

The hearth has a built-in platform 8 feet 4 inches long, 2 feet wide and $2\frac{1}{2}$ feet high. There is a twelve inch wide central flue running along the length of the hearth and is connected to a chimney 7 feet high and 12 inches square in section internally. A baffle 8" x 6" is put in near the end of the flue. The baffle could be increased or decreased in size, to reduce or increase the draught as desired. The flue is covered on the top with an iron plate provided with 5 rings for taking in 5 vessels. The first two rings are nine inches and the others eight inches in diameter. The iron plate is plastered over with a three inch layer of mud. A grating one foot wide and two feet long is fixed at an incline at the flue entrance. The grating receives the husk from the feeding tray placed just over it. The tray is of galvanised iron twelve inches wide near the grating, two feet three inches at the other end and three feet long. The sides of the tray are raised and hold a fair quantity of groundnut husk. An ash pit below the grating receives the burnt ash.

A sample hearth built at Pallur, Arkonam taluk, is in use and is working very satisfactorily. The family consists of 8 members. On an average, 56 lb of wood fuel were being used by the family for cooking food previously. The new hearth now cooks food for the family—2 Madras measures of rice and proportionate quantities of *sambar*, *rasam*, dhall and a curry—in about 35 minutes using 20 lb. of groundnut husk, valued at 6 pies. A bag of husk measures 50 to 60 Madras measures ($3\frac{1}{2}$ c. ft. to 4 c. ft.) and weighs 60 to 72 lb. A bag costs one and a half annas and cooks 3 to 4 meals for the family. By the use of groundnut husk as fuel the family is now saving six annas a day—nearly 85 per cent. in the cost of fuel.

Climate and Crop Production in the Guntur Black Soils.*

A Preliminary Study.

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Introductory. The black-soil of the Guntur District is one of the most interesting tracts in this presidency and has recently come into great prominence on account of the extensive production of cigarette tobacco. This tract has long been known to be an important centre for chillies groundnut (bunch variety), cotton and cigar-tobacco. Consequent on the introduction of the Virginia tobacco and its spread, the area under the food, fodder and chilli crops has been reduced. The approximate acreage of the different crops in the two districts of Guntur and Kistna are as follows:—groundnut 6,25,000, cotton 1,10,000, tobacco (virginia) 85,000, chillies 56,000. It is of a great agricultural interest that all these crops are grown under dry conditions. No other tract in this presidency or even in India, grows so many money crops with such success as can be seen from the following statement:—

* Paper read at the Agricultural Section of the Indian Science Congress held in Madras, January 1940.

Yield of Crops per acre in lbs.

Crops.	Yield average for 16 years.	Maximum yield.	Minimum yield.
<i>First season.</i>			
Cholam dry (fodder)	4065	7000	2225
Groundnut (pods)	1331	2400	350
<i>Second season.</i>			
Cholam (dry grain)	439	950	73
Chillies (dry fruits)	344	758	75
Tobacco virginia (cured leaf)	670	844	466
Cotton (kapas)	474	850	110

Dry-farming as is known to us, has its own vicissitudes and disappointments but in this tract it is of a different nature in that it is intensive and ordinarily devoid of serious failures. On the other hand the yields of crops are on a par with those of the irrigated tracts elsewhere. It is this aspect that makes the agriculture of this tract most interesting.

Geographical position. This tract lies in the curve of the peninsula on the Eastern side and near to the coast line. This aspect of the tract gives this area a specially favoured position with reference to rainfall and air movements. As we proceed westwards in this tract into the typical dry black soil of the Ceded districts, or to the South into the red soil tract of the Nellore district, such a benefit is entirely absent with the result that the only extensively grown crop is cotton. However, the precipitation in Guntur black soils during the N. E. Monsoon season is fitful and the tract is often subject to sudden cyclonic down-pours or rain may often fail. Thus the cropping in this tract is dependent more or less on the earlier rains than the later ones. The average rainfall data for 16 years (1923-1938) in 12 months is given below.

Average rain-fall data for 16 years.

