physical, chemical and biological". Physical in the sense it improves the soil texture. Chemically, liming of the soil tends to correct its acidity, regenerating inorganic plant foods from combination in the soil and thus making them available to the plant. Use of a limy manure controls the undesirable micro-organisms and encourages beneficial ones, an example of which is the process of nitrification by certain types of bacteria which will not be able to thrive and carry on its work in an acid medium. So prawn shell manure is a naturally available organic manure rich in lime content and this should prove very useful for certain types of soil.

Experiments on the manuring of soils with fish manures have been conducted at the various Agricultural Research Stations of the Madras Government and increased yield of crops due to fish manure have also been reported in some stations. However, there seems to be a dearth of detailed systematic investigations for the various crops and soils of this Presidency, and it is to be hoped that this type of investigations will be taken up by the Agricultural Department.

Conclusions: Beach-dried fish manures contain about 5 to 7% of nitrogen, 4 to 6% of phosphate and an equal amount of C_aO with sand varying from about 10 to 30%. Pit fish manures prepared out of whole fish and out of wastes contain about 3 to 5% nitrogen and 2 to 6% phosphate and 1 to 5% lime. In all these cases sand, i.e., the percentage of insolubles is an important factor in deciding the quality of a manure since it is found to be anywhere between 20 to 45%. It is possible to bring down the high sand content by observing a few precautions during preparation. Fish manures are concentrated organic manures and should be of high value to the various types of crops though at present they are popular with only tobacco, tea and coffee planters. Experimental data on all important crops is lacking and it is hoped that ere long the Agricultural Department will be in a position to take up this problem.

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Manurial Experiments on Rice*

2. *Effects of season and continuous green leaf manuring on yield*

By

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Introduction: Rice growers of this Province, by traditional experience resort to green leaf manuring with a view to obtain increased yields. Investigations to assess its effect were for some time past in

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progress in this and other provinces. Two schools of thought were developed, the one attributing the beneficial effect of green leaf manuring to Nitrogen and its influence on the biological reactions in the soil and the other laying stress on the physical effects of the organic matter and also the possible influence on the solubility of soil phosphates. However, the literature on the cumulative effects of green leaf manuring over long periods is scanty. Irrespective of the nature of its action, green leaf manuring is an accepted practice among farmers to increase rice yields. Twenty five years ago two experiments on continuous green leaf manuring were laid out at Palur and Manganallur. At Palur in one experiment on rice, green leaf was applied to alluvial soils. The rice was grown in the *samba* season (September—January) irrigated by a perennial spring channel of Gadilam river. Green leaf at 4,800 lb. per acre of "*Calotropis gigantea*" and tree leaves (*Pongamia glabra* and *Azadirachta indica*) along with other bulky organic manures were applied from 1908 to 1921. In another experiment "*Dhaincha*" (*Sesbania aculeata*) was applied over a period of fourteen years to a saline soil. In the first experiment green leaf manuring increased the yield of rice but failed to show any cumulative effect which in the second experiment was evident for the first nine years but none thereafter. At Manganallur, the experiment was conducted on heavy clay soils of single crop wetlands. The supply of water was constant and commenced from the last week of July or in the first week of August. Green leaf (Sunnhemp) at 2,000 lb. per acre alone and in combination with bone-super was tried from 1914 to 1919. The results are similar to the first experiment at Palur cited above. Due to the change in varieties during the course of the experiment and in the absence of a modern statistical layout, the results can be taken as only indicative. In the Vizagapatam district the conditions of rice growing are quite different, since there is no regular irrigation system and the crop is frequently subject to seasonal vicissitudes, the plantings are often delayed and the growth periods are consequently reduced resulting in poor yields. The average yields of rice for the district are the lowest for the Presidency, ranging between 1,100 to 1,400 lb. of grain per acre. The nursery is sown in the first week of July under rainfed conditions but the age of seedling at planting differ widely from year to year due to the transplantation depending upon the receipt of the South-West Monsoon. The transplantation may thus come off early in August or be delayed till late in September. To assess the value of green leaf manure to rice under these conditions a long-range experiment was laid out at the Agricultural Research Station, Anakapalle in 1927 and continued for a period of twenty years.

2. **Material and Method:** The experiment consisted of two variants viz. (i) the application of 3,000 lb. of green leaf (sunnhemp) per acre and (ii) no manure. G. E. B. 24 was the only variety raised throughout the

course of the experiment. The experiment was laid out on AB—AB pattern. In 1938-39 the same layout was changed into AB—BA layout to conform to the modern methods of field technique. This was done by splitting each plot into two and allowing a suitable margin in between. The change in layout was so effected that the plots continued to receive the same treatments as before. The yields of grain and straw are represented in Table I and rainfall data in Table II.

