

As regards the *Kanni* crop, selections from the Agricultural Research Station at Pattambi in South Malabar have yet to gain a foot-hold. Their popularity in the tract is ultimately a matter of their ability to imitate the growth intervals of the local types. The main varieties and their many sub-types are of relatively short duration and are peculiar to the taluk, which is situated mid-way between the rest of Malabar and the dry regions of the Coimbatore district. Here, isolation and selection from among the local varieties and their spread seem to be the need of the hour.

Acknowledgements. The survey was made under the guidance of Sri. C. R. Srinivasa Ayyangar, Paddy Specialist and Sri. C. Ramaswamy, Deputy Director of Agriculture, IV Circle, Coimbatore. Their uniform courtesy and personal interest are gratefully acknowledged.

The Nizam Sugar Factory Plantation.

By S. KRISHNANANDA SASTRY, B. A., B. Sc. (Ag.)

Supervisor, Nizam Sugar Factory, Bodhan.

Introductory. In the course of the last decade, India has been able to become self-sufficient with regard to her sugar requirements. But South India is far behind in contributing her proportionate quota of sugar as the number of sugar factories and large scale sugarcane plantations are few. The Nizam Sugar Factory Ltd., however, satisfies a longfelt need in the Hyderabad State.

This sugar factory is situated at Bodhan one hundred miles distant from Hyderabad city (Deccan). It possesses an extensive cane estate of about 8000 acres. The area is not a contiguous block but extends on the eastern and northern directions of the factory the farthest points being about seven miles in either direction. Of the total estate only about 3000 acres are planted every year. All the area is cultivated under the Nizam-Sugar project, one of the biggest in India. In this paper, an attempt is made to give a brief account of the plantation side of the sugar factory.

Soil. The soil varies from light red loams to medium and heavy black soils with a porous morram or light black subsoil.

Climate. Average rainfall is about 35—40 inches most of which is received during the South west monsoon. A few intermittent heavy showers, occur during the North west monsoon. The altitude of the place is about 1200 feet above sea level.

Varieties of Cane. The varieties that are chiefly propagated at present in the estate, are P. O. J. 2878; Co 290; Co 419; E. K. 28 and H. M. 230. Of these P. O. J. 2878 gives a very good yield in red loams provided all cultural operations are done properly and in time. Co. 290 is very useful in alkaline and in black soils; Co. 419 is very promising particularly in black soils and the area under this variety is gradually increasing. Out of 3000 acres, P. O. J. 2878 occupies half the area; Co. 290 occupies 1000 acres and the other varieties are planted in the rest of the area.

Rotation. The usual rotation is sugarcane sugarcane-fallow or green manure crop. Except growing green manure crops like sunnhemp no other crop is grown in rotation. The general principle is that the total area should be $2\frac{1}{2} + 3$ times the standing crop. Since there are 8000 acres, every year about 3000 acres are planted. Where soils are good a ratoon crop is raised. Otherwise the land is ploughed and planted again either in the season or in the next according to the fertility of soil.

Seasons. There are two seasons for planting cane. The first planting is done after the receipt of the first monsoon showers from June up to August-September. This will mature in October of the succeeding year. This is called the *Adsali* or eighteen month crop. The second season is from November to January. It is called the *Ekasali* or twelve month crop. Planting after February is inadvisable because it increases borer attack. In the factory estate, of the 3000 acres, *Adsali* plantation occupies 2000 acres, *Ekasali* 500-600 acres and the rest of the area is ratoon. This major portion *Adsali* comes handy to the factory in early October, for crushing.

Cultivation. Three agencies are in operation human, animal and machine. Machinery is used for preparatory cultivation. All cultural operations are done both by bullock power and manual labour according to convenience and cheapness.

