undertaken it should be by financial aid from the industrialists or private institutions. Just as cess is collected for roads, education and irrigation projects, a cess for research is suggested so that every cultivator may realise his contribution for his improvement and naturally he will take keener interest. Though at present, some of the commodity committees are formed this way, the number of research institutions and research workers are too few to meet the actual need. As a deviation, the Sugarcane Development Scheme of Madras roped in the sugar factories to pay for research into their problems of increased recovery. A similar system for all the other crops is to be devised wherein the cultivatior or the industrialist will have direct concern in research. Organisations for research must be on a much wider scale so that every individual can approach it for easy as well as cheap and quick solution of his problem.

Sugarcane cultivation in Hawaii reached high level of perfection because sugarcane planters themselves organised research institutions and established extensive field laboratories and the problems of the individual plantations were solved to be immediately adopted into field practice.

The Potential value of the press for greater publicity has to be realised in a greater measure. The people are to be widely informed of the efforts that are being made by scientists to enable them to become more appreciative of science. With a more energetic system of publicity, the results will spread through the land more easily and rapidly.

Publication of a larger number of books and other literature in the local languages dealing with the local problems must be encouraged. The State should take direct interest in protecting the interests of the authors and encourage them to publish more and more.

https://doi.org/10.29321/MAJ.10.A04484

The Intermediate Seasonal Cropping in Godavari Delta

By

C. HANUMANTHA RAO, B. SC., (Ag.)

Probationary District Agricultural Officer

(Received on 12—11—1949)

The total area under paddy in the Godavari delta is 12,49,000 acres. In the double crop areas the first crop "Sarwa" is grown between June to November and the second crop "Dalwa" between February to May. The area alloted to the Dalwa crop is about 30 per cent of the first crop area of which the western delta alone contributes 1,30,000 acres. The water supply in the second crop season (Dalwa) is limited and in years of low rainfall it may run short before the maturity of the crop.

Further the alternate wetting and drying caused by the inadequate water supply may tend to make the soil more alkaline due to lack of proper drainage especially, in low lying areas. The second crop was grown only in February since it is the firm conviction and experience of the ryots in the tract that paddies planted in the heavy delta clay in the months of November to January, when the cold easterly wind blow, fail and succeed only when planting is attempted when the southernly wind (pyru-gali) begins. The reasons attributed are, that the maturity of the crop is prolonged and the crop is subjected to insect ravages.

The chief problem, that has been engaging the attention of the Agricultural Research Station at Samalkot and Maruteru was in regard to the utilisation of the canal water, otherwise running to waste, in the intermediate season i.e. October to January. If a paddy crop can be raised in the intermediate season, the crop would not run the risk of failure owing to lack of water towards the end of its growth, as it is generally experienced in the case of the second crop at the present. By this means a larger area can be brought under double crop by a judicious use of channel water. To this end intensive work was done in the Agricultural Research Stations at Samalkot and Maruteru for over a period of many years. The various methods adopted are detaild below :

1. Varietal trials in the intermediate season.
2. Broadcasting and transplanting immediately after the first crop.
3. Two crops in the "Sarwa" season, an early variety followed by a long duration variety,
4. Udu cultivation.
5. Raising three crop (i) short duration crop (first crop) (ii) long duration crop (Intermediate crop) (iii) short duration crop (for the second time as the third crop) as against the local method of raising a long duration variety at the normal time of planting.

1. *Varietal trials in the intermediate season :* Between 1909 to 1917 at the Agricultural Research Station, Samalkot several varieties were planted in the intermediate season and the experience in each year had been the same i.e., either the plants withered outright or they rushed into head very quickly. In only a few cases was any thing like a satisfactory yield obtained. Even then, the yields were not consistent for the varieties tried and varied from year to year. In the seed-bed also the seedlings did not thrive well as in the normal seasons due probably to the harmful effect of the cold weather and other factors, like damage by the shoot borer, during the period October to December. Among the

varieties tested at Samalkot *Iswarakora* was found to be less succeptible to shoot borer attack than the rest. Trials at Maruteru indicated that G. E. B. 24 is less succeptible to shoot borer attack than the several other varieties tried. The varietal trials indicated that the performance of *Iswarakora* was uniformly good in September and October sowings and plantings. In 1920 and 1921 the October series failed due to shoot borer attack. These facts are brought out clearly in the yield data given below in Table I.

TABLE I.

Yield of $\frac{\text{Grain}}{\text{Straw}}$ in lb. per acre.

