatest crops when cultivated on land that has been waste, and over-run with bushes; but it also thrives tolerably on land that is alternately cultivated with it and sáme, or sajje. In the month which precedes and that which follows the autumnal equinox, sow the seed broad-cast, and then cover it with the plough. In four months it ripens without farther trouble. Both straw and husks are reckoned good for labouring cattle; but they are said to be bad for milch cows.[1]

Uddu—is of two kinds; *chik uddu*, and *doḍ uddu*. The *chik uddu* seems to be a variety, with black seeds. It is cultivated in Mysore District as follows:—The ploughing commences ten days after the feast *Sivarátri*, in February. Previous to the first ploughing, if there has not recently been any rain, the field must have a little water, and then it is three times ploughed. The seed is sown immediately before the third ploughing, by which it is covered. This crop obtains neither water, manure, nor weeding. The straw, when ripe, is pulled up by the roots, stacked for three days, dried two days in the sun, and then trodden out by bullocks. The flour, made into cakes, and fried in oil, is here a common article of diet. It is also mixed with rice flour, and made into white cakes called *dósé*, which are also fried in oil, and are a favourite food. The straw is reckoned pernicious to cattle. It is thrown on the dunghill, and serves to increase the quantity of manure. The grain is always preserved in the *múde*, or straw bag.

Dod uddu is also called *hain uddu*. It is cultivated and managed exactly like the other kind; but the first ploughing is on the eighth day after the *Swarna Gauri vrata*, in August. The sowing season is fifteen days afterwards. The straw is equally pernicious to cattle, but the grain is reckoned better than that of the *chik uddu*.

About Madgiri it grows best on a black soil, which it does not injure for the succeeding crop of jóḷa. Plough twice in Ashádha or Srávana, the fourth and fifth months after the vernal equinox. After the next rain sow broad-cast, and plough in the seed. In three and a

[1] The following is the result of Professor Church's analysis of horse-gram:—

	In 100 parts unhusked	In 1 lb oz	grs
Water	11·0 ...	1	333
Albuminoids	22·5 ...	3	262
Starch	56·0 ...	8	420
Oil	1·9 ...	0	133
Fibre	5·4 ...	0	378
Ash	3·2 ...	0	224

The nutrient ratio is 1 : 2·7, and the nutrient co-efficient 83. The ash contains nearly one-third its weight of phosphoric acid.

half months it ripens without farther trouble. The straw is only useful as fodder for camels.

Dod uddu is cultivated in the west on good rági soils, and is taken as an alternate crop with that grain. After cutting the rági the field is ploughed once a month for a year. At the last ploughing some people sow the seed broad-cast, and cover it with the plough; others drop it into the furrow after the plough. In this last case, the young plants are always too thick; and when they are a month old, part of them must be destroyed by the hoe drawn by oxen. If sown broad-cast, the weeds at the end of a month must be removed by the hand. The broad-cast sowing gives least trouble. The drill *uddu* produces a little more. It ripens in three months.

The *chiṭṭu*, or lesser *uddu*, is cultivated at the same season with the *kár rági*, and requires four months to ripen. Owing to a more luxuriant growth, even when sown broad-cast, it requires the use of the hoe drawn by oxen. It is not, however, so productive as the great uddu. Cattle eat the straw of uddu when mixed with the husks, and with those of hurali, kadale, avare, and togari, and with the spikes of rági, after these have been cleared of grain. This fodder is reckoned superior to even the straw of rági.

Hesaru.—It is of one kind only, but is cultivated in the south both as a *hain* and as a *kár* crop; in both of which the manner of cultivation is exactly the same as that of the *uddus*. The straw, being equally unfit for cattle, is reserved for manure. The grain is dressed as curry.

In the east it is commonly raised on dry field. It requires a black clay; and, although it have no manure, it does not injure the following crop of rági. In the course of a few days in Vais'ákha, plough twice, sow broad-cast, plough the seed, and harrow. In three months it ripens without farther trouble. It is then cut by the ground, stacked for six days, dried in the sun for four, and trodden out by oxen as usual. The grain, for use, is preserved in store-houses, and does not keep good more than two months, even although it be occasionally dried. The straw is totally useless, and will not even answer for manure.

The *hesaru* cultivated at Sira is called *kari*, or black, and requires a black soil, to which it is said to add much strength. It is therefore taken alternately with *navaṇe*, or with *huchchelḷu*, both of which are considered as exhausting crops. It is cultivated exactly in the same manner as *hurali* is, and ripens in three months. Except for feeding camels, its straw or husks are of no use.

In a few places in Shimoga where there is a moist black soil, the rice-ground produces a second crop of *kadale*, and of *hesaru*. For the

hesaru, the field after the rice harvest must be ploughed twice. In the month following the shortest day, it must be watered from a reservoir, and smoothed with the implement called *koradu*. As a mark for the sower, furrows are then drawn through the whole field, at the distance of four cubits; and the seed having been sown broad-cast is covered by the plough. The field is then smoothed with the *koradu*, and in four months the crop ripens.

Wollellu—is cultivated near Seringapatam, and in some places is called *phulagana ellu*. It is raised exactly like the *kár uddu*, cut down when ripe, and stacked for seven days. It is then exposed to the sun for three days, but at night is collected again into a heap; and, between every two days drying in the sun, it is kept a day in the heap. By this process the capsules burst of themselves, and the seed falls down on the ground. The cultivators sell the greater part of the seed to the oil-makers. This oil is here in common use with the natives, both for the table and for unction. The seed is also made into flour, which is mixed with jaggory, and formed into a variety of sweet cakes. The straw is used for fuel and for manure.

In Kolar it is more commonly called *achchellu*, and is cultivated as follows. In Vais'ákha plough twice, without manure, sow broad-cast, and plough in the seed. In three months it ripens without farther trouble, is cut down by the ground, and is afterwards managed exactly like the *uddu*. The seed is preserved in the same manner. The produce in a good crop is twenty seeds, and in a middling one twelve. The straw is used for fuel.

North of the Túmkúr District are cultivated two kinds of *sesamum*, the *karu* or *wollellu*, and the *gur-ellu*. The last forms part of the watered crops; the kar-ellu is cultivated on dry field. The soil best fitted for it is *dare*, or stony land, which answers also for sáme and hurali. The ground on which kar-ellu has been cultivated will answer for the last-mentioned grain, but not so well as that which has been uncultivated. After it, even without dung, sáme thrives well. The same ground will every year produce a good crop of this *ellu*. If a crop of ellu is taken one year, and a crop of sáme the next, and so on successively, the crops of ellu will be poor, but those of sáme will be good. After the first rain that happens in Vais'ákha, which begins about the middle of April, plough three times. With the next rain sow broad-cast, and plough in the seed. In between four and five months, it ripens without farther trouble. The produce in a good crop is eighty-fold.

In the west the *kar-ellu* is sown on rági fields that consist of a red soil, and does not exhaust them. The field is ploughed as for rági,

but it is not allowed manure. The seed is mixed with sand, sown broad-cast, and harrowed with the rake drawn by oxen. It ripens in four months without farther trouble. The seed is equal to half of the rági that would be sown on the same field. The produce is about twenty seeds. The straw is burned, and the ashes are used for manure.

Huchchellu—or the *foolish-oil-plant*, is near Seringapatam most commonly sown after jóḷa as a second crop. When that has been reaped, plough four times in the course of eight days. Toward the end of Srávaṇa, or about the middle of August, after a good rain, sow broad-cast, and plough in the seed. It requires neither manure nor weeding, and ripens in three months. It is cut near the root and stacked for eight days. Then, having been for two or three days exposed to the sun, the seed is beaten out with a stick, and separated from fragments of the plant by a fan. The seed is kept in pots. Part of it is parched and made into sweetmeats with jaggory; but the greater part is sold to the oil-maker for expression. This oil is used in cookery, but is reckoned inferior to that of *woḷḷeḷḷu*. The stems are a favourite food of the camel; but are disliked by the bullock, though want often forces this animal to eat them. When not used as a second crop after jóḷa, it is always sown on the two poorer soils.

The *huchcheḷḷu* near Bangalore is managed exactly in the same manner as the *woḷḷeḷḷu*. The 70 seers measure require a little more water than the other eḷḷu, and gives 65 seers of oil (or a little more than $4\frac{1}{2}$ gallons). This also is used for the table. The cake is never used for curry, but is commonly given to milch cattle.

Huchcheḷḷu is never sown at Kolar as a second crop. After the male, or heavy rains are over, plough once, sow broad-cast, and plough in the seed. It gets no manure, and in three months ripens without farther trouble. It is then cut down near the root, stacked for six days, dried in the sun for three, and trodden out. The seed is preserved in store-houses; the straw is used only as manure.

In Madgiri *huchcheḷḷu* is sown in places called *javugu*, or sticking-land, which are situated at the bottom of rocks; from whence in the rainy season the water filters, and renders the soil very moist. In such places nothing else will thrive. When the rain has set in so late as to prevent the cultivation of anything else, the huchcheḷḷu is sown also on any land, especially on rági fields. On such soils, however, it does not succeed. In Bhádrapada or Asvíja (from about the middle of August till about that of October), plough once, sow broad-cast, and plough in the seed, which ripens in four months.

Haralu.—Two varieties of it are common; the *chikka*, or little haralu, cultivated in gardens; and the *dodda*, or great haralu, that is

cultivated in the fields. To grow the latter:—In the spring, plough five times before the 15th of Vais'ákha. With the first good rain that happens afterwards, draw furrows all over the field at a cubit's distance; and having put the seeds into these at a similar distance, cover them by drawing furrows close to the former. When the plants are eight inches high, hoe the intervals by drawing the *kunte* first longitudinally, and then transversely. When the plants are a cubit and a half high, give the intervals a double ploughing. The plant requires no manure, and in eight months begins to produce ripe fruit. A bunch is known to be ripe by one or two of the capsules bursting; and then all those which are ripe are collected by breaking them off with the hand. They are afterwards put into a heap or large basket; and the bunches, as they ripen, are collected once a week, till the commencement of the next rainy season, when the plant dies. Once in three weeks or a month, when the heap collected is sufficiently large, the capsules are for three or four days spread out to the sun, and then beaten with a stick to make them burst. The seed is then picked out from the husks, and either made by the family into oil for domestic use, or sold to the oil-makers. It is cultivated on the two best qualities of land, and on the better kinds of *maralu*. When the same piece of ground is reserved always for the cultivation of this plant, the succeeding crops are better than the first; when cultivated alternately with rági, it seems neither to improve nor injure the soil for that grain.

In Kolar District both the great and small kinds are cultivated; but, although the mode of cultivation is the same for both, they are always kept separate. In the beginning of the female or slight rains plough twice. When the rains become heavy, plough again; and then, at the distance of three-quarters of a cubit from each other in all directions, place the seeds in the furrows. When the plants are a span high, weed with the plough, throwing the earth up in ridges at the roots of the plants. At the end of the first and second months from the former weeding, repeat this operation. In four months it begins to give ripe fruit; and once in four days the bunches that are ripe are collected in a pit until a sufficient quantity is procured. It is then exposed to the sun, and the husks are beaten off with a stick. In the May following, the plant dries up, and is cut for fuel. It is only cultivated in the good rági soils, which it rather improves for that grain, although it gets no dung. The small kind is reckoned the best, and most productive.

Haralu is cultivated in the north-east on a particular soil, which is reserved for the purpose, and consists of ash-coloured clay mixed with sand. There are here in common use three kinds of *haralu*; the *phola* or field; and the *doḍḍa*, and *chiṭṭu*, which are cultivated in

gardens. A red kind is also to be seen in gardens, where it is raised as an ornament. The *chit haralu* produces the best oil. Next to it is the *phola* that is cultivated in the fields. In the course of a few days, any time in the three months following the vernal equinox, plough three times. With the next rain that happens, plough again, and at the same time drop the seeds in one furrow at the distance of one cubit and a half, and then cover them with the next furrow. A month afterwards hoe with the *kunte*, so as to kill the weeds, and to throw the earth in ridges toward the roots of the plant. It ripens without farther trouble. At the time the *haralu* is planted, seeds of the pulses called avare and togari are commonly scattered through the field. In four months after this, the haralu begins to produce ripe fruit, and for three months continues in full crop. For two months more it produces small quantities.

Haralu, of the kind called *phola*, is cultivated at Sira. For this a sandy soil is reckoned best; and as it is thought to improve the soil, the little rági that is sown on dry field generally follows it. In the first month after the vernal equinox, plough twice; then, with the first rain in the next month, at every cubit's distance throughout the field, draw furrows intersecting each other at right angles. At every intersection drop a seed, and cover them with another furrow. After two months weed with the plough; and with the *kunte*, or hoe drawn by oxen, throw the earth in ridges toward the young plants. In six months it begins to give ripe fruit, which for three months is gathered once a week.

Sanabu.—For the cultivation of this plant as pursued in the Bangalore District, the soil ought to be red or black, like the best kind used for cultivation of rági. It is allowed no manure; and the seed is sown broad-cast on the ground, without any previous cultivation, at the season when the rains become what the natives call male, that is to say, when they become heavy. After being sown, the field is ploughed twice, once lengthwise, and once across; but receives no farther cultivation. At other times the sanabu is cultivated on rice-ground in the dry season; but it must then be watered from a canal or reservoir. It requires four months to ripen, which is known by the seeds having come to full maturity. After being cut down, it is spread out to the sun, and dried. The seed is then beaten out by striking the pods with a stick. After this, the stems are tied up in large bundles, about two fathoms in circumference, and are preserved in stacks or under sheds.

Cotton.—The soil on which it is sown at Sira is a black clay containing nodules of limestone. In the two months following the vernal

equinox, plough three times. At any convenient time, in the two next months, mix the seed with dung, and drop it in the furrows after the plough, forming lines about nine inches apart. A month afterwards plough again between the lines; and in order to destroy the superfluous plants and weeds, use the hoe drawn by oxen three times, crossing these furrows at right angles. The second and third times that this hoe is used, it must follow the same track as at first, otherwise too many of the plants would be destroyed. Between each hoeing three or four days should intervene. In six months the cotton begins to produce ripe capsules, and continues in crop four more. The plants are then cut close to the ground; and after the next rainy season the field is ploughed twice in contrary directions. A month afterwards it is hoed once or twice with the same implement, and it produces a crop twice as great as it did in the first year. In the third year a crop of *sáme* or *navaṇe* must be taken, and in the fourth year cotton is again sown as at first.

The principal crop in the fine country towards Narsipur and Talkad is cotton, which there is never raised in soil that contains calcareous nodules. The black soil that is free from lime is divided into three qualities. The first gives annually two crops, one of jóḷa and one of cotton; the two inferior qualities produce cotton only.

Cotton is raised towards Harihar entirely on black soil, and is either sown as a crop by itself, or drilled in the rows of a navane field. In the former case, two crops of cotton cannot follow each other, but one crop of jóḷa at least must intervene. In the second month after the vernal equinox, the field is ploughed once, then manured, then hoed with the *heg kuṇṭe*; and the grass is kept down by occasional hoeings with the *bolu kuṇṭe*, until the sowing season in the month preceding the autumnal equinox. The seed is sown by a drill having only two bills, behind each of which is fixed a sharp-pointed bamboo, through which a man drops the seed; so that each drill requires the attendance of three men and two oxen. The seed, in order to allow it to run through the bamboo, is first dipped in cow-dung and water, and then mixed with some earth. Twenty days after sowing, and also on the thirty-fifth and fiftieth days, the field is hoed with the *edde kuṇṭe*. The crop season is during the month before and that after the vernal influence.

