

RUBBER.

THE BUDDING OF RUBBER.

THE PRESENT POSITION.

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In the *Tropical Agriculturist* for December, 1921, and subsequent numbers, attention was drawn to the possibilities of budding or bud-grafting rubber. Various demonstrations in budding methods were subsequently given. It was pointed out that investigations in different rubber-growing countries had demonstrated the widely differing yielding capacities of plantation rubber trees. Observations made in Sumatra and in Ceylon have shown that yield is most probably an inherent character, as good yielders remain, if disease factors do not interfere, as good yielders, and bad yielders remain bad yielders. This appears to be established under differing soil conditions and though it is possible for yields to be increased by different cultural operations it is improbable that a bad yielder can be transformed into a good yielder.

With these facts established, it therefore became apparent that increased yields from rubber plantations could be looked for if propagation from only high-yielding stock was adopted; and two methods were available, *viz.*, by seed selection and by budding.

The results which can be attained by seed selection are seen in the figures which have been published from the individual tapping experiment on the Peradeniya Experiment Station from the plantation raised from Heneratgoda No. 2 tree. Whereas the average yields from this plot are in excess of yields from trees of mixed parentage, they show that areas planted from seed, the maternal parent of which is known to be a high yielder, will always contain a mixture of high, moderate and low yielders. Difficulties in controlling cross-pollination and the knowledge that seedlings from a known parent gave varying results naturally suggested that budding would provide a more certain, and at the same time a quicker, means of securing plantations of high-yielding capacity.

When budding first attracted public attention extraordinary hopes were entertained by some as to the possibilities of very high acreage yields and the enthusiasm aroused received a severe set-back when the first yields from budded areas in the Dutch East Indies became available. These results did not justify the extravagant expectations of the budding enthusiasts and showed that much more experimental work was required. They came to hand when the rubber industry was in the depths of the slump and these disappointments were interpreted by many as failures. Interest in budding waned and it was only a few who persisted in their efforts.

With the recovery of the industry and the decision to plant up further new areas, interest in budding has again been aroused and a large number of growers are now desirous of undertaking the budding of considerable areas. The latest reports from budded areas in Malaya and the Dutch East Indies indicate that very high yields are being secured from budded areas and in consequence it is essential for every grower desirous of securing

the highest yield from newly planted lands to undertake budding. The future of plantation rubber in the form of large estates depends upon the production of high acreage yields. There is little doubt that the production of rubber by small growers will eventually play a much more important part in the industry than it does at present and will constitute in the long run a factor of enormous importance. The production of rubber by small growers has during the past few years increased enormously and although this output in many rubber-growing countries reacts with the price of the commodity there is no doubt that the industry will in the future secure from small growers those supplies which will keep prices on a reasonable basis. All estates therefore desirous of being prepared for the time when production will be equal to or even in excess of demand must look to either cheaper production or increased production per acre. The former may be attainable in certain cases, but is unlikely to be generally possible, and therefore those who desire to look to the future would be advised to explore the possibilities of higher acreage yields.

Budding offers these possibilities provided that certain necessary and essential preliminaries are given heed to. It is, therefore, proposed to review the results that have been secured up to date and to summarise the conclusions that are to be drawn therefrom. Production figures from large acreages of buddings have not been published but they are reported to have been in many cases 50 per cent. in excess of yields from seedlings.

It has been demonstrated that high yielders do not invariably give rise to high-yielding offspring. Some high-yielding mother trees do not produce uniformly high-yielding progeny. The value of a mother tree for budding purposes can only be determined by actual tapping of the offspring. All the budded offspring of a single mother tree are referred to collectively as a "clone" and the feature which has been shown by tappings of budded areas is the uniformity of the yields of the individual members of any one clone. All are either high yielders, moderate yielders or poor yielders. It also appears that there are high-yielding trees which give rise, under varying conditions, to clones of offspring which are uniformly high yielding.

A small number of results from the Central Experiment Station at Java indicate that there may be some influence between stock and scion. The figures available are limited and therefore the conclusions drawn from them can only be tentative. They do however indicate that the growth of the root stock is related to the vigour of the scion used and that the yield values of the stock and scion show some relation to one another. These indicate that care must be taken in the choice of stocks and that budding should be done on stock of good quality grown from seed of selected trees. It is quite possible that certain combinations of stocks and scions will give better results than others and therefore it is essential that some knowledge of the origin of the stock on which buddings are done should be available.

Tappings of budded trees have shown that yields do not increase as the cut approaches ground level as is the case with seedlings and there are indications that bark can be productively tapped at greater heights than with seedlings.

Budded trees appear to be cylindrical in shape and in this respect differ from seedlings.

YIELDS.

The following summary of yields which have been published up to date may be of general interest :—

MALAYA.

Kajang Estate.

