

(3) Greater production and use of artificial manures with green leaf and where it is necessary, with cheap lime.

(4) An extended use of catch and cover crops of legumes. Introduction of pis-ci-culture in rice fields where feasible.

(5) Greater and closer attention to seed distribution methods. The full benefits of intensive rice cultivation are realised only with good seed improved by breeding. A central Seeds Organisation may well be worth consideration.

(6) Research for greater use industrially of waste products of rice as in Japan

## Pastures of the Kangayam tract

By

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**Introduction:** Among the different breeds of cattle in India, the Kangayam breed is one of the efficient and scientifically bred animals (3). These are bred mainly in the Kangayam firka in Dharapuram Taluq of Coimbatore district and to a small extent in parts bordering on Erode and Gobi taluqs. The development of this breed has so far been carried on by enterprising well-to-do ryots, the Pattagar of Palayakottai being the foremost. The aforesaid ryots own extensive areas of well organised pastures, the Kangayam tract particularly being one with such good private pastures (2) which might be said to be responsible for the development of this famous breed of the tract.

**Maintenance of Pastures: Fencing:** The large blocks of land owned by the breeders are divided into smaller blocks by live-fencing. These fences facilitate controlled grazing by animals and form an effective protection against their straying away from one block to another, besides functioning as wind breaks. The most effective, popular and easily raised fence is *Commiphora berryii*, Engl. (Mul kiluvai) which is propagated by cuttings. With the beginning of South-West Monsoon, the existing fences are strengthened and new ones are put up. Holes are made by means of crowbars, the cuttings planted into these and are covered. The cuttings are put at least in three alternating rows which establish within a month and form a good live-fence in a short time. *Euphorbia antiquorum*, Linn. (Sathurakalli or Thirugukalli), *E. tirucalli*, Linn. (Tirukalli or Kolkalli), *Agave americana*, Linn. (Railway kathalai) *Azima tetracantha*, Lam. (Sangam mulchedi) are among some of the other fence plants arranged in the order of their respective importance.



(ii) *Cultivation of Grasses*: Great care is being taken for maintaining a good stand of *Cenchrus ciliaris*, Linn. (Kolukattai pull) in the pastures and in fact, this is the only species of grass which is actually cultivated for grazing purposes, although there are quite a large number of other grasses which grow naturally in the pastures. *Cenchrus ciliaris* forms the staple pasture and fodder grass for the Kangayam breed of cattle (1). When a field is to be brought under this grass, 2 to 4 ploughings are given with a country plough in the favourable season and the seeds are sown by broadcasting either pure or as mixtures with cholam or cumbu. 10 to 15 lbs. per acre is the seed rate adopted and the seeds are not usually covered. The seeds germinate within 5 days and in about 3 months, the grass attains a height of 2 to 3 feet with profuse tillering in average soils. Animals are let in for grazing only six months (and some times one year) after the sowing, by which time the underground rhizomes are well formed and the grass is established. Though it dries upto the bottom in the summer, being perennial and rhizomatous it revives remarkably and quickly with the rains yielding plenty of green herbage.

(iii) *Grazing*: Ten to twenty days after the monsoon rains, when there is young green flush, calves are let in for grazing as they do little harm to the growing grass. After the grass has put in good growth, the bigger animals are let in, in definite numbers and are allowed to graze for particular periods taking care to see that the pasture lands are not overgrazed. The systematized and controlled grazing practised in this tract helps to a great extent in the maintenance of pastures which are often left as permanent grazing grounds for many years.

*Cultivation of legumes and trees*: Besides the valuable grass, *Cenchrus ciliaris*, the important leguminous forage plant, *Phaseolus aconitifolius*, Jacq. (Naripayathan kodi) is regularly raised in the pastures year after year. Though an annual it enriches the pastures and are greatly relished by cattle both when green and dry. Very often this species along with *Phaseolus trilobus*, Ait. (Siru naripayathan kodi) the common pillipesara, comes up from the self-sown seeds of the previous year and afford a nutritious feed for the grazing animals. There are also a good number of other leguminous plants occurring naturally with the grasses.