Statistical Analysis: The data on yield of grain from manured and un-manured plots for the twenty years given in Table I may be taken up for detailed study. The yields from manured as well as un-manured plots show peaks and troughs in alternate years with only very few exceptions. Except for the year 1936, manured plots give greater yields than unmanured plots. Wide fluctuations in yield from year to year are prominent in the data. Hence it will be interesting to study the data under the following heads. (a) Periodicity, (b) Effect of manure, (c) Causes of seasonal variations.

(a) *Periodicity:* Since the same variety G. E. B. 24 was tried in the same field under identical conditions of manuring the yield factor due to varietal and soil effects may be taken to be constant throughout the trial period and the fluctuations observed in the values may be assigned to seasonal effect i. e., time of planting, meteorological conditions etc., and random causes. Hence the model for the yield may be set up as $Y=m+s+e$.....(1) where the component 'm' may be estimated as the the mean of the twenty values, 's' the effect due to season and 'e' random error. Thus for studying seasonal effects, it may be sufficient to observe the trend of 'Y' itself, because Y—m when graphically represented means only a parallel displacement of the 'x' axis of the graph of 'y' and 'e', the random error will be removed by a smoothing of the observed data. With this model in view the study of periodicity in the data will simply mean the study of seasonal cycles.

The search for periodicity was made with the yield data of 20 years. The result of the investigation is that two years is the most probable period. But for the search of the periodicity the values for the first four years are excluded because of the irregularity of peaks and troughs. The same period of two years is obtained for yields from both the manured and un-manured plots. But in both cases though the period is two the successive waves differ widely, the periods of the cycles are the same but the amplitudes are different. Hence it is impossible to predict the values for the future with the information available. That there is a period of two is also evident by obtaining a moving average for two-year periods or with periods which are multiples of two. The eight-year moving averages for both the manured and un-manured data for the eight years from 1935-1942 are given in Table III. They show that the irregular deviations

can be smoothed out by a period which is a multiple of two and that a period of years is possible. But since the values cannot be predicted by any curve due to irregularity of amplitudes, it is better to study the peaks and troughs separately.

TABLE III. Centred Eight-Year moving averages of yields

Year	Manured	Un-manured
1935	2750	2476
1936	2724	2457
1937	2748	2477
1938	2761	2467
1939	2757	2436
1940	2711	2343
1941	2748	2336
1942	2742	2322

Since the peaks and troughs are observed in alternate years, considering the values of yields from 1931 onwards there are 8 peaks and 8 troughs each for the manured and un-manured plots. The data show that a period of 8 for the peaks as well as troughs is probable, but the insufficiency of the data prevents any theoretical establishment of the same. It may be that the peaks and troughs are repeated after eight years. However, sine-cosine curves of the form

$$Yr = a_0 + a_1 \cos \theta r + a_2 \text{Cos}_2 \theta r + \ldots\ldots \quad (2)$$
$$+ b_1 \text{Sin } \theta r + b_2 \text{Sin}_2 \theta r + \ldots\ldots$$

may be fitted to the data of the troughs and peaks separately where Ys stands for the yield for the year and $\theta r = 2\pi r/p$ where p is the period and r takes values from 0—p–1, a's and c's being constants. Table IV gives the values of a_0, a_1, b_1, b_2 for the sine-cosine curves fitted to the 8 troughs and peaks each of the manured and un-manured plots.

TABLE IV

Values of constants in (2) for peaks and troughs of yields from manured and un-manured plots (Period 8)

Constants.	Manured		Un-manured	
	peaks	troughs	peaks	throughs
a_0	3151·3750	2331·8750	2865·6250	1936·6250
a_1	—330·9896	390·3936	—358·2173	424·3611
a_2	—52·7500	—294·5000	—1110·0000	—369·5000
b_1	233·0760	—78·5516	329·2244	109·4940
b_2	70·0000	230·7500	74·2500	268·2500

Ordinates obtained from the curves for the peaks and troughs may be compared with the observed values given in Table V. The ordinates considering the first harmonic term only and first and second harmonic terms are given separately.

TABLE V.

Observed values (peaks)	Manured Ordinates lb. I.H.T.	I & II H.T.S.	Trou-ghs.	Ordinates I. H.T.	I&II H.T.	Obser. (Peaks)	Un-manured Ordinates. I H.T.	I&II H.T.	Obs. (trough)	Ordinates. I. H.T.	I & II H.T.
2600	2820	2768	2300	2722	2428	2200	2507	2397	1925	2361	1991
3375	3082	3152	2750	2552	2783	3075	2845	2919	2500	2314	2582
3125	3385	2480	2625	2000	2548	3150	3195	3305	2585	2040	2415
3865	3550	3480	1791	2000	1770	3473	3352	3277	1447	1714	1446
3033	3482	3429	1442	1941	1647	2860	3224	3114	958	1512	1143
3632	3220	3290	2708	2111	2342	3256	2886	2960	2161	1560	1827
2719	2918	2971	2295	2410	2705	2350	2536	2646	1836	1827	2197
2862	2752	2612	2744	2653	2463	2561	2380	2305	2141	2159	1891

NOTE: I. H. T. denototes 1st Harmonic term i. e.