Preparatory Tillage. The land is first tractor ploughed by a heavy plough or subsoiler to a depth of 12-15 inches. If there are ridges of the previous crop, a heavy disc harrow is passed over to break the ridges and then the soil is ploughed. After leaving the field for weathering for a few months or weeks (as the case may be) a cross ploughing is done. After a week or two, disc harrows are passed over to pulverise the big clods and bring the soil to optimum tilth. Finally a two to three furrowed ridger which makes furrows and ridges at 3 ft. 6 inches or 4 ft. apart and 20 inches deep is passed. Planting is done in these furrows. Harrowing and ridging are done by light tractors while ploughing is done by tractors of heavy type. Up to this stage, all operations are done by machinery.

After ridging by tractors manual labour is employed to remove old stubbles, to do local levelling within furrows and to rectify ridges so that they may be straight and uniform. Then cross drains (1 ft. \times 1 ft.) are excavated at convenient distances of 33 feet or 40 feet and the whole field is divided into regular blocks of convenient dimensions, say 8-acre blocks. Each block is surrounded by drains and field roads. Drains and surrounding gutters are dug to collect run-off water from each block and carry it to a place beyond the entire field. Also deep subsoil drains are dug wherever necessary, particularly in black soils, to drain off subsoil water and thus prevent accumulation of salts which in the long run may lead to alkalinity. Good drainage is an important factor in cane cultivation. Each eight acre block is again subdivided into half acre blocks by strong bunds and cross-bunds. These will facilitate storage of water in the summer season. Field

channels and sub-channels are excavated from the distributary according to the level of the land.

Planting. Throughout the length of the furrows, grooving from 3 inches to 4 inches depth is made by a curved type or *Konki* made of wood, in the middle of the furrow, just a little high on the side according to the season. A slight dose of ammonium sulphate or super phosphate is spread in the grooves. After preparing beds in the above manner an irrigation is given if there is no rain. Healthy setts free from stem borer, red-rot etc. and which have good healthy green eye-buds are selected. As a precautionary measure they are dipped in Bordeaux mixture. Ten to fifteen thousand setts each with three eye buds are selected and placed end to end in the grooves keeping the eye-buds on one side of the groove and then covered by a layer of earth. The small dose of manure serves as a starter for the young germinating shoots. After planting, an irrigation should be given unless there is rain.

After-cultivation. In two to four weeks all the buds germinate and young shoots sprout up. One mulching is given at this stage to hasten germination. After a month, if there are any gaps owing to failure in germination, fresh setts or young plants are planted. Within a period of two months, three or four mulchings are given by curved tynes or blade-harrows. The field is always kept free from weeds. Concentrated manures in the form of ammonium sulphate and castor or groundnut cake are given in two or three doses with an interval of one or one and half months between each application. Deep grooving throughout the length of the plant furrows is done before each manuring and manure is applied as deep as possible so that the roots may go deeper and tap the subsoil layers and not become lateral and feed on the surface soil. The oil cake is well powdered and mixed with ammonium sulphate before application. After each manuring a portion of the ridge is cut off and the plant is well earthed up to the collar. This will prevent borer attack and also encourage tillering. The final manuring is done five to six months after planting. Along with it the final earthing up is done by which operation the previous ridges are converted into furrows and furrows into ridges. The shoot portion is covered to about one to one and half foot height and the furrow is made one foot deep from ground level. Then bunds are formed in each half acre block so that water if left in the first furrow may flow to the last in a zig-zag manner without any interference. Where the level is not uniform and gradual, but steep and sudden the half acre block is further divided into two or four sub-blocks. Each sub-block is banded strongly and beds made so that irrigation is done very efficiently and economically. No wrapping or propping is done for the crop. The crop is heavily earthed up to prevent lodging to a certain extent. Copious irrigation and free drainage are practised.

Manures and Manuring. Sugarcane is a crop that responds well to liberal manuring. Systematic green manuring during fallow and additions

of all available compost, farm-yard manure and poudrette before and after planting are beneficial to the crop. Molasses and press cake by-products in sugar manufacture are profitably utilised by their application to the soil during fallow and ploughing them in after a shower. This is specially useful for reclaiming alkaline and saline lands. Besides these, nitrogen, potassium and phosphorus are given in the form of oil cakes and ammonium sulphate. Superphosphate is specially used in alkaline patches. The usual quantity of manure is 2 cwts. of ammonium sulphate and $2\frac{1}{2}$ tons of castor or groundnut cake given in 3 or 4 doses in the same proportion of 1:10 (nearly).

