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 arpaying 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.

LITERATURE CITED

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On Wrapping and Propping Sugarcane

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Introduction: A cane crop standing 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

present a general account of the methods followed to keep cane crops erect and furnish a review of the results of experiments so far conducted in this province to study the efficacy and economics of these operations in this paper.

In wrapping, old and dead leaves are twisted and wrapped around canes. For propping, after partly wrapping the canes, the old and dead leaves are twined round bamboo props planted vertically in the soil near the cane clumps. Propping is done in two ways : central as well as side props are usually put to heavy crops. This will mean two small sized and one big bamboo for every four to six clumps. For moderate crops central cropping will do. For every 4 clumps, one central prop will be put in this method. There are two other types of propping tried at research stations. One is, stretching wire in a loop on both sides of canes and fixing the free ends of the wire to bamboos planted vertically at either end of the cane rows. The other is planting two bamboos at either end of the cane rows and tying cane clumps to a horizontal bamboo stretched along the rows and fixed to the bamboos planted at either end of the rows. Wrapping alone is done twice in North Vizag and rarely in Chittoor district. Wrapping and propping are done for all crops in South Vizag, East and West Godavari districts, except for some neglected crops.

The cultivation of noble canes which needed very liberal treatment, in earlier days, must have been primarily responsible for the development of these practices. These were soft canes highly susceptible for jackal attack. Wrapping in the first instance might have been commenced to protect the canes against the depredation of the jackals. Propping must have been a later development. Some popular beliefs grew around these practices as days went by and several good points were attributed to them. Some of them are :—

(a) Wrapped canes do not crack ;

(b) grow taller ;

(c) are softer and less susceptible to jackal attack.

As mentioned in para – 2, wrapping and propping practices are peculiar to our Province only and are practically confined to three contiguous districts in the North East Coast. In the agricultural economy of a sugarcane cultivator of these districts, they loom large and cut a large slice of the total expenditure incurred in cane cultivation. According to the latest cultivation statistics collected in these districts wrapping and propping charges ranged between 3·5 to 28·6% of the total cost of cultivation as noted below.

	Locality	Expenditure on wrapping and propping expressed as a percent of the total expenditure	Remarks
1.	Seethanagaram	7·5	No propping but only two wrappings
2.	Bobbili	3·5	do.
3.	Samalkot	2·47	Complete wrapping and propping
4.	Kirlampudi	21·4	Do.
5.	Ramachendrapur	28·6	Do.
6.	Etikoppaka	15·0	Do.
7.	Thumpala	24.8	Do.
8.	Chodavaram	14·5	Do.

These three districts are very important gur producing tracts where ryots used to feel about a decade back that even if canes slightly bent quality of jaggery was adversely affected. Hence they vied with each other to keep the crop erect. With the advent of the Co. canes, it must be admitted, the cultivation standards have been lowered to a certain extent, since they are hardy and can withstand indifferent treatment.

Apart from wrapping and propping two other methods are suggested for preventing cane crops lodging. It is pertinent to deal with them also here. The object of wrapping and propping is to prevent the crop from lodging and any other method which is more economical and less cumbersome should always be welcome. One of the methods is, trashing canes and subsequently stooking them or not. It is claimed that by removing the leaves wind is allowed free passage between cane rows without any obstruction and hence the possibility of lodging is less. Trashed canes were also supposed to mature earlier. The second method is, planting cane in deep trenches and earthing it up subsequently to a greater height than in the case of a normally grown-up crop. This is supposed to give a greater anchorage to the plants by allowing nodal roots to develop into the earth ridged up around the cane clumps.

This problem of keeping the cane crop from lodging claimed the attention of the research workers of this Province at Coimbatore, Samalkot, Anakapalle, Palur and Gudiyatham. Large scale field experiments done at four of these latter stations are reviewed in the following pages. Experiments on wrapping and propping will be dealt with first and the results of other trials will be considered later on.

