

## PLUCKING STANDARDS.

F. R. TUBBS.

It is a common place that refinements of factory technique lose much of their value if leaf of a satisfactory and even standard is not available. The present note places on record some of the results of long-continued examination of plucking standards as achieved in practice. Such standards may be regarded as involving the aspects of fineness, evenness and absence of damage. Important among the factors affecting them are :—

- (a) Effects of cultural treatment and bush type.
- (b) The efficiency of the plucking operation
- (c) Transport and handling

Dealing with the first group of factors, the length of the plucking round influences firstly, the size of an average flush and secondly, variability in size from flush to flush. Thus, for example, the average dry weight of a single flush on a fortnightly round is distinctly larger than on a weekly round owing to the later stage of development of the parts of the flush shoots comprising the crop. The leaf harvested from plots under these two treatments was consistently found to be easily distinguishable to the eye. At the same time, the longer intervals between pluckings resulted in the simultaneous harvesting of shoots of more widely differing ages although of the same morphological composition. This leads to an increased variability in the size of the individual shoots in the crop.

Other influences which materially affect the size of the shoots are position in the field, jat of tea, and age from pruning. The first two are unalterable but the very considerable differences in flush size which arise

from variations in the age of the various fields from pruning can be greatly reduced by light pruning. Again, since flush size becomes relatively stable early in the pruning cycle, the evenness of leaf in the crop as a whole is increased by lengthening the cycle. Reference may be made to the *Tea Quarterly*, Vol. VII, page 142, 1934, and Vol. X, page 23, 1937, and to Bulletin No 15, page 21.

The main field factors which contribute to general evenness in size, excluding the human element, are thus: light pruning, long cycles, even jat and short plucking rounds

The factor of plucking efficiency influences the extent to which the existing degree of evenness on the bush is maintained or increased during the operation of harvesting. It cannot compensate for the effects of a long round in increasing the average size of a normal flush for example. Again, the proportion of banji shoots is known to vary not only seasonally, but also with the age from pruning and nutritional status of the bush (*Tea Quarterly*, Vol. X page 26, 1937, and Bulletin No. 15, page 22) and is largely independent of plucking efficiency. The importance of the latter factor in relation to the proportion of banji shoots in the crop is indirect, and arises in connection with the thoroughness of removal of banji at an early stage. The earlier that banji are detected the greater the proportion in which the second leaf is soft enough to be plucked as a "banji bud plus two leaves." The limitations imposed in this respect by too long a plucking round must however, be clearly borne in mind when determining, as suggested later, the proportion of 'two leaf and a bud' shoots in the crop harvested.

It will be agreed that fragmentation and crushing of the shoots is undesirable whatever the standard of plucking adopted. Apart from other effects the younger parts of such fragmented shoots dry faster and cause an uneven wither. Damage may occur in the pluckers' hands, in the basket, and leaf sack, and also during spreading in the factory. Only constant care will maintain it at the minimum.

The figures for damaged shoots discussed later represent only a portion of the damage which had actually occurred, since the "one leaf and a bud" portions of broken two leaf flush were not included in the total of damaged shoots and since no account was taken of damage from crushing. Nevertheless even this, restricted, estimate of damage has been found to rise as high as 57 per cent by weight in commercial plucking. Further comment on the seriousness of the problem is unnecessary.

One criterion of 'fineness' of plucking is the mean size of a two leaf flush. Data exhibiting the range will be found in the references given above, but the compiling of such records must be done on a dry weight basis, and is unsuitable for the ordinary estate. Further details of flush size and morphological composition are given in Tables III to VI.

The results now to be discussed provide information upon the composition of the crop harvested by ordinary estate labour. The data for St. Coombs in Table I represent means of continuous series of determinations made on groups of plots clean pruned respectively in January, May and September 1936. The data for Galatura are means of the data from Travancore (cut-across  $\frac{1}{2}$  in. above previous tipping level), rim-lung and clean pruned plots shown in detail lower in table. "Flush bud plus one leaf" and "banji bud plus one leaf" necessarily include the apical portions of broken shoots.

