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Potato Growing in the Nilgiris.

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Section I. Preface.

Historical. The early history of the potato is shrouded in doubt but the consensus of opinion is that its original home is in the highlands of Peru and Chili in S. America where it still grows wild. It had apparently been under cultivation for many centuries by the natives, when the Spaniards discovered the potato in the neighbourhood of Quito. The natives used the potato in place of bread and generally ate it cooked or made into flour or dried in the sun for preserving it for future use.

Potatoes were first introduced into Spain during the sixteenth century from whence it spread into the other countries of Europe. It is recorded that the colonists from Virginia, under the patronage of Sir Walter Raleigh introduced the potato into Britain in 1586 and was first cultivated on the estates of Sir Walter Raleigh near Cork. The progress of potato growing in England, however, was slow and in 1619 it was mentioned as being among the articles provided for the Royal household. During the reign of James I it was so rare as to be priced at two shillings a pound. By 1633 the Royal Society realised the valuable qualities of potato and took necessary measures to encourage its cultivation. The cultivation however became general only within the last century.

The potato probably was first brought to India from Spain during the seventeenth century. Its present distribution in India is very wide. It is grown in Bihar, Bengal, Bombay and the Punjab. In the South it has extended to Mysore and the adjoining parts of Salem district in Madras, but the Nilgiris District is the main centre of potato cultivation in the Madras Presidency. The other places in the Presidency where the potato is cultivated on an appreciable scale are the agency tracts in the Northern Circars and the hill tracts of Madura district.

It is not known when potato cultivation was started in the Nilgiris but in 1824 Sir Frederick Price recorded that a potato weighing 5 lbs. was raised that year in Mr. Sullivan's garden at Stonehouse Hill. In the Nilgiri

Gazetteer (Page 203) it is reported that in 1832 "under Major Crewe's superintendence, fields in Ketty had been broken up in the English fashion by English ploughs, and potatoes, wheat, oats and barley had been put down on 150 acres". In 1876 it is recorded by Mr. H. B. Grigg, that 754 acres were under potatoes. He also states that due to a steep increase in the price of potatoes, the Badaga ryots grew large areas under this crop.

Climate of the Nilgiris No other district in the Madras Presidency presents a more varied climate and range of rainfall than the Nilgiris. Gudalur taluk is the wettest of the three taluks comprising the district. The annual rainfall is about 160 inches of which nearly 130 inches are received during the S. W. Monsoon. The moisture-laden S. W. Monsoon wind, strike the western ghats at Devala where the heaviest rainfall in the District is recorded. Further east in the Ouchterlony valley the annual fall drops to 90 inches of which 70 inches are received in the S W. Monsoon period. At Naduvattam on the crest of the plateau, the total rainfall again rises to 102 inches of which 79 inches are received during the South-West monsoon. As the wind blows eastwards across the plateau less and less rain is deposited until its course is checked by the Doddabetta range. Thus during the South West Monsoon places lying west of Doddabetta receive a heavier rainfall than those situated to the East of this range, while during the North-East Monsoon the process is reversed and portions to the East receive more rain than the area to the west of the Doddabetta.

The Nanjanad potato station being further west than Ootacamund receives considerably more rain in the S. W. Monsoon and less than Ootacamund during the N. E. Monsoon. On the other hand both Coonoor and Kotagiri being situated to the east of Doddabetta receive considerably less rain during the S. W. than during N. E. monsoon. The District average rainfall is about 67 inches of which 50% received during the S. W. monsoon and 30% during the N. E. Monsoon period while 20% is received as summer rains. The rainfall of the District is therefore fairly evenly distributed. The average monthly rainfall in Ootacamund, Nanjanad, Coonoor, and Kotagiri is shown in the accompanying statement.

Statement of average monthly Rainfall of the Potato growing tracts of Nilgiris.