Tobacco is sown in Banavar in the dry field cultivated for rági and other similar grains, of which a crop must intervene between every two crops of tobacco. When the season proves very wet, it cannot be cultivated, and it requires a good rági soil. A few small stones do no harm, but it will not grow on the hard soil called *dare*; and, in fact,

the soil of the first quality is that usually employed, though sometimes the tobacco is planted on the best fields of the second quality. In the three months following the vernal equinox, the field ought, if possible, to be ploughed ten times; but some of these ploughings are often neglected. After the fourth or fifth time, sheep and cattle must for some nights be kept on the field for manure. During the last fifteen days of the second month after midsummer, small holes are made throughout the field. They are formed with the hand, and disposed in rows distant from each other $1\frac{1}{2}$ cubit; and in every hole a young tobacco plant is set. This being the rainy season, the tobacco requires no watering, unless during the first ten days from its having been transplanted there should happen to be two successive fair days. In this case, on the second fair day, water must be given with a pot. On the fifteenth day a little dung is put into each hole, and the field is hoed with the *kunte*. Every fourth or fifth day, until the tobacco is cut, this is repeated, so as to keep the soil open and well pulverized. At the end of a month and a half, the top shoots of the plants are pinched off, and every eight or ten days this is repeated; so that six or seven leaves only are permitted to remain on each stem. In the month preceding the shortest day, it is fit for cutting.

The stems are cut about four or five inches from the ground, and are then split lengthwise; so that each portion has three or four leaves. These half stems are strung upon a line, which is passed through their root ends; and then for twenty days they are spread out to the sun and air. Every third day they are turned, and they must be covered with mats should there happen to be rain; but at this season that seldom comes. The tobacco is then taken into the house, put into a heap, and turned four or five times, with an interval of three days between each time. It is then fit for sale, and by the merchants is made up into bundles which include the stems.

In order to prepare the seedlings, a plot of ground must be dug in the month which precedes the longest day. It must be then cleared from stones, and separated by little banks into squares for watering, in the same manner as in this country is done to kitchen gardens. The tobacco seed is then mixed with dung, and sown in the squares, which are smoothed with the hand, sprinkled with water, and then covered with branches of the wild date. Every third day it must be watered. On the eighth day the plants come up, and then the palm branches must be removed. If the plants be wanted soon, they ought to have more dung, and to be kept clear from weeds. With this management, they are fit for transplanting in from a month to six weeks. If they are not wanted for two months, or ten weeks, the second dunging is omitted, and the

growth of the plants is checked by giving them no water for eight days after they come up.

Sasive is a mustard which is always sown, in the east, mixed with rági. It ripens sooner than that grain; and, when dry, the branches are broken with the hand, exposed two days to the sun, and then beaten out with a stick. In this country, oil is never made from the seed, as is usual in Bengal; it is employed as a seasoning in curries and pickles.

Kadale always requires a black mould; and is cultivated, in the west, partly as a second crop after rági, and partly on fields that have given no other crop in the year. In this case, the produce is much greater, and the manner of cultivation is as follows:—In the two months preceding the autumnal equinox, the rági having been cut, the field is ploughed once a month for fourteen or fifteen months. Then in the course of four or five days plough twice. After the last ploughing, drop the seed in the furrows at six inches distance from each other, and it ripens without farther trouble. The seed is sown as thick as that of rági.

It is a considerable crop in the south-east of the Mysore District, but so exhausts the soil of even the richest fields that it is seldom taken from the same ground oftener than once in seven years. It is generally sown after jóḷa in place of cotton, and must be followed by wheat, woḷḷeḷḷu or rági. The two former may be followed by cotton, the rági cannot. In the third year, when rági has been used, the field is sown with navane or jóḷa, succeeded as usual by cotton. Immediately after the jóḷa has been cut, which is about the autumnal equinox, the field is ploughed once, then dunged, and then ploughed three times, all in the course of a month. In the beginning of the second month after the autumnal equinox, the kadale is sown in drills like the cotton; but the drills are only half a cubit distant. Between the drills, on the fifteenth day, the hoe drawn by oxen is used. On the thirtieth the weeds are removed by the *kale kudagoḷu*. If the soil be rather hard, about the thirty-third day the hoe drawn by oxen must be again used. In four months the *kaḍale* ripens. Kadale is sometimes sown after a fallow; in which case the ground is prepared in a similar manner as for cotton in the two poorer soils.

Towards Harihar, a few rich spots are reserved solely for the cultivation of *kaḍale*, and these are cultivated in the following manner:—In the month following the vernal equinox the field is ploughed once, then manured, and in the following month is hoed with the *heg kunte*. Between that period and the month preceding the shortest day, the grass is ploughed down twice, and the seed is sown with the sharp

bamboo following the plough, and covered with the *heg kunte*. It ripens in three months.[1]

Wheat.—There are two kinds cultivated, *jave gódhi* (*triticum monococcum*) and *hotte gódhi* (*triticum spelta*). For the former, in Kolar, the ground is sometimes ploughed five times; and sometimes dug with the hoe called *kol gudali* to the depth of one cubit, which is reckoned preferable. In Jyéshtha (May—June) the seed is sown broad-cast, and covered with the hoe. Channels and squares are then formed, and the ground is smoothed with the hand and dunged; while such of the seed as may happen to be above the ground is pushed down with the finger. In forty-five days the field must be watered nine times. It is then weeded with the instrument called *woravari*; after which one watering in six days suffices. It ripens in three months, is cut, tied up in small sheaves, and stacked for four days. It is then dried one day in the sun, and thrashed out by beating the sheaves against a log of timber. To separate the awns, the grain is then beaten with a stick. In the fields of wheat, radishes are planted on the mounds which divide the squares.

In the black clay in Madgiri, wheat of the kind called *jave godhi* is the most common crop. It is but a poor grain, and five-twelfths of it consist of husks. Any time in Pushya (Dec.—Jan.) plough once; next day, if there be no rain, water the field, and plough again across, dropping the seed in the same manner as in sowing jóḷa. The plots must be formed in the same manner. It gets no manure nor weeding, and requires only three waterings, on the fortieth, sixtieth and eightieth days. It is much subject to disease, and not above one crop in four is good. After reaping the wheat, the field, in order to expose the soil to the rain, must be immediately ploughed.

In Sira, in place of the *Vaiś'ákha* crop, when there is a scarcity of water, wheat, both *jave* and *hotte*, are sown on rice-lands. These grains may be followed by a *Kártika* crop of rági; but by this process the ground is as much exhausted as if it had been sown with navane. If

[1] Professor Church gives the following analysis of the composition of chick pea, or Bengal gram :—

	In 100 parts		In 1 lb
	Husked	with husk	husked
Water	11·5 ...	11·2 ...	1 oz 367 grs
Albuminoids ...	21·7 ...	19·5 ...	3 ,, 207 ,,
Starch	59·0 ...	53·8 ...	9 ,, 192 ,,
Oil	4·2 ...	4·6 ...	0 ,, 294 ,,
Fibre	1·0 ...	7·8 ...	0 ,, 70 ,,
Ash	2·6 ...	3·1 ...	0 ,, 182 ,,

The ash of husked contains 1·1, and of unhusked 0·8 of phosphoric acid. The nutrient ratio of the unhusked peas is 1 : 3·3; the nutrient value 84.

the *Kártika* crop be altogether left out, the *Vaiś'ákha* crop of rice following wheat will be as good as if the ground had been regularly cultivated for rice alone; and in India it is a commonly received opinion, that where a supply of water admits of it, ground can never be in such good heart as when regularly cultivated by a succession of rice crops. Wheat requires a clay soil, and the manner of cultivating both kinds is the same. In the two months preceding, and the one following the autumnal equinox, plough five times. In the following month, after a rain, or after having watered the field, plough again, and drop the seed into the furrows. Then divide it into squares, as for jóḷa, and water it once a month. The straw is only used for fire. If given to cattle for fodder, it is supposed capable of producing the distemper.

A very small quantity of the wheat called *jave godhi* is raised near Periyapatna on fields of a very rich soil, from which alternate crops of *kadale* and of it are taken. The manure is given to the kadale; but wheat requires none. From the winter to the summer solstice plough once a month. Then in the following month plough twice, sow broadcast, and cover the seed with the plough. It ripens in four months without farther trouble.

The wheat raised near Narsipur in the Mysore District is of the kind called *hotte gódhi*, and there are two seasons for its cultivation, the *hain* and *kár*. It is sown on the best soil only, and always after a crop of kadale. The kár season, when the rains set in early, is always preferred, not only as the wheat is then more productive, but as in the same year it may be followed by a crop of cotton, which is not the case with the hain wheat. In the two months following the vernal equinox, the field for kár wheat is dunged, ploughed two or three times, and then hoed with the *kunte*, which is drawn by oxen. The seed is then sown, in drills one cubit distant, by dropping it in the furrow after a plough. On the fifteenth, twenty-eighth and thirty-fifth days the hoe is again used, and two or three days afterwards the weeds are removed by the *kale kudagolu*. This wheat ripens in three months and a half, and is immediately followed by a crop of cotton. The wheat is liable to be spoiled by a disease called *arsina mári*; owing to which, in the course of one day, it becomes yellow and dies.

When the rains are late in coming, the hain crop of wheat is taken after kadale. Cotton cannot be taken in the same year. The manner of cultivation is the same as for the kár crop, only the season is different. The ploughings are performed in the month which precedes the autumnal equinox, or in the beginning of that which follows. At the end of this month the seed is sown. The produce is about one-half only of that of the kár crop.

Rice.—Of the varieties of this grain 108 specimens have been collected in the Government Museum, each bearing its appropriate vernacular name. There are three modes of sowing the seed, from whence arise three kinds of cultivation. In the first mode the seed is sown dry on the fields that are to rear it to maturity: this is called the *bara batta* or *puṇaji*. In the second mode the seed is made to vegetate before it is sown; and the field when fitted to receive it is reduced to a puddle: this is called *moḷe batta*. In the third kind of cultivation the seed is sown very thick in a small plot of ground; and when it has shot up to about a foot high, the young rice is transplanted into the fields where it is to ripen: this is called *náṭi*.

The kinds of rice cultivated at Seringapatam are as follow:—*doḍḍa batta, hoṭṭe kembatti, arsina kembatti, sukadás, murarjila, yálakki raja, konavali, bili sanna batta, putta batta, kari kallu*. With the exception of the first, which takes seven months, all the other kinds ripen in five and a half months.

In the hain crop the following is the management of the dry-seed cultivation. During the months Phálguna, Chaitra and Vais'ákha, that is from February till May, plough twice a month; having, three days previous to the first ploughing in Phálguna, softened the soil by giving the field water. After the fourth ploughing the field must be manured with dung, procured either from the city or cow-house. After the fifth ploughing the fields must be watered either by rain or from the canal; and three days afterwards the seed must be sown broad-cast and then covered by the sixth ploughing. Any rain that happens to fall for the first thirty days after sowing the seed must be allowed to run off by a breach in the bank which surrounds the fields; and should much rain fall at this season, the crop is considerably injured. Should there have been no rain for the first thirty days, the field must be kept constantly inundated till the crop be ripe; but if there have been occasional showers the inundation should not commence till the forty-fifth day. Weeding and loosening the soil about the roots of the young plants with the hand, and placing them at proper distances, where sown too close or too far apart, must be performed three times; first on the forty-fifth or fiftieth day; secondly twenty days afterwards; and thirdly fifteen days after the second weeding. These periods refer to the crops that require seven months to ripen. For rice which ripens in five and a half months, the field must be inundated on the twentieth day; and the weedings are on the twentieth, thirtieth and fortieth days.

In the hain crop the following is the manner of conducting the sprouted-seed cultivation. The ploughing season occupies the month of Ashádha (June—July). During the whole of this time the field is

inundated and is ploughed four times; while at each ploughing it is turned over twice in two different directions, which cross each other at right angles. This may be called double ploughing. About the 1st of Srávana the field is manured, immediately gets a fifth ploughing, and the mud is smoothed by the labourers' feet. All the water except one inch in depth must then be let off, and the prepared seed must be sown broad-cast. As it sinks in the mud it requires no labour to cover it. For the first twenty-four days the field must once every other day have some water, and must afterwards, until ripe, be kept constantly inundated. The weedings are on the twenty-fifth, thirty-fifth and fiftieth days. In order to prepare the seed it must be put into a pot, and kept for three days covered with water. It is then mixed with an equal quantity of rotten cow-dung, and laid on a heap in some part of the house, entirely sheltered from the wind. The heap is well covered with straw and mats; and at the end of three days the seed, having shot out sprouts about an inch in length, is found fit for sowing. This manner of cultivation is much more troublesome than that called dry-seed: and the produce from the same extent of ground is in both nearly equal; but the sprouted-seed cultivation gives time for a preceding crop of pulse on the same field, and saves a quarter of the seed.

Two distinctions are made in the manner of cultivating transplanted rice; the one called *baravági* or by *dry plants*; and the other called *nirági* or by *wet plants*. For both kinds low land is required.

The manner of raising the dry-seedlings for the hain crop is as follows:—Labour the ground at the same season, and in the same manner as for the dry-seed crop. On the 1st of Jyéshtha, or in May, give the manure, sow the seed very thick and cover it with the plough. If no rain fall before the eighth day, then water the field, and again on the twenty-second; but if there are any showers these waterings are unnecessary. From the forty-fifth till the sixtieth day the plants continue fit to be removed. In order to be able to raise them for transplanting, the field must be inundated for five days before they are plucked. The ground on which the dry-seedlings are to be ripened is ploughed four times in the course of eight weeks, commencing about the 15th of Jyéshtha; but must all the while be inundated. The manure is given before the fourth ploughing. After this, the mud having been smoothed by the feet, the seedlings are transplanted into it, and from three to five plants are stuck together into the mud at about a span distance from the other little bunches. The water is then let off for a day: afterwards the field, till the grain is ripe, is kept constantly inundated. The weedings are performed on the twentieth, thirty-fifth and forty-fifth days after transplanting.

The manner of raising the wet-seedlings for the transplanted crop in the hain season is as follows:—In the month Phálguna (Feb.—Mar.) plough the ground three times, while it is dry. On the 1st of Jyéshtha inundate the field; and in the course of fifteen days plough it four times. After the fourth ploughing smooth the mud with the feet, sow the seed very thick and sprinkle dung over it: then let off the water. On the third, sixth and ninth days water again; but the water must be let off and not allowed to stagnate on the field. After the twelfth day inundate until the seedlings be fit for transplantation, which will be on the thirtieth day from sowing. The cultivation of the field into which the seedlings are transplanted is exactly the same as that for the dry-seedlings. The plot on which the seedlings are raised produces no crop of pulse; but various kinds of these grains are sown on the fields that are to ripen the transplanted crop, and are cut down immediately before the ploughing for the rice commences. The produce of the transplanted crop is nearly equal to that of the dry-seed cultivation; and on a good soil, properly cultivated, twenty times the seed sown is an average crop.