Month.	Rainfall in inches (average for 16 years).	Number of rainy days (average for 16 years).	Month.	Rainfall in inches (average for 16 years).	Number of rainy days (average for 16 years).
January	0.01	0.6	July	5.81	11.5
February	1.12	1.4	August	5.26	10.0
March	0.16	0.38	September	6.28	9.6
April	0.75	1.5	October	5.62	6.6
May	2.14	2.4	November	3.20	4.0
June	3.54	6.5	December	0.90	0.4

Nature of the soil. The soil is a heavy clay containing about 30 per cent of clay and 30 per cent of fine silt. It is over six feet deep in some places and can be said to be the best black soil of the Presidency. Its retentive power for moisture is very great and this accounts mostly for the very successful cultivation of the various commercial crops. The analysis of the soil done by the Agricultural Chemist, Coimbatore in 1923, when the station was newly brought under cultivation is given below:—

Loss on ignition	7.100	Moisture	8.19
Insoluble mineral matter	68.069	Fine gravel	5.14
Iron (Fe_2O_3)	6.787	Coarse sand	2.74
Aluminium (Al_2O_3)	11.174	Fine sand	11.30
Lime (CaO)	2.590	Silt	11.23
Magnesia (MgO)	2.380	Fine silt	30.06
Phosphoric acid (P_2O_5)	0.039	Clay	29.01
Potash	0.543		
Soda	0.619		
Sulphuric acid	0.036		
Carbonic acid	1.093		
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Nitrogen	0.0550		
Available phos. acid	0.0039		
" potash	0.0166		

The analysis shows a deficiency in phosphoric acid and nitrogen which is generally made up by systematic application of cattle manure and the mixed cropping that is practised under normal conditions. It is generally well supplied with lime and potash.

During summer the temperature goes well beyond $110^{\circ}F$. and the soil cracks deep. The inherent fertility is kept up and does not seem to have been affected even in places where, due to economic reasons, rotation of cropping has not been kept up. It is an almost ideal soil which retains moisture to the greatest extent, allows free drainage and when kept under good tilth becomes fit for sowing or cultivation within an astonishingly short time even after very heavy showers. In 1938 except for an abnormally heavy rainfall of 20" in August-September, there were no further rains still the second season crops were grown successfully with the rain received in August-September. Such is the retentive capacity of this soil.

Season and rainfall. The year in this tract may be classified into (a) the summer months (from February to May), (b) South-west monsoon or 'Punasa' season (from June to September), and (c) the North-east monsoon or the 'Pyru' season (from October to January). The *Punasa* is suited for fodder, groundnut and minor food crops and the *Pyru* for tobacco, cotton, chillies and millets. The period from January to March is cool, dry and practically rainless. It therefore aids the ripening, harvesting, and preparation of the produce for storage or sale. In general, once the rains start in June or July, the precipitation continues at intervals upto about October, so that the crops in that season get the supply in adequate quantities and the fields intended for the second season crops are cultivated several times when conditions permit and are thereby enabled to absorb and retain the maximum amount of moisture necessary for the benefit of the second season crops.

Cropping system. A very good system of rotation of crops to meet the various needs of the farmer is practised *viz.*, in the first season a pure fodder crop or groundnut (a cash crop) and in the second season cash crops (tobacco and chillies) and grain crops for food and fodder. The following system of rotation of cropping is followed under normal conditions and has proved to be the best for the tract:- First year—chillies:

second year—ground nut or maize or late grain cholam; third year—tobacco or fodder crop, or first year—fodder cholam; second year—chillies; maize or variga; third year—tobacco; fourth year—ground nut.

Yield and its correlation with rainfall. It has been pointed out that the successful cultivation of crops under dry conditions, elsewhere grown in garden-lands, is mainly due to the adequate and well distributed rainfall. On correlating the rainfall with the yield of the more important crops the following interesting features were brought out:- (1) It is the distribution and not the total rainfall that counts. In 1929, the rainfall was the lowest, yet the yields were favourable, probably due to the good distribution of the precipitation. (2) In years when the average has been exceeded due generally to sudden down-pours or cyclones the crops have been adversely affected and pests and diseases have increased. (3) A rainfall less than average does not necessarily reduce the yield. (4) Years-succeeding those with rainfall in excess of the average have given better yields. (5) A favourable first season is an almost sufficient warrant for a fairly successful second season. (6) More than average rainfall is not at all necessary for tobacco and cotton.