Trees except *Acacia leucophloea*, Willd. (white babul; velvela maram) are encouraged to grow inside the pastures. Sowing of the babul seeds is usually done during South-West Monsoon and within 5 or 6 years they grow into trees giving enough shades for the resting animals, mitigating the force of the westerly strong wind and above all yielding valuable pods which are eaten by animals during the hot summer months. The pods mature in, in February-March and as they drop from the trees, the cattle feed on them. Besides, they are also collected by ryots, pounded into coarse powder and substituted for cotton seed and

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bran. *Acacia leucophloea*, Willd. is preferred to *A. arabica*, Willd. (the common babul) as the pods of the latter are relished only by goats and not by cattle. Further it comes up much better than the latter in laterite rocky soils common to this tract.

**Natural Pasturage:** The plants which are found in the pastures of the Kangayam tract and which form the natural feed for the cattle can be grouped as (a) pasture grasses and (b) browse plants.

(a) *Pasture grasses:* There are over forty-five grasses both annuals and perennials which grow naturally in the pastures along with predominant perennial *Cenchrus ciliaris* (Kolukattai grasses). Many of these grasses are relished by cattle and only a few like *Aristida depressa* Retz. are generally left untouched. The annuals come up with the rains of the North-East Monsoon in October–November, seed in December–January and dry up afterwards. The perennial grasses have a green flush in July–August if there are enough South-West Monsoon rains. These are usually benefitted by the North-East Monsoon rains and remain green upto January–February after which period, they are alive only under the ground and revive again with the rains of the next season.

*Perennial grasses:* Twenty-four species of perennial grasses were recorded in this tract. *Chrysopogon montanus*, Trin. is the second important grass (the first being *Cenchrus ciliaris*) and is followed by *Cenchrus setigerus*, Vahl. (Black kolukattai), *Cynodon dactylon*, Pers. *Cynodon dactylon*, var *intermedius* C. E. C. Fischer. (Hariali or doob grass), *Dicanthium annulatum*, Stapf. and *Chloris barbata*, Sw. *Chrysopogon montanus*, Trin. is a very drought-resistant grass coming up well in sandy and stony places. Other species like *Enteropogon monostachyos*, Schum., *Apluda aristata*, Linn., and in rocky areas *Cymbopogon caesius*, stapf., *Themeda triandra*, Forsk., *Eragrostis bifaria* Wt., are often met with. The well known grasses such as *Heteropogon contortus*, Roem & Schult. (Spear grass), *Setima nervosum*, Stapf., (Nendra gaddi) and *Iseilema laxum*, Hack. (Chengali gaddi of Ongole tract) are rare in this tract and are found as stray clumps here and there *Chloris barbata*, Sw. (Kuruthu pul) is widely distributed in different kinds of soils. Rooting at all nodes, it is often a weed in garden land and tolerates alkalinity, though it is poor in growth under such conditions it is the only grass coming up in saline patches.

Near wet areas around Gobi and Bhavani taluqs, *Ischaemum aristatum*, Linn., *Panicum repens*, Linn., and *Eriochloa procera*, C. E. Hubb. are the dominants. *Panicum repens*, Linn. which is known as Ingi-pillu or anai arugu is a hardy plant coming up well in all kinds of soil near moist places. Because of the stoloniferous habit it tends to become a nuisance in cultivated field near channels. The cattle relish this grass and it is supposed to stimulate milk yield. *Ischaemum aristatum* and *Eriochloa procera* are mainly cut and fed to milch cows.