The kár crops, according to the time of sowing, are divided into three kinds. When the farm is properly stocked, the seed is sown at the most favourable season, and the crop is then called the *Kumba kár*; but if there be a want of hands or cattle, part of the seed is sown earlier, and part later than the proper season; and then it produces from thirty to fifty per cent. less than the full crop. When sown too early the crop is called *Tula kár*; when too late it is called *Mésha kár*. The produce of the *hain* and *Kumba kár* crops is nearly the same.[1]

No Tula kár dry seed is ever sown. The ploughing season for the Kumba kár dry seed is in Bhádrapada (August), and the seed is sown about the end of Márgasira (December). In the Mésha kár dry-seed the ploughing commences on the 1st of Chaitra (March), and the seed is sown at the feast of Chitra Paurnami in April. The Tula kár sprouted seed is sown on the 1st Kártika (October), the ploughing having commenced with the feast Navarátri, in September. The Kumba kár sprouted seed is sown in Pushya, about the 1st of January. The ploughing season occupies a month. The ploughing for the Mésha kár sprouted seed commences about the 15th of Chaitra. The seed is sown about the 16th of Vais'ákha (May). The Kumba kár transplanted rice is cultivated only as watered seedlings. The ground for the seedlings begins to be ploughed in the end of Kártika or middle of November, and the seed is sown on the 15th Pushya or end of December. The fields on which this crop is ripened are begun

[1] *Kumba* or *Kumbha* is the sign Aquarius; *Tula* is Libra; and *Mésha* is Aries.

to be ploughed in the middle of Márgasira (1st December). The transplanting takes place about the 15th of Mágha or end of January. The Tula kár transplanted rice also is sown *nírágí* about the 30th of Asvíja or middle of October, and in a month afterwards is transplanted. The Mésha kár transplanted rice is also sown as watered seedlings, about the 15th of Vais'ákha (May), and about a month afterwards is transplanted. The regular kár crop of the transplanted cultivation does not interfere with a preceding crop of pulse; but this is lost, when from want of stock sufficient to cultivate it at the proper time the early or late seasons are adopted. The various modes of cultivating the rice give a great advantage to the farmer; as by dividing the labour over great part of the year fewer hands and less stock are required to cultivate the same extent of ground than if there was only one seed-time, and one harvest.

The manner of reaping and preserving all the kinds of rice is nearly the same. About a week before the corn is fit for reaping, the water is let off, that the ground may dry. The corn is cut down about four inches from the ground with a reaping-hook called *kudagolu* or *kudagu*. Without being bound up in sheaves it is put into small stacks, about twelve feet high; in which the stalks are placed outwards and the ears inwards. Here the corn remains a week, or if it rains, fourteen days. It is then spread out on a threshing-floor made smooth with clay, cow-dung and water, and is trodden out by driving bullocks over it. If there has been rain, the corn, after having been threshed, must be dried in the sun; but in dry weather this trouble is unnecessary. It is then put up in heaps called *ráshi*, which contain about 60 kandagas, or 334 bushels. The heaps are marked with clay and carefully covered with straw. A trench is then dug round it to keep off the water. For twenty or thirty days (formerly, till the division of the crop between the Government and the cultivator took place) the corn is allowed to remain in the heap.

The grain is always preserved in the husk, or, as the English in India say, in *paddy*. There are in use here various ways for keeping paddy. Some preserve it in large earthen jars that are kept in the house. Some keep it in pits called *hagevu*. In a hard stony soil they dig a narrow shaft, fifteen or sixteen cubits deep. The sides of this are then dug away so as to form a cave with a roof about two cubits thick. The floor, sides and roof are lined with straw; and the cave is then filled with paddy. These pits contain from fifteen to thirty kandagas. When the paddy is wanted to be beaten out into rice, the whole pit must at once be emptied. Other people again build *kanajas*, or store-houses, which are strongly floored with plank to keep out the

bandicoots or rats. In these store-houses there is no opening for air; but they have a row of doors one above another, for taking out the grain as it is wanted. Another manner of preserving grain is in small cylindrical stores, which the potters make of clay, and which are called *wóde*. The mouth is covered by an inverted pot; and the paddy, as wanted, is drawn out from a small hole at the bottom. Finally, others preserve their paddy in a kind of bags made of straw, and called *múde*. Of these different means the *kanaja* and *wóde* are reckoned the best. Paddy will keep two years without alteration, and four years without being unfit for use. Longer than this does not answer, as the grain becomes both unwholesome and unpalatable. No person here attempts to preserve rice any length of time; for it is known by experience to be very perishable. All the kinds of paddy are found to preserve equally well. That intended for seed must be beaten off from the straw as soon as cut down, and dried for three days in the sun, after which it is usually kept in straw bags.

There are two manners of making *paddy* into rice; one by boiling it previously to beating; and the other by beating alone. The boiling is also done in two ways. By the first is prepared the rice intended for the use of rájas, and other luxurious persons. A pot is filled with equal parts of water and paddy, which is allowed to soak all night, and in the morning is boiled for half an hour. The paddy is then spread out in the shade for fifteen days, and afterwards dried in the sun for two hours. It is then beaten, to remove the husks. Each grain is broken by this operation into four or five pieces, from whence it is called *aidu núgu akki*, or five-piece rice. When dressed, this kind of rice swells very much. It is always prepared in the families of the rájas, and is never made for sale. The operation is very liable to fail; and in that case the rice is totally lost.

Rice prepared by boiling in the common manner is called *kudupal akki*, and is destined for the use of the Sudras, or such low persons as are able to procure it. Five parts of paddy are put into a pot with one part of water, and boiled for about two hours, till it is observed that one or two of the grains have burst. It is then spread out in the sun for two hours; and this drying is repeated on the next day; after which the paddy is immediately beaten. Ten parts of paddy, by this operation, give five parts of rice, of which one part goes to the person who prepares it, for his trouble. Ten seers of paddy are therefore equal in value to only four seers of rice.

The rice used by the Brahmans, and called *hasí akki*, is never boiled. On the day before it is to be eaten, the paddy must be exposed two hours in the sun. If it were beaten immediately after

being dried, the grain would break, and there would be a considerable loss. Even with this precaution many of the grains break; and, when these are separated from the entire rice to render it saleable, the *hasí akki* sells dearer than the *kudupal akki*, in the proportion of nine to eight.

The beating is performed chiefly by women. They sometimes, for this purpose, use the *yáta*, or a block of timber fastened to a wooden lever, which is supported on its centre. The woman raises the block by pressing with her foot on the far end of the lever, and by removing her foot allows the block to fall down on the grain. The more common way, however, of beating paddy, is by means of a wooden pestle, which is generally about four feet in length, and three inches in diameter, which is made of heavy timber, and shod with iron. The grain is put into a hole formed in a rock or stone. The pestle is first raised with the one hand, and then with the other; which is very hard labour for the women.

The kinds of rice cultivated at Mandya are *doḍḍa batta*, *putta batta*, *hote kembatti*, *konavali*, and *mulu batta*. The first four take each five months to ripen, and the last, three. Every kind may be cultivated, either as *hain* or *kár*. The mulu batta is never sown except when there is a deficiency of water. The only cultivation here is the *mole batta*, or sprouted-seed; the manner of preparing which is as follows: Steep the seed in water all night; next morning mix it with cow-dung, and fresh plants of the *tumbe soppu* (*phlomis esculenta*), and put it in a *múde*. On the *múde* place a heavy stone, and on the two following days sprinkle it with water. On the third day it is fit for sowing.

For the *hain* crop, the ploughings, from about the 1st of June till the middle of July are nine in number. Dung and leaves are then put on the field, and trampled into the mud. The water is now let off, until no more than a depth of one inch remains; afterwards, the seed is sown and a slight sprinkling of dung laid over it. A watering once in three days is then given; and after the third time, the field is inundated till the grain ripens. The weeds are removed on the twentieth, fortieth and sixtieth days. The kár cultivation is exactly the same, only the ploughings are in November and December. In both kinds of cultivation, and in every species of rice, an equal quantity of seed is sown on the same extent of ground, and the produce is nearly equal.

Of the different kinds of rice cultivated at Maddur *arisina kembatti*, *puṭṭa batta*, *yálakki rája*, *sukadas*, *konavali*, and *murarjila*, are equal in produce. The first four ripen in $4\frac{1}{2}$ months, the next in five, and

the last in six. The produce on first quality of soil is 114 seeds, on second quality 100 seeds, and on third, half that quantity. *Hote kembatti* and *doḍḍa* or *bili batta*, which ripen in five months, produce 100, 70 or 40 fold, according to quality of soil. All the kinds of rice may be raised either as hain or kár crops, or the moḷe or náti modes of cultivation. No *punaji* is ever attempted. The seedlings for transplantation, in the náti cultivation, are always raised as nírági. The produce of the same kind of rice in the same soil, whether cultivated as hain or kár, or as moḷe or náti, is nearly the same.

The seasons for cultivating rice in the Kolar District are two; and the two crops, from the months in which they ripen, are named the *Kártíka* and *Vais'ákha*. In this neigbourhood no rice is transplanted. When the seed is sown dry, the cultivation is called *puledi*; when it is prepared by being sprouted, it is called *moḷe*.

The only kind of rice cultivated as *puledi*, or dry seed, is the *doḍḍa baira*; and it is only sown in this manner for the Kártíka crop. In the course of Vais'ákha and Jyéshtha plough the ground without water four times. About the end of the latter month (June), after a day's rain, sow the seed broad-cast, and cover it with the plough. Then harrow the field with the implement called *halive*. The crop has no manure, and the field is not inundated till the end of the second month; when it must be harrowed again, and the weeds removed by the hand. A good crop of this is reckoned fifteen seeds, a middling one ten seeds.

The *moḷe* for the Kártíka crop is cultivated as follows: In Asháḍha, and the first half of Srávana, plough from seven to nine times, the field being always inundated. Then manure it, either with leaves or dung; both are rarely given: but, could they be procured, this would greatly increase the produce. Then let out all the water, except two inches in depth, and sow the prepared seed broad-cast. Next day the field is dried, and sprinkled with some dung. At the end of three days it is covered with water for four hours. On the seventh, water the field for a whole day. After the tenth day, it must be kept constantly inundated to the depth of two inches. At the end of the month harrow it once lengthwise; on the third day harrow it across; and on the fifth day harrow again lengthwise. Four days afterwards weed with the hand, and repeat this after an interval of two weeks.

All kinds of rice are cultivated in the same manner. The rice for seed, after being trodden out, must be dried three or four days in the sun; and may be kept either in a straw *múde*, or in a store called *kaṇaja*. When it is to be prepared, it must be dried one day in the sun; then soaked a night in water; the next morning it must be mixed

with *haraḷu* leaves and dung, and tied up in straw. This is dipped in water, and placed under a large stone. In two days it must again be dipped, and is then fit for sowing. The produce of the doḍḍa baira, which is the common coarse grain of the country, is the greatest. A good crop of this is said to be fifteen seeds, and middling crop about ten seeds. The other kinds, on the same extent of ground, produce eight or ten seers less.

The *moḷe* cultivation for the Vais'ákha crop is as follows: Having inundated the field, plough it five or six days during the course of the twenty days preceding the feast Dipávaḷi. In the course of the next month plough four times. Then let out all the water, except two inches in depth; manure with leaves; and, having trodden these well into the mud, sow the prepared seed broad-cast. Next day dry the field, and manure it with duug. Three days after, water for two hours. Then every second day, for three times, water for four or five hours. Afterwards keep the field inundated. At the end of the month harrow, with the *halive*, three times in three directions, with a day's rest between each harrowing. A week afterwards weed with the hand, and in two weeks repeat this operation. This is the most productive crop, and gives from one to two seeds more than that which is reaped in Kártíka.

The mode of cultivation, or the season of sowing, makes no difference here in the quality of the grain, nor in the length of time that it will keep good. The grain is always preserved in the husk; and until wanted for immediate consumption, is never beaten. In store-houses, or *kanajas*, if well dried in the sun previous to its having been put up, it preserves well for two years. Paddy is sometimes kept in pits, or in the straw packages called *múḍes*; but these are inferior to the store-house.

At Madgiri, when there is plenty of water, the same ground in the course of the year gives two crops, the *Kártíka* and *Vais'ákha*. The former, provided two crops are taken, is the most productive; but, if the Kártíka be omitted, the Vais'ákha gives a greater return than the Kártíka alone would have given; not, however, equal to the produce of both crops. The quality of the grain in both crops is the same. The Vais'ákha crop, although raised in the dry season, is the one most regularly taken. For this crop all the kinds of rice may be sown; for the Kártíka crop the *bili sanna batta* and *kari channangi* are never sown; as with rain they are apt to lodge. The soil used for *tripati sanna batta*, *bili channangi*, *kari channangi*, and *put raj*, is *maralu* or sandy. The others require a clay, which in the low grounds is always black. The red soil is always confined to the rising grounds, and is

therefore never cultivated for rice, except when it can be watered by machines; and if the water is more than 31½ feet from the surface, these are never used. Two men and four oxen can, by means of the machine called *kapile*, supply an acre and a half of ground with water sufficient to raise a crop of rice. One set works four or five hours in the morning, and the other as much in the evening.

The only manner of cultivating rice that is in use here is the *moḷe*, or sprouted-seed; the manner of preparing which is as follows:—The ears must be cut off, the grain beaten out immediately, and then dried in the sun three or four days. It must be preserved in straw or in jars. When wanted for sowing, it must be exposed to the sun for a day, and soaked in water all the following night. It is then put upon a layer of the leaves of the *yekka* (*calotropis gigantea*), or of *haraḷu*, mixed with sheep's dung, and is surrounded by stones, so as to keep it together. It is then covered with *bandári* (*dodonæa viscosa*) leaves, and pressed down with a stone. Next morning the upper leaves are removed, and a pot of water is thrown on the seed, which must be turned with the hand, and then covered again with the leaves and stone. Daily, for three or four times, this operation must be repeated, and then the sprouts from the seed will be almost an inch long.

For the *Kárttika* crop plough seven times in the course of thirty days, the ground all the while being inundated. In the next place manure the ground with leaves, and tread them into the mud. Then let off the water, and sow the seed broad-cast, covering it with a little dung. On the fourth day cover the ground with water, and immediately afterwards let it run off. Repeat this daily till the eighth time, after which the field must be kept constantly inundated to the depth of one inch for ten days, and four inches for the remainder. The weedings are at the end of the sixth, tenth, and twelfth weeks from sowing. The season for ploughing continues all the months of Jyéshtha and Ashádha.

For the *Vaiśákha* crop the same process is followed; but the ploughing season is from the 15th of Asvíja till the last of Margasira. By this time the whole seed must be sown; and the nearer it is done to it the better.

The large-grained rices, *doḍḍa batta*, which ripens in 4½ months, and *kari channangi* and *bili channangi*, which ripen in four months, produce in a good crop twenty-fold, and in an indifferent crop one-fifth less. *Kembatti* or *doḍḍa kembatti*, and *garuda* or *sanna kembatti* yield twenty-three and thirteen-fold respectively in a good crop, or fifteen and seven-fold in an inferior one. The first ripens in five months, the second in four. Of the small-grained rices, *bili sanna batta*, *kari sanna*

batta, *put raj* and *tripati sanna batta*, the first ripens in five months, the second in five and a half, the third in four, and the fourth in three and a half. Their respective yield in a good crop is twenty-four, thirty-two, fifteen and seventeen-fold.