Month.	Nanjanad 1911—1943.	Ooty 1911—1943.	Coonoor 1911—1943.	Kotagiri 1911—1943
January	1·19	1 19	5·21	3·45
February	0·49	0·41	2 84	1·90
March	1·66	1 07	2·17	2 24
April	3 47	3·46	4 55	5 00
May	6·23	6·66	4 24	6·95
June	7 36	6 14	3·12	4.82
July	10·56	7·86	3·54	4 53
August	6·59	5 81	3 86	4·51
September	4 91	5·53	4·55	6·22
October	6 86	8·59	13·54	13·02
November	4·69	6·52	11·87	10·34
December	1·74	2·22	6·61	4·29
Total.	55·75	55·46	66 10	67·27

The climate of Gudalur is moist and warm and unsuitable for potato cultivation while that of Ootacamund and Coonoor is favourable for large-scale cultivation of potatoes. Frost is very common in Ootacamund during the winter months, but Coonoor hardly ever experiences frost on a large scale.

Areas. The potato growing tracts of the Nilgiris are mainly the taluks of Ootacamund and Coonoor. The acreage under this crop in the Nilgiris during 1942—43 was 19,167 acres. In 1876 there were only 754 acres under potato; by 1915 the area was estimated at 4000 to 5000 acres and during the Great War the area got doubled. For the years preceding 1920 the acreages under this crop are not known with any degree of accuracy. Due to the fall in the prices of all commodities after the war of 1914—18 the area under potato remained stationary but during this period there was an increase in the use of artificials, thereby increasing the total yield per acre. The extensive use of artificials is being continued. Due to the war-time quality of the proprietory manure mixtures now available, the yield which was once being obtained by their application is not obtainable today. Owing to the large demand for potatoes for supply to the Military, there has been a very marked and rapid increase of area under potatoes and all available lands have been leased out with the result that the area under this crop during the year is estimated at 21,930 acres. The area under potatoes in two taluks is as follows :—

Area under potatoes in the two taluks, Ootacamund and Coonnoor.

Year.	Ootacamund.	Coonoor.	Total area in acres.
1921 – 22	4657	3910	8567
1922 – 23	4538	4038	8576
1923 – 24	4806	3587	8393
1924 – 25	4974	3686	8660
1925 – 26	4997	3597	8594
1926 – 27	4597	3514	8111
1927 – 28	4899	3274	8173
1928 – 29	5648	2817	8465
1929 – 30	5987	3240	9227
1930 – 31	6438	Not available.	
1931 – 32	6164	"	
1932 – 33	6543	"	
1933 – 34	7675	4399	12074
1934 – 35	8317	5376	13693
1935 – 36	7671	5190	12861
1936 – 37	7467	5454	12921
1937 – 38	9459	5538	14997
1938 – 39	8774	5303	14077
1939 – 40	7726	6106	13832
1940 – 41	9060	7073	16133
1941 – 42	9033	6938	15975
1942 – 43	9666	6440	16106

From the above figures it is evident that even during the years of glut, the area under potatoes never declined but with the increase in price, there has been a steady rise in the total area under this crop. Judged from the previous experience it may be concluded that even after the war the area under potato is likely to be maintained at a level high enough to ensure the growing demand for potato for civilian consumption.

Prices. The price of potatoes during 1913-14 varied between twelve annas to Rs 1—4—0 per maund of 25 lbs. By 1916 the rate increased slightly and by 1918-19 potatoes in Otacamund were sold at Rs. 2—8—0 to Rs. 2—12—0 per mnd. These high prices were largely due to the increased demand from large consuming centres cutside the presidency. The interruption caused by the war in the potato trade from Europe to ports like Bombay and Colombo not only caused a shortage of potatoes but also a shortage of seed potatoes, particularly in Bombay Deccan where the potato crop rapidly deteriorated through disease and with the famine in 1918-19 the crop nearly disappeared. Similarly the trade in potatoes to Colombo increased through Tuticorin. This increased demand stimulated potato growing on the Nilgiris, but when normal conditions returned the potato trade gradually resumed its pre-war level and export to distant centres decreased owing to competition with other sources of supply. The result was that prices dwindled and during 1931 potatoes were sold at twelva annas to Rs. 1—0—0 per maund. With the increase in acreage as a result of the war-time stimulation and the loss of important markets of Colombo, Calcutta and Bombay, the low-level price of potatoes continued, and the prices ranged from twelve annas to Rs. 1—4—0 per maund. From 1942 onwards the price of potatoes has risen from Rs. 1—4—0 to Rs. 2—8—0 per maund and the increase has been maintained until the ceiling price of Rs. 3—4—0 was reached during 1944.