TABLE I.  
Crop Composition—Percentages of unbroken shoots by number.

| Place                    | Year from Pruning | FLUSH |                         |     | BANJI |                               |     | Total percentage of banji shoots |
|--------------------------|-------------------|-------|-------------------------|-----|-------|-------------------------------|-----|----------------------------------|
|                          |                   | 1     | Bud plus<br>2<br>leaves | 3   | 1     | Banji bud plus<br>2<br>leaves | 3   |                                  |
| St. Coombs<br>(4500 ft.) | First             | 8     | 60                      | 8   | 7     | 14                            | 3   | 24                               |
|                          | Second            | 9     | 52                      | 5   | 10    | 22                            | 3   | 35                               |
|                          | Third             | 13    | 47                      | 3   | 11    | 23                            | 2   | 36                               |
|                          | Mean              | 10    | 53.0                    | 5.3 | 9.3   | 19.7                          | 2.7 | 31.7                             |
| Galatura<br>(200 ft.)    | First             | 4     | 59                      | 6   | 10    | 18                            | 3   | 31                               |
|                          | Second            | 2     | 54                      | 3   | 13    | 25                            | 3   | 41                               |
|                          | Mean              | 3.0   | 56.5                    | 4.5 | 11.5  | 21.5                          | 3.0 | 36.0                             |
| Galatura<br>Clean        | First             | 4     | 62                      | 7   | 9     | 16                            | 3   | 28                               |
|                          | Second            | 2     | 56                      | 3   | 13    | 24                            | 3   | 40                               |
| Galatura<br>Rim-Lung     | First             | 4     | 65                      | 6   | 9     | 14                            | 3   | 26                               |
|                          | Second            | 2     | 57                      | 3   | 13    | 23                            | 3   | 39                               |
| Galatura<br>Travancore   | First             | 3.4   | 51                      | 5   | 13    | 24                            | 4   | 41                               |
|                          | Second            | 1     | 51                      | 2   | 15    | 28                            | 4   | 47                               |

In Table II, the percentage composition of the harvested leaf *by weight* is summarised, with the inclusion in this case of the percentage by weight of broken shoots and of those fragments which could not be assigned as a complete shoot to one of the other categories. For example if 2 leaves and a bud had become broken in half during collection, the adhering bud and one leaf was placed in the latter category, and the single leaf and subtending stalk under 'broken leaf'. A shoot having the greater portion of one leaf missing was also placed in the latter category, together with portions of leaves.

The data given in Tables I and II, besides providing illustrations of the effects of some of the factors referred to earlier, make it plain that the average standard of plucking between one estate and another

may vary to a degree far exceeding the average effects of the other factors examined. Nor are these estates by any means extreme cases, as experience in factory advisory work has shown. Further, it is apparent that even where a high standard of plucking is achieved, the leaf entering the factory is at best a heterogeneous mixture of shoots of varying age and morphological constitution, accompanied by a proportion of fragmented material. This situation is fundamentally inescapable, and a good plucking standard must be one in which the proportion of 'normal' (two leaf) shoots is as high as possible, and the proportion of damaged shoots as low as possible. It is universally accepted that modern labour conditions render close adherence to a standard increasingly difficult and it is the more necessary, therefore, to obtain a yard stick by which the need for action may be gauged. Some

TABLE II.  
Crop Composition—Percentages of all shoots by weight.

| Place               | Year from Pruning | FLUSH          |      |     | BANJL          |      |     | Broken |
|---------------------|-------------------|----------------|------|-----|----------------|------|-----|--------|
|                     |                   | Flush bud plus |      |     | Banji bud plus |      |     |        |
|                     |                   | 1              | 2    | 3   | 1              | 2    | 3   |        |
| St. Coombs          | First             | 5              | 59   | 11  | 4              | 11   | 3   | 8      |
|                     | Second            | 5              | 50   | 6   | 5              | 18   | 3   | 12     |
|                     | Third             | 8              | 47   | 3   | 6              | 20   | 3   | 13     |
|                     | Mean              | 6.0            | 52.0 | 6.8 | 5.0            | 16.3 | 3.0 | 11.0   |
| Galatura            | First             | 2              | 58   | 9   | 6              | 15   | 4   | 6      |
|                     | Second            | 1              | 54   | 4   | 8              | 23   | 5   | 5      |
|                     | Mean              | 1.5            | 56.0 | 6.5 | 7.0            | 19.0 | 4.5 | 5.5    |
| Galatura Clean      | First             | 2              | 63   | 9   | 5              | 12   | 3   | 6      |
|                     | Second            | 1              | 56   | 5   | 8              | 21   | 5   | 5      |
| Galatura Rim-lung   | First             | 2              | 60   | 10  | 5              | 14   | 4   | 6      |
|                     | Second            | 1              | 56   | 5   | 8              | 22   | 5   | 4      |
| Galatura Travancore | First             | 2              | 52   | 7   | 8              | 20   | 5   | 6      |
|                     | Second            | 1              | 52   | 4   | 9              | 26   | 5   | 4      |

simple means of ascertaining the 'evenness' of the leaf, for occasional rather than routine use, is desirable