In Periyapatna and the west the principal cultivation is the transplanted or *náti*, and by far the greatest quantity of rice cultivated is the *hain* crop or *anaputti*. The other kinds raised are *kembatti*, *konavali*, *sanna batta*, *sanna kembatta*, and *kâru*; all ripen in six months, except the last, which ripens in five. The following is the manner of cultivating the *hain náti* or crop of transplanted rice growing in the rainy season:—The ground on which the seedlings are to be raised gets seven or eight ploughings between the middle of Vais'ákha and the 10th of Jyéshtha, which are the second and third months after the vernal equinox. In the intervals between the ploughings the field is inundated; but at each time that operation is performed, the water is let off. After the last ploughing, manure with the leaves of the *chandra mallige* (*mirabilis*) or *ummatte* (*datura stramonium*); but, if these cannot be had, with the leaves of the *chaudangi* (*solanum*). Then tread the leaves into the mud, sow the seed very thick and cover it with dung. The seed is in general prepared for sowing by causing it to sprout: and the reason assigned for so doing is, that it is thereby secured from the birds. If the seed has been prepared, or *moḷe*, the field has water during the third, sixth, and ninth days, the water being allowed to remain on the field all day, and being again let off at night. On the tenth day the field is filled with water an inch deep and is kept so till the eighteenth, when that water is let off. Immediately afterwards the field is filled to three inches deep, and is kept thus inundated until the seedlings be fit for transplantation. If the seed be sown dry, it receives water on the first, second, and third days. On the fourth it has the manure which is given to the *moḷe*, when that is sown. It receives water again on the seventh, which is let off on the ninth. Water is again given on the thirteenth, seventeenth, and twenty-first; and the field is then inundated, until the seedlings are fit for transplantation. They must be transplanted between the thirtieth and forty-sixth days.

The ploughings for the fields into which the seedlings are to be transplanted are performed during the time in which these are growing; and are done exactly in the same manner as for the field in which the seed has been sown. Stiff ground requires eight ploughings; in a light soil six are sufficient. The manure is given before the last ploughing. The seedlings are pulled in the evening, and kept in water all night. Next morning the field has the last ploughing, and the mud is smoothed

by having a plank drawn over it. The seedlings are then planted, and get no water until the eighth day. On the eighth, twelfth, sixteenth and twentieth days the water is kept on the field, and is let off at night. The yellow colour occasioned by the transplantation is then changed into a deep green; after which, until the crop ripens, the field is constantly inundated. In a bad soil, the weeds are removed on the thirtieth day, in a good soil, on the forty-fifth.

The farmers here make their sprouted-seed in the following manner: The seed is soaked all night in water, and is then placed in a heap on a piece of sackcloth, or on some leaves of the plaintain-tree. There it is mixed with some buffalo's dung, and the leaves of the *burike* (*ocymum molle*), and covered with pack-saddles. In the evening it is sprinkled with warm water, and covered again. In the morning and evening of the second day it is sprinkled with cold water, and next day it is fit for sowing.

Every kind of rice that is sown in Nagar takes six months to grow; and they are of less variety than usual, namely, *bili batta* or *heggai*, and *jolaghena*, which may be cultivated both as dry-seed and as transplanted; and *honasena*, or *kempu*, which can be sown only as dry-seed.

The *bara-batta* cultivation is conducted as follows:—In the course of the five months following the winter solstice, the field gets four single ploughings. In the second month after the vernal equinox, it is manured with leaf-dung, and ploughed once. After the next rain, the seed is mixed with dry cow-dung, sown broad-cast, and covered by the implement called *koradu*. A month after sowing, when the young rice is about four inches high, the field is turned over with a small plough, to kill the grass and to destroy part of the young corn, which is always sown too thick. After this, the field is again smoothed with the same implement, and harrowed with a bunch of thorns. In the second month after the summer solstice, all the banks are repaired, to retain the water on the fields, which are then ploughed again and smoothed with the implement called *aligina koradu*. A large rake, called *halaku*, is then drawn by the hand over the field, to remove the weeds. In the month preceding the autumnal equinox, the weeds are removed by the hand. In the two months preceding the shortest day, the crop is ripe. It is cut close by the ground, and for four days is allowed to lie loose on the field. It is then stacked in heaps, with the ears inward, but without having been bound up in sheaves. In the course of three months, it is trampled out by oxen. The grain with the husk is preserved in store-houses, or straw bags, and is only made into rice as it may be wanted for immediate use.

The process for transplanted rice, called here *nitti*, is as follows:—

In order to raise the seedlings, in the course of fifteen or twenty days during the month following the vernal equinox, a plot is inundated, and ploughed four times. It is then manured with any kind of fresh leaves, and with the dung made by cattle that have been littered with dried leaves. These are ploughed down, and the mud is smoothed, first with the *noli*, and afterwards by the *mara*, which is a square log of timber yoked in the same manner. The field is then drained so that three inches of water only remain. In any of the three months between the vernal equinox and the summer solstice, the seed is sown broad-cast. As this is the dry season, the seedling plot must be very low, so as to receive a supply of water from some rivulet. On the fifth day after the seed has been sown, the whole water is allowed to drain from the plot; and for three days this is kept dry, after which it is constantly inundated, till the seedlings are fit for transplantation. The field into which they are to be removed is inundated during the two months following the summer solstice, and in the course of three days during that period ploughed four times. It is then manured, in the same manner as the plot was; and afterwards, in the course of two or three days, it is ploughed again three times. The mud is then smoothed with the *noli*, above mentioned; and the water having been let off to the depth of three inches, the seedlings are transplanted into the field, which must be always kept under water; and a month after it has been planted, the weeds must be removed by the hand. The harvest is in the month preceding the winter solstice.

All the fields are capable of both modes of cultivation. The transplanting is reckoned most troublesome and least productive, and requires most seed. A kandaga of land is an extent that in the transplanting cultivation requires one kandaga of seed; in dry-seed cultivation, it requires only fifteen kolagas. The produce of all the three kinds of rice is nearly the same, only the *heggai* gives rather most. Of this grain a kandaga of land of the first quality, cultivated by transplanting, produces eleven or twelve kandagas; land of the second quality produces eight kandagas; and land of the third quality produces six kandagas. The same ground, cultivated with dry-seed, would produce from half a kandaga to one kandaga more.

The kinds of rice cultivated at Shimoga are *sampige dála*, *beṭṭa kendál*, *kembatti* and *sanabatti*, producing in a good crop ten, twelve and nine-fold respectively, the last two being equal. All these require six months to grow. They are all large-grained, except the *sanabatti*, which sells five per cent higher than the others. The lowest ground is used for the *sanabatti*, the highest for the *kembatti*.

The cultivation of all soils and all kinds of rice here is the same, and

the unprepared seed is sown by a drill. Immediately after harvest, the ground is once ploughed. When the rains commence during the two months following the vernal equinox, it is ploughed again twice, smoothed with the implement called *koradu*, and then hoed twice with the *heg kunte*, which is drawn by two oxen. This removes the grass; after which the clods are broken by drawing the *koradu* twice over the field, which in some measure serves as a rolling-stone. The dung is then spread; and after the first good rain the seed is sown with the drill or *kúrige*, and covered with the *koradu*. At this season the rain comes in showers, between which are considerable intervals. On the third day after having been sown, the field is hoed with the *heg kunte*, which here is called also *kambutige*. On the twentieth day, when the seedlings are nine inches high, the *koradu* is used again; then the *edde kunte*; then the *koradu*, and finally the harrow, which is made of a bunch of thorny bamboos. On the thirtieth day, more grass having sprung, the *edde kunte* is again used, the rows of young corn passing between the hoes; and this must be repeated as often as the grass springs. In the third month the water is confined, and then for the last time the *edde kunte* must be used. The mud raised by this is smoothed by the *koradu*; but in this operation the same implement is called *aravasi*. All these weedings are not sufficient, and the remaining grass must be removed by the hand and weeding-iron. The rice is cut with the straw, and for two days is allowed to lie loose on the field. It is then put in ricks, without having been bound in sheaves, and remains there until trodden, which may be done any time in the course of three months. It is always preserved in the husk, and when wanted for consumption is cleaned by a hand-mill of the usual form, but made entirely of timber, which removes the outer husk; but the inner one, or bran, must be separated by beating in a mortar. Eight measures of clean rice, as usual in India, are equal in value to twenty of that which retains the husk.

South of the Chitaldroog District, all the rice ground is cultivated as sprouted-seed. The seed is sown equally thick, yet in Budihal the land often produces sixty-fold, and the ordinary crop is forty seeds; while towards Garudagiri, the usual produce is twenty seeds. In the course of one year there are frequently from the same field two crops of rice.

The kinds of rice cultivated at Belur are *hasude*, *bola mallige*, *bili sanna batta*, *kérivanna* and *putta batta*, which ripen in eight months; and *chípiga*, *kesari*, *kumbara kesari*, *kempu sanna batta*, and *modara*, which ripen in seven months. On *nirávari* land, or that which has a supply of water from tanks, the rices most commonly cultivated are

kirivanna and *hasude*. All the three kinds of cultivation are in use; but in ordinary seasons the dry seed is by far the most prevalent. In extraordinary wet seasons a good deal is transplanted, and some is sown sprouted.

The cultivation of the dry-seed is conducted as follows:—In the month following the winter solstice, the ploughing commences, and in the course of two months the operation is eight times repeated. The little banks, inclosing the plots for confining the water, are then repaired, and the field is manured. In the month preceding the vernal equinox, after a shower of rain, the clods are smoothed with the *ada*, or *gidde mara*, which is the same implement which at Nagar is called *noli*. Eight days afterwards, the field is again ploughed and again smoothed with the *ada*. The seed is sown by the drill, according as the rainy season commences, during the two months and a half which follow the vernal equinox. It is then covered by the *ada*. On the twenty-third day after having been sown, the field is hoed with the *edde kunte*, and this is repeated twice, with an interval of four days between each time. The field is then inundated by confining the water, and the *kunte* is drawn a fourth time in the mud. On the day following, the soil is smoothed with the *ada*. Eight days afterwards, the field is drained until the weeds can be removed by the hand. After a month or six weeks, this must be repeated. The rice is cut with the straw, and trodden out by oxen.

When the rains are heavy, a good deal of rice is raised by transplantation. For every kandaga land, two kandagas of seed must be sown; and the produce of this, on the best land, is only twenty-one or twenty-two kandagas. Very little sprouted-seed is sown; but it seems to be the cultivation that would answer best. For a kandaga land fifteen kolagas of seed are sufficient, and the produce is little less than in the dry-seed. On the *makke* land, or that which depends entirely on rain for a supply of water, the seed is always sown without preparation, and managed exactly in the same manner as on the nirávari. The produce on the best land is twenty-two kandagas, from thirty kolagas sown on a kandaga field.

Sugar-cane.—A considerable quantity of sugar-cane is cultivated near Seringapatam. It is of two kinds, *rastáli* and *paṭṭápaṭṭi*.[1] Both yield *bella* or *jaggory*; but the natives can extract sugar from the paṭṭápaṭṭi alone. The jaggory of the latter is also reckoned the best. The rastáli can be planted only in Chaitra; the paṭṭápaṭṭi may also be planted in Srávana or Mágha. The crop of rastáli is over in a year; that of

[1] *Rastáli* is the original sugar-cane of the country; *paṭṭápaṭṭi* was introduced, it is said, from Arcot, in the time of Haidar, by Mustafa Ali Khan, a paymaster-general.

paṭṭápaṭṭi requires fourteen months, but may be followed by a second crop, or, as is said in the West Indies, by a crop of *ratoons*, which require twelve months only to ripen. The rastáli will not survive for a second crop.

When the ground is to be cultivated for sugar-cane, it is watered three days, and then for the same length of time it is allowed to dry. During the next eight days it must be ploughed five times, and the clods must be beaten small with a kind of pick-axe, called *kol gudali*. The field must then be manured, and ploughed a sixth time. The ground now rests fifteen days; after which, in the course of one or two days, it must be ploughed twice, and then be allowed eight days more rest. It is afterwards ploughed a ninth time. These operations occupy forty-four days; six more are employed in planting the cane, which is done by the instrument called *yale gudali*. With this the field is divided into beds of about six cubits wide. These beds are separated by small trenches, which are about fourteen inches wide, and eight deep. In every alternate trench are dug small wells about two feet deep. The water from the canal flows through all the trenches, and, a quantity of it lodging in these wells, is taken out with pots for watering the plants by the hand. Across every bed, at the distance of a cubit, are dug five holes, about six inches in diameter and three in depth. In each of these are placed horizontally two cuttings of the cane, each containing three joints. These are covered slightly with earth, over which is laid some dung. When the cane is planted in Chaitra, the trenches must be filled with water from the tank, and every hole must be watered by pots. At the other seasons the trenches are full, it being the rainy weather; but, even then, for one month, the holes containing the canes must daily be watered by the hand. The earth in the holes is then stirred up with a stick, and a little dung is added. Next month the daily watering must be continued, and at the end of it the whole field must be dug up with the *yale gudali*; and round every cluster of young canes there must be formed by the hand a small cavity, into which a little dung is to be put. In the third month the canes must be watered every other day. At the end of the third month, if the canes have grown with luxuriance, the field must be dug over again with the *yale gudali*; but, if they are rather stunted, the watering must be continued all the fourth month, before they get the third weeding. At this time, the earth at the roots of the cane is heaped up into ridges, crossing the beds at right angles to the trenches. Afterwards, no water is given immediately to the plants; but for three days the trenches must be kept full. It is then let out for a week. If there be rain, there is no occasion for more watering; but, if it be dry weather, the trenches, for a month, must be

filled with water one day in the week. Then the weeding with the *yale gudali* must be repeated, and the earth must be smoothed with the hand, and placed carefully round the canes. The young shoots from each hole will be now ten or twelve in number; those which are sickly must be cut off; and the healthy, which are about a cubit long, must be tied up with a leaf of the plant into bundles of two or three, in order to prevent them from spreading too much. Should there be no rain, the trenches must once in fifteen days be filled with water, till the canes, having grown higher, again require to be tied together. In a month after the first tying they ought to be two cubits high. When the plants are eight months old they will have grown another cubit, and will require another tying. The farmer now begins to repair his apparatus for making jaggory: the *ále mane*, or boiling-house; the *gána*, or mill; the *kopparige*, or boiler; the *achchu*, or mould; the *kunu*, or cooler; the *gormane*, or ladle; and the *chibalu*, or skimmer. In the eleventh month he begins to cut the rastáli, and the crop must be finished within the year. The paṭṭápaṭṭi is ripe in twelve months, and two months may be allowed for cutting it.

If it be intended to keep the field of paṭṭápaṭṭi for a second year's crop, the dry leaves which are cut off at crop season must be burned on the spot, and the whole field must be dug with the *yale gudali*. The trenches must then be filled with water, and for six months the watering must be continued once in eight or ten days, unless there be rain. The weedings during this time ought to be three; at each of which dung ought to be given. At the end of six months, the canes having grown one cubit high, the weakly plants must be removed, and the strongest tied up, as in the first crop. The manner of conducting the two crops after this is quite similar. The canes of the second crop must be all cut within the year.