*Annual grasses*: Twenty-three annual species were recorded and most of them in areas with plenty of moisture as in wet-land cultivated tracts of Gobi and Bhavani. *Echinochloa colona*, Link., *E. crus-galli*, Beauv., *Brachiaria ramosa*, Stapf. *B. distachya*, Stapf., *Urochloa reptans*, Stapf. and *Ischaemum rugosum*, Salisb., are important among them. In garden lands and in shaded places near hedges species like *Dactyloctenium aegyptium*, Baauv., *Setaria verticellata*, Beauv., *Eleusine indica*, Gaertn., and *Digitaria marginala*, Link., occur quite frequently. *Brachiaria eruciformis*, Griseb., and *Trachys muricata*, Stend., are common annnals coming up after rains in black cotton and sandy soils respectively.

(b) *Browse plants*: The richness of the pastures of the Kangayam tract is due to the presence of a good number of plants both leguminous and non-leguminous which grow with the grasses. There are nineteen such plants which have been observed to be growing naturally in the pastures, in addition to the cultivated legume *Phaseolus aconitifolius*, Jasq., (Naripayathan kodi). This is the only legume cultivated in the pastures and is also grown as a pulse and a supplemental fodder in dry lands. *Phaseolus trilobus*, Ait. (Panipayar or Pillipesara) and *Indigofera enneaphylla*, Linn., (Seppunerinji) are the other two important legumes followed by *Alysicarpus* and *Rhynchosia*. Among the non-legumes, amarantaceous plants as *Digera arvensis*, Forsk, *Celosia argentea*, Linn. *C. Polygonoides*, Retz. and *Allmania nodiflora* R. Br. are the common ones. The convolvulaceous *Merremia tridentata*, Hallier., *Ipomoea pes-tigridis*, Linn and are greatly relished by cattle to some extent. The other plants which are eaten by cattle are *Boerhaavia diffusa*, Linn. (*Nyctaginaeaceae*), *Tridax procumbens* (*Compositae*) *Physalis minima*, Linn. (*Solanaceae*), *Borreria hispida*, K. Sch. (*Ruciaceae*) and *Commelina benghalensis*, Linn. (*Commelinaceae*). In times of great fodder scarcity as in prolonged summers, the leaves of *Borassus flabellifer* (Palmyra) is fed to animals and forms an important famine fodder.

## II. NOTES ON NATURAL PASTURAGE.

### Perennials:

1. *Cenchrus setigerus*, Vahl. (Kolukattai grass-black) Tamil: Karuppu Kolukattai pull. Though this is not found so commonly as *C. Ciliaris* is next of importance in fodder value.
2. *Chrysopogon montanus*, Trin. Tamil: Chola pull; Telugu: Adavi soma gaddi. The second commonest grass after *Cenchrus ciliaris* in the dry tract coming up well in sandy and stony soils. It forms a good fodder grass for the animals before flowering. By March—April when the grasses dry up, the yellow thin culms devoid of the spikelets which fall off are grazed by cattle.
3. *Cynodon dactylon*, Pers. Hatiali or Doub grass. Tamil: Arugampull; Telegu: Gericha gaddi, Kanarese: Kuddi garika. Perennial with decply penetrating underground root-stocks and growing to 6 to 9 inches. It is often a very bad weed in cultivated field with heavy soil. The grass is relished by horses and sheep.



4. *C. dactylon* Pers. var *intermedius*, C.E. C. Fish, similar to the above but prefers slight moisture conditions and puts-forth better growth.

5. *Amphilophis pertusa*, Stapf. Tamil: Chinnakalai pull, Chevoarugam pull; Telugu: Genjulu. A well spreading grass coming up well in loams, but found in all soil conditions and forms an excellent green feed.

6. *Dicanthium annulatum*, Stapf. Telugu: Molava gaddi. A tufted grass found in good loams. Highly relished by cattle, but rather rare.

7. *Chloris barbata*, Sw. Tamil: Kuruttu pull; Telugu: Uppu gaddi. Widely distributed on all soils, rooting at nodes and is often a weed in garden lands. It has a virtue namely it tolerates alkalinity in soil. Cattle feed on them readily.