$a_0 + a_1$ as $\theta r + U_1 \sin \theta r$.

I & II H. T. denotes I. H. T. $+ a_2$ as $2\theta r + U_2 \sin 2\theta r$.

The observed values and the curves for the "Manured" and the "un-manured" are almost similar in their nature. One remarkable feature of the curves is that the peak curves reach a maximum and fall down but the trough curves reach a minimum and go up and the respective maxima and minima correspond to consecutive years. This, of course, accounts for the variation between the values of the amplitudes of different waves.

(b) *Effect of manure:* It has been observed that the yields from un-manured plots are invariably smaller than those of the manured plots. But it has to be determined whether the former values are significantly different from the latter. Analysis of variance based on all the pairs of values has been done according to the scheme of a randomized block of two treatments and 20 replications. The results are given in Table VI. F. test in Table VI shows that there is significant difference between "Un-manured" and "Manured" yields.

TABLE VI. Analysis of Variance of the Yield of Manured and Un-manured Plots.

Source		Degrees of freedom	Sum of squares	Mean square	F.
Total	...	39	145,59333·97		
Years	...	19	131,98035·47	694638·45	48·65 (Significant)
Treatments	...	1	10,89990·22	108990·22	76·33 (Significant)
Error	...	19	2,71308·28	14279·38	

That there is no significant effect of manure for the improvement of the soil year after year has been revealed from the results of the soil analyses conducted in 1926 and 1937 with an interval of eleven years, kindly furnished by the Government Agricultural Chemist, Coimbatore, as in Table VII.

TABLE VII. Results of Soil Analysis Conducted in 1926 and 1937.

Year	Total Nitrogen %		Available Phosphorus %		Available Potash %	
	Manured	Unmanured	Manured	Unmanured	Manured	Unmanured
1926	0·054	0·054	0·0525	0·0513	0.01240	0·01260
1937	0·071	0·068	0·0522	0·0480	6·01203	0·01165

(c) *Causes of seasonal variations:* The Analysis of variance in Table VIII shows that F for years is significant so that there are considerable variations between yields of different years. The possible factors for the wide fluctuations in the yields of rice are in general the quantity and distribution of rainfall at the time of planting. It is within the experience of the cultivators of this tract that the above two factors have a profound effect on the final yield. As already pointed out the dry nursery is invariably sown in the first week of July while the transplantation is dependent upon the receipt of water in the irrigation sources which may take place from the first week of August to last week of September causing the delay of eight weeks. Records indicate that temperature and humidity do not play any role in influencing the yields of grain and straw.

A scrutiny of the rainfall data presented in Table II, shows that the total rainfall and the rainfall during the crop period have a similar relationship to the yield. The values of correlation co-efficient between rainfall and yield are presented Table VIII.

TABLE VIII. Values of the Correlation Co-efficients between Rain and Yield**

	Correlation between 1	Values of (r) 2	Significance 3
1.	Yield from unmanured plots and total rain-fall ...	0·1680	N O
2.	Yield from manured plots and total rain-fall ...	0·0082	N O
3.	Increase in yield of manured plots over unmanured plots ...	0·0531	N O
4.	Yield from unmanured plots and rain-fall received during the crop growth ...	0·1080	N O
5.	Yield from manured plots and rain-fall received during the crop growth ...	0·0080	N O
6.	Percentage increase in yield of manured plots over unmanured plots ...	0·0300	N O

** The correlation co-efficients are tested using the transformation of Fisher, $Z' = \frac{1}{2} \log_e \frac{1+r}{1-r}$ which is a normal Variate with SD $= \frac{1}{\sqrt{n-3}}$

The above data show that in general while the crop yield is dependent on rainfall, there is no significant correlation between the two. This is due to the fact that irrespective of the quantity of rainfall there is yet another important factor which effects the yields significantly. Irrespective of the quantity of rainfall received, the time of transplantation may vary as already pointed out. As the variety under test is a season-bound one, which comes to harvest invariably by the first week of December, later planting shortens the growth period and this in turn is reflected in the yield. The correlation between the yields from manured and un-manured plots and the percentage increase in yields of manured over the un-manured plots on the one hand and the post transplantation period (from the time of planting to flowering) on the other shows the pronounced effect of the latter over the yields. The values of (*r*) are presented in Table IX below :

TABLE IX

Values of correlation coefficient between the Post-transplantation Period and Yield

Correlation between	(r)	Significance.
1. Yield from unmanured plots and post-transplantation period in days.	0·593	Yes.
2. Yield from manured plots and post-transplantation period in days.	0·507	Yes.
3. Percentage increase in yield of manured plots over unmanured plots and post transplantation period in days.	—0·480	Yes.