The kinds of sugar-cane cultivated in Kolar are four, which are esteemed in the following order: first *rastáli*, second *paṭṭápaṭṭi*, third *mara kabbu*, fourth *kaṭṭe kabbu*. The two last are very small, seldom exceeding the thickness of the little finger; yet the kaṭṭe kabbu is the one most commonly cultivated. This is owing to its requiring little water; for by means of the *yáta* it may have a supply sufficient to bring it to maturity. From the end of Phálguna to the end of Chaitra (Mar.—April) plough eight or ten times. Manure the field with dung, and plough it again. Then spread leaves on it, and cover them with the plough. By the small channels that are to convey the water, the field is then divided into beds eight cubits broad. Furrows are then drawn across the beds at the distance of nine inches from each other. The cuttings of cane, each containing four or five eyes, are then placed

lengthwise in the furrows, the end of the one touching that of the other. They are covered with a very little earth, over which is laid some dung. They are then watered, the water flowing through every channel, and entering every furrow. For one month the watering is repeated once in three days; the earth round the canes must then be loosened with the point of a sharp stick. For fifteen days more the watering must be continued; when the whole field should be hoed, and levelled with the *kól gudali*. Four days afterwards, between every second row of sugar-cane a trench is dug, and into this the water flows from the channels. Thus in the progress of its cultivation each bed assumes two forms. When there is no rain, the field requires to be watered once in fifteen days. When four or five months old, the canes are tied up in bundles; and when they are a cubit and a half high this is repeated. In eleven months they are ripe, and a month and a half are allowed for the crop season. The soil here used for sugar-cane is the rich black soil called *ere*; and after sugar it requires one or two years' rest before it gives a good crop of rice. The sugar-cane is all made into jaggory; seventy-four seers measure, or nearly eighteen ale-gallons of juice, are said to produce fifty kachcha seers weight (about 26½ lb. avoirdupois) of the jaggory.

The sugar-cane field at Madgiri is divided into two equal portions, which are cultivated alternately, one year with sugar-cane, and the other with grain; the cane, however, thrives better when the field, in place of being cultivated for grain, is allowed an intermediate fallow; but then the loss is heavy, as after cane the grain thrives remarkably. The grains cultivated are rice, rági, and jóḷa; the first injures the cane least, and the jóḷa injures it most. The kinds of cane cultivated are the rastáli and mara kabbu. In Kártika and Márgasira (Oct.—Dec.) plough seven times, and manure with sheep's dung and leaves. Then with the hoe called *yale gudali* form channels at a cubit's distance. In these also, at a cubit's distance, plant single shoots of the cane, each about a cubit in length. If the soil be poor, they must be planted rather nearer. They are laid down in the channels, which are filled with water, and then people tread the shoots into the mud, by walking through each channel. A *koḷaga* of land requires 18,000 shoots, on which data it ought to contain 1·8 acre. If the soil be of a moist nature, the cane has water once in eight days; but, if it dry quickly, it must, until ripe, be watered once in six days, except when there is rain. At the end of the first month the field must be hoed with the *kali kudali*. Near each cane, as a manure, some leaves of the *honge* are then placed, and they are covered with a little mud; so that the channels are now between the rows of cane, and the canes grow on the ridges. When these are 2½

cubits high, they are tied up in bunches of three or four; and as they grow higher, this is three or four times repeated. Twelve months after planting, the crop season begins; and in six weeks it must be finished: 250 maunds of jaggory is here reckoned a good crop from a kolaga of land, which is very nearly 15 cwt. an acre; 150 maunds, which is about 9 cwt. from the acre, is reckoned a bad crop. Black clay gives the greatest quantity of jaggory, but it is of a bad quality. A sandy soil produces least jaggory, but that of a high value. One *kapile* can water an acre and a half of sugar-cane land.

The ground for cultivating sugar-cane in Sira is also divided into two equal parts, which are alternately cultivated; one year with cane, and the other with rice. It is watered either from the reservoirs, or by the *kapile*. In the last case, a field of two *kolagas*, or three acres, one-half of which is in sugar-cane, and the other in rice, requires the constant labour of four men and eight oxen. Day-labourers must also be hired to rebuild the boiling-house, to tie up the cane, and to weed. When the field is watered from a reservoir, one man only is regularly employed; but to plough, to plant, to weed and to tie up the cane, both men and cattle must be hired in addition. Three kinds of cane are here cultivated. The most valued is the *rastáli*, which grows best on a black soil in which there is much sand or gravel; a good crop of this, on a *kolaga* land, produces 100 maunds of jaggory; which is about 29⅓ cwt. on an acre. The next in quality is the *kari kabbu*, or black cane. It requires a pure black mould, called *ere bhúmi*; and, in a good crop, produces, from a *kolaga* land, sixty maunds of jaggory, or from an acre nearly 17½ cwt. The poorest cane is the *mara kabbu*, or stick cane. It is cultivated on the same kind of soil with the rastáli; but produces only half as much jaggory as the kari kabbu, and that of a very bad quality, for it is quite black.

The cultivation of the rastáli, however, is comparatively much more troublesome. In the course of the eight months following the summer solstice, the field must be ploughed eleven times; and once a month, during the whole of that time, 1,000 sheep must be folded for one night on the field. It is then manured with mud from the bottoms of the reservoirs, and ploughed again twice. The channels are then formed, and in them the cuttings are laid down, two and two being always placed parallel. A *kolaga* of land requires 50,000. The channels are then filled with water, and the cuttings are trodden into the mud with the feet. The second watering is on the fourth day, the third watering on the twelfth; afterwards the field, if the soil be good, must be watered once a fortnight; or once a week, if it part with its moisture quickly. On the twentieth day the field is weeded with the small hoe

called *molu potu*, which implies that the operation is done very superficially. On the thirty-fifth day the whole field is dug with the large hoe called *yale gudali*; and, the earth being thrown up toward the canes in ridges, the channels for conveying the water run between the rows. About the ninetieth day the canes are tied up with a leaf of the plant in parcels of five or six, and once a month this is repeated. When the cane is ten months old, the crop begins, and in thirty days it must be finished.

Towards Periyapatna, the cane is watered from reservoirs; the natural moisture of the climate not being sufficient to raise it, and machinery being never employed. The kinds cultivated, besides a little paṭṭápaṭṭi, are rastáli and mara kabbu, both of which grow nearly to the same length, which is in general about six feet. The rastáli ripens in twelve months, while eighteen are required to bring forward the mara kabbu; so that as a crop of rice must always intervene between two crops of sugar-cane, the rotation of the former occupies two years, while in that of the latter three are consumed.

For the mara kabbu plough twenty times either in Asvíja and Kártika, the two months immediately following the autumnal equinox; or in Kártika and Márgasira, which is of course one month later. The canes are planted in the second or third months after the winter solstice. In order to plant the cane, longitudinal and transverse furrows are drawn throughout the field, distant from each other one cubit and a half; at every intersection a hole is made, nine inches wide, and of the same depth; in each hole are laid horizontally two cuttings of cane, each containing three joints; finally under them is put a little dung, above them an inch of mould. Then water each hole with a pot, from a channel running at the upper end of the field. On the two following days this must be repeated. Until the end of the third month, water every other day. From the third to the sixth month, the field must, once in eight days, be ploughed between the rows of holes; and at the same time, should there be any want of the usual rain, it must be watered. At the first ploughing a little dung must be given, and at the end of six months the field must be copiously manured. At this time channels are formed winding through among the canes; so that every row is between two channels. When the rainy season is over, these channels must be filled with water, once in eight days in hot weather, and once a month when it is cool. At the beginning of the eighth month the whole field is hoed, and at the end of two months more this is repeated. The cane here is never tied up.

The sugar-cane cultivated in Nagar is the *mara kabbu*. The ground

fit for it is that which has a supply of water in the dry season. Any soil will do, but a red earth is reckoned the best. In the month preceding the vernal equinox plough four times; and then throughout the field, at the distance of one cubit and a half, form with the hoe trenches one cubit wide, and one span deep. Then cover the field with straw, dry grass, and leaves, and burn them to serve as a manure. The soil in the bottom of the trenches is afterwards loosened with a hoe; and a man, with his hand, opens up the loose earth, puts in a little dung, and upon this places horizontally, and parallel to the sides of the trench, cuttings of the cane, each containing four or five joints. These he covers with a little dung and earth. The cuttings are placed in one row in each bed, the end of the one being close to that of another. Once a day, for a month, the canes must be watered with a pot; the young plants are then about a cubit high; and, the earth round them having been previously loosened with a sharp-pointed stick, a little dung should be given to their roots. After this, the ridges are thrown down, and the earth is collected toward the rows of young cane, which by this means are placed on ridges, with a trench intervening between every two rows. Until the rains commence, these trenches must every other day be filled with water. In the month preceding the autumnal equinox, in order to prevent them from being eaten by the jackals and bandicoots, the canes are tied up in bundles of from five to ten, and each of these is surrounded by a series of straw rope. In ten months they are fit for cutting, and require no farther trouble. The crop season lasts one month. On the second year a crop of ratoons is taken, in the third year the roots are dug up, and the field is again planted with cane; so that it is never reinvigorated by a succession of crops.

Sugar-cane is at Harihar the most considerable irrigated crop. In the intervals between the crops of cane, a crop of rice is taken, should there be a sufficient supply of water; but that is seldom the case, and the intermediate crop is commonly some of the dry grains. The cane may be planted at any time; but there are only three seasons which are usually employed. One lasts during the month before and month after the summer solstice. This is the most productive and most usual season; but the cane requires at this time longer to grow, and more labour, than in the others. The other two seasons are the second month after the autumnal equinox, and the second month after the shortest day. Those crops arrive at maturity within the year.

The kind of cane cultivated is the *mara kabbu*, and the following is the process in the first season:—In the second month after the

vernal equinox, the field must be watered, and eight days afterwards it is ploughed once. After another rest of eight days, it must be ploughed again with a deeper furrow, four oxen having been put into the yoke. After another interval of eight days it is ploughed, first lengthwise, and then across, with a team of six oxen. Then, at the distance of three, or three and a half cubits, are drawn over the whole field, furrows which cross each other at right angles. In order to make these furrows wider, a stick is put across the iron of the plough. In the planting season, two cuttings of the cane, each containing two eyes, are laid down in every intersection of the furrows, and are covered slightly with mud. The furrows are then filled with water, and this is repeated three times, with an interval of eight days between every two waterings. A little dung is then put into the furrows; and when there happens to be no rain, the waterings once in the eight days are continued for three months. When the canes have been planted forty days, the weeds must be removed with a knife, and the intervals are hoed with the hoe drawn by oxen. This operation is repeated on the fifty-fifth, seventieth, and eighty-fifth days, and the earth is thrown up in ridges toward the canes. In the beginning of the fourth month, the field gets a full watering. Fifteen days afterwards, the intervals are ploughed lengthwise and across; and to each bunch of plants a basket or two of dung is given and ploughed in. The weeds are then destroyed by a hoe drawn by oxen; after which, channels must be formed between the rows; and until the cane ripens, which varies from fourteen to seventeen months, these channels are filled with water once in fifteen days. The crop season lasts from one month to six weeks.

Cardamoms—are propagated entirely by cuttings of the root, and spread in clumps exactly like the plantain-tree. In the month following the autumnal equinox, a cluster of from three to five stems, with the roots adhering, are separated from a bunch, and planted in the same row, one between every two areca-nut palms, in the spot from whence a plantain-tree has been removed. The ground around the cardamom is manured with *nelli* (*emblica*) leaves. In the third year, about the autumnal equinox, it produces fruit. The capsules are gathered as they ripen, and are dried four days on a mat, which during the day is supported by four sticks, and exposed to the sun, but at night is taken into the house. They are then fit for sale. Whenever the whole fruit has been removed, the plants are raised, and, all the superfluous stems and roots having been separated, they are set again; but care is taken never to set a plant in the spot from whence it was raised, a change in this respect being considered as necessary. Next

year these plants give no fruit, but in the year following yield capsules again, as at first. After transplantation, the old stems die and new ones spring from the roots. Each cluster produces from a quarter to one seer weight of cardamoms, or from $\frac{15}{100}$ to $\frac{6}{10}$ of a pound.

Areca-nut.—In the gardens near Channapatna the areca palm requires a rich black soil, and is planted in such places only as produce water on digging a well two cubits deep. There are here two varieties of the areca, the one bearing large and the other small nuts. The produce of both kinds is nearly equal in value and quantity.

The following is the manner of forming an areca-nut garden :—A plot of ground having been selected for a nursery, is dug to the depth of one cubit. When the seed is ripe, which happens between the middle of January and that of February, trenches must be formed in the nursery, a span broad and a cubit deep. The trenches are half filled up with sand, on the surface of which is placed a row of the ripe nuts. These are again covered with five inches of sand, and two inches of rich black mould, and watered once in three days for four months, at which time they are fit for being transplanted into the garden. The garden having been fenced with a hedge of *euphorbium tirucalli*, or *jatropha curcas*, is dug to the depth of a cubit at the same time with the nursery and planted with rows of plantain-trees at the distance of three cubits. When the young palms are fit for being transplanted the garden must be dug again to the former depth, and two young arecas must be set in one hole between every two plantain-trees. When there is no rain they must have water every third day. When the rainy season commences, a trench must be dug between every third row of trees ; that is to say, so as between every trench to form beds each of which contains two rows of the areca. These trenches serve to carry off superfluous water and to bring a supply from the reservoir when wanted. The garden must be dug twice a year to keep it clear of weeds. At the end of three years the original plantain-trees are removed, and a row is set in the middle of each bed and kept up ever afterwards in order to preserve a coolness at the roots of the areca. When the areca-trees are about five feet high, which requires about five years, they receive no more water than what is given to the plantain-trees, which in dry weather must be watered twice a month. The tree when five years old begins to produce fruit, and lives from thirty to forty years.

Each tree pushes out three or four spadices which from the middle of August until that of November become fit for cutting at different intervals of twenty or thirty days, one after the other. When the nuts have been cut, the skin is removed with an iron knife, and a quantity

is put into a pot with some water, in which it must be boiled till the eyes be separated. The nut is then cut into three or four pieces and for three or four days dried on mats exposed to the sun, when it becomes fit for sale. The plantations are interspersed with cocoa-nut, lime, jack and other trees, which add to the shade and to the freshness of the soil. Under the trees are cultivated ginger, and various vegetables.

The situation that is reckoned most favourable for areca gardens in Madgiri is a black soil which contains calcareous nodules. It differs from that in which cotton is raised by having the limestone a cubit or two deep; whereas the cotton requires it to be at the surface. The gardens at this place are watered from reservoirs, from canals, and from wells by means of the *kapile*.

