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	Revised Names.	Old Names.
207.	Bromus catharticus. Vahl.	Bromus unioloides, H. B. K.
208.	Streptogyna gerontogea, Hook. f.	Streptogyna crinata, Thw.
209.	Triticum dicoccum, Schrank.	Triticum vulgare, Vill. F. B. I. VII. 367.
210.	Hordeum hexastichon, Linn.	Hordeum vulgare, Linn. var. hexastichon, Ait.
211.	Teinostachyum Beddomei, C. E. C Fischer, n nom.	Teinostachyum Wightii, Bedd.
212.	Oxytenanthera monadelpha, Alstom.	Oxytenanthera Thwaitesii, Munro.
213.	Ochlandra scriptoria, C. E. C. Fischer n. Comb.	Ochlandra Rheedii, Gamble.
214.	O. Wightii, C. E. C. Fischer, n. Comb.	,, Brandisii, Gamble.

Groundnut Oil-cake as Manure and Cattlefeed.*

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The international situation brought about by the present war has, among other things, affected the export trade of most of the countries of the world due to the closure of foreign markets resulting in an upset of agricultural economy. The situation is particularly embarassing to a country like India which is essentially a producer of raw materials entirely dependent upon other countries for the disposal of most of its agricultural produce. Of the many such products produced in the country on a large scale and marketed elsewhere groundnut figures prominently.

In spite of the offer of the United Kingdom to purchase all its requirements of oil seeds from India and attempts being made to explore new markets, the total production of groundnut in this country is bound to leave a surplus for which use has to be found. Restriction in area can be done only to a certain extent, for groundnut is a crop that is easily raised in the poor dry lands of the Province with little investment or care and is one of the few attractive crops for the dryland farmer. It becomes, therefore, necessary to absorb this anticipated excess production in the country itself by developing the Indian oil-seed crushing industry on a sound and planned basis and utilizing the oil and the residual cake *(poonac)*.

1. **Grades of groundnut poonac.** There are two grades of groundnut *poonac* recognised in trade and available in Madras. The one is the "expeller" quality and the other the "chekku" quality. The former is the residual matter left after the extraction of oil from the kernels, in power-driven oil mills or hand presses, while the latter is the residual cake left after the extraction of oil in the indigenous wooden *chekku* or *ghanni*. *Chekku* cake generally contains a little more of oil due to incomplete extraction and is consequently valued slightly higher than the expeller quality.

* Contribution No. 17 from the Oil Seeds Section of the Madras Department of Agriculture.

2. **Groundnut *poonac* as manure.** Groundnut *poonac* contains about 7 to 8 per cent of nitrogen and is considered a good organic nitrogenous fertilizer. Its manurial value compares very favourably with some of the other oil-seed cakes available in our country as can be seen from the following comparative figures of analysis.

	N	P_2O_5	K_2O
Groundnut cake	8·0	1·4	1·2
Castor cake	4·5	1·9	0·7
Coconut cake	3·4	1·5	1·3
Pungam *(Pongamia glabra)* cake	3·6	1·3	0 7
Neem cake	5·0	1·3	1·7

The use of groundnut *poonac* as a fertiliser for paddy and sugarcane crops is a well established practice in Madras. For sugarcane the *poonac* is particularly suitable and considered better than ammonium sulphate from the point of view of jaggery making and sugar refining. Experiments have shown that groundnut *poonac* at 400 to 600 lb. per acre to supply 30 to 40 lb. of N for paddy and at about a ton to supply 150 to 200 lb. of N per acre for sugarcane have given increased yields. In places where green manuring is not possible or practicable, groundnut *poonac* can be safely adopted as a manure for paddy. Taking the paddy crop into consideration even if 10 per cent of the total area of $10\frac{1}{2}$ million acres under paddy takes to the application of groundnut *poonac* as manure, at the rate of 600 lb. per acre, it will easily account for a consumption of nearly 281,000 tons of the *poonac* in the Province itself. Again the total area of one lakh of acres under sugarcane in our Province can easily consume another one lakh tons of *poonac*. Thus there is a possibility of utilizing nearly 381,000 tons of groundnut *poonac* in Madras itself for manuring paddy and sugarcane alone not taking into account an appreciable quantity that can be used for crops like coffee, tea, oranges, plantains, vegetables etc. This extensive scheme of manuring if brought into operation will account for nearly 700,000 tons of groundnut kernels out of normal estimated production of 1,200,000 tons of shelled nuts in our presidency.

