

Investigations into the Methods of Increasing the Outturn of the Fannings Grade.

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Prior to 1939, the fannings grade often commanded a higher price than B.O.P. especially in the London Market where the Blenders purchased their requirements directly at the Auctions. In addition to this demand for fannings there was a general tendency to prefer small neat B.O.P's to the larger types of this grade.

The Blenders in the U.K. appear to use only teas of the size of small B.O.P. and fannings in all the popular blends. In canteens and restaurants small leaf and even dust is favoured on account of its economy and rapid brewing properties.

During 1946 it was noticed during visits to blending establishments in the U.K. that normal B.O.P. was cut as a matter of course and it appeared highly illogical that fannings and small B.O.P. should find so little favour in the open market in Colombo while bulk buying prevented the U.K. blender from buying his exact requirements directly.

Possibly the return to more normal trading conditions will result in a marked increase in demand for fanning grades. Mr. Keegel commences his article with a reference to an increase in the demand for this grade already apparent in the Colombo Market and proceeds to give an account of his investigations into methods for producing smaller leaf. Research into methods of tea manufacture is greatly complicated by the fact that there are no fundamental standards by which tea can be valued. Nobody can say exactly what any tea is worth until the Auctioneer's hammer falls. Nevertheless there are distinct trends in market requirements and Mr. Keegel has endeavoured to anticipate possible changes which will be required in manufacture to meet future requirements.—(Editor).

For some time in the latter half of the year, 1949, anyone closely following the trend of the Colombo tea market would have noted the increasing prices realized for the Fannings grade. Some estates naturally altered their grading procedure to take advantage of the increased demand for this particular grade while a few changed their rolling technique with the same object in view, namely, to increase the Fannings outturn. The question of which procedure gives the best return is a vexed one. It is hoped that the results of these investigations will help to clarify the doubtful points arising from the adoption of either method.

It is well known that the Fannings grade falls into two main categories, one being the flaky type and the other the grainy variety. Generally speaking, the former is larger in size, the smaller the size of the grade the more grainy it is considered to be. However, this must not be taken as a hard and fast rule because a small flaky Fannings could still be obtained by rolling under-withered or overwithered leaf. There is also another type of Fannings referred to as leafy, this term being used to indicate the presence of big pieces of leaf that are not open. In order that no confusion should exist regarding these terms the following definitions are given for the purpose of this article.

Grainy.—Term applied to a well made grade, the generally accepted standard of size being that taken through a No. 16 or 18 mesh size. Anything larger than this is considered *leafy*. *Flakiness* explains itself and is not regulated by size.

The investigations carried out into the production of increased outturns left out the question of small size, flaky Fannings because the methods employed to produce this type would have been abnormal and secondly, the low prices paid for them would have nullified any advantages accruing from an increased outturn.

The question, therefore, resolved itself into one of increasing the outturn by methods practicable in an ordinary factory and of producing a *marketable* grade at the same time. A number of promising methods were available but on trying them out only a few gave the desired results. Nevertheless a record of the more important experiments is given for general information. It must be clearly stressed of course that the adjustment of grades to pre-arranged requirements is not an evolutionary idea in tea manufacture. Many factories do in fact alter their manufacture from time to time to suit special market demands but how many really do so without any consideration of its effect on the grades other than the one on which most attention is paid? The purpose of these investigations was to find how best to increase the outturn of the Fannings grade from an economic point of view.

The first stage in the experiments was to try to obtain an appreciable increase in the outturn by altering rolling technique. Some of the more familiar methods for which many claims have been made, actually failed to do so the reasons for which only became clear when subsequent experiments were carried out. The second stage, which involved a change in grading procedure enabled higher outturns to be obtained. Some experiments employed both methods.

The size of mesh for separating the Fannings grade in these experiments, unless otherwise stated, was No. 18, this being the mesh commonly used. The material worked with was ordinary estate leaf subject to the usual degree of variation in wither.

Rolling under heavy pressure seemed to be the method most likely to give the required increase in the outturn of the Fannings grade. In fact it did not result in any change in the outturn of this particular grade or for that matter in that of the other grades. Appearance of the teas from the point of view of twist was slightly improved but quality was appreciably marked down. Tip was also lost in the process.

Effect of increasing the number of rolls.—Additional rolling also failed to make any appreciable difference in the outturn of the Fannings grade but imparted more tip due to the lower initial dhoof outturns.

Continuous Pressure versus 5 minutes on 5 off.—Rolling under continuous pressure made very little difference to the outturns of any of the grades and there was very little indeed to choose between the two methods in respect of liquor or appearance.