Wrapping and propping: (a) Samalkot was the first station at which experiments involving these operations were started. The idea all along had been to see whether it is possible to economise expenditure on these operations or dispense with them altogether. Two experiments which have a direct bearing on this problem were conducted from 1922 to '26 and 1942 to '45 at this station. In the earlier experiment, five

treatments Viz., (1) no wrapping and no propping, (2) wrapping without propping, (3) wrapping and propping on railings, (4) wrapping and propping in the usual manner (5) and propping with wire, were tried. Varieties included in this experiment are now either obsolete or extinct. However the treatment effects are broadly noticeable in the following results.

Variety	Local method of wrapping and propping with Bamboos	Wrapping and propping with wire	Wrapping and propping on railings	Wrapping and no propping	No propping and no wrapping
	Tons	Tons	Tons	Tons	Tons
B. 1529.					
1921 & 22	Cane 30·7	...	27·8	25·0	15·2
1922 & 23.	Jaggery 3·9	...	3·4	9·0	1.8
J. 247.					
1923-24 to	Cane 39·0	37·3	35·1	...	...
1925-26.	Jaggery 4·4	4·6	3·8	...	...

The distinct superiority of the local method over no wrapping and and propping is evident from the above results. The economic aspects of the trial for all the years of experimentation are not available.

In the second of the experiments, the effect of wrapping alone on cane and its economics were studied. Propping was done to both wrapped and unwrapped plots. Variety was Co. 419.

	Average yield of cane in tons per acre.	Average value of out turn per acre.	Average cost of cultivation per acre.	Net profit per acre.
Wrapping	70·89	Rs. 1790	Rs. 938	Rs. 852
No. ,,	63·25	1535	855	680

The results of this experiment were consistent in all the three years and wrapping seems to influence yields favourably. But juice quality of wrapped canes was slightly inferior to that of unwrapped canes.

(b) At Anakapalli a similar experiment as above to test the efficacy of wrapping alone was conducted in 1931—'32 to 33—34. There were other variants such as type of land and seed material. Economics of the treatments are not available and the results do not disclose such marked superiority of wrapping as at Samalkot.

Treatment.	Average yield of cane per acre (co. 213)
Wrapped and propped	75,516 lb.
Propped but not wrapped	73,019 lb.

The second experiment at Anakapalle was conducted from 1937—'38 to 1939—40. Variety was J. 247 (less vigorous than Co. 419) now practically extinct. There were four treatments viz., (1) wrapping and propping with bamboos (local method) (2) wrapping and propping with wire, (3) wrapping and stooking (4) and partial trashing and stooking, with five replications. The following are the average results.

	Average yield of cane in tons per acre	Average cost of treatment per acre.	Total cost of cultivation per acre.	Production cost per ton of cane.	Average juice quality	
					Sucrose.	Purity.
		Rs.	Rs.	Rs.	%	%
1. Wrapping and propping with bamboos.	40·01	83–15—4	333—3—1	8—5—4	15·66	88·09
2. do. with wire	42·16	107—5—5	357—9—8	8—7—6	16·01	89·19
3. Wrapping and stooking.	38·03	83—9—9	331—0—1	8–11–10	15·54	88·58
4. Partial trashing & stocking	36·76	78—7–10	324–13—6	8–12–10	15·44	88·19

The results indicated that the cost of production per ton did not go down by giving up wrapping and propping but was maximum in the case where the two operations were not done. This was because, what was saved by giving up propping, was spent, in frequently lifting and tying up canes which lodged to a very great extent in this treatment. The sucrose content of juice from propped canes was higher. Thus the results are in favour of propping and the local method of wrapping and propping with bamboos was most economical. It is quite possible that the out-skirts rows of the more vigorous growing Co. 419 planted at right angles to the experimental plots in this experiment mitigated the adverse effects of the wind on the treatments which were not propped. This is probably the reason for the slight differences in yield between the different treatments. Moreover, all the treatments were completely randomised in this experiment. It is quite likely that treatments (3 & 4) when coming in between plots of the other two treatments came in for less damage than when exposed to wind directly.

The good points attributed to wrapping (vide para 3 supra) were not it was reported, borne out by experimental evidence.

(c) At Gudiyattam an experiment with the same design and treatments as the second experiment at Anakapalli dealt with above, was conducted from 1937—'38 to 1939—'40. Variety was *Thella cheruku*, which is now practically extinct. Average results are furnished below.