Climatic influences. Though the rainfall is the main factor there are other influences which affect the cropping of this tract. The rainy days should alternate with clear days and when this happens an astonishingly rapid growth in the crops is seen. During these months there are frequent thunder-storms which probably help in the growth by way of electrical influences. Alternating dry periods are essential for the inter-cultural operations which have a very good effect on the crops. The tract is subjected to sudden down-pours (as much as 10 inches in 11 days) yet the soil is not subjected to serious wash as the land is not undulating and a well-cultivated soil absorbs surprisingly large quantities of moisture. Such heavy rains however, give rise to much surface surplus flow and the system of storing the surplus water in ponds adjacent to the fields is an interesting arrangement, in that the ponds retain water for a long time and enable the farmers to sow and water their chilli and tobacco nurseries and subsequently to water the transplanted crops. The dry weather period succeeding the North-East monsoon season is of great importance for the maturing and successful harvest of the money crops. A steady sea-breeze starts from about the end of December which is believed to help the rapid growth and maturity of all the second season crops. The temperature variations between night and day during the first season are very little, the average minimum ranging about 80° and the average maximum about 90°F. The first season crops therefore, have generally, very favourable temperature conditions for their growth.

Forecasting and how it can help. A tract which is so greatly dependent upon climatic influences should naturally benefit very much by a systematic study of the climatological manifestations and the part they play on the crop production. If it were only possible to forecast the nature of the first

season, its rainfall and distribution, the ryots would be in a position to adjust their cropping definitely with reference to their needs of food, fodder and cash. It has been found by experience that when there are reports of heavy rainfall in the West and North-West as in Mahabaleswar and Nagpur adequate rainfall can be expected in this tract immediately after. In the same way when there is heavy fall recorded at Masulipatam and Cocanada there is sure possibility of rains in this tract. The early or late start of the season has its own bearings on the situation since an early one facilitates the raising of two crops. The raising of nurseries can be adjusted so that the crops are planted at the right time. Sometimes heavy rains are received in February and March. An indication of these in advance should give the cultivator a chance to manipulate his harvest and curing of the tobacco in such a way as to incur minimum loss. It is therefore, not out of place to emphasise here the necessity for starting meteorological sub-stations in such important tracts.

Conclusion. In conclusion, it may be said that this tract enjoys a more favourable condition of weather and rainfall than other dry-land tracts. Yet it is left to us to use our ingenuity to extract the maximum benefit out of the indulgence of nature. We have to make efforts to keep the soil in its right condition, sow the best and give the best of our attention so that the normal out-turn is assured invariably. Any complicated or elaborate system of manuring is out of the question particularly with artificials. Systematic and adequate manuring with organic manures like cattle manure, sheep manure or cake and bones have given the best results. Crop improvement work in such a tract should proceed on the following lines:—Crops should be bred to (1) withstand heavy rainfall and long drought; (2) give immunity or resistance to diseases and insect pests; (3) come into maturity at suitable seasons (4) conform to the quality required in the markets and (5) give adequate yields to make their cultivation pay a handsome return.

Seed Testing.

An important Agricultural Practice.

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Introduction. What is it that every gardener or farmer would most desire? The ready answer to this question will doubtless be one word 'success'. Success in good farming or gardening will mean the production of the largest, the handsomest, the healthiest and the most vigorously growing plants yielding the maximum produce which will give an abundant return for the labour and expense of running a farm or a garden. For, 'a product properly produced is already more than half marketed'. The first and the foremost criterion is the purity of the seed for its species and the strain or variety the farmer which intends to grow. For example, if it is to be *Co₂ Cambodia*, he must make sure that it is *Co₂ Cambodia* and nothing