Previous improvements in varieties and methods of cultivation. Potatoes received considerable attention from successive superintendents of the Government Botanic Gardens, at Ootacamund. As early as 1877 the Superintendent Mr. Gomieson wrote an article on potatoes for the benefit of the cultivators in the Nilgiris. In addition to introducing new varieties from England, he was an enthusiastic advocate of prevention of disease by selection of resistant varieties. He raised over a dozen distinct varieties from seeds which however do not appear to have turned out to be of any special merit. The introduction of varieties mainly from Australia and England continued. These were grown in the gardens and given free or sold to the cultivators. The area under potatoes in the Government Gardens in 1910 amounted to 1—1½ acres and was being utilised to try out new varieties and to produce potato seed for supply to the public. In 1914, 2½ acres were being so used and 16 imported varieties of potatoes were under examination and trial. In 1915 and 1916 the question of expansion of the work of seed production and methods of cultivation was under discussion and in 1917 the Government accepted the necessity for a potato station on the Nilgiris. After several attempts to obtain land the present site of the potato station at Nanjanad was finally accepted.

Section II. Methods of Potato Cultivation on the Nilgiris.

The local method of cultivating potato is entirely by the use of manual labour and no cattle power is utilised at any stage of the cultivation. Usually the richest land available is selected for planting potatoes and

the scrub jungle and wild grass is removed and the land so cleared is forked to a depth of 10 inches to 1 foot at least a month prior to planting. A fortnight later the clods are pulverised to a fine tilth by breaking them by means of a *guddali* — (a two-pronged hoe which is in use for all subsequent operations). The roots and other plant growth are then collected and burnt *in situ*. This is a good practice as it saves the cost of transporting the debris and also serves to sterilize the soil. Immediately before planting the land is laid out into small ridges and furrows by the *guddali*. The usual length of the furrow is 10 to 15 feet. At the end of each row (which is generally along the slope) a small drain is made to catch up the silt washed down by running rain water. The ridges are 15 to 24 inches apart and 4 to 6 inches high. As a result of departmental propaganda, a large number of ryots are now adopting contour planting.

Seeds and sowing. The size of setts used for planting is generally small, varying from ½ oz. to 1 oz. The setts are planted in furrows from 6 to 12 inches apart, the distance varying with the season of planting and size of tubers used. In the main crop usually 8 to 10 inches are allowed while in the second crop the distance between setts is from 6 to 8 inches, whereas in an irrigated crop up to a foot is generally allowed with big-sized tubers. As a result of demonstration, larger setts are becoming more popular. Practically no cutting of tubers is done for planting. The danger in planting small-sized setts is that they are more likely to be virus carriers than big tubers. Generally speaking the ryot has no clear idea as to how much seed is to be actually planted per acre. He determines the acreage from the quantity of seed planted which naturally varies with the size of seed and distance of planting. Thus 10 bags of very small seed may plant up to 150 cents while 10 bags of large seed will be sufficient to cover only 80 cents. It is difficult in such cases to get accurate information from the ryot as to the actual seed rate used. Planting 1½ oz. to 2 oz. size tubers in 8 inches apart in rows two feet distant, as much as 4,000 pounds of setts may be required to plant an acre. After planting the drills are covered by means of the *guddali*.

Manure and manuring. Cattle manure if available is generally placed immediately over the potato setts, one handful to each sett. Artificial fertilisers are also applied similarly, at the rate of one bag (2 cwts.) of manure per every bag of potato planted. It is not unusual to see some ryots applying two bags of fertilisers for every bag of seed. The manuring is as a rule done at the time of planting and not subsequently. Since 1920 the use of artificial fertilisers has been on the increase, as they gave spectacular results compared with cattle manure. It is estimated that over 17000 tons of fertilisers are being used for the potato crop alone at present (1945). There can be no doubt of the utility of artificial fertilisers when rationally and economically used in conjunction with a basel dressing of farm yard manure. At present the ryots have a tendency of eschewing farm yard manure due to the following reasons.

1 The difficulty of carting to the land over long distances in head loads as the hill sides are not connected by suitable roads.

2 The case with which artificials are obtained and the smaller transport charges incurred in transporting it to the field. Experiments carried out go to show that it is beneficial to apply cattle manure to each sett when planting and therefore this beneficial effect must always be borne in mind even though artificials may be cheap and economical.