8. *Enteropogon monostachyos*, Schum. Tamil: Kannai pull. It grows upto 3 feet with erect and tufted stems arising from a woody root-stock. It is found scattered in some places and forms a good fodder.

9. *Iseilema laxum*, Hack. Tamil: Thenganari pul; Telugu: Erra chengali gaddi. This occurs as stray clumps with short creeping root-stock. A good fodder grass.

10. *Eremopogon foveolatus*, Stapf. Grass growing in clumps with plenty of foliage and prefers calcareous soil. Fairly abundant and is one of the best fodder grasses.

11. *Apluda aristata*, Linn. Tamil: Malam pul, Manda pul. Telugu: Bura kanchi; Kanarese: Akki Hubbu. Tall leafy grass. Coming up well on hills and near hedges, but not common. Fairly good fodder.

12. *Eragrostis bifaria*, Wt. Telugu: Nakka piththu kaserevu, Gubbikal Gaddi; Kanarese: Modi Mara Hullu, Nosai Hullu. A slender grass growing in dry rocky and gravelly area. Cattle graze this readily.

13. *E. plumosa*, Link. Slender grass readily grazed by cattle but the quantity of forage is better and the grass is also not common.

14. *Sporobolus coromandelianus*, Kunth. Short stumpy and tufted grass common on poor soils but a poor fodder.

15. *Heteropogon contortus*, Roem and Schult. 'Spear grass' Tamil: Oosi pul; Telugu: Ooba gaddi, Pandi mullu gaddi; Kanarese: Ankari Hullu. Densely tufted grass which stands drought well and though not common. It is found on hill sides. A good fodder when young and green but not touched by cattle after flowering due to the presence of long awns. Cattle graze the grass after the awns drop off. It forms a good hay crop.

16. *Setima nervosum*, Stapf. Telugu: Nendra gaddi; Kanarese: Nalai hullu. Though not common in the tract, it is found in stray places near hills and grows in clumps with large number of tillers. It grows to about a foot in height in this area and is highly relished by cattle. If only this could be cultivated it will form one of the best fodder grasses.

17. *Themeda triandra*, Forsk. Tamil: Erigai thattu pul. Telugu: Pedda yerra kalla kasuri. An erect, tall growing, coarse grass, eaten by cattle only when young and occurring on dry hilly areas.

18. *Aristida hystrix*, Linn. f. Diffuse and branching grass, found common in the hilly dry and gravelly areas but not eaten by cattle.

19. *Aristida setacea*, Retz. Tamil: Thodappan pul. Tall and coarse grass used in making brooms. Not eaten by cattle.

20. *Ischaemum aristatum*, Linn. An erect and decumbent grass common in wet areas around Gopi and Bhavani. It is usually cut and fed to animals.



21. *Panicum repens*, L. Ginger grass. Tamil: Inji pul Anaiairugan; Telugu: Lada or Karigaddi; Sonti Hullu. The grass is found in moist and wet areas in both sandy and clayey soils. It has hardy stoloniferous rhizomatous stems. The cattle relish it well; and it is said to stimulate the yield of milk.

22. *Eriochloa procer*a, C. E. Hubb. Tamil: Karunganni pul. Another grass found along the irrigation channels in paddy fields in Gobi and Bhavani and readily eaten by cattle.

23. *Enneapogon elegans*, Stapf. This is a slender erect grass growing 3-12 inches. Though fairly abundant, this is not relished by cattle.

24. *Cymbopogon caesius*, Stapf. Tamil: Vella Mungan pul. Kamatchi pul; Telugu: Kasigaddi; Kanarese: Kasi hullu. An erect grass, coarse and with a strong odour occurring on hills but not eaten by cattle.

#### Annuals:

25. *Dactyloctenium aegyptium*, Beauv. Tamil: Matthangi pul. It is a prostrate plant with stems rooting at the nodes. Though it comes under all conditions, it prefers loamy garden soil. Cattle eat them well.