Variety	September Series				October Series		
	1920—21	21—22	22—23	23—24.	21—22	22—23	23—24.
Garikasannam ...	1162	2214	120	194	—	328	560
	1562	2230	1792	1341		1226	1560
Moolakolukulu ...	959	3096	1864	988	—	2574	1512
	2188	5160	2750	2135		2286	1306
Peeshanam ...	1022	3790	2614	994	—	2996	1750
	2038	5312	3084	2160		2666	1888
Iswarakora ...	2516	3666	2848	2434	4184	3360	2390
	2362	5300	3384	3680	11008	4034	2176

2. *Broadcasting and Transplanting immediately after the first crop :* Broadcasting at different periods after the first crop was done with medium duration varieties in 1917 and 1918 at the Agricultural Research Station, Samalkot. The general trend of results obtained indicated that a broadcast crop when sown out of season is less subject to stem borer attack than the transplanted crop in the adjoining fields. Series of trials were conducted from 1921 to 1940 to study the performance of broadcasting versus transplanting, method of cropping in the intermediate season. From the results presented in Table II below the following salient points will be evident.

(i) The yield from the two series (September and October series) are quite fair, in spite of the high incidence of the stem borer attack during the season. (ii) No appreciable difference is seen between broadcasting versus transplanting systems of cropping. In water logged areas broadcasting is not possible. (iii) Broadcasting is preferable in normal areas with good drainage to transplanting, both from the point of view of economy and its less susceptibility to the shoot borer attack.

TABLE II.

Grain Yield in lb. per acre.

Year	G. E. B. 24		Co. 2		Co. 3		Co. 4		Co. 8		Adt. 5		PTB. 3	
	*Tpd.	Bcd.	Tpd.	Bcd.	Tpd.	Bcd.	Tpd.	Bcd.	Tpd.	Bcd.	Tpd.	Bcd.	Tpd.	Bcd.
1	2		3		4		5		6		7		8	
September Series.														
1937—'38	2164	1444	2220	1839	2156	1983	1199	1815	1528	1904	2118	1851	...	...
1938—'39	Cyclone damage		...	...	...	...	...	...	...	...	...	...	...	...
1939—'40	2594	1600	2678	2261	2394	2055	...	...	...	...	...	...	1961	1678
1940—'41	708	797	788	1031	1063	1076	...	...	...	...	...	...	681	1307
October Series.														
1937—'38	1586	1605	1943	1969	1295	1951	1731	1553	1536	1693	1931	1491	...	...
1938—'39	Cyclone damage		...	...	...	...	...	...	...	...	...	...	...	...
1939—'40	Not significant		Co. 3 broad casted fared better than the rest				...	...	...	...	...	...	...	...
1940—'41	703	1075	700	1300	1211	1311	...	...						

* Tpd.—Transplanted; Bcd.—Broad casted.

3. *Two crops in the "Sarwa" season, a short duration variety followed by a long duration variety :* A systematic study in raising a short duration crop in the beginning of the first crop season followed immediately by a long duration variety as in the Tanjore delta, so that both the crops are off the ground by February before the water in the canals dry up was initiated in 1928 — 1929 in Meruteru and in 1932 — 1933 in Samalkot and continued over a long period. The results show that the yields from the two crops (vide Table III) at Samalkot were more than that obtained from a single long duration "Sarwa" crop in most cases, whereas at Maruteru the results were consistent in all the years. All these facts go to show that there seems to be no foundation for the popular belief for the failure of the crop in the intermediate season. Despite the incidence of the shoot borer and occasional silver shoot attack the yield data from the two stations are fairly encouraging and in a way supporting my advocacy for raising a crop during October — January.

It is worthwhile to encourage the cultivation of the paddy crop with suitable strains like Adt. 3 followed by G. E. B. 24 which is less susceptible to disease in the intermediate season to solve the acute food shortage facing the country at present. To minimise the borer attack it is suggested that the variety grown in the intermediate season should be such that its harvest synchronises with the harvest of a long duration "Sarwa" crop in the area. Moreover the seed bed for the intermediate cropping should be raised early in the "Tholakari" season.

TABLE III

Yield of grain in lbs. per acre

Maruteru Agricultural Research Station

		Early crop followed by a medium duration variety					
1928—29	(a)	Sawarnalu Krishnakatika 4750 lbs.	(b)	Kasipichodi Krishna-katika. 4050 lbs.	Single Sarwa (Long duration crop)	3020 lb.	
1929—30	(a)	Kuruvai 18 2640 G. E. B. 24 1000 3640 lbs.	(b)	Kuruvai 18 2640 Garikasanna vari 1726 4366 lbs.	do.	3233	,,
1930—31		Adt. 3. (Kuruvai) 3300 G. E. B. 24 1710 5010 lbs.		...		3270	,,
1932—33		Adt. 3 (Kuruvai) 3634 G. E. B. 24 1568 5202 lbs.		...		2836	,,