A note of warning is however necessary. In most cases the manure pit is the dumping ground for diseased and rotten potatoes and therefore in many cases cattle manure is an agent for propagating such diseases as ring disease etc. Consequently all waste potato should be excluded entirely from the manure pit and should be fed to cattle only after boiling.

After cultivation. When the plants are about 6 inches high the first weeding and earthing up by means of *guddali* is given. The second is given before the haulms spread too much and cover the field.

Harvesting. The crop is ready for harvest when the haulms die down. This will naturally vary from 4 to 5 months from the time of planting. In places where disease is feared or when good prices are obtainable, the crop may be lifted before they are fully ripe. Harvesting is done by inserting the *guddali* at the side of the ridge immediately below the potato and pulling forward and upward. The tubers are gathered and allowed to remain exposed on the ground till their surface is dry. Immature potatoes are likely to peel badly and will not stand long distance transport or storage for long. The produce is then graded as table, seed, chats, and rejected (including cut and diseased).

Yield. The ryot calculates the yield as "FOLD" yield. Fold yields vary from 3-fold to 8-fold but cases have been known where over fourteen fold yields have been obtained. The method of estimating the yield by "FOLD" yield does not always give fair indication of the yield per acre as it depends upon the quantity of seed planted over a specified area. The correct method of estimating yield is by calculating the yield by weight obtained from an acre In good lands properly manured and planted with good sized seed, acre yields upto 15,000 pounds have been obtained. 10,000 pounds may be reckoned as an average yield per acre.

Practice at the Agricultural Research Station, Nanjanad.

At the Agricultural Research Station, Nanjanad, most of the cultural operations are done by animal power and implements. The preliminary cultivation is done by ploughing the field with the victory plough. Then cattle manure is carted to the field, applied broadcast and covered by means of monsoon plough. The furrows and ridges are made by means of a double mould-board plough which can easily cover 2 acres a day. Fertiliser is spread evenly in the furrow and tubers 1½ to 2 oz. in size are planted 9 inches apart in furrows 27 inches wide. Covering the seed is done by a smaller double mould-board plough. The earthing up also is

done by the same implement while weeds are removed by human labour. The potato digger is employed for harvest of all the three crops.

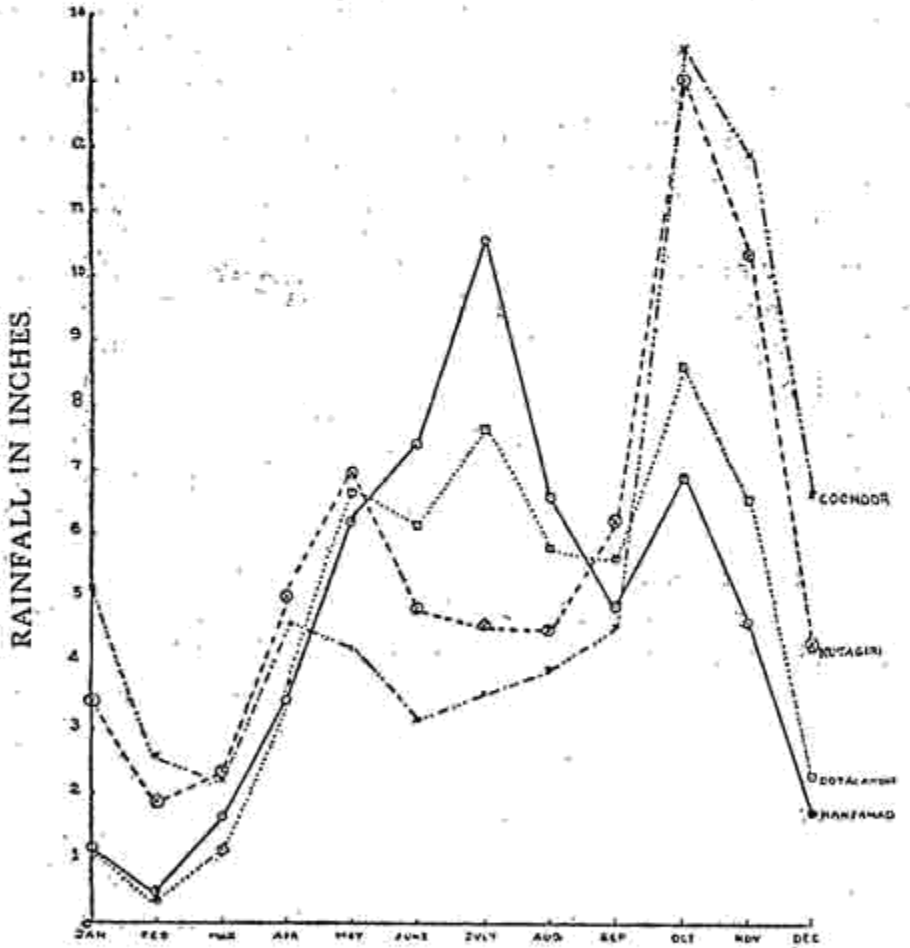
Seed supply for planting. The main crop, forming nearly two-thirds of the total area under potatoes in the district is planted in April—May and harvested in July—August and supplies seed for planting an irrigated crop during January February. This irrigated crop supplies seed for planting the second crop (which is less than one-third of the total area) which is mainly looked upon by the ryots as a seed supply crop for the main crop. The weakest link in the chain of seed supply at present is undoubtedly the irrigated crop, the seed of which is used for planting the second crop.