26. *Andropogon pumilus*, Roxb. Tamil: Kaththiri pul. Fairly common in the black soils and relished by cattle before flowering.

27. *Trachys muricata*, Steud. Tamil: Karuvattu pul or Sani velam pul. Telugu: Pedda utla gaddi. This grass grows abundantly in sandy areas soon after rains and forms a very good fodder.

28. *Perotis indica*, O. Ktz. Tamil: Narival pul, Kudiraival pul; Telugu: Boosara gaddi, Nakka toka gaddi; Kanarese: Nari Meesai hullu. A small grass with a prominent and characteristic inflorescence. Grows in rocky and gravelly areas. Does not form a good fodder though animals graze on them.

29. *Urochloa reptans*, Stapf. Tamil: Shani pul. A slender prostrate annual found on heavy, moist soils and is liked by cattle.

30. *U. setigera*, Stapf. Much bigger than the former species and greatly relished by cattle.

31. *Brachiaria eruciformis*, Griseb. Telugu: Dhoma Kalugaddi. A common grass in the black soil areas of the tract and often found near fences. The forms small tufts with slender spreading branches and is readily eaten by cattle.

32. *Brachiaria ramosa*, Stapf. Tamil: Sommai pul; Tel. Eduri gaddi; Kanarese: Kodu Baragu hullu. One of the best fodder grasses growing in abundance after the rains. The stems are stout and ascending from a creeping base and are relished by cattle.

33. *B. distachya*, Stapf. Telugu: Kotanna gaddi, Kanarese: Hambu haraka hullu. A fairly common grass of the tract in loamy soils. Does not thrive in rocky areas. Forms a good fodder.

34. *Eragrostis ciliaris*, Link. Often found as a weed in dry and garden lands. Cattle relish it.

35. *Eleusine indica*, Gaertn. A tufted grass growing in moist areas after rains. It is readily grazed by cattle.

36. *E. lagopoides*, Merr. Found in alkaline, wet places and well spreading. Cattle don't relish it.

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37. *Dinebra retroflexa*, Panz. Occurs in alkaline loams. Cattle relish it before flowering.

38. *Setaria pallidifusca*, Stapf et Hubb. Tamil: Korattu pul; Telugu: Korattu pul; Telugu: Kuradakori gaddi.

39. *S. Verticellata* Beauv. Tamil: Korattu pul. Slender tufted grasses occurring in shades near fences. Cattle graze on these readily.

40. *Allotropsis cimicina*, Stapf. Tamil: Chena pul; Telugu: Bottanpala gaddi; Kanarese: Neru sajjai hullu. Though this is not found very commonly in the tract, it was found to be in good proportions with other grasses in few pastures around Gobichettipalayam and Udumalpet and are readily grazed by cattle.

41. *Echinachlou colona*, Link. Tamil: Karumpul, Varsanam pul, Telugu: Otha gaddi.

42. *E. Crusgalli*, Beauv. Tamil: Oothu pul; Telugu: Pedda otha gaddi. These grasses grow as weeds with paddy in paddy fields and are cut and fed to animals which relish them very much.

43. *Paspalidium flavidum* A. Camus. Tamil: Arisi pul; Telugu: Uda gaddi. A very good fodder grass growing in low lying moist areas, but not common.

44. *Digitaria marginata*, Link. var *fimbriata* Stapf. Tamil: Kakkai kal pul. A decumbent grass with long flowering culms and often found as a weed in garden lands.

45. *Tragus biflorus*, Schult. Tamil: Ottupul. A low spreading grass thriving in dry sandy localities. Though common cattle do not readily eat them.

46. *Aristida depressa*, Retz. A tufted grass rarely attaining more than one foot high and common on poor soils, but cattle do not eat this.

47. *Ischaemum rugosum*, Salisb. An erect plant found along wet land bunds and in shaded areas near fences. Cattle feed on them.