If it is accepted that one leaf banji is normally plucked, as such because the second leaf has hardened too far, it follows that, excepting cases where the shoot goes banji abnormally early in its development a high proportion of one leaf banji indicates too long a round or inefficient plucking on an earlier occasion. Again the presence of one leaf 'flush' shoots indicates either stripping or breakage of normal shoots. Three or more leaf flush of course indicates coarse plucking and, if not resulting from taking the whole shoot above the fish leaf also suggests either too long a round or inefficient plucking on the previous occasion.

It may be argued, therefore that the larger the percentage of the two leaf shoots the more efficient the plucking system, provided that the second leaf on banji shoots is soft and pliable. This standard has been occasionally used on estates in the past and its more frequent application would provide useful information. Again, the higher the percentage of damaged material the more the need for care in harvesting and subsequent treatment of the leaf.

Final standards must await correlation of factory and field observations, but as an interim standard it is suggested that an average of at least 80 per cent by number of two leaf shoots be sought, or, by weight, of at least 75 per cent of two leaf shoots and of under 5 per cent of broken material.

A method of determining the proportions actually occurring is as follows:— Two or three samples of about one pound fresh weight of flush are removed from tats just after spreading, taking care to avoid additional damage in the process and to sample from numerous tats. All two leaf shoots are separated and at the same time, all damaged shoots are placed aside. A young leaf is regarded as separate from the bud and constituting an additional leaf as soon as it is sufficiently reflexed to expose the bud clearly. The scales for weighing the leaf must obviously be sufficiently delicate to allow of measurement to an accuracy of  $\frac{1}{4}$  ounce or less if the results are to be reasonably accurate.

The relative proportions of bud, first and second leaves and of the two included internodes in normal flush and in "two leaf banji" has been determined on a plot of tea at St. Coombs, clean pruned in May 1936 over a period of three years from pruning. For the purposes of determination, the fragment of the third internode beneath the second leaf was discarded; thus the sum of the first and second internode weights does not represent the total amount of stem present in a normally harvested shoot. The dry weights of the various components over the period are shown in Table III together with the percentage composition of the shoot by weight, while their relative proportions by weight are given in Table IV. Similar data for "two leaf banji" shoots are shown in Table V and VI. The data in these tables are grouped into "periods" of three months corresponding to the four quarters of the year.

TABLE III.

Dry weights of the components of a two leaf flush shoot in milligrammes.

| PERIOD                               | Determinations | Bud  |      | First Internode |     | First Leaf |      | Second Internode |     | Second Leaf |      | Total |
|--------------------------------------|----------------|------|------|-----------------|-----|------------|------|------------------|-----|-------------|------|-------|
|                                      |                | Wt.  | %    | Wt.             | %   | Wt.        | %    | Wt.              | %   | Wt.         | %    | Wt.   |
| Tipping.<br>13.9.36 to<br>28.10.36   | 3              | 13.2 | 10.6 | 2.7             | 2.4 | 28.5       | 22.9 | 9.7              | 7.8 | 70.0        | 56.3 | 124   |
| Plucking.<br>16.11.36 to<br>21.12.36 | 3              | 12.6 | 10.6 | 3.1             | 2.6 | 28.5       | 24.0 | 11.0             | 9.3 | 63.6        | 53.5 | 119   |
| 9.1.37 to<br>26.4.37                 | 7              | 12.8 | 12.0 | 3.2             | 3.0 | 27.2       | 25.4 | 10.5             | 9.8 | 53.6        | 49.8 | 107   |
| 14.5.37 to<br>30.8.37                | 7              | 11.6 | 11.9 | 2.7             | 2.7 | 25.4       | 26.2 | 8.6              | 8.9 | 48.6        | 50.2 | 97    |
| 17.9.37 to<br>16.12.37               | 6              | 11.4 | 13.5 | 2.4             | 2.8 | 22.3       | 26.3 | 8.1              | 9.5 | 40.8        | 48.0 | 85    |
| 3.1.38 to<br>21.4.38                 | 7              | 11.1 | 12.4 | 2.5             | 2.8 | 24.0       | 26.8 | 8.2              | 9.2 | 43.6        | 48.8 | 89    |
| 9.5.38 to<br>25.8.38                 | 7              | 10.2 | 11.8 | 2.3             | 2.6 | 22.9       | 26.6 | 7.7              | 8.9 | 43.4        | 50.2 | 86    |
| 11.9.38 to<br>29.12.38               | 4              | 10.6 | 12.5 | 2.0             | 2.4 | 23.3       | 27.5 | 7.1              | 8.4 | 41.7        | 49.3 | 85    |
| 3.2.39 to<br>16.4.39                 | 3              | 9.4  | 11.9 | 2.1             | 2.6 | 21.4       | 27.0 | 6.8              | 8.5 | 39.8        | 50.0 | 79    |
| 22.5.39 to<br>2.8.39                 | 3              | 9.9  | 11.3 | 2.1             | 2.3 | 19.6       | 27.4 | 7.0              | 8.0 | 44.9        | 51.1 | 88    |
| Mean                                 |                | 11.1 | 12.0 | 2.5             | 2.6 | 23.8       | 26.4 | 8.3              | 8.9 | 46.7        | 50.1 | 93    |