The ideal will be to have equal areas under these three crops in the three planting seasons of January, April, and September. If a more equable distribution of area could be obtained among the three crops, the supply of potatoes for the market could be more equally maintained throughout the year and periods of over-supply followed by periods of comparative scarcity which are at present so much in evidence can be greatly obviated. To this end, the area under irrigated crop should be increased by use of water lifts to bale out water from streams and wells. Over numerous small areas of swamp land, scattered over the district which are used at present for raising the irrigated crop, the ring disease becomes prevalent and only in exceptional years is a comparatively healthy crop obtained. The second methodof securing seed for the second crop is to store the seed from the previous second crop, harvested in December—January, for planting during the next August—September. But the loss in shrinkage is anything from 30 to 50% even under optimum storage conditions and old seed does not give as satisfactory an yield as seeds 2 to 3 months old. The other alternative is to artificially sprout the seed of an early main crop by means of chemicals, such as Carbon-bisulphide and plant during September. If the planting of the second crop is delayed beyond September, then the young crop gets caught in frost and damaged.

Section III. Trade prices and cost of production.

Marketing is generally done as soon as the harvest is over. In the majority of cases the middlemen in the village who supply fertilizers on credit to the growers, insist on purchasing the potato crop. Thus the growers, suffer under the double disadvantage of paying a higher price for his manure and not being able to sell his produce in the open market. The potato trade of the Nilgiris is very largely in the hands of middlemen in Mettupalayam. These middlemen send them out to consuming markets of Madras, Bombay, Poona, Calcutta, etc. With a view to handle the crop co-operatively and secure better prices for the growers, a Purchase and Sales Society was started at Ootacamund in 1919 which in 1923 converted itself into a Potato Growers Purchase and Sale Society. For various reasons this Society did not function well and collapsed in 1925 and the trade remained in the hands of commission agents at Mettupalayam. The society was revived in 1935 and continues to function now. During 1944 the Civil Supplies Department began making their purchases under an

Assistant Marketing Officer at Ootacamund. Due to correct weight and fair prices obtained by the ryots this organisation is now very popular and the purchase during the year 1945 was about 3019 tons, valued at Rs. 8,05,057. During the war a large quantity of potatoes was being purchased by Military departments for army consumption and by Messrs. Parry & Co., for dehydration for military supplies. During 1943 the Potato Control Office was instituted in order to control the transport of potatoes to other provinces and also within the province. Marketing is generally done as soon after harvest as possible. Thus during the harvest of the main crop at the end of July or August large quantities of potatoes come into the market and prices drop. The potato trade therefore is faced by serious difficulties in supply and demand. If prices could be maintained at a reasonable level throughout the year, both demand and supply would be more stabilised and the ryot would be assured of a more steady income.