Samalkot Agricultural Research Station:										
1932—33	(a)	Rasangi 26	2639	(b)	Rasangi 26	2639				
		Co. 2	1022		G. E. B. 24	1120				
			3661 lbs.			3759 lbs.			3362	
1933—34	(a)	Rasangi 26	2580	(b)	Rasangi 26	2580	(c)	Rasangi. 26	2580	
		Co. 2	583		G. E. B. 24	471		Adt. 5	533	2507
			3163 lbs.			3051 lbs.			3113 lbs.	
1934—35	(a)	Adt. 4	1625	(b)	Kasipichodi	1250			...	4475
		G. E. B. 24	2400		G. E. B. 24	2950				
			4025 lbs.			4200 lbs.				
1935—36	(a)	Kasipichodi	2219	(b)	Kasipichodi	2219				
		Co. 2	2875		G. E. B. 24	2450				3850
			5094 lb.			4669 lbs.				
1936—37	(a)	Kasipichod	1785	(b)	Kasipichodi	1885	(c)	Kasipichodi	1790	
		Co. 3	810		G. E. B. 24	445		Co. 4	595	2011 ,,
			2595			2330			2385	
1943—44	(a)	S. L. O. 16	2080	(b)	S. L. O. 16	2040				
		G. E. B. 24	487		G. E. B. 24	487			..	3300 ,,
			2527 lbs.			2127				
1944—45	(a)	K. 238/1.	3662							
		Kasipichodi	893		...			...	...	3200 ,,
			4555 lbs.							
1945—46	(a)	S. L. O. 16	2042	(b)	S. L. O. 16	3700	...		...	2358 ,,
		Co. 3	2033		G. E. B. 24	446				
			4075 lbs.			4146 lbs				
1946—47	(a)	S. L. O. 16	4076	(b)	S. L. O. 16	4076				
		Co.3	266		S. L. O. 12	266				4687 ,,
			4342 lbs.			4342 lbs.				

* Single long duration Swarna crop.

4. *Udu cultivation :* In view of the varying performances of the different varieties and of the heavy toll taken by the stem borer in October and November plantings, the system of Udu cultivation (i. e., growing of an early and late varieties together) common in Cauvery delta, was also introduced. The results (Table IV) indicate that the performance is not so encouraging at Samalkot station as in Maruteru, owing to the inevitable late planting in this tract compared to that of the western delta.

TABLE IV

Yield of grain in lb. per acre

	Early	Late	Total	Yeald of single long duration crops of Sarwa season
1928—29				
Samalkot	1476	1427	2903	2946
1926—27				
Maruteru	2310	1450	3760	2972

At Samalkot it was recorded that an extra cost of Rs. 12/- per acre was incurred in harvesting the kuruvai crop. Further its value was lowered by about 8 annas per bag of 166 lb. than Akkulu, the local variety of medium duration. But for the difficulty felt in the harvest of the kuruvai crop due to heavy rains (12") at the time, the yields are quite appreciable to that of the single long duration crop.

5. *Raising three crops:* (i) Early duration crop (first crop) (ii) long duration crop (intermediate crop) and (iii) early duration crop (for the second time as the third crop) as against the local method of raising a long duration variety followed by a short duration variety at the normal time of planting.

At Samalkot a trial was initiated in 1944—'45 to study whether a crop can be raised in the intermediate season in the existing double crop lands to attain increased production in contrast to the existing practice of raising two crops only. The yields (Table V) indicated that in no case they exceeded those obtained from the normal crops raised as per the local practice.

TABLE V

Yield of grain in lb. per acre

	First crop	Intermediate crop	Second crop	Total
1944—45	Rasangi 26	G. E. B. 24	Kasipichodi	
	3063	797	468	4328
	Yield of two crops (control) : 4555 Lbs.			
1945—46	Kasipichodi	G. E. B. 24	Kasipichodi	
	1450	720	400	2570
	Yield of two crops (control) : 4075 Lbs.			
1946—47	Kasipichodi	G. E. B. 24	Kasipichodi	
	1963	1760	486	4109
	Yield of two crops (control) : 4342 Lbs.			

Discussion and Conclusion : From the several trials it can be seen that a paddy crop can be raised with success in the intermediate season inspite of the prevalence of the shoot borer attack in that season. Work on the prevalance of the shoot borer indicated that the intensity of each

brood increases and reaches the maximum in January. Evidently due to this finding, the early varieties harvested in September are free from attack. Stray patches of attack are noted in October harvests. Thereafter the percentage of attacked earheads increased in sucessive fortnights in the varieties that are harvested in November and December (vide Table VI). In the second crop season the trouble from the pest is experienced in the initial stages in seed beds and fields transplanted before February. Observations showed that egg laying was more in wet seed beds than in semi-dry seed beds.

TABLE VI.

Percentage of stem borer attack.