TABLE IV.

Ratios of weights of components of a two leaf flush shoot.

| PERIOD.                              | Determi-<br>nations. | Bud:<br>1st Leaf. | 1st Leaf:<br>2nd Leaf. | 1st Internode:<br>2nd Internode. | Bud:<br>1st Internode | 1st Leaf:<br>2nd Internode. |
|--------------------------------------|----------------------|-------------------|------------------------|----------------------------------|-----------------------|-----------------------------|
| Tipping:<br>13.9.36 to<br>28.10.36   | 3                    | .43               | .41                    | .30                              | 4.7                   | 3.1                         |
| Plucking:<br>16.11.36 to<br>21.12.36 | 3                    | .44               | .45                    | .28                              | 4.1                   | 2.7                         |
| 9.1.37 to<br>26.4.37                 | 7                    | .47               | .51                    | .31                              | 4.0                   | 2.6                         |
| 14.5.37 to<br>30.8.37                | 7                    | .46               | .52                    | .31                              | 4.4                   | 3.0                         |
| 17.9.37 to<br>16.12.37               | 6                    | .51               | .55                    | .30                              | 4.8                   | 2.8                         |
| 3.1.38 to<br>21.4.38                 | 7                    | .46               | .55                    | .30                              | 4.5                   | 3.0                         |
| 9.5.38 to<br>25.8.38                 | 7                    | .44               | .53                    | .29                              | 4.5                   | 3.0                         |
| 11.9.38 to<br>29.12.38               | 4                    | .45               | .56                    | .28                              | 5.3                   | 3.3                         |
| 3.2.39 to<br>16.4.39                 | 3                    | .44               | .54                    | .31                              | 4.6                   | 3.2                         |
| 22.5.39 to<br>2.8.39                 | 3                    | .41               | .54                    | .29                              | 4.9                   | 3.5                         |
| Mean                                 |                      | .45               | .53                    | .30                              | 4.6                   | 3.0                         |

TABLE V.

Dry weights of the components of a two leaf banji-shoot in milligrammes.