Pests and Diseases. Fortunately in this tract red rot and mosaic which have proved the bane of cane crops in several parts of India are still unseen and it is hoped that with a little care in the selection of material at planting time, these can be prevented in the future. Stem borer *Diatraea sticticrasis* and top borer *Scirpophaga nivella* are frequently found to infest cane in this tract. Their attack is minimised by timely planting and by copious irrigation during summer. Moths are collected at night by light traps, on a mass scale.

Pyrilla purpusella is another pest which makes frequent visits. It is found to be harmless if it attacks a grown up crop but in young plantation its damage is considerable. Bagging and other remedial measures are done to lessen the damage to the crop.

Striga lutea, *Striga densiflora* and *Striga euphrasioides* are rampant in the tract specially in black soils. All the sorghum fields have been brought under cane cultivation since the inception of the project. Therefore striga proved devastating in the initial stages. Regular and timely intercultural operations, uprooting the weed and preventing the plant from flowering whenever it appears in any nook or corner of the field have been successful in keeping the weed under control. This method of dealing with the parasite was expensive in the initial stages but all the same the experience at the place shows that the weed can be brought under control within a year or two.

Harvesting. Twelve or eighteen months after planting according to the season (*Ekasali* or *Adsali*) the crop is harvested after testing for maturity of the crop. From September onwards at regular intervals samples of cane are taken to the factory laboratory and tested for maturity. After the chemist certifies that the canes from particular fields have become mature to give good recovery, those fields are harvested. Harvesting is done by cutting the canes by a cane cutter to the bottom most portion or by uprooting the stools by crowbars. Then the canes are stripped of leaves, cut into bits of convenient size, 20-30 sticks made into a bundle and sent to the factory by carts or lorries or by factory's own railway line.

With cultivation on scientific lines an average yield of 40-60 tons for *Adsali* crop and 25-40 tons for *Ekasali* is obtained in these lands. After

harvesting, the same field is kept as ratoon without planting again, from which 15 to 20 tons yield is obtained. One ratoon can be profitably kept in rich soils while a second ratoon even in fertile soils is inadvisable as it will harbour pests. In a sugar factory estate it is not possible to have an alternative crop like paddy in rotation. Therefore after one or two successive crops the land is kept fallow and green manures are grown and ploughed in.

Acknowledgements I acknowledge my grateful thanks to Mr. Tarapore, the General Manager and Mr. Haquani, the Assistant General Manager of Nizam Sugar Factory Ltd., Bodhan, for their guidance in the preparation of this paper.

Appendix.

Cost of cultivation of sugar cane per acre of Adali or 18 months crop.

Preparatory Cultivation.

Ploughing by machinery:—

Double ploughing, harrowing and ridging	Rs.	25	0	0
---	-----	-----	-----	----	---	---

Preparing beds:—

Making plot bunds	...	...	...	Rs.	2	0	0
" field channels	...	...	...	Rs.	2	0	0
" field drains	...	...	...	Rs.	3	0	0
Dressing of furrows	...	...	...	Rs.	3	0	0

Seed and sowing:—

Harvesting for seed (a) Harvesting stripping etc.	...	...	...	Rs.	0	12	0
10000—15000 setts. (b) conveying into field for 2½ tons...	...	...	...	Rs.	0	8	0
Cost of seed (2½ tons @ Rs. 20 per ton)	...	...	...	Rs.	50	0	0
Planting	...	...	...	Rs.	4	0	0
Weeding: 3—4 times. 1st and 2nd weeding @ Rs 1—8—0	...	...	...	Rs.	5	0	0
each and 3rd and 4th weeding @ Re. 1 each	...	...	...	Rs.	5	0	0
Mulching and hoeing—4 times @ Rs. 1—4—0 each	...	...	...	Rs.	5	0	0