Variety	Date of Flowering	Percentage of Stem borer attack
G. E. B. 24 ...	30—10—1929	3·13
Krishna Katika ...	10—11—1929	6·32
Atragada ...	28—10—1929	17·58
G. E. B. 24 ...	12—11—1929	26·00
Krishnakatika ...	15—11—1929	54·19
Atragada ...	20—11—1929	40·76

Statement of month-war catches of stem-borer moths by light trap campaign during (1933—1934)

Period	Number of moths caught
24th February to 31st March 1933 ...	Light traps not kept.
1st April to 14th April ...	do.
15th April to 30th April ...	639
1st May to 14th May ...	1824
15th May to 28th May ...	3731
29th May to 11th June ...	755
12th June to 2nd September ...	...
3rd September to 16th September ...	47
17th September to 30th September ...	117
1st October to 14th October ...	799
15th October to 28th October ...	243
29th October to 11th November ...	236
12th November to 25th November ...	400
26th November to 9th December ...	...
10th December to 23rd December ...	196
24th December 1933 to 6th January 1934 ...	105
7th January to 20th January ...	575
21st January to 3rd February ...	310
4th February to 17th February ...	1817
18th February to 3rd March ...	209
4th March to 17th March ...	95
18th March to 31st March ...	28

The reason why the same variety when grown out of normal season yields low is evident from the table below;

TABLE VII

Variation in the duration of paddies by planting in intermediate season

Variety	Date of sowing	Date of Planting	Date of flowering	Interval between sowing and flowering	Date of sowing	Date of planing	Date of flowering	Interval between sowing to flowering	Difference in duration
G. E. B. 24			27—10—35	153			27—11—35	85	68
Co. 2			9—11—35	166			9—12—35	97	69
Co. 4	27—5—1935	8—7—1935	2—12—35	189	3—9—1935	2—10—1936	2—1—36	121	68
Co. 8			2—12—35	189			18—12—35	104	83
Adt. 2			3—12—35	190			25—12—35	113	77
Adt. 5			4—12—35	191			29—12—35	117	74
BH. 1.			29—10—35	155			1—12—35	89	66
Mohipalo			30—10—35	156			2—12—35	90	66

Due to the reduction of the duration, the yield will naturally be low. But the popular belief in this connection appears to be not sound as the low yield of crop is mainly attributed to the damage caused by the cold weather and the stem borer. The fact that each variety has got its own season bound habits seems to have been totally ignored. It is suggested therefore, that with suitable long duration varities and judicious manuring the yields can be improved.

The conclusions are that (i) paddy crop can be successfully raised in the intermediate season; (ii) Double cropping with an early duration variety followed by a long duration variety as Kasipichodi and Co. 2, Adt. 3 and G. E. B. 24, in the Sarwa season is successful where the irrigation supply is inadequate in the second crop season. Since the incidence of pest is less in the young crop planted with seedlings from semi-dry nursery as against wet nursery seedlings, it is advocated that semy-dry nurseries are raised for the intermediate crop. (iii) *Udu* cultivation, using Adt. 3 and G. E. B. 24, Adt. 3 and *Krishnakatika* Adt. 3 and *Alaragada* is recommended in places where labour scarcity is felt and when preparatory cultivation could not be conveniently

attended to in the low lying lands due to water logged condition. (v) By careful and timely manuring for each crop it should be possible to have increased yields from every one of the three crops raised in a year. This will go a long way in solving the present food shortage, and (v) If the stem-borer pest can be controlled by fortnightly dusting or srpaying with D. D. T. from October to November there is a certainty of getting another 25 per cent increased yield in bad years and the risk of losing a crop in the intermediate season due to adverse weather conditions will also be avoided.

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On Wrapping and Propping Sugarcane

By

Sri M. LAKSHMIKANTAAM, B. Sc. (Ag.),

Superintendent, Sugarcane Liaison Farm, Samalkot

(Received on 11—3—1950)

Introduction: A cane crop standmg erect yields more cane and sugar per acre than that which is lodged and broke and otherwise damaged. Besides physiological deterioration due to inversion of juices from fallen canes tending to grow again or rooting at nodes, physical destruction due to attack of rats and other rodents, is responsible for reduced yields from lodged crops. In brittle canes, like Co–419 the damage is all the more great. Hence it is in the interests of increased production to prevent lodging of cane crops. Never-the-less precautions, other than mere tying up of clumps are not taken in most countries of the world to keep the cane crop erect. Even this tying up is not a regular practice in all the plantations of all the countries. The seriousness of this problem varies with the locality. Where cyclonic winds are frequent and regular, it is incumbent on the cultivators to take greater precautions. Hence the ryots of the East coast districts, of this province which are subject to cyclonic winds very often, developed two elaborate practices to a fine art for keeping cane crops erect, (Wrapping and proping of cane). It is proposed to