To make a new garden,—in Srávana, the fifth month after the vernal equinox, plough four times. Then with the hoe called *yale gudali* form the garden into beds six cubits wide. Between every two beds is a raised channel for bringing a supply of water; and in the centre of each bed is a deep channel to carry off what is superfluous. The beds are divided into plots ten or twelve cubits long. Then plant the whole with shoots of the betel vine, and for its support sow the seed of the *háluvána*, *agase* and *nugge*. Then surround the whole with a thick hedge, and once a day for three months water with a pot. Whenever weeds grow they must be removed; and at each time the betel vines must get some dung. Between every two rows of the vines, in the fourth month, is put a row of young plantain-trees. Once in four days afterwards, the water is given from the reservoir or well. In six months the vines must be tied up to the young trees. At the same time, for every *wokkala* land, 3,000 nuts of the areca must be planted near the roots of the vines. When they are three years old a thousand of them will be fit for use, and 800 are required to plant a *wokkala* land, or about an acre and a half. They are planted distant in every direction from each other five cubits. At the same time plant on the inside of the hedge some rows of cocoa-nut palms and orange, lime, mango, or jack trees. The 800 areca palms, at five cubits distance, would only occupy about an acre; but a considerable space is taken up by a walk, and by the rows of fruit-trees between them and the hedge.

In nine years from the first formation of the garden the betel vines and most of the trees that supported them are removed. A few of the *agase* and all the plantains are allowed to remain. In the twelfth year the areca palms begin to produce fruit. The remaining *agase* trees, and one-half of the plantains are then removed. After this the garden requires water only once in eight days when there is no rain; and the whole is dug over, and formed like rice-ground into proper squares

and channels for distributing the water. One year it is manured with dung; in the second with the leaves of the *honge* and *koghi*, and in the third year with mud from the bottom of a reservoir. So long as the garden lasts this succession of manures should, if possible, be continued; and when the palms attain their full growth, which is in the fourteenth year of the garden, the plantain-trees are entirely removed. For thirty years from its arriving at maturity the palm continues vigorous, and for fourteen years more gradually declines; during which time a new garden ought to be formed, and then the old trees should be cut, and the ground cultivated with grain, till the second formed garden again begins to decay. In place of those that die, some poor farmers plant new trees, and thus constantly keep up a garden on the same spot; but here this is looked upon as a bad practice.

The crop season lasts two months before, and one after, the autumnal equinox. The nut, after being peeled, is cut into seven or eight pieces, and put up in a heap. Then take one seer of the nut, one seer of *cut terra japonica*, and a hundred leaves of the *piper betel*, beat them together repeatedly with some water, and strain the juice thus obtained into a pot. Take twenty seers of the bark of the *kari jáli* and boil it during a whole night in a large pot with forty seers of water. With this decoction mix the juice expressed from the former materials, and boil again. While it is boiling, put in the areca-nut, after it has been cut, until the pot be full. Immediately after, take it out with a ladle, and put in more, till the whole is boiled. In order to be dried, it must be three days exposed on mats to the sun, and is then fit for sale. Forty maunds of dried nut is here reckoned the common produce of a *kolaga* land, which is about $6\frac{1}{3}$ cwt. an acre, or for each tree about $1\frac{1}{3}$ lb.

Near Chiknayakanhalli the areca thrives best in the rich black mould called *ere*, or *krishna bhúmi*. The natives here look upon it as a matter of indifference, whether or not, on digging a little depth, water may be found in the soil. All that is required is to have a proper supply of water either from the reservoir or by means of machinery.

In the second month after the winter solstice, the nut intended for seed is cut; and, having been put in a heap, is for eight or ten days kept in the house. A seed-bed is then dug to the depth of a foot, and three inches of the mould is removed from the surface, which is then covered with a little dung. On this the nuts are placed with their eyes uppermost, and close to each other. They are then covered with an inch of mould, and for three months are watered every other day. The seedlings are then three or four inches high, and must be transplanted into a fresh bed that is prepared in the same manner: but in this they

are placed a cubit distant from each other. Here they grow for three years, receiving water once every other day; and once a month they are cleaned from weeds and have a little dung.

One year after planting the seed, the ground that is intended for the garden must be dug to the depth of a cubit, and the soil exposed for two months. Young plantain-trees are then placed in it at sixteen cubits distance from each other, and it is surrounded by a screen of cocoa-nut palms, and of jack, lime, and orange-trees, which are defended by a hedge of the milk-bush. At the same time seeds of the *agase* are planted throughout the garden, at the distance of four cubits. When there is no rain the garden must once in fifteen days be watered by channels made for the purpose. In the second month after the summer solstice of the third year, the young arecas are fit for transplantation. Then throughout the garden, at the distance of sixteen cubits, and in the middle between every two plantain-trees, are formed pits, a cubit deep and a cubit wide. In each of these pits a young areca is put, and it must be carefully raised from the seed-bed with much earth adhering to its roots; and, after it is placed, the pit must be filled with earth, and then receive a pot of water. The young arecas are then between two and three feet high, and have four or five branches. If there be water in the reservoir, an irrigation once a month is sufficient; but the *kapile* must be used once in ten days, as the waterings given by it are but scanty. For three years afterwards the whole garden must be completely hoed twice annually. At the one hoeing, for every four arecas, it must have a bullock-load of dung; and at the other hoeing, every tree must be allowed an ox-load of red soil. The mud of reservoirs is here thought to be very bad for an areca-nut garden. Ever afterwards the garden is hoed completely once a year only, and is then manured with dung and red earth. At the intermediate period of six months, it is hoed near the trees, and has a little dung. At the end of the first three years the *agase* trees are cut. The plantains are always reserved; but, as the old stems are cut, which is always done in from twelve to eighteen months, the young shoots are conducted to a distance from where the parent was originally placed; and when the garden is twenty years old, in these spots are planted other young arecas, to supply the places of the old ones when they decay. This second set are again supplanted by a third, growing where the first set did, and thus a constant succession is preserved. In a new garden the areca begins to bear fruit in nine years; but fourteen or fifteen years are required to bring forward those which are planted among old trees. They continue to bear for sixty or seventy years; but after having been twenty-five or thirty years in perfection they begin to decay.

There are annually two crops of areca-nut: one in the second month after the summer solstice, the other in the two months which precede the shortest day. The last crop is superior both in quantity and quality. The nut, on being cut, is skinned in the course of two days, and put into a large pot with as much water as will cover it two inches. It is then boiled for about three-quarters of an hour until a white scum rises. The largest are then cut into eight pieces, and the smallest into two, with the others in proportion to their size. During the four following days they are spread out in the sun to dry, and every night they are gathered in a heap. When the fruit has been allowed to approach too near to maturity, the nut loses its colour; and a deceit is attempted by adding a little reddle to the water in which it is boiled. This frequently deceives the consumer, but never the experienced dealer; and seems to be done purposely to enable him to defraud the unwary.

A garden of 1,000 trees, allowing eight cubits square for each tree, ought to contain rather more than $3\frac{1}{3}$ acres; but a young garden, containing trees at sixteen cubits, will require $8\frac{1}{2}$ acres. The produce is reckoned from forty to sixty maunds. The areca-tree is never cut till its leaves have turned brown. Its stem has then acquired great hardness, and in building is very useful.

The following process is adopted in Periyapatna to make a new plantation of areca:—Take a piece of ground consisting of black mould or a substratum of limestone, with water at no greater depth than three cubits, and surround it with a hedge of the *euphorbium tirucalli*, and some rows of young cocoa-nut palms. Then, at the distance of twelve cubits, dig rows of pits, two cubits deep and one and a half in diameter. These pits are six cubits distant from the nearest in the same row. In the second month after the vernal equinox, set in these pits young plantain-trees, and give them water once; after which, unless the weather be uncommonly dry, they require no more. Two months afterwards hoe the whole garden and form a channel in the middle between every two rows of plantain-trees. The channels are intended to carry off superfluous water, and are a cubit wide and two feet deep. In the month immediately following the winter solstice, hoe the whole garden a second time. In the following month, between every two rows of plantain-trees make two rows of holes, at six cubits distance and one cubit wide and deep. Fill each hole half up with fine mould; and in this place two ripe nuts of the areca, six inches asunder. Once in two days for three months water each hole with a pot. The shoots come up in Vais'ákha, after which they get water once only in five days. The holes must be kept clear of the mud that

is brought in by the rain; and for three years must, on this account, be daily inspected. In the month following the autumnal equinox give a little dung. Ever afterwards the whole garden must be hoed three times a year.

After they are three years old the areca palms must be watered every other day in hot weather; when it is cool, once in every four or five days, and not at all in the rainy season. The waterings are performed by pouring a pot-full of water to the root of each plant. In the beginning of the seventh year the weakest plant is removed from each hole; and at each digging, for three years more, every tree must receive manure. After this, for three years, the young palms have neither dung nor water. In the fourteenth year they begin to bear, and in the fifteenth come to perfection, and continue in vigour until their forty-fifth year, when they are cut down. The crop season lasts over Asvíja, Kártika, and Márgasira. A good tree gives 857, and an ordinary one 600, nuts. Sixty thousand nuts, when prepared for sale, make a load of between seven and eight maunds. One thousand ordinary trees at this rate should procure seventy-five maunds.

In Nagar the nursery is managed as follows:—In the month preceding the vernal equinox the seed is ripe. After having been cut, it is kept eight days in the house. In the meantime a bed of ground in a shady place is dug, and in this the nuts are placed nine inches from each other, and with their eyes uppermost. They must be covered with a finger-breadth of earth. The bed is then covered with dry plantain leaves, and once in eight days is sprinkled with water. In the month preceding the summer solstice, the plantain leaves are removed, and young shoots are found to have come from the nuts. In the second month afterwards, leaves of the *nelli* are spread between the young plants. In the month preceding the vernal equinox, they get a little dung. In the dry season they are watered once in from four to eight days, according to the nature of the soil.

In the month preceding the autumnal equinox of the second year, the young plants are removed into another nursery, where they are planted a cubit distant and manured with *nelli* leaves and dung. This nursery must be kept clear of weeds, manured twice a year, and in the dry season should receive water once in eight days. The seedlings remain in it two years, when they are fit for transplantation. When the arecas are three years old, they are removed into the garden, planted close to the drains for letting off the water, and remain there two years, when they are finally placed in the spots where they are to grow. Once in twenty or thirty years only the watering channels are filled up with fresh earth, and then are not allowed water. During that year the

garden is kept moist by occasionally filling the drains. The water in these is, however, reckoned very prejudicial, and is never thrown upon the beds. Once in two years the garden is dug near the trees and manured. The manure is dung, above which are placed the leafy twigs of all kinds of trees. When an areca dies, a new one is planted in its stead; so that in an old garden there are trees of all ages. When the trees are sixteen years old they are employed to support pepper vines. The extent of a garden of a thousand rated trees is about 18¼ acres. Its produce of areca-nut weighs 920½ lb., and of pepper 117 lb.

Cocoa-nut.—There are four varieties of the cocoa-nut: 1st, red; 2nd, red mixed with green; 3rd, light green; and 4th, dark green. These varieties are permanent; but, although the red is reckoned somewhat better than the others, they are commonly sold promiscuously. Their produce is nearly the same.

The soil does not answer in the Bangalore District unless water can be had on digging into it to the depth of three or four cubits; and in such situations a light sandy soil is the best. The black clay called *ere* is the next best soil. The worst is the red clay called *kebbe*; but with proper cultivation all the three soils answer tolerably well.

The manner of forming a new cocoa-nut garden is as follows:—The nuts intended for seed must be allowed to ripen until they fall from the tree; and must then be dried in the open air for a month without having the husk removed. A plot for a nursery is then dug to the depth of two feet, and the soil is allowed to dry three days. On the *Ugádi* feast (in March) remove one foot of earth from the nursery, and cover the surface of the plot with eight inches of sand. On this place the nuts close to each other, with the end containing the eye uppermost. Cover them with three inches of sand and two of earth. If the supply of water be from a well, the plot must once a day be watered; but, if a more copious supply can be had from a reservoir, one watering in the three days is sufficient. In three months the seedlings are fit for being transplanted. By this time the garden must have been enclosed and hoed to the depth of two feet. Holes are then dug for the reception of the seedlings, at twenty feet distance from each other in all directions; for when planted nearer they do not thrive. The holes are two feet deep and a cubit wide. At the bottom is put sand seven inches deep, and on this is placed the nut with the young tree adhering to it. Sand is now put in until it rises two inches above the nut, and then the hole is filled with earth and a little dung. Every day for three years, except when it rains, the young trees must have water.

The cocoa-nut palm begins to produce when seven or eight years old, and lives so long that its period of duration cannot readily be ascertained. Young trees, however, produce more fruit, which comes forward at all seasons of the year. A good tree gives annually a hundred nuts. A few are cut green on account of the juice, which is used as drink; but by far the greater part are allowed to arrive at some degree of maturity, although not to full ripeness; for then the kernel would become useless.

Cocoa-nut palms are planted in Chiknayakanhalli in rows round the areca-nut gardens, and also separately in spots that would not answer for the cultivation of this article. The situation for these gardens must be rather low, but it is not necessary that it should be under a reservoir; any place will answer in which water can be had by digging to the depth of two men's stature. The soil which is here reckoned most favourable for the cocoa-nut is a red clay mixed with sand. It must be free of lime and saline substances. Other soils, however, are employed, but black mould is reckoned very bad. The cocoa-nuts intended for seed are cut in the second month after the winter solstice. A square pit is then dug, which is sufficiently large to hold them, and is about a cubit in depth. In this, fifteen days after being cut, are placed the seed-nuts, with the eyes uppermost, and contiguous to each other; and then earth is thrown in so as just to cover them, upon which is spread a little dung. In this bed, every second day for six months, the seed must be watered with a pot, and then the young palms are fit for being transplanted. Whenever, during the two months following the vernal equinox, an occasional shower gives an opportunity by softening the soil, the garden must be ploughed five times. All the next month it is allowed to rest. In the month following the summer solstice, the ground must again be ploughed twice; and next month, at the distance of forty-eight cubits in every direction, there must be dug pits a cubit wide and as much deep. In the bottom of each a little dung is put; and the young plants, having been previously well watered to loosen the soil, are taken up, and one is placed in each pit. The shell still adheres to the young palm, and the pit must be filled with earth so far as to cover the nut. Over this is put a little dung. For three months the young plants must be watered every other day; afterwards every fourth day, until they are four years old, except when there is rain. Afterwards they require no water.

Every year the garden is cultivated for rági, uddu, hesaru, or whatever other grain the soil is fitted for, and is well dunged; and at the same time four ox-loads of red mud are laid on the garden for every

tree that it contains, while a little fresh earth is gathered up toward the roots of the palms. The crop of grain is but poor, and injures the palms; it is always taken, however; as, in order to keep down the weeds, the ground must at any rate be ploughed; as the manure must be given; and as no rent is paid for the grain. On this kind of ground the cocoa-nut palm begins to bear in twelve or thirteen years, and continues in perfection about sixty years. It dies altogether after bearing for about a hundred years. They are always allowed to die; and when they begin to decay a young one is planted near the old one to supply its place.

In this country, wine is never extracted from this palm, for that operation destroys the fruit; and these, when ripe, are considered as the valuable part of the produce. A few green nuts are cut in the hot season, on account of the refreshing juice which they then contain, and to make *coir* rope: but this also is thought to injure the crop. The *coir* made from the ripe nuts is very bad, and their husks are commonly burned for fuel.

The crop begins in the second month after the summer solstice, and continues four months. A bunch is known to be ripe when a nut falls down, and it is then cut. Each palm produces from three to six bunches, which ripen successively. A middling palm produces from sixty to seventy nuts. As the nuts are gathered, they are collected in small huts, raised from the ground on posts. When a merchant offers, the rind is removed, at his expense, by a man who fixes an iron rod in the ground and forces its upper end, which is sharp, through the fibres; by which means the whole husk is speedily removed. He then, by a single blow with a crooked knife, breaks the shell without hurting the kernel, which is then fit for sale, and is called *kobbari*. A man can daily clean 1,300 nuts. From twenty to thirty per cent of them are found rotten.