The significant positive correlation between the yield and the post transplantation period indicates the pronounced effect of the time of planting on the yield. The significant negative correlation between the percentage increase of manured over un-manured and the post transplantation period indicates that the green leaf manure has a pronounced effect when the transplantation is late. The twenty-year period of the experiment may be arbitrarily grouped into three categories as in Table X.

TABLE X

Yield in relation to post-transplantation period

Time of planting.	Rainfall in inches	Yield in lb. per acre.			
		manured		Unmanured	
		grain	straw	grain	straw
GROUP I.					
July 1927	15·88	2925	4700	2850	4400
July 1936	15·49	3125	6496	3150	5738
Average	15·69	3025	5598	3000	5069

Time of planting.	Rainfall in inches	Yield in lb. per acre.			
		Manured		Un-manured	
GROUP II.					
August 1928	36·89	2650	5857	2500	4849
,, 1931	23·78	2300	3066	1925	2201
,, 1932	9·79	2600	3573	2200	2752
,, 1933	22·87	2750	3425	2520	2953
,, 1934	15·10	3375	3538	3075	3237
,, 1938	25·39	3865	6341	3473	5191
,, 1940	11·83	3033	3969	2860	3416
,, 1942	11·85	3632	4411	3256	3961
,, 1944	15·90	2719	4205	2350	3580
,, 1945	20·38	2744	3818	2141	3244
,, 1946	11·29	2862	3971	2561	3041
Average	18·64	2957	4198	2624	3457
GROUP III.					
Sept. 1929	13·91	2375	2406	1825	1850
,, 1930	9·33	2475	2263	2075	1891
,, 1935	8·93	2625	3132	2525	2812
,, 1937	12·96	1791	1897	1447	1556
,, 1939	15·96	1442	2022	958	1331
,, 1941	17·38	2708	3275	2161	2766
,, 1943	14·46	2295	2686	1836	3249
Average	13·29	2244	2526	1832	2066

Irrspective of the quantity of rainfall it is seen that there is a a critical post-transplantation period below which the yields are lowered. The average yield for post-transplantation in periods of (1) below 60 days, (2) 60 to 80 days, (3) above 80 days are presented in Table XI.

TABLE XI

Yield of grain in lb. per acre		Less than 60 days	60—80 Days	Above 80 days
Manured	...	2246	2950	2994
Un-manured	...	1824	2589	2761

The data reveal that though the cultivation of paddy is dependent on rainfall the yield is closely related to the time of planting and the increase due to green leaf manuring is more pronounced in seasons of late planting than in early ones.

The data as classified in Table X are useful for the study of the differences in yield due to different times of planting. Since group 1 contains only two values, it has not been taken up for study. Considering group two and three it has been found that between "manured" in the different groups there is a significant difference and so also in the case of "Un-manured". The tests are given in Table XII.

TABLE XII
Tests of significance for yields regarding different time of planting

Treatment	Means		Mean square				
	G. II.	G. III.	G. II.	G. III.	F. Least Estimate of S.D.		T.
Manured	2957·27	4444·43	276282·21	213665·28	1·368 (Not sig.)	471·02	31·3 (Significant)
Unmanured	2623·73	1832·43	238522·41	259950·02	1·089 (Not sig.)	496·61	3·30 (Significant)

First, the mean squares for the two samples are tested and since they do not differ significantly the best estimate of the standard deviation is given by the formula $S^2 = (S_1^2+S_2^2) / n_1+n_2-2)$ where the S_1^2 and S_2^2 are the respective sums of squares of deviations from the respective means and n_1 and n_2 are the different sample sizes. For T. test the formula is $(d/s.)\sqrt{(n_1 n_2)}. (n_1+n_2-2) / (n_1+n_2)$, d being the difference between the two means. Since T's in Table XIV are significant the two group means for the manured as well as the unmanured are significantly different and it may be inferred that the times of planting are responsible for the difference in yields, between groups. But the variation within groups has to be traced by fitting curves to the data of yields in Table 10 there being four sets of data, manured and unmanured for the two groups. The sine-cosine curve given in (2) has again been chosen for the purpose. The constants for the four different curves are given in Table XIII and the trend values in Table XIV.