Other variations of pressure application such as 8 minutes on, 2 off and 7 on and 3 off also had hardly any noticeable effect and the question naturally arose why such methods were ineffective.

The controlling factor seemed to be the Big Bulk outturn which in the experiments previously referred to was the same in each comparison. There was strong reason to believe that this was so because in a subsequent experiment where the Big Bulk outturn was high even under heavy pressure the Fannings outturn was found to be lower than that obtained from light rolled leaf which had a relatively lower Big Bulk outturn. Further confirmation was obtained from an analysis of the dhools of a normal 5 roll programme:—

	<u>% outturn</u>	<u>% outturn of B.O.P. and F.P.</u>	<u>% outturn of Fannings and Dust</u>
Dhool 1	16	14.5	1.5 (9% of dhool)
" 2	18	16	2.0 (12% of dhool)
" 3	20	17.5	2.5 (13% of dhool)
" 4	21	15	6.0 (31% of dhool)
" 5	19	12.5	6.0 (33% of dhool)
Big Bulk	6	—	—
	<u>100</u>	<u>75.5</u>	<u>18.0</u>

The figures given above are worth a close study and show how misleading such statements as "extra rolling has increased my Fannings outturn" or "I have now resorted to heavy pressure as a result of which I am getting more fannings" could be. The increase in outturn, if any, was due entirely to the reduction of the Big Bulk brought about by the change in rolling. For instance, in the figures just quoted, assuming a negligible contribution of Fannings and Dust from cutting of the Big Bulk, the outturn of these two grades would vary as follows:—

6% Big Bulk	—	18% Fannings and Dust.
25% Big Bulk	—	12% " " "
46% Big Bulk	—	6% " " "

To say, therefore, that an increased outturn of Fannings is obtained from heavier rolling or increasing the number of rolls is meaningless unless the expression is qualified with the amount of Big Bulk outturn. To decide whether a higher Big Bulk outturn (lower percentage of Fannings) is better than a smaller Big Bulk outturn (higher percentage of Fannings) all the grades must be valued and the average price obtained. The effect on the average price depends of course on the locality of the factory (whether low elevation or high); and on the state of the market, and is a matter for experiment by anyone interested. Suffice it to say that the lower Big Bulk outturn would result in more broken grades irrespective of what form of rolling is adopted.

Another important factor generally lost sight of is the influence of size of the roll-breaker mesh. It was shewn that heavy pressure gave the same results as light pressure. In these experiments the same roll-breaker mesh was used and the same Big Bulk outturn aimed at. Dhool outturns were naturally higher for the heavy pressure teas on account of the less number of rolls done. In another series of experiments, however, where the same number of rolls were done but by the use of smaller mesh, dhool percentages adjusted to the figures obtained for light rolling, the heavy pressure yielded more Fannings by about half its normal outturn. The effect on valuations was as follows:— All the grades except the dusts of the normal rolled teas were preferred in appearance and quality. The extra colour and strength contributed by the heavy pressure did not compensate for the diminution of these two characters. Loss of tip as a result of heavy pressure combined with the effect of smaller mesh was the notable feature.

Further studies of the influence of size of mesh may be summarised as follows:—

No. 4 mesh versus No. 5 mesh.—The increase in the Fannings Grade outturn was only 4% or thereabouts with the smaller mesh. There was very little difference between the two types of Fannings obtained except that the former had a little more tip on account of which it was valued slightly more than the other. The most marked effect of the larger mesh was to increase the outturn of the Flowery Pekoe grade from 7 to 20%. These results were obtained with equal dhool outturns by decreasing the pressure on the No. 4 mesh teas but on repeating the experiment with *equal pressure applications* the outcome of which was to increase the percentage dhools for the former, the Fannings grade was considered appreciably worse in appearance.

No. 5 mesh versus No. 6 mesh.—Once again the use of the smaller mesh resulted in more Fannings being produced, as much as 15% being obtained as against 8% from the former. The Fannings from No. 6 mesh was similar in size perhaps a little blacker, otherwise there was no commercial difference. It is of interest to note that the F.P. percentage of 20 obtained with No. 4 mesh dropped to 3% on using No. 6.

Here seemed a possible method of increasing the Fannings grade outturn but the lower valuation obtained for the B.O.P. grade (from No. 6 mesh) counteracted to some extent any advantage resulting from the production of more Fannings.

Effect of double roll-breaking the dhools.—The results obtained were practically identical with those from the use of a smaller mesh on the roll-breaker.