Betel Vine.—The *betel vine* thrives best in low ground, where it can have a supply of water from a reservoir. If that cannot be had, a place is selected where water can be procured by digging to a small depth. A black soil is required. A betel-leaf garden is thus managed in the east:—In Chaitra or Vais'ákha, trench over the whole ground one cubit deep, and surround it with a mud wall; immediately within which plant a hedge of the *euphorbium tirucalli*, and of the *arundo tibialis*. When there is not plenty of rain, this must for six months be regularly watered. Then dig the garden, and form it into proper beds, leaving a space of about twenty feet between them and the hedge. From the main channel for conducting the water to the garden, draw others at right angles, and distant twenty-two cubits. Between every two of these, to

drain off the superfluous water, draw others about a cubit wide, and deeper than the former. The garden is thus divided into rows ten cubits in width, having on one side an elevated channel for supplying it with water, and on the other side a deep canal, to carry off what is superfluous. These rows are divided into beds, each also having on one side a channel to supply it with water, and on the other a canal to carry off what is superfluous; and it is surrounded by a narrow bank, about six inches high, which excludes the water that flows through the channels: within these little banks the divisions of the beds are carefully levelled.

In the centre of each division is then formed a row of small holes, distant from each other one cubit; and in Pushya (Dec.—Jan.) in every hole are put two cuttings of the betel-leaf vine, each two cubits long. The middle of each cutting is pushed down, and slightly covered with earth; while the four ends project and form an equal number of young plants, which for the first eighteen months are allowed to climb upon dry sticks that are put in for the purpose. For the first week after being planted, the shoots must be watered twice a day with pots; for another week once a day, and until the end of the second month once in three days. A small drill is then made across each division of the beds, and between every two holes in each; and in these drills are planted rows of the seeds of the *agase*, *nugge* and *varjepu*. The young betel plants must then have some dung, and for four months more must be watered with the pot once in three days. Afterwards, so long as the garden lasts, all the channels must once in four days be filled with water. This keeps the ground sufficiently moist, and water applied immediately to the plants is injurious. The garden ought to be kept clean from weeds by the hand, and once a year, in December, must have dung.

When the plants are a year and a half old they are removed from the sticks; two cubits of each, next the root, is buried in the earth; and the remainder, conducted close to the root of one of the young trees, is allowed to support itself on the stem. At the end of two years two cubits more of each plant are buried in the ground; and ever afterwards this is once a year repeated. At the beginning of the fourth year the cultivator begins to gather the leaves for sale, and for six or seven years continues to obtain a constant supply. Afterwards the plants die, and a new garden must be formed in some other place. In order to give additional coolness to the garden, at its first formation a plantain-tree is put at each corner of every bed, and by means of suckers soon forms a cluster. So long as the garden lasts these clusters are preserved. At all times the gardens are very cool and

pleasant; but they are not neatly kept; and in the space between the hedge and the beds, a great variety of bushes and weeds are allowed to grow.

In the west, the betel vine is grown with the areca palm in the following manner:—When the areca plantation is fifteen years old, in the month immediately following the vernal equinox, a hole is dug near every tree, one cubit deep and one and a half in width. After having exposed the earth to the air for a month, return it into holes and allow it to remain for another month. Then take out a little of the earth, smooth the surface of the pit, and bury in it the ends of five cuttings of the betel-leaf vine, which are placed with their upper extremities sloping toward the palm. Once every two days, for a month, water the cuttings, and shade them with leaves. Then remove the leaves and with the point of a sharp stick loosen the earth in the holes. In the first year the waterings must be repeated every day, and the whole must once a month be hoed; while at the same time dung is given to every plant. In the second year, the vines are tied up to the palms; once in two months the garden is hoed and manured; and it is in the hot season only that the plants are watered. At the end of the second year the vines begin to produce saleable leaves. In the third year and every other year afterwards, so much of the vines next the root as has no leaves, must be buried. Once in six months the garden must be hoed and manured; and in the hot season the vines must be watered every other day.

The owners of these plantations are annoyed by elephants, monkeys and squirrels; and, besides, both palms and vine are subject to diseases; one of which, the *anibe*, in the course of two or three years kills the whole. Except when these causes of destruction occur, the vine continues always to flourish; but the palm begins to decay at forty-five years of age, and is then removed, care being taken not to injure the vine. Near this is made a fresh hole, in which some persons place two nuts for seed, and others plant a young seedling. In order to support the vine during the fifteen years which are required to bring forward the new palm, a large branch of the *háruvána*, or *erythrina*, is stuck in the ground, and watered for two or three days; when it strikes root and supplies the place of an areca.

Coffee.[1]—The variety of coffee cultivated in Mysore appears to be the true *coffea arabica*, which Rhind informs us was originally introduced into Arabia from Abyssinia. It was introduced into this Province some two centuries ago by a person named Baba Budan, who,

[1] Adapted from a memorandum by Mr. Graham Anderson, C.I.E., Bargua Estate, Manjarabad.

on his return from a pilgrimage to Mecca, brought a few seeds, which he planted on the range of mountains still bearing his name.[1]

In the selection of land for coffee cultivation, care must be taken to obtain a tract well sheltered by nature from undue exposure either to the south-west or the east wind, and situated, with a northern, north-eastern, or north-western aspect, within the zone that is favoured with as large as possible a share of the March and April showers and yet not visited by too large a share of rain in the south-west monsoon. There is in fact a line or coffee zone in every coffee-producing country, and more especially in Mysore, even a mile beyond which the coffee-tree will not exist. The plant rejoices in a damp, warm temperature, such as is procurable in the west of Mysore at elevations from 2,500 to 3,500 feet above sea-level, although the tree will grow under certain circumstances at elevations both below and above these. A good rich loamy soil, of any colour, with a good deposit of vegetable matter on the surface, and not much sheet rock underlying it, is required.

There are five descriptions of land in Mysore in which coffee has been planted[2]:—the forest termed *káns*; heavy ghat forest, termed *male*; village jungles, termed *uḍuve*; *kumri*, or land the original timber on which having been cut has been followed by a secondary growth of trees of a smaller type; and *kaṇave*, or lands covered with hard-wood trees and bamboos. Some of the finest estates have been formed on lands of the first and third classes, which have the decided advantage over all other descriptions, of possessing a rich deposit of decayed vegetable mould that has not been exposed to atmospheric influences, and hence contains an almost inexhaustible store of organic and inorganic constituents available as food for the coffee plant.

The *káns* are generally situated in mountainous country, intersected by streams of clear water, with rocky or sandy beds. The peculiarity of the ravines through which these streamlets flow is, that the undergrowth is entirely different from that found under similar circumstances in the ghat forests, consisting as it does of a gigantic species of

[1] Further particulars of the history of coffee cultivation will be found under Kadur and Hassan Districts in Vol. II.

[2] This description applies to the Malnád, where alone extensive coffee plantations have hitherto been formed. But forty years ago there were coffee gardens in Bangalore, and a few plants were grown in private gardens under wells by European residents since then, yielding sufficient for domestic wants. The same practice seems to have been common in Cochin so far back as 1743, according to Cantervisscher's "Letters from Malabar." Of late years an experiment on a larger scale has bee made at Bangalore, by Mr. Minakshaiya, and coffee grown with great success on irrigated land. The consequence has been a demand by European planters for land suitable for the purpose near Bangalore and Mysore, and in other Maidán parts.

triangular coffee-weed (called in Canarese *hanal* or *heb-gúrkal*), and other succulent plants, whereas in the latter case basket reeds (termed *warti*) and canes (*betta*) of every description are generally found in a tangled mass. *Uḍuve* is strictly village jungle or forest, sometimes almost entirely surrounded by rice-fields. The trees are frequently large and of good descriptions, and the undergrowth is principally small coffee-weed, bamboos and thorns. There are fewer ravines in this kind of land and they are generally smaller and less precipitous, but frequently old excavations, termed *wanigalu*, are met with, which evidently were dug out as approaches to villages formerly situated in the very heart of the forest. *Male* tracts are situated close to the crest of the ghats and generally contain gigantic timber, but can seldom boast of good soil, except in protected situations, the generality of the land having suffered from wash caused by the almost incessant rainfall in the monsoon. The great height of the trees also proves prejudicial to coffee, which is cut to pieces by the drip. The situation being bleak, windy, and exposed to terrific rainfall, is seldom profitable for coffee cultivation. *Kumri* lands frequently contain magnificent-*looking* soil, but a certain amount of virtue has gone out of it by former exposure, and although coffee has been planted and fine estates made on such land, still the operation is always accompanied by a considerable amount of risk, and always by heavy extra expenditure. In *kaṇave* lands ravines containing fair average soil and trees are to be met with, and these places are the only portions suitable for coffee. This description of land has the disadvantage of showing a maximum area of holding with a minimum of space available for cultivation.

Clearing for a plantation consists of removing with the axe and cutting all undergrowth and obstructions, and such trees as are not required. Large trees that have a thick foliage in the hot weather and little or none in the monsoon, are left as shade at regular distances, attention being paid to leave fewer trees on portions with a northern aspect than on those facing the south, all quarters exposed to the wind especially requiring protection. This accomplished, the ground is either cleared by lopping and laying in line to await the process of rotting in the monsoon, or fire is used to facilitate matters. Lines of pegs, generally at 6 × 6 feet, are then laid down, and the land is holed, each hole being generally one foot wide by two feet deep. This is done to remove all obstacles to the roots of the young plants, and to make a nice loose bed for their reception. Roads are traced to and from convenient points in the property, and these are again intersected by paths to facilitate the general working of the estate.

For *nurseries*, convenient situations, with facilities for irrigation or

with river or tank frontage, are selected and entirely cleared of trees, the soil being dug to the depth of two feet or more, and every root and stone removed. This is then laid out into beds, generally about four feet wide, separated by paths, and the whole well drained and put in order with the same care as a flower garden. Manure is applied and the beds are then cut up into furrows, at six inches apart, into which the seeds are placed, about one inch apart. The whole bed is then covered up with dry leaves and watered by hand, care being taken to maintain a uniform state of moisture, which must not be excessive. The seed germinates in six weeks, and from the bean, which is raised on a slender green stem of about eight inches in height, burst forth two small oval leaves. These two-leafed seedlings are pricked out into beds at either 4 × 4 or 6 × 6 inches, and require from ten to fourteen months, with constant attention and watering, to form into good plants, which should have three or four pairs of small primary branches and be from one foot to one and a half in height.

Planting is performed in the months of June, July and August. The plants being carefully removed from the beds and the roots trimmed, they are planted either with a *mamoti* or planting staff by a regular gang of experienced men. Great attention is paid to this operation to see that the holes are properly filled in and that the roots are not bent or injured, and lastly that the plants are firmly set in the ground and not hung.

Under favourable circumstances, the plants are ready for *topping* in the second year. A topping staff, duly marked to the proper height, is placed alongside of the young tree, and the top or head and *one* primary branch are removed. Trees are topped at heights varying from two feet to four and a half feet, but the medium of three feet is generally preferred. This operation has the effect of directing the sap into the primary branches and making them throw out secondary shoots, which come from each eye along the branch. An abundance of vigour has the effect of forcing out a number of shoots under the junction of the upper primaries with the stem, and also from the stem at various places. These are termed suckers, and are all removed by gangs of women and boys. The first crop generally appears in the third year, and consists merely of a few berries on the primary branches, aggregating about one maund per acre. In the fourth year a return of about one cwt. per acre may be expected, and it is not until the seventh or eighth year that the planter is rewarded by a full crop, which, even under the most favourable circumstances, rarely exceeds five or six cwts. per acre.

The crop commences to ripen in October and Novemb[er] As soon

as the cherries are of a fine red colour, they are picked into baskets, and brought to the pulper to be either measured or weighed, and deposited in a vat made for their reception. They are passed through the pulper with a stream of water either the same day or early next morning, and the pulp or outer skin being thus removed, the beans are allowed to ferment for twenty or twenty-four hours, without water, to facilitate the removal of the saccharine matter which surrounds them. After the mass has been washed and well stamped out in three waters, all light beans and skins being carefully separated, the beans are removed to the draining mats, where they are constantly turned over and allowed to remain for a day or more, or until all water has drained off. They are then spread out thickly on the drying ground in order to dry slowly. This is an ation requiring constant attention for six or eight days, the whole ing to be covered up every evening to protect it from dews. The beans should not be dried too thinly spread, or too suddenly exposed to the full rays of the sun, as they are apt to become bleached and bent. A drying ground protected by large trees is the best, as in that case portions in shade and sun are both available. When the beans are sufficiently dried, they are bagged and despatched to the coast or Bangalore for preparation and shipment.

The yield of an estate that has been well maintained in cultivation may be put down at from three and a half to four cwts. per acre. As much as six cwts. per acre have been produced off portions, but of course only under the most favourable circumstances, and such is an exception to the general rule. An accurately calculated estimate shows that, in a series of years, the crop is more frequently below three and a half cwts. than above. But the result varies in different places.

The earliest official notice[1] of coffee in Mysore is said to have been in 1822. But though the plant has been known for so long, it is only of recent years that coffee has come into use among natives, and chiefly in the towns. When Mr. Elliot first settled in Mysore, in 1856, he was repeatedly asked by the farmers of the country whether Europeans ate the berry, or of what use it could possibly be. The variety of coffee originally cultivated here came to be known as Chick, probably from Chickmagalur, the principal town at the foot of the Baba Budan hills, the Mysore home of the plant. This variety had thriven well and promised to do so for an indefinite period of time, but in 1866 and the three succeeding years there were dry hot seasons, which caused a wide-spread attack of the Borer insect. About the same time a general

[1] The information in the following paragraphs is taken chiefly from *Gold, Sport and Coffee-planting in Mysore*, by Mr. R. H. Elliot, of Bartchinhulla Estate, Manjarabad.

decline in the constitution of the trees became manifest. So serious was the result that coffee-planting seemed likely to come to an end in Mysore, except in the case of a few elevated tracts in the Baba Budan hills. At this juncture, in 1870, Mr. Stanley Jupp, having observed advantages in the coffee grown in Coorg, recommended his brother planters to introduce seed from that province. The young plants raised from the imported seed throve with extraordinary vigour, and it was soon found that the new variety would grow and crop well, and even on land on which all attempts to reproduce the Chick variety had utterly failed. "Then this sinking industry rose almost as suddenly as it had fallen; old and abandoned estates, and every available acre of forest and even scrub, were planted up; and land which used to change hands at from Rs. 5 to 10 an acre was eagerly bought in at twelve times these rates." Another cause for anxiety, however, now arose, for when the produce of the new variety came into the market, brokers objected to pay Mysore prices for Coorg coffee. But, as the trees from Coorg seed aged, the produce each year assimilated more and more in appearance and quality to that of the old Mysore plant. Consequently the Coorg variety, the stock of which is kept up by continual importations of fresh seed, has been permanently adopted as a plant which crops more regularly and heavily than the Chick, and the produce of which has so improved under the influence of the soil and climate of Mysore, that, with the exception of the long-established brand of "Cannon's Mysore," and the produce of a few other estates that still grow Chick, in the Baba Budan hills, there is little difference in value.