Manuring:—

Cost of manure—2 cwts of Ammonium sulphate	...	...	...	Rs.	22	0	0
@ Rs. 11 per cwt.	...	...	...	Rs.	88	0	0
2½ tons of oil cake @ Rs. 55 per ton	...	...	...	Rs.	10	0	0
F. Y. M. compost, green manure etc.	...	...	...	Rs.	6	0	0
Application of 3 doses @ Rs. 1—8—0 per application	...	...	...	Rs.	6	0	0
Rs. 4—8—0 powdering cake and conveying within field as. 8 per application.	...	...	...	Rs.	6	0	0

Irrigation:—

35—40 times in red soils 20—25 in black soils	Rs.	24	0	0
---	-----	-----	-----	-----	----	---	---

Maintenance of drains and field channels	Rs.	2	0	0
--	-----	-----	-----	-----	---	---	---

Harvesting a 40 tons crop and transporting up to factory site @ Rs. 2 per ton	...	...	...	Rs.	80	0	0
0—12—0 for harvesting and stripping, 0—4—0 for conveying up to rail site Re. 1 Loading in bogies and cost of transport (per ton)	...	...	...	Rs.	48	0	0
Assessment (including watercess)	...	...	...	Rs.	48	0	0

Supervision charges:—

1 supervisor	Rs. 75	} per month for 300 acres.	...	Rs.	13 5 0
3 fieldmen	Rs. 75				
6 maistires	Rs. 72				

Miscellaneous:—

Watchmen	...	...	...	Rs.	3 0 0
Pests and diseases control	...	...	...	Rs.	5 0 0

Total Rs. 401 9 0

or Rs. 400 0 0

40 tons crop valued @ Rs. 13 per ton. Rs. 520

Expenditure. Rs. 400

Profit. Rs. 120 per acre.

For Ekasali (12 months crop) the margin of profit will be reduced to about Rs. 70 while for ratoon it will be Rs. 50 nearly.

Note. All the above calculations are done in terms of O. S. Rupees. 116 O S. Rupees are equivalent to Rs. 100 in British Indian currency.

SELECTED ARTICLE

Economic Factors in Agricultural Development.*

By K. C. RAMAKRISHNAN, M. A.

(Continued from Vol. xxix, p. 197).

III. Effects of Land Tenure and Taxation. Conditions of tenure and taxation of land play an important part in promoting or impeding agricultural improvement. For more than a century in Great Britain leadership in farming was in the hands of landlords who had enlarged and enclosed their estates by buying off the numerous strips of yeoman farmers, often with the profits made in trade and invested capital in long-term improvements like drainage works and farm buildings and did pioneer work in the cultivation of better crops and the breeding of pedigree stock. It is the success of these ventures that made Britain the pioneer of modern agriculture, as well as of large-scale manufactures. This period of prosperity lasted for over a century—from 1750 to 1870. After 1870, however, American competition killed cereal farming; there was a continuous fall in rents, while the cost of cultivation, particularly wages, increased. Arable farming gave place to grass farming and stock-raising. Industries were more paying than agriculture. Industrial magnates bought land more for its amenities and social prestige than for its profits as a farm enterprise or for the love of agricultural research. Research indeed passed into the hands of several specialists and it was beyond the capacity of any landlord to set himself up as a leader in science or technique. Continuous increase in income-tax and death duties led to the break-up of big estates and many old farmers became, in the first thirty years of this century, occupying owners with the help of the State. But a decade of falling prices has impoverished these owners too, who have little capital left to work their farms. Small holdings in certain specialised lines of agriculture like dairying, fruit culture and vegetables are still favoured, but for staple cereals large scale mechanised farming with State ownership of land and control of cultivation is advocated.

* Reprinted from the *Madras University Journal* Vol. 29, Jan. 1941.