- (a) *Age.* Of stock 5 years, of bud shoot 4 years.
- (b) *Girth.* 21'66 inches at 17 inches from ground and only 1'17 inches less at 39'37 inches from ground.
- (c) *Mother Trees.* 13 years old.
- (d) *Stocks.* Miscellaneous—not selected seed.
- (e) *Control trees* from same stock non-budded.
- (f) *Tapping System.* Half spiral, daily tapping for 5½ weeks followed by rest for same period, then changed to alternate-day tapping.
- (g) *Yields.* Clone 1 Average 16'3 grams per tapping.
Mixed Clones 1 & 9 " 19'9 " " "
Control trees " 5'8 " " "

In Clone 1 the highest yielder gave 24'5 grams, and the poorest 9'1 grams per tapping.

In mixed Clones 1 and 9 the highest yielder gave 28'7 grams, and the poorest 12'3 grams per tapping.

In the Control Block the highest yielder gave 12'6 grams and the poorest 2'3 grams per tapping.

Taking 80 trees per acre tapped on 160 days per annum Clone 1 would give 459 lb. per acre per annum. Mixed Clones 1 and 9 would give 561 lb. per acre per annum and the Control would give 163 lb. per acre per annum.

These yields are from 5 year old rubber (4 years budded).

SUMATRA.

A. V. R. O. S.

- (a) *Age.* Of stock average 6 years. Of bud shoot average 5½ years.
- (b) *Girth.* Average about 21 inches to 25 inches at 20 inches above union of scion and stock.
- (c) *Mother Trees.* Age not stated.
- (d) *Stocks.* From selected seed.
- (e) *Control Trees or Seedlings.* From same selected seed as the stocks.
- (f) *Tapping System.* Alternate monthly on daily cuts over half the circumference.
- (g) *Yields.* Average yield from seedlings is 8 grams per tree per tapping which, on the basis of 160 tapping days and 80 trees per acre, gives 225 lb. per acre per annum.

Clone 33. Average 14'65 grams per tree per tapping equalling on above basis 413 lb. per acre per annum.

Clone 36. Average 11'66 grams per tree per tapping equalling on above basis 314 lb. per acre per annum.

Clone 50. Average 20'11 grams per tree per tapping equalling on above basis 567 lb. per acre per annum.

Clone 52. Average 12'98 grams per tree per tapping equalling on above basis 366 lb. per acre per annum.

Clone 80. Average 13'04 grams per tree per tapping equalling on above basis 367 lb. per acre per annum.

JAVA.**Malamboo Estate.**

- (a) Age. Of stock 5 years, of bud shoot $4\frac{1}{2}$ years.
 (b) _____
 (c) *Mother Trees.* Average age 9 years at time buds were taken from them.
 (d) *Stocks.* Selected seed from trees of good girth measurement.
 (e) *Control Trees.* Same seed as stocks on which buds were grafted.
 (f) *Tapping System.* Single cut on half circumference.
 (g) *Yields.* Expressed in terms of percentage of the average yield of the control trees.

Clone	A.	B.	C.	D.	E.	F.	Control
Percentage	87	138	162	122	195	90	100

Clones A and F are, therefore, poorer yielders than the control cut, B, C, D and E are higher.

Expressed in terms of yield per centimeter of tapping cut :—

Clone	A.	B.	C.	D.	E.	F.	Control
Percentage	101	174	191	157	253	111	100

It is pointed out that the bud shoot is 6 months younger than the control shoot.

CONCLUSIONS.

From the above it is clear that in Ceylon general budding cannot yet be undertaken with certainty of success. It is not possible by external characters to recognize a high-yielder which will produce offspring of high-yielders. What has to be done on estates is first the selection of a number of high-yielders and the setting apart of some of these to provide bud-wood and of others to provide seed for the stocks. Nurseries from the seed of those reserved for stocks should be planted this year or the seed should be planted out at stake and those trees reserved for buds should be pollarded in order to provide good bud-wood from which to bud the stocks being grown. It has been found that the best results are secured when buds are taken from bud-wood which is the same age as the bark of the stock on to which it is to be bud-grafted. An accurate record of the buddings should be kept in order that definite data will be available as to those combinations which give the most satisfactory results. It is only when the behaviour of mother trees is known as tested by the tapping results that progress on sound lines can be made.

The latest report just received from Sumatra shows that the yields of seedlings and of a mixture of buddings from unproved clones are about the same. The experiment reported on shows that the method of using buddings from unproved mother trees on a large scale should not be applied when laying out a plantation with budded plants. Such experiments should only be laid down by estates on limited acreages in order to secure data on the estates' own land regarding the value of different mother trees for future plantings and budding work. For such experiments at least one half acre of buddings should be planted from each selected tree and the likely mother trees which it is desirable to test should not be less than 20 if the estate contemplates planting out in future years anything in excess of 100 acres of budded rubber.

The Rubber Research Scheme has commenced the development of an experiment station of 50 acres in extent in the Kalutara district for investigation work in the budding and selection of rubber, but estates should not await the results from these experiments. They should lay down experiments of their own and advice as to how these experiments should be designed to yield the information required can be secured from the officers of the Department of Agriculture or of the Rubber Research Scheme.