TABLE XIII Constants of the Sine-Cosine Curves of Manured and Unmanured plots for the Groups II and III

Constants	Group II		Group III	
	Manured	Unmanured	Manured	Unmanured
a_0	2957·2737	2623·7273	2244·4286	1832·4286
a_1	—504·1659	—516·0407	356·9951	301·1096
a_2	155·1215	231·7813	—421·5918	—507·9268
b_1	—66·1762	—15·6360	60·2537	215·3991
a_2	—149·8553	—133·4703	—17·5311	—87·7825

TABLE XIV Trend Values of Manured and Unmanured for the Groups II and III

	Manured			Unmanured			Manured			Unanured	
Observed values	Ordinates I H.T.	Ordinates I & II H.T.	Ob. Vs.	Ordinates I H.T.	Ordinates I & II H.T.	Ob. Vs.	Ordinates I H.T.	Ordinates I & II H.T.	Ob. Vs.	Ordinates I H.T.	Ordinates I & II H.T.
2650	2453	2608	2500	2108	2340	2375	2601	2180	1825	2134	1626
2300	2497	2425	1925	2181	2156	2475	2515	2591	2075	2189	2216
2600	2688	2473	2200	2395	2142	2625	2223	2611	2525	1975	2471
2750	2964	2857	2520	2682	2497	1791	1949	1700	1447	1655	1407
3375	3237	3364	3075	2950	3040	1442	1897	1620	958	1478	1082
3865	3422	3634	3473	3114	3382	2708	2106	2478	2161	1555	1975
3033	3459	3509	2860	3123	3246	2295	2420	2531	1836	1852	2050
3632	3337	3167	3256	2973	2808	...	...	...	...	...	...
2719	3095	2903	2350	2713	2453	...	...	...	...	...	...
2744	2808	2820	2141	2424	2373	...	...	...	...	...	...
2862	2569	2770	2561	2198	2416	...	...	...	...	...	...