The chief impediment that hitherto stood in the way of its extended use was the high price the commodity commanded in the local markets during the pre-war period due to the large demand of groundnut kernels from foreign markets at attractive prices leaving only a limited quantity for crushing in the country. Moreover, ammonium sulphate with nearly 20 per cent nitrogen in an easily available form was then procurable at comparatively cheaper prices and proved attractive.

The absence of adequate export trade in groundnuts has brought about a marked decline in the prices of *poonac*. The current price-trend of groundnut *poonac* in the various markets in the Presidency has shown a fall of about 50—75 per cent from the pre-war level, making it at present a fertiliser definitely much cheaper (based on nitrogen content) than ammonium sulphate. In the appended statement the actual price of groundnut *poonac* per ton which existed before the outbreak of war and as it prevailed in

September 1940 is furnished in respect of the important groundnut crushing centres in the Presidency. It may be seen therefrom that the highest price of expeller groundnut *poonac* per ton is about Rs. 50 in Cuddalore (South Arcot) while in Vizagapatam, Guntur, Kurnool and Anantapur districts, the price is about Rs. 25 to Rs. 30 per ton. These prices are equivalent on the nitrogen basis to about Rs. 135 per ton of ammonium sulphate at Cuddalore and about Rs. 70 to Rs. 85 in the northern and central districts—prices which are far less per unit of nitrogen than even the pre-war prices of ammonium sulphate. With a further fall in the price of groundnut *poonac* which at the time of writing is about Rs. 16 per ton in several producing centres, it seems to be definitely economical to use the *poonac* as manure where-ever ammonium sulphate or other nitrogenous fertilizers were utilised before. It will not only supply the required quantity of nitrogen but, being an organic manure will also improve the soil texture. Moreover, groundnut is grown in almost all the districts of the Province barring perhaps the West Coast and the Nilgiris. This facilitates the crushing of the produce locally and using the *poonac* in the centres of production themselves without the necessity for large scale movements over long distances. This local sufficiency is likely to keep the price of *poonac* at reasonable levels due to the low cost of short-range transport.

Further, due to the war the availability of imported artificial fertilisers such as sulphate of ammonia, niciphos, ammophos etc., is very restricted. There is a great shrinkage in their imports, and attendent to lack of suitable transport facilities, future supplies are likely to be affected seriously. Prices have also soared and are still on the upward trend and may even become prohibitive. Ammonium sulphate, for example, which was selling at about Rs. 120 per ton in normal times is now being sold at Rs. 240 per ton subject to availability of stock. It is, therefore, expedient under existing conditions to bring into greater use in their place, a material like groundnut *poonac* which is locally available at economic rates.

Groundnut *poonac* as cattle feed. The importance of oil cakes as feed for work animals and milch cattle is widely recognised. Of the many sorts, groundnut *poonac* is perhaps the cheapest and the one very largely used, though preference is shown to gingelly *poonac* in some places for feeding milch cattle. It may be easily seen from the figures of analysis of the different oil-cakes furnished below that groundnut *poonac* is a rich source of protein and fat and is a useful concentrated feed.

	Moisture.	Ash.	Crude protein.	Carbo-hydrates		Fat.
				Crude fibre	Nitrogen free extract.	
Groundnut cake	10·7	4·9	47·6	5·1	23·7	8·0
Coconut cake	10·5	5·2	21·4	11·7	42·7	8·5
Gingelly cake	9·5	10·7	39·8	6·8	20·6	12·6

(From " Principles of Feeding Farm Animals " by Bull and Carroll)