The high reputation of Mysore coffee, the best quality of which is commonly quoted at 10s. to 15s. a cwt. above that of any other kind that reaches the London market, is attributed partly to the soil and climate, and partly to the coffee being slowly ripened under shade. The pioneers of the industry, following the practice in Ceylon, had cleared away all the forest and planted their coffee in the open. That this was a fatal mistake was not at first decisively apparent. But the devastations of the Borer and leaf disease, the great enemies of coffee, eventually put the question beyond all doubt. And so clearly is the vital necessity of shade now recognized, that, in Mr. Elliot's opinion, formed after ample experience, "if good shade of the best kind is grown, it is absolutely impossible to destroy a plantation in Mysore, even with the worst conceivable management or neglect." The easiest of the methods that have been adopted for providing shade is to clear down and burn the entire forest and then plant shade trees along with the coffee. Another plan is to clear and burn the underwood and a certain portion of the forest trees, leaving the remainder for shade.

Experience shows that the retention of as much as possible of the original forest is desirable, and that land which has not been burnt will last far longer. To this may be attributed the continued existence of the most ancient estates in Mysore.

Five trees are specially recommended as the most suitable to grow for shade, namely, *kap basari* (ficus tjakela, Burm.)[1], *gôni* (ficus mysorensis, Heyne), *kari basari* (ficus infectoria, Roxb.), *ili basari* (a variety of the same), and *mitli* (? streblus asper, Lour.), of which there are two kinds, *heb mitli* and *haralu mitli*, the second being "a bad tree." The trees should be planted in lines running east and west, in order to provide shade from the southerly sun, and so close in each row that in five or six years the tops will touch. When they begin to crowd, every other one should be removed, and this process can be repeated if found necessary.

Of the diseases to which the coffee plant is subject in Mysore, *leaf disease* is the growth of a fungoid named *hemileia vastatrix*, which distributes its spores in the form of yellow powder. The effect is to strip the tree more or less of its foliage. The disease called *borer* is due to a beetle (*xylotrechus quadrupes*), red or yellow with black lines, and about as large as a horsefly. It lays its eggs in some crevice in the bark. The larvæ, when hatched, bore into the stem and live on the heartwood for from three to five months, when they eat their way out as winged beetles. Coffee-trees attacked by borer wither away throughout the part the insect has injured. The best remedy for and preventive of both diseases is said to be properly shading the coffee with suitable trees. Another disease of coffee is called *rot*, also the growth of a fungoid, named *pellicularia koleroga*, which covers the leaves and berries with a black slime, causing them to rot away. The free circulation of air seems to be required when this appears.

With the view of ascertaining whether coffee grown from seed imported from other countries would be less susceptible to leaf disease, Messrs. Matheson and Co. went to great expense in Coorg in introducing coffee seed from Brazil, Venezuela, Costa Rica, and Jamaica. But it was found that in that respect they were neither better nor worse than the Coorg variety. A further experiment has been made with Blue Mountain seed, but the plants do not seem to be in any way different.

Liberian coffee (*coffea liberica*), a taller and stronger plant, with a larger leaf and berry, was introduced by Colonel Benson, Assistant

[1] Mr. Elliot gives this as Cub Busru (Ficus tuberculata), and no botanical name for the last two. My names are taken from Mr. Cameron's catalogue on the assumption that they represent the trees intended.

Commissary-General, about the time when leaf disease was causing such destruction. It was thought that this hardier plant, native of a hotter climate and lower region, might be found proof against the disease. But, notwithstanding various experiments, whether the flavour of the berry is inferior, or from whatever cause, it has not supplanted the old variety.[1] A hybrid, a cross between the two, is said to be more promising.[2]

Among *plants of economic value* introduced into the country in recent years, the following are deserving of mention :—

Casuarina.—None has been more successful or more extensively cultivated, principally as a fuel tree, than *Casuarina equisetifolia*, called by the natives *késarike*. It is an Australian tree, the swamp oak of Queensland, but better known as the Tinian pine or beefwood tree. The numerous and extensive plantations formed of it, especially in the Bangalore District, have visibly altered the landscape in some parts. As fuel it develops more heat in a given quantity than any other kind of local wood ; in fact, for locomotive and domestic purposes it is found necessary to use inferior fuel with it, in order to moderate the intense heat, which would otherwise prove destructive to engines and utensils. In experiments on the Mysore State Railway it was reckoned that casuarina logs ran a train over a distance thirteen per cent. in excess of that attained by the next best kind of fuel available in the Mysore forests.

Cinchona.—Two plantations were originally formed ; one in 1866 at Kalhatti on the Baba Budan hills (Kadur District), with 5,000 plants, and the other in 1867 on the Biligiri Rangan hills in Yelandur (Mysore District), with 2,000 plants. The only kind permanently cultivated was *C. succirubra* ; the more valuable but less hardy species of *C. calisaya* and *C. officinalis* were also tried, but without success. The number of trees in the first plantation had increased to 24,000, and a number had been distributed to favourable localities in the western Districts, when in 1871 the bark of trees from both plantations was submitted to analysis by Mr. Broughton, Quinologist to the Madras

[1] Mr. Cameron says :—" When first introduced, the Liberian species had the reputation of being tropical in its requirements, and that its cultivation would extend to the plains of India. Experience has not proved this capacity, although, no doubt, when under shade, the plant can endure a considerably higher degree of temperature than the Arabian shrub. But under full exposure to the sun the former died outright, while the established species grew vigorously and produced good crops of coffee."

[2] The following grafts have been established at the Lal Bagh for experiment :— Liberian on Arabian stock, Arabian on Liberian stock, Maragogipe on Arabian stock, Liberian on itself, Arabian on itself.

Government. The results obtained by him were reported as follows :—

Site of Plantation.	Yield in percentages of dry bark.				
	Total Alkaloids.	Quinine.	Chinchonidine and chinchonine.	Pure sulphate of quinine obtained crystallized.	Other sulphates of quinine.
Baba Budans { trunk ...	4·50	·86	3·64	·67	2·35
Baba Budans { branch..	1·48	·42	1·06	·30	·60
Biligiri Rangans ...	7·50	2·01	5·49	1·09	4·84

The above analyses showed that, while as a source of alkaloids the bark of the Baba Budan plantation was of satisfactory quality, it was inferior in yield of total alkaloids to the bark from trees of the same age on the Nilgiris, namely, branch bark 2·28 per cent., trunk bark 6·49 per cent. "But though the amount of alkaloids is thus less," Mr. Broughton observed, "than is usual with good India grown bark, it fully equals the yield of ordinary red bark from South America." The bark from the Biligiri Rangan plantation was pronounced of high quality for *C. succirubra* and quite equal to that grown on the Nilgiris.

In consequence of this report the intention of extending the Baba Budan plantation was abandoned, but private planters, occupying more suitable sites, were encouraged to grow cinchona. Meanwhile the febrifuges obtained from the plantations were distributed to the local hospitals, and in 1875 the gardener in charge was sent to Ootacamund for instruction in collecting bark by the coppicing and the barking and mossing processes. Eventually, in 1877, the Biligiri Rangan plantation was made over to the Jagirdar of Yelandur, in whose estate it was situated, on his paying to Government half the produce of bark yielded for five years ; and in 1881 the Baba Budan plantation was sold to Mr. Sylk, a private planter, for Rs. 5,000.

The existing depression of the quinine trade holds out at present, it is understood, little prospect of profit on the cultivation ; but the importance and medicinal value of the products of cinchona are never likely to diminish, and prices may again rise, though probably not to former rates. Special arrangements are being made, in common with other Indian Governments, for the manufacture and cheap distribution of quinine to all classes (for the latter purpose using the agency of the village post offices), a boon which should be highly appreciated in the malarious and fever-stricken parts of the country.

Cinchona cultivation has since 1881 been entirely in private hands, and the following are the statistics for 1893-4, the plants being mostly scattered, in the midst of coffee or cardamom estates:—

Species.	District.	No. of acres.	No. of plants.	
			Mature.	Immature.
C. succirubra (red bark)	Mysore ...	24	8,860	12,873
	Kadur ...	224	124,255	43,450
	Total ...	248	133,115	56,323
C. officinalis, var. condaminea (Loxa or crown bark; pale bark) ...	Mysore ...	1	75	1,141
	Hassan ...	36	8,000	5,003
	Kadur ...	34	14,464	...
	Total ...	71	22,539	6,144

Vanilla.[1]—In a climate like that of Bangalore there is no difficulty whatever in cultivating the *vanilla aromatica*, as it grows luxuriantly without artificial assistance, provided that a suitable position is selected for the plantation. The least expensive and perhaps the most favourable site which can be selected for the purpose is an *old* mango tope, because the mango-trees in that stage are not too dense in foliage, and are better adapted to produce the checkered shade so essential to the healthy development of the vanilla plants. Like all succulents, this plant detests excessive moisture; swampy situations should therefore be avoided. A light vegetable soil intermixed with sand is an agreeable compost, and cocoa-nut fibre is perhaps the best manure that can be applied. Ordinary-sized cuttings generally produce flowers three years after they are rooted, but large cuttings consisting of four or more nodes will produce flowers two years after they are rooted. The vanilla should be planted round the base of the mango-trees, small beds of the soil recommended having been previously prepared, and as the plants grow they should be trained round the stem and along the principal limbs of the trees for their future support.

In South America an indigenous insect fertilizes the vanilla flowers

[1] From notes by Mr. Cameron, Superintendent of the Lal Bagh.

accidentally, and thus secures the fruit, but in this country no such insect has yet made its appearance. We must therefore adopt our own means to fecundate the flowers. The process is simple when once acquired. The organs of reproduction (unlike the ordinary state of things) are disposed in a peculiar form, as if to prevent natural fecundation, and until this takes place by artifice, or chance as explained, the beans which comprise the economic product of vanilla will not be obtained.

Cocoa.—The chocolate-nut tree, *theobroma cocoa*, is indigenous to South America and the W. Indies, where it has been cultivated for various uses for many generations. The tree is an evergreen, which grows from sixteen to twenty-five feet high. The leaves are entire, smooth, and very glossy in appearance; the flowers, which are diminutive, are borne on the stem and principal limbs of the tree; hence the rare and curious appearance which the capsules present suspended from the bare stem. The trees in the Government Gardens have produced fruit freely. The peculiarities of the cultivation consist in the application of dense shade, moderate moisture, and decomposed vegetable soil, chiefly. Salt is also an indispensable ingredient in a compost for chocolate trees.

Rhea.—The Rhea plant or China grass of commerce is the *boehmeria nivea*. The fibre produced from the bark of this plant is very strong and delicate, but the difficulty of preparing it by machinery continues to obstruct its utility on an extensive scale. There are three species of *boehmeria* in the Lal Bagh, and the climate of Mysore seems to facilitate their growth. The young shoots which produce the fibre grow more regular and free under half shade than when fully exposed to the sun's rays. The species *nivea* is quite established here, but never produces seed. It possesses the great advantage, however, that it can be helped by man; so that its naturalization in most parts of India is almost certain.

The following are other plants whose experimental cultivation has been more or less successful, some of them being permanently established:—

Acrocarpus fraxinifolius	Shingle-tree
Agave rigida ...	Sisal hemp
Artiplex nummularia	Salt bush
Artocarpus cannoni	Copper-coloured foliage
Artocarpus incisa ...	Seedless bread fruit
Bambusa vulgaris ...	Golden bamboo
Barringtonia speciosa	Ornamental tree
Brassica chinensis...	Shantung cabbage
Broussonettia papyrifera	Paper mulberry tree
Bursaria spinosa ...	Ornamental tree
Cæsalpinia coriaria	Divi-divi tree
Carissa edulis ...	(Edible berry)
Castonospermum australe	Moreton - bay chestnut
Castilloa elastica ...	Central American rubber

Ceratonia siliqua ...	Carob-bean tree
Clausena wampi ...	Wampi (fruit)
Cola acuminata[1] ...	Kola nut
Colvillea racemosa	Ornamental tree
Couroupita guianensis	Cannon-ball tree
Crescentia alata ...	Calabash tree
Cyphomandra betacea	Tree tomato
Dipsacus fullonum	Fullers' teazel
Erythroxylon coca	Yields cocoaine
Euchlæna luxurians	Buffalo grass
Fagopyrum esculentum	Buckwheat
Grevillea robusta ...	Silver oak
Gynocardia odorata	Yields chaulmugra oil
Hyoscyamus niger	Henbane
Lagunaria patersonii	Foliage tree
Landolphia kirkii ...	Yields caoutchouc
Landolphia watsoni	Yields caoutchouc
Malachea capitata	Yields fibre
Manihot glaziovii ...	Ceara-rubber tree
Mentha viridis ...	Spearmint
Millingtonia portensis	Indian cork tree
Monstera deliciosa	Climbing aroid
Opuntia ficus indica	Malta prickly-pear
Panicum sarmentosum	Mauritius grass
Paritium elatum ...	Cuba bast
Parmentiera cerifera	Candle tree
Phœnix dactylifera	Date-palm
Pithecolobium saman	Rain tree
Poinciana regia ...	Gold-mohur tree
Rubia tinctorum[2] ...	Madder plant
Rubus idæus ...	Raspberry
Smilax sarsaparilla	Yields sarsaparilla
Stillingia sebifera ...	Chinese tallow tree
Trapa bispinosa ...	Zinghara nut, water chestnut
Tristania conferta ...	Timber tree
Vangueria edulus ...	Fruit tree
Vitis martini ...	Cochin-China vine

Experiments have also been made with several varieties of cotton and potatoes. Varieties of cocoa-nut have been imported from Colombo in Ceylon; also trial has been made of various kinds of grape vines, loquat and bhere fruit (zizyphus jujuba).

It may be useful here to give the following list of plants whose cultivation has been attempted without any permanent success at Bangalore:—

Acacia decurrens ...	Black wattle
Arracacia eseulenta	Arracacha
Avena elatior ...	Common oat
Camellia theifera ...	Tea plant
Caryophyllus aromaticus	Clove tree
Cassia obovata ...	Tinnevelly senna
Castania vulgaris ...	Spanish chestnut
Catalpa speciosa ...	Californian timber tree
Cephælis ipecacuanha	Ipecacuanha
Cyperus esculentus	Ground almond, rush-nut
Cyperus pangorei ...	Sedge
Durio zibethinus ...	Durian
Eucalyptus globulus[3]	Blue gum
Garcinia mangostana[4]	Mangosteen
Glycine hispida ...	Soy bean
Helianthus annuus	Russian sunflower
Humulus lupulus ...	Hop vine
Myristica fragrans	Nutmeg tree
Platanus orientalis	Oriental plane
Symphytum asperrimum	Prickly comfrey
Ullucus tuberosus	Tuber
Withavia (Puneeria) coagulans	Cheese-maker

[1] Botanically not far removed from the indigenous *kendale mara* (sterculia urens).

[2] The plant which yields Indian madder has been found wild in Kankanhalli and other parts.

[3] Eucalyptus saligna, rostrata, marginata and citriodora are established in the gardens and furnish seed.

[4] Grafting it on the gamboge tree (Garcinia morella) seems to have been successful in Jamaica.