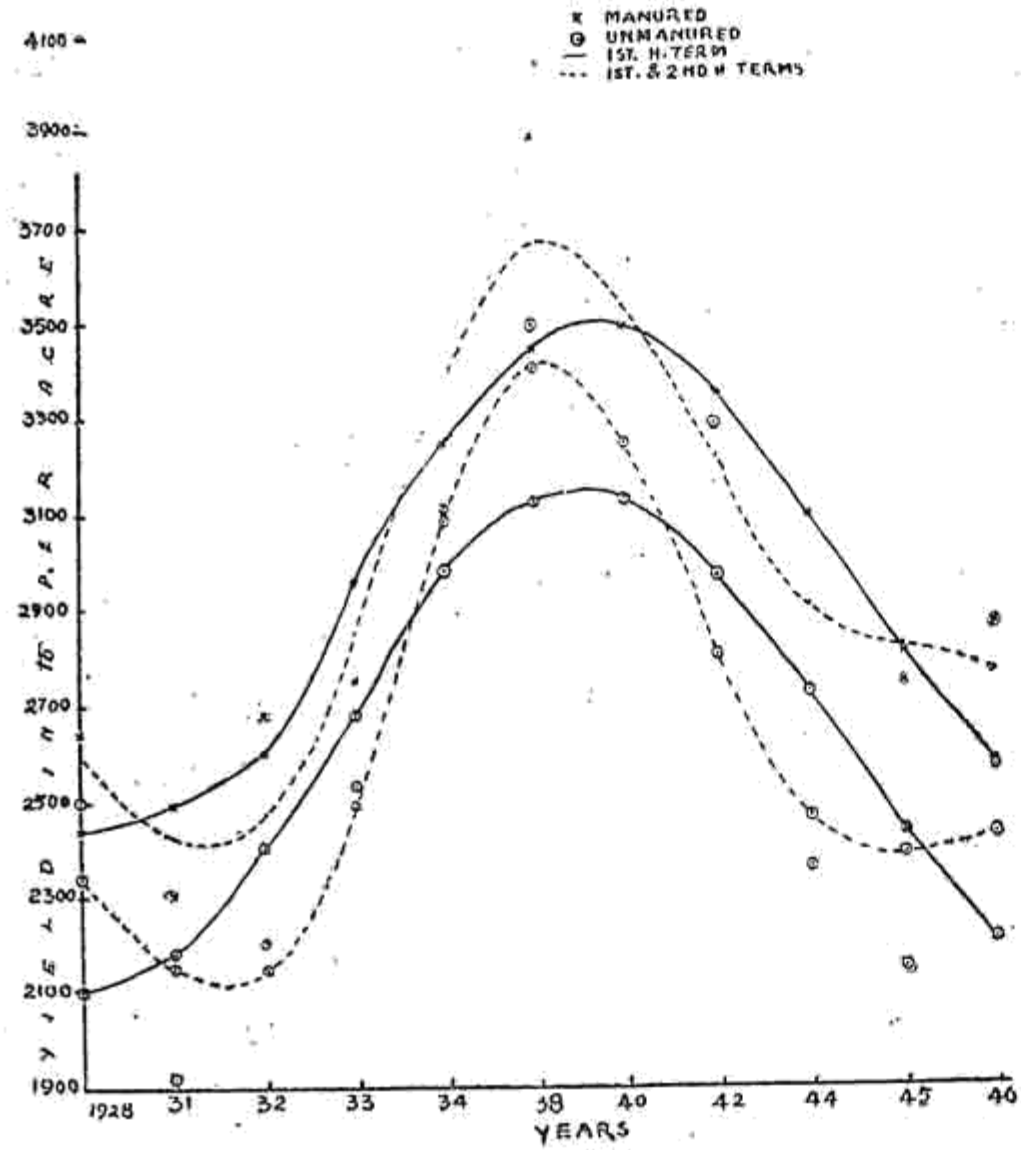


FIG. 3

TREND VALUES OF MANURED & UNMANURED FOR THE GROUPS 3E

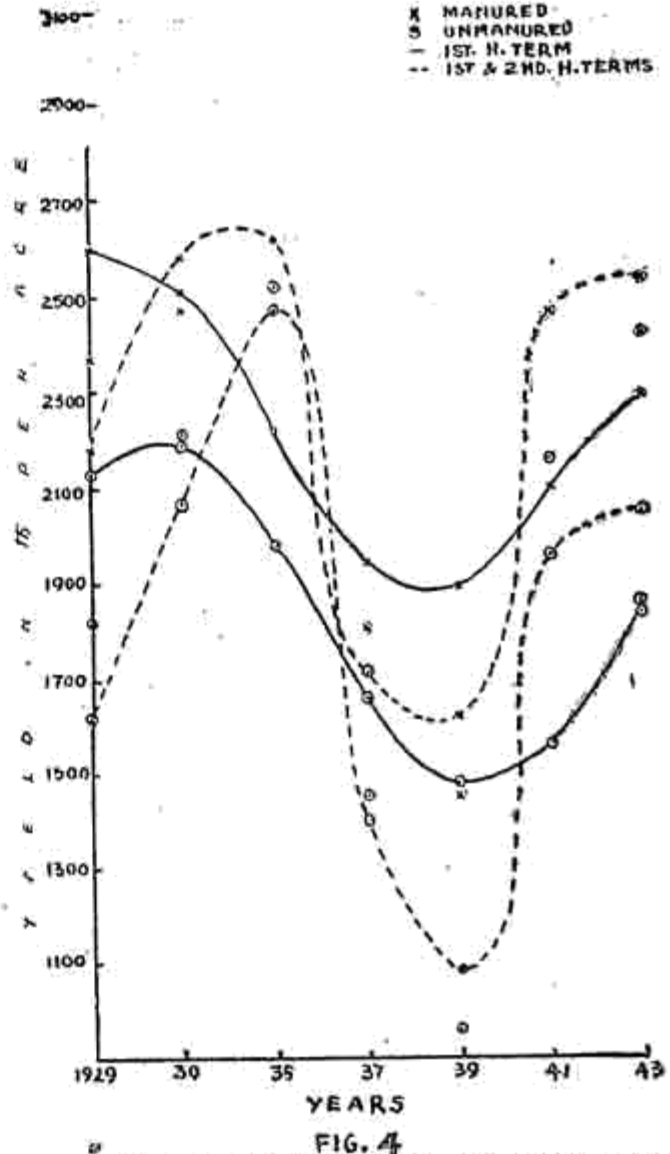
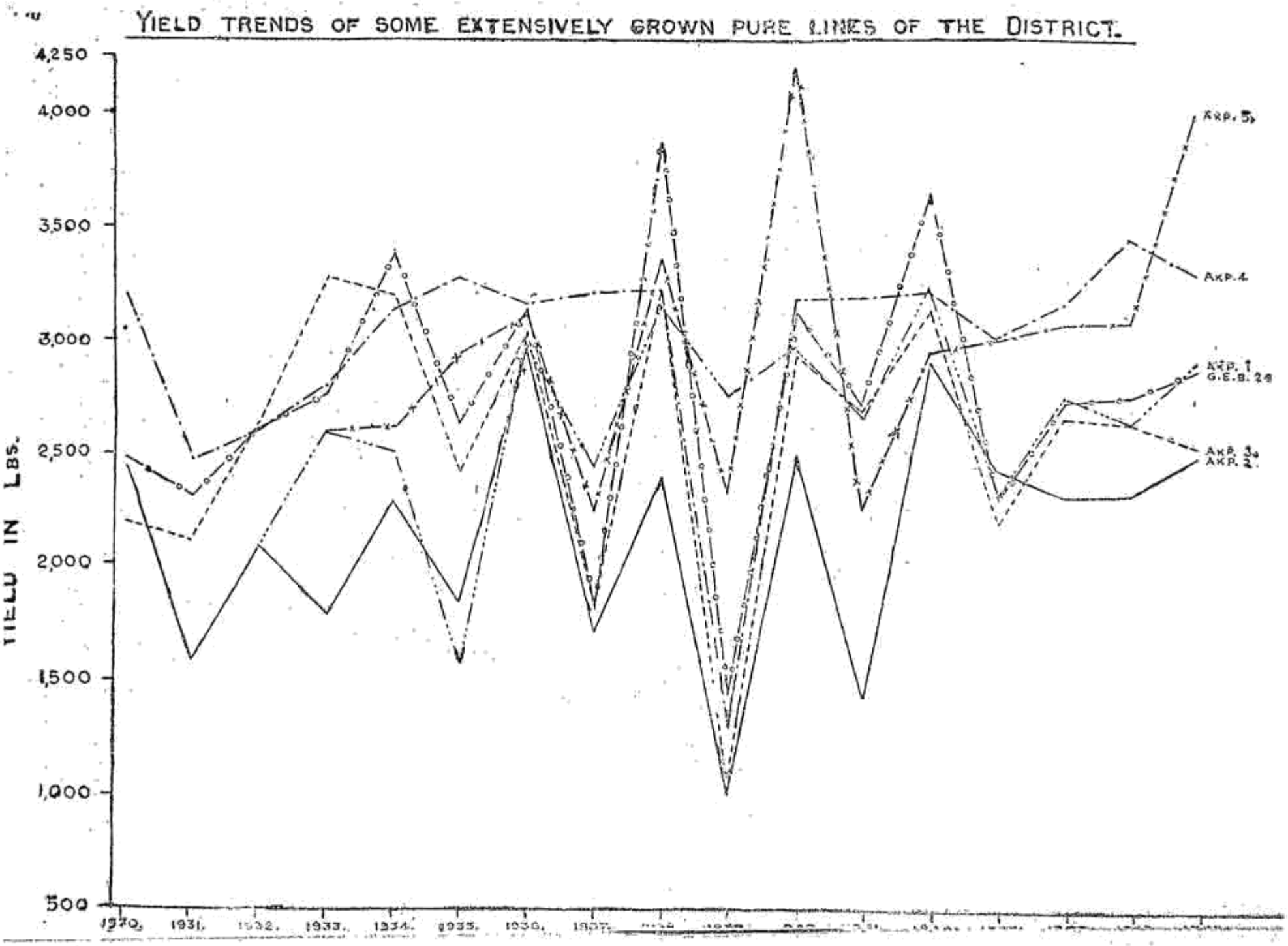