Nutrition experiments conducted by the Government Agricultural Chemist, Coimbatore, have shown that groundnut *poonac* is a very healthy cattle feed and that there is no ground for the prejudice shown against it in some tracts. It has been determined that where paddy straw is used as roughage for feeding cattle about 14 oz. and where *cholam* (sorghum) straw is used about 4 oz. of groundnut *poonac* per day per head of cattle is a necessary maintenance ration if we are to improve the condition of our livestock and increase its efficiency and utility to us. Taking at the lowest level of 4 oz. per day, each head of cattle can consume about 90 lb. of *poonac* per annum. This ration at the present level of prices works out to only about a rupee per annum. Even if only about 25 per cent of the total estimated 17 million head of cattle in the Province is fed with the maintenance ration it could easily account for about 170,800 tons of groundnut *poonac*. Nearly four times or more of this quantity will be required when the question of feeding milch cattle or animals at work or those fed with the poorer bulk fodder like paddy straw is considered. Thus a drive in favour of the proper feeding of our cattle with groundnut *poonac* would appreciably enhance the utilization of more *poonac* and account for the local consumption of a good bit of the groundnut produced in the country and formerly exported. This would also improve the present impoverished condition of our cattle and indirectly increase the manurial value of the dung and result in the increased production of crops.

From the above statement of facts it can easily be seen that the only way to meet the difficult situation arising out of the lack of export trade in groundnuts is to utilise the produce in our country itself and to our great advantage remembering the fact that the foreign countries were purchasing this commodity at such high prices and transporting the stuff to long distances because they fully realised the value of the different products that can be obtained from this oil seed.

Current and prewar prices of groundnut cake—expeller quality.

Centre.	Prewar price.	Sept. 1940 price (per ton.)	Percentage fall	Calculated equivalent price of ammonium sulphate per ton based on current price of cake*
	Rs.	Rs.		Rs.
Anantapur district				
1. Pamidi, Gooty taluk	50 to 55	29	45	77·3
2. Hindupur	46	30	35	80
North Arcot District				
3. Tirupattur	58·2 to 62·7	39·2 to 40·3	34	106
South Arcot District				
4. Cuddalore	63·3	50·6	20	134 9
Bellary District				
5. Adoni	42 to 51	27·5	41	73·3
Coimbatore District				
6. Pollachi	67·2 to 71·7	35·8 to 38·1	47	98·5

Centre.	Prewar price.	Sept. 1940 price (per ton.)	Percentage fall.	Calculated equivalent price of ammonium sulphate per ton based on current price of cake*
Guntur District				
7. Guntur	53·8	44·8	17	119·5
8. Narasaraopet	53·8 to 58·2	26·9 to 29·1	50	74
9. Tenali	53·8 to 62·7	31·2 to 35·8	32	77·7
10. Ongole	44·8 to 53·8	34 7 to 38·1	26	97·1
Kistna district				
11. Bezwada	58·2 to 60·5	30·8 to 33·6	46	85·9
Kurnool district				
12. Kurnool	49·3 to 53·8	26·9 to 28	47	73·2
13. Nandyal	58·2	29·1	50	77·6
Tanjore district				
14. Pattukottai	49·3	45·9	7	122·4
Tinnevelly district				
15. Virudhunagar	58·2	49·3	15	131·5
Vizagapatam district				
16. Anakapalle	56	29·8	46	79 8
17. Vizianagaram	67 2	26 9	60	71·7

* Calculated on the basis of 7·5% of N in groundnut cake and 20% in ammonium sulphate.

SELECTED ARTICLE

Economic Factors in Agricultural Development.*

By K. C. RAMAKRISHNAN, M. A.

I. Economic Aims. Handicaps and Incentives. The ultimate aim of all agricultural development should be to ensure as high an income as possible for every worker on land, and not merely raise the yield per acre or secure a larger return on the capital invested. Comparisons are commonly made in agricultural publications of acreage yields of particular crops in different countries without reference to the diverse conditions, social as well as physical, in which they are produced. For instance, it is not so well known that in China, which is quoted for high yield per acre of rice and wheat, that the peasant had to sweat more than in any other country on his tiny holding, especially because of the lack of cattle power; and for manure he has to depend largely on night-soil. In Japan, again, which has next to Italy the highest yield of rice per acre, the tenant cultivator has not only to put in very hard work but he remains for ever in debt on account of the forced use of fertilisers at the behest of his money-lending landlord, and is often obliged to pay off the interest due by sending his children to toil in the small industries run by the same landlord. It is no doubt necessary in old settled countries, where scope for expansion of cultivation is limited and population is already pressing on the soil, that all efforts should be made to raise the yield per acre, if only as a means to raise it per worker. But it is necessary to reckon, in addition to items paid for in cash or kind, the human cost involved in such production. It is not altogether a matter for satisfaction

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