| Period                               | Determinations | Bud |     | First internode |     | First leaf |      | Second Internode |     | Second leaf |      | Total Wt. |
|--------------------------------------|----------------|-----|-----|-----------------|-----|------------|------|------------------|-----|-------------|------|-----------|
|                                      |                | Wt. | %   | Wt.             | %   | Wt.        | %    | Wt.              | %   | Wt.         | %    |           |
| Tipping:<br>13.9.36 to<br>28.10.36   | 3              | 2.1 | 2.0 | 0.7             | 0.7 | 21.8       | 22.7 | 4.6              | 4.8 | 67.7        | 69.8 | 97        |
| Plucking:<br>16.11.36 to<br>21.12.36 | 3              | 1.4 | 1.7 | 0.6             | 0.7 | 23.6       | 27.7 | 5.1              | 5.9 | 54.7        | 64.0 | 85        |
| 9.1.37 to<br>26.4.37                 | 7              | 1.1 | 1.4 | 0.6             | 0.8 | 22.4       | 29.6 | 4.5              | 5.9 | 47.1        | 62.3 | 76        |
| 14.5.37 to<br>30.8.37                | 7              | 0.7 | 0.9 | 0.5             | 0.6 | 23.8       | 30.0 | 4.1              | 5.2 | 50.1        | 63.2 | 79        |
| 17.9.37 to<br>16.12.37               | 6              | 0.8 | 1.0 | 0.5             | 0.6 | 22.6       | 30.7 | 4.2              | 5.6 | 45.8        | 62.0 | 74        |
| 3.1.38 to<br>21.4.38                 | 7              | 0.6 | 0.9 | 0.4             | 0.6 | 21.6       | 30.9 | 3.8              | 5.4 | 43.7        | 62.3 | 70        |
| 9.5.38 to<br>25.8.38                 | 7              | 0.7 | 1.0 | 0.4             | 0.5 | 23.4       | 30.3 | 4.0              | 5.2 | 51.8        | 63.1 | 77        |
| 11.9.38 to<br>29.12.38               | 4              | 0.8 | 1.0 | 0.4             | 0.6 | 23.2       | 30.3 | 3.8              | 4.9 | 48.3        | 63.2 | 76        |
| 3.2.39 to<br>16.4.39                 | 3              | 0.9 | 1.3 | 0.5             | 0.7 | 21.0       | 30.4 | 3.3              | 4.7 | 43.4        | 62.8 | 69        |
| 22.5.39 to<br>2.8.39                 | 3              | 0.7 | 0.9 | 0.4             | 0.5 | 25.1       | 30.9 | 3.7              | 4.5 | 51.0        | 63.1 | 81        |
| Mean                                 |                | 0.9 | 1.1 | 0.5             | 0.6 | 23.0       | 30.1 | 4.1              | 5.3 | 48.4        | 62.9 | 76        |

TABLE VI.

Ratios of weights of components of a two leaf banji shoot.

| PERIOD.                              | Determi-<br>nations. | Bud:<br>1st Leaf | 1st Leaf:<br>2nd Leaf. | 1st Internode:<br>2nd Internode. | Bud:<br>1st Internode. | 1st Leaf:<br>2nd Internode. |
|--------------------------------------|----------------------|------------------|------------------------|----------------------------------|------------------------|-----------------------------|
| Tipping:<br>13.9.36 to<br>28.10.36   | 3                    | .09              | .33                    | .15                              | 2.8                    | 4.8                         |
| Plucking:<br>16.11.36 to<br>21.12.36 | 3                    | .06              | .43                    | .11                              | 2.4                    | 4.7                         |
| 9.1.37 to<br>26.4.37                 | 7                    | .05              | .48                    | .13                              | 1.8                    | 5.0                         |
| 14.5.37 to<br>30.8.37                | 7                    | .03              | .48                    | .13                              | 1.5                    | 5.8                         |
| 17.9.37 to<br>16.12.37               | 6                    | .03              | .50                    | .11                              | 1.7                    | 5.5                         |
| 3.1.38 to<br>21.4.38                 | 7                    | .03              | .50                    | .12                              | 1.5                    | 5.8                         |
| 9.5.38 to<br>25.8.38                 | 7                    | .03              | .48                    | .10                              | 1.8                    | 5.9                         |
| 11.9.38 to<br>29.12.38               | 4                    | .03              | .48                    | .12                              | 1.8                    | 6.2                         |
| 3.2.39 to<br>16.4.39                 | 3                    | .04              | .48                    | .16                              | 1.7                    | 6.5                         |
| 22.5.39 to<br>2.8.39                 | 3                    | .03              | .49                    | .11                              | 1.8                    | 6.9                         |
| Means                                |                      | .04              | .48                    | .12                              | 1.8                    | 5.8                         |

Dealing firstly with Table III, the last column provides a further example of the rapid decrease in flush size in the early part of a cycle, and of its relative stability in the latter part, which has already been referred to. This decrease in weight is apparent in all the components of the shoot, but not to the same degree. Inspection of the figures indicates that while the percentage weights contributed by bud, first internode, second internode and second leaf show small variations with age from pruning, there is a more distinct tendency for the proportion by weight of the first leaf component to increase at the expense of the

other components. To this limited degree the shoots show a tendency to differ less markedly from the banji shoot (Table V) as their parent bushes approach the end of the pruning cycle.

The two leaf banji shoot shows a similar trend in size and composition to the flush shoot. The bud is, of course, both absolutely and relatively smaller, and this is true of the stem components also. On account of its coarser nature the proportion of weight provided by the first, and particularly the second, leaf is materially greater than in normal flush.