FIG. 4

TREND VALUES OF MANURED & UNMANURED FOR THE GROUP


YIELD TRENDS OF SOME EXTENSIVELY GROWN PURE LINES OF THE DISTRICT.
YIELD IN LBS.
4,250
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
1930.
1931.
1932.
1933.
1934.
1935.
1936.
AKP. 5.
AKP. 4
AKP. 1
G.E.B. 24
AKP. 3
AKP. 2.

The curves of trends based on values in Table XIV are shown in figures III and IV. The nature of the respective curves are similar to those of the curves in figures I and II, but it may be observed that most of values in each group fall on alternate years and this may be a reason for the alternate peaks and troughs.

It is interesting to study whether the above conclusions are applicable only to G. E. B. 24 which was the variety under test or it will be a general feature for all the varieties cultivated in this tract. For examining this point, fluctuations in the yields of some important early, medium and late strains released from Agricultural Research Station Anakapalle are graphically represented in figure No. 6. The yield trends indicate that essentially all the varieties are similar and therefore the conclusions drawn from the experiment can be safely extended to other varieties also. However there is an interesting exception in the strain AKP. 4. which is a drought-resistant variety of long duration and on account of this fact, the yields are always maintained high with low fluctuations even during years of later planting.

SUMMARY

The study of periodicity on the data of yield obtained from the manured as well as un-mannred plots showed a probable period of 2 years but the amplitudes of the successive waves vary considerably.

Peaks and troughs of the data have been considered separately and sine-cosine curves were fitted to the data. The movements of the peaks and troughs were observed to be entirely different.

Significant effect of manure was observed as regards the yield in each year. But the soil analysis did not show any improvement in the conditions of the soil year.

The reason for the seasonal fluctuations of the data is found in the different times of transplanting rather than in rainfall or other meteorological conditions. The yields of earlier transplanting are significantly different from those of later transplanting. Under transplanting the yields were low.

The seasonal trends of the August group and September group have been determined by means of the sine-cosine curves.

The conclusions based on the variety (G. E. B. 24) raised in the experiment, are applicable to other important varieties of the tract, with AKP. 4. as an exception.

Aoknowledgement: I am indebted to Sri K. Ramaiah, Director, Central Rice Research Institute, Cuttack and K. S. Nair, Professor of Statistics, Travancore University, for the valuable help rendered in the preparation of this paper.

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Madras Agricultural Station Reports: Palur — 1908 to 1921
" " Manganallur — 1914 to 1919

TABLE No. I. Yield of grain & Straw in lb. per acre.