#### Browse Plants: i. Legumes:

48. *Phaseolus aconitifolius*, Jacq. Tamil: Naripayathan Kodi, Thulukkappayar. The only legume cultivated in the pastures for grazing and on dry lands as a pulse and a supplemental fodder. It is a long trailing plant and requires fairly good soil. Relished by cattle both when green and dried.

49. *Phaseolus trilobus*, Ait. Tamil: Passipayaru, Sirunaripayathan kodi. Telugu: Pillipesara. A variable plant found in all kinds of soils either poor or rich and encouraged to grow in the pastures. It appears year after year from self sown seeds and forms a nutritious food.

50. *Indigofera enneaphylla*, Linn. Tamil: Seppu neringi. A common and very important perennial with thick root stock and spreading habit. Enriches the pastures and is greatly relished by cattle.

51. *Rhynchosia minima*, Yc. A slender trailing or climbing plant which is encouraged to grow in the pastures and readily grazed by cattle.

52. *R. Capitata*. A bigger plant than the former, but rare.

53. *Alysicarpus rugosus*, Dc. Tamil: Nama poondu. An erect herbaceous annua with moderate foliage and well relished by cattle.

54. *A. rugosus*, Dc. var. *styracifolius*, Baker. Tamil: Sirunama poondu. A smaller form of the above-mentioned species, but quite common in heavy black soils.



55. *Crotalaria globosa*, W and A. Tamil: Ponnai kattai kodi. A very common trailing annual coming up even in poor soils and forms a fairly good fodder.

ii. Non-Legumes.

56. *Digera arvensis*, Forsk. (Amarantaceae) This is an annual herb with prostrate branches found as a weed in cultivated lands, waste places and also in pastures. This is a greatly relished by cattle. The leaves are used as a green vegetable by poor people.

57. *Celosia argentea*, Linn. (Amarantaceae) Tamil: Ponnai kerai. A very common plant which grows to 3 to 5 feet, often allowed to grow with cholam with which it is harvested and stacked. After 2 or 3 months, both are shafted together and fed to animals which relish them. Cattle also browse on the leaves and tender portions of the plant.

58. *C. polygonoides*, Retz. Tamil: Elikattu keera. Another common amarantaceous plant similar to *Digera arvensis* but found in dry and poor soils and readily browsed by cattle.

59. *Allmania nodiflora*, R. Br. (Amarantaceae) This is a perennial with stout roots stock. The herbaceous branches are relished by cattle.

60. *Aerva tomentosa*, Forsk (Amarantaceae) It is a white tomentose plant common on road sides, rocky and gravelly areas and in cultivated field. It is eaten only by goats.

61. *Boerhaavia diffusa*, Linn. (Nyctaginaceae) A common weed in dry localities and on field bunds with stout root-stock and many procumbent branches which are eaten by cattle.

62. *Merremia tridentata*, Halliei f. (Convolvulaceae) Tamil: Savuli kodi. A perennial herb with long slender prostrate branches greatly relished by cattle.

63. *Ipomoea pes-tigridis*, Linn. A hairy climber readily browsed by animals.

64. *Tridax procumbens*. Tamil: Orambuppondu. A common compositae found in all kinds of soils and greatly relished by buffaloes. When fresh and green after rains, cattle also feed on them.

65. *Physalis minima*, Linn. (Solanaceae) Tamil: Natuthakalli. Telugu: Budama aakku. A succulent herb growing after rains and easily made out by the inflated accrescent calyx. Cattle eat these readily.

66. *Borreria hispida*, K. Sch. (Rubiaceae) Tamil: Naththa choori Telugu: Mathana aakku. A herb with long procumbent branches and browsed by cattle.

67. *Commelina benghalensis*, Linn. (Commelinaceae) Tamil: Valukkai poondi. A slender herb with creeping stem which root at lower nodes. Common on red loams and greatly relished by cattle.

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