	Average yields of cane per acre (tons)	Average cost of treatment per acre.	Average cost of production per ton of cane	Average percent	
				Sucrose in	Purity juice.
		Rs.	Rs.		
Wrapping and propping with Bamboos	24·96	66–15–8	10–10–0	14·93	85·98
Wrapping and propping with wire	25·26	160–7–9	14–1–8	15·69	87·02
Partial trashing and stooking or clumping.	19·96	61–3–9	11–10–9	12·94	83·33
Wrapping and stooking	24·38	58–8–5	11–8–10	13·46	84·04

(Propping with bamboos was not done in this experiment as at Samalkot and Anakapalli. Two bamboos were planted vertically at either end of each cane row and a horizontal bamboo tied to them. To this horizontal bamboo cane clumps were tied). The results furnished above disclosed that treatment wrapping and propping with bamboos, was most economical. Inspite of this finding, canes are not propped in this and surrounding districts, probably because of the non-availability of bamboos.

The experiments to study the direct effects of propping or otherwise on cane yield and its juice quality were not conducted on Co. 419, the present ruling cane of the Province. However indications are that wrapping and propping are beneficial from the point of increased yields and production costs per unit weight are also less than when these operations are omitted.

Trashing experiment: An experiment to test the effect of trashing in minimising lodging was conducted at Palur from 1936—'37 to 1938—'39. Trashing was done twice before the setting in of the North East Monsoon. Results are furnished below. Cost of trashing was Rs. 8—8—0 per acre in one year.

	Average yield of cane in tons per acre,	Percent sucrose in juice	Percent coefficient of purity
Untrashed	53·63	15·84	84·71
Trashed	53·97	15·72	83·93

There was practically no difference either in tonnage or in juice quality. That in other countries like Puerto Rico, Hawaii and in Australia also stripping cane did not improve juice quality was reported by Cross. (Int. Sug. Journ.; Oct. 1946). Pyrilla incidence was stated to be less in the trashed plots. It was also reported from Australia, (Queensland) that there was a smaller borer beetle population in trashed canes. (Facts about sugar Vol. 34) and that hardness of canes was in no way affected by trashing.

Other experiments: Among suggestions to keep the cane crop erect without incurring heavy expenditure on propping, planting in trenches and earthing up to a high level are important. An experiment involving wrapping and propping on one hand and ridging alone on the other hand was conducted from 1914—'15 to 1918—'19 at Samalkot. The following are the results.

	Yield of cane in lb. per acre.	Estimated yield of jaggery
Wrapped and propped	75,352	9.873
No propping but ridging at the base of cane rows.	69,409	8,529

Wrapping and propping gave better yields. A preliminary trial in 1945—'46 with Co. 419 at the Agricultural Research Station, Anakapalli to test the efficacy of planting in trenches (1½ feet deep) and subsequent earthing up as in Java disclosed that inspite of planting so deep cane crop lodged badly. It looks as though wrapping and propping are a necessary evil in this tract.

Summary and Conclusions: Experiments on wrapping and propping sugarcane and other methods for keeping the crop erect and protect it against the onslaught of cyclonic winds were conducted at four Research Stations of this Province. The results of these experiments are reviewed in this paper. The aim of these experiments was to reduce the expenditure on these two operations, either by completely omitting them or by resorting to other methods such as stooking cane clumps or ridging cane rows by earthing up to a greater height than is usual. The economics of adopting these practices were also studied and the cost of production per ton of cane in the various treatments was worked out. The results indicated the beneficial effect of wrapping and propping to sugarcane and were generally in favour of the local method of wrapping and propping with bamboos.

However except in one experiments in which wrapping and no wrapping were the only variants all the other experiments were conducted on canes other than Co. 419, the ruling cane of the day.

Co. 419 is a tall growing top heavy brittle cane which is liable to greater damage by lodging than others. Hence in these days when maximisation of production is the immediate need, it seems advisable for the ryots to continue these age old practices till a better cane is introduced in this tract. In the mean while experiments to estimate the actual loss in tonnage due to lodging when wrapping and propping are not done to Co. 419, have to be conducted and the cost of production of the cane with and without wrapping and propping worked out.