S. No.	Year.	Yield of grain in lb. per acre				Yield of straw in lb. per acre			
		Manured	Unmanured	% increase over no manure.	Significance	Manured	Unmanured	% increase over no manure.	Singinificance
1	1927	3.925	2,850	2·82	Not Sig.	4,700	4.400	7·05	Yes
2	1928	2.650	2,500	6·00	Yes	5,857	4,849	20·78	Yes
3	1929	2,375	1,825	22'90	Yes	2,406	1,860	22·31	Yes
4	1930	2,475	2,075	19'70	Yes	2,263	1,891	19·68	Yes
5	1931	2,300	1,925	20·60	Yes	3,066	2.201	39·28	Yes
6	1932	2,600	2,200	16·90	Yes	3,573	2,752	29·84	Yes
7	1933	2,750	2,500	10·40	Yes	3.425	2.953	15·97	Yes
8	1934	3.375	3.075	9·37	Yes	3,538	3,237	9·29	Yes
9	1935	2,625	2,525	3·84	No	3,132	2,812	11·39	Yes
10	1936	3,125	3,150	0·25	No	6'496	5,738	13·20	Yes
11	1937	1,791	1,447	23·76	Yes	1,897	1,556	21·90	Yes
12	1938	3,865	3,473	13·47	Yes	6,341	5,191	22·15	Yes
13	1939	1,442	958	50·40	Yes	2,022	1,331	51·91	Yes
14	1940	3.033	2,860	6·00	Yes	3,969	3,416	16·20	Yes
15	1941	2,708	2,161	25·30	Yes	3,275	2,766	18·40	Yes
16	1942	3,632	3,256	11·56	Yes	4,411	3,961	11·39	Yes
17	1943	2,295	1,836	25·00	Yes	2,686	2,249	19·43	Yes
18	1944	2,719	2,350	15·64	Yes	4,205	3,580	17,49	Yes
19	1945	2,744	2.141	28·10	Yes	3,818	3,244	17·70	Yes
20	1946	2,162	2,561	11·74	Yes	3,371	3.041	35·20	Yes

TABLE II. Rainfall.

Year.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total.	Rainfall during crop growth from sowing to flowering	Remarks
1927	1·01	1·29	2·59		1·42	9·64	7·13	6·13	5·62	0·20	2·94		37·97	15·88	
1928				4·48	0·60	4·47	8·52	4·68	19·15	13·06			54·96	36·89	Heavy rains in Sept. Oct—(32")
1929		4·65			1·66	12·80	0·73	5·32	4·06	9·85		1·35	40·42	13·91	Late planting.
1930		2·67			7·33	4·02	2·63	3·75	2·88	6·45	8·19		37·92	9·33	do.
1931				0·38	3·10	6·06	5·41	2·00	5·17	16·76	4·64		43·52	23·78	Early planting with 11" rainfall at flowering—floods.
1932			0·30	2·59	1·21	2·85	7·40	1·08	7·24	2·40	8·46		33·53	9·79	Medium time of planting.
1933			0·08	3·54	4·10	4·37	7·52	4·54	11·12	9·39	1·52	0·11	46·29	22·87	Early planting.
1934			0·08	0·35	0·37	1·94	11·62	8·78	5·01	3·07	3·56		34·78	15·20	do.
1935				0·55		1·29	4·36	2·21	7·30	6·40	0·11		22·22	8·93	Late planting.
1936	1·44	4·61	0·35		7·93	4·52	3·60	4·55	2·62	7·05	2·19	1·81	40·67	15·49	Very early planting.
1937		2·94	2·65	5·73	0·96	2·63	4·88	7·04	10·68	2·28	0·28		40·07	12·96	Late planting. Failure of water in the channel in November.
1938		1·36		0·07	2·49	8·55	3·42	7·11	17·30	2·44	8·16		50·30	25·39	Earlier planting, floods in November.
1939	0·15		1·48	0·03	0·56	3·01	2·92	1·95	12·03	13·59	3·87	0·75	40·34	18·96	Very late planting.
1940	0·15	2·17	4·55	0·31	0·79	5·59	3·61	3·89	6·73	5·10	0·39		39·61	11·83	Medium time of planting.
1941			0·34		0·44	2·56	3·02	2·89	6·88	12·67	5·63		34·43	17·38	Late planting.
1942		0·20		3·19	1·51	4·99	0·74	6·04	4·84	7·01	3·35	0·38	32·85	11·85	Medium time of planting.
1943	0·98	1·33	2·72	1·30	1·72	5·85	3·47	2·80	7·54	8·53	1·55		37·79	14·56	Late planting.
1944	0·30			2·63	1·41	6·64	5·26	2·61	6·48	7·80	1·14		33·82	15·90	Early planting.
1945	0·02			1·30	0·99	1·14	6·84	6·11	9·84	9·07	0·91	0·23	36·52	20·38	do.
1946		0·39		0·70	0·23	2·19	6·52	3·89	5·19	2·21	2·37		23·69	11·29	do.