GRAPH SHOWING THE RAINFALL OF
THE POTATO GROWING TRACT OF NILGIRIS

A change in the areas of the three crops now raised will enable growers to make a more regular supply. This under existing conditions is rather difficult. The only other method whereby this end may be attained is by withholding a part of the main crop under cold storage till the period of scarcity in March—May. Experience in other countries and elsewhere in

India show that potato can be preserved in cold storage without deterioration for several months, at a temperature of 40°F. without undue increase in price due to cost of cold storage. In other potato producing countries the surplus is used either for stock rearing or for industrial purposes like making starch and alcohol, but in this country where potatoes are not available for purchase by the poor people prices are generally maintained at such a level as to preclude the purchase of potatoes for industrial purposes at a reasonable rate. To correctly assess the cost of production of potatoes and the yield per acre in ryots' holdings is a very difficult task, as enormous variations occur in the seed rate, amount of manure applied and the yield per acre. The net income is naturally dependent upon the yield obtained, the prices prevailing and the cost of cultivation. It may however be stated that while seed and manure form three-fourths of the total cost, labour charges is represented by one-fourth. As the seed rate per acre increases, the amount of manures applied per acre also increases, while the other one-fourth, with a possible small increase in harvesting charges remains the same. The pre-war average cost of cultivation at the Potato Research Station, Nanjanad and estimates of ryot's cultivation, which may be regarded as normal are as follows:—

Items.	Research Station, Nanjanad.			Ryot's holding.		
Preparatory cultivation.	17	10	0	55	0	0
Manure and manuring.	117	0	0	120	0	0
Seeds and sowing.	82	0	0	60	0	0
After cultivation.	8	0	0	10	0	0
Harvesting.	18	8	0	25	0	0
	Rs. 243	2	0	Rs. 270	0	0
Yield.						
340 Mds. at Re. 1 per maund	340	0	0	300 Mds. at Re. 1 per maund	300	0	0
85 Mds. at 6 annas per maund	31	14	0	80 Maunds at 6 annas per maund	30	0	0
	371	14	0		330	0	0
Net Profit.	128	12	0		60	0	0

The cultivation expenses being almost the same, the margin of profit will diminish rapidly with a reduction in the scale of prices and on the other hand with a particularly good yield of about 600 maunds per acre, the net income will be more even if slightly lesser prices are obtained. Due to the prevailing high prices of manures, seed and cost of labour, the present cultivation expenses work out to about Rs. 600 per acre but the present price of Rs. 25 per bag of 200 lbs. is a very good incentive for the cultivation of potatoes. One item of expenditure which has not been taken into consideration in arriving at the cost of production is the putting up of fences against inroads by wild animals such as pigs and porcupines, which

in parts of Nilgiris assumes serious proportions. Fencing is erected with different materials e. g. wire nettings, ideal wire fencing, rough stone dykes, and katcha fencing of bramble. The cost of fencing will vary from Rs. 2 to Rs. 1—8—0 per running yard and often forms a considerable item of expenditure.

Pests and diseases. Diseases appear to have made their appearance very early in the history of potato cultivation in the Nilgiris. The chief diseases noted were the Ring disease, early Blight and scabs, while Rhizoctonia and Fusarium are also in evidence. Among the insect pests the chief enemies are the potato moth which affects the crop both in the field and warehouse and cut-worms which damage the young crop in the early stages of plant growth.

Ring disease which is more virulent sometimes appears in an epidemic form. Seed selection and rotation of crop are likely to bring some relief. Among insect pests the potato moth is often serious. Its spread can be checked by putting up light-traps at night as the moths are attracted by light. The present low yields of potato on Nilgiris is attributed partly to the wide-spread existence of virus diseases such as mosaic and leaf roll and studies are in progress to determine the extent of damage and remedial measures necessary.

A Very Promising Drought Resistant Fodder Grass for South India.

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Introduction. The problem of producing good fodder grasses and improving the pastures has been engaging the attention of many in the development of Indian Agriculture & Livestock. Good pastures not only provide an excellent feed, but they reduce the labour and expense involved in Livestock production and maintenance by supplying the essential nutrients for body development. Improved pastures and improved livestock always go hand in hand. In South India there are over a dozen good perennial pasture grasses of which only a few form the staple fodder for the South Indian breeds of cattle. The bulk of our cattle which are in the villages depend on the poor local natural pastures or grazing grounds which consist chiefly of annual grasses which spring up with the rains of the monsoons and die after seeding from October to January. There are no regular pastures as in the western countries where they are systematically grazed. While efforts are being taken to popularise and improve the pastures with the selections of the more important indigenous perennial