Continuous rolling.—The method adopted here was to roll the leaf continuously for the same length of overall time as normal rolling without breaks for roll breaking. Pressures were increased at the appropriate times consistent with normal conditions and a final roll-breaking done to remove the Big Bulk. The average grade outturns of a number of experiments were as follows:—

		<u>Continuous Rolling.</u>	<u>Normal Rolling.</u>
B.O.P.	...	50	56
F.P.	...	7	14
Fannings	...	14	8

The outturn of the Fannings grade was almost doubled as a result of this method with a corresponding reduction in the B.O.P. and F.P. outturns. Dusts increased slightly by 1%. The Tasters' remarks and valuations were "Normal has considerably more tip than the other which is inclined to be choppy. Fannings of normal is worth 10-15 cents more on to-day's market and so is the B.O.P."

The experiment, therefore, yielded no useful results, no advantage being gained in this particular instance in the increased Fannings outturn. It is possible that had tip been retained by separating the first dhool an increased value might have been obtained for the Fannings grade but it is open to question whether such a procedure would have benefited the other grades as well. So many modifications could be carried out in tea manufacture that to consider each one in turn would undoubtedly be a lengthy process. Only general principles were considered in these investigations.

The results of the experiments up to now indicated quite clearly that the Fannings outturn is chiefly influenced by two factors, namely, the size of roll breaker mesh used and the total amount of dhool taken out, that is to say, the amount of Big Bulk left over. The appearance of this grade was governed by the absence or presence of tip which was destroyed either by heavy rolling in the early rolls or continuous rolling. Hence, it seemed probable that to get the best results it would be necessary to apply heavy pressure in the later

rolls only. This was done but the grade outturns were *not* affected. The results of this experiment provided further confirmation of the fact that the application of heavy pressure either in early rolls or last rolls made no material difference to the outturn of the Fannings grade.

It is probable that exceptionally heavy pressure would have a marked effect but on account of the practicable limits to which heavy pressure could be applied in an ordinary Batten/Pressure cap roller attention was turned to the use of Epicyclic pressure rolling and cutting battens for bringing about the production of increased Fannings. These two in turn will now be dealt with.

E. P. Rolling.—It must be emphasised that by employing suitable E.P. fittings to get orthodox dhool outturns no fundamental difference is observed between E.P. rolling and Batten/Pressure cap rolling either in outturn of grades or the appearance thereof. The use of an extra large fitting however, for the second rolls enabled more Fannings to be produced without loss of value but at the expense of the other grades. The results are of interest and are given below without comment.

No. of rolls	EXPERIMENT, 2 x 20 minutes.	CONTROL, 3 x 20 minutes.
% dhool outturns: 1	18	18
2	75	28
3	—	42
B.B.	4	9
% grade outturns: B.O.P.	48	64
F.P.	3	7
Fannings	21	10
B.P.	2	4
Dust	11	3
B.M.	8	9
Waste	7	3
Total	<u>100</u>	<u>100</u>

Valuations.—(Control taken as standard for comparison).

Grade	Appearance.	Colour.	Strength.	Quality.	Comparative valuation in Cts.
B.O.P.	S.W.	S.W.	S.W.	E.	- 7
F.P.	S.W.	S.W.	S.W.	E.	- 3
Fannings	E.	S.W.	S.W.	E.	0
B.P.	S.W.	S.W.	S.W.	E.	- 3
Dust	S.B.	S.W.	S.W.	E.	+ 5

S.W.=Slightly worse; E=Equal; S.B.=Slightly better.

In the light of these results it was clear that too high a dhool outturn though increasing the Fannings gave all-round unsatisfactory results. It was then thought that a lower dhool outturn would effect an improvement and an experiment was done to test this out. Instead of one final roll to give 75% dhool, two rolls were done and a smaller fitting used in the first roll to give less dhool so that there would be sufficient leaf for the 2nd and 3rd rolls. The dhool outturns obtained were 10, 55, 24 and B.B.6, but the effect on the Fannings grade was very small. An increase of only 3% over the control was noted. Dusts, however, showed the same remarkable rise as in the previous experiment. A secondary effect of taking these large abnormal dhool outturns was to produce more "addapu" dhool, more than twice the normal amount being obtained.

Cutting Battens.—The use of severe forms of cutting battens affixed to the door of an ordinary batten/pressure cap roller resulted in the Fannings outturn being almost doubled. The general result was almost the same as that obtained

from severe types of E.P. fittings, the value of the Fannings being hardly affected whereas the other grades received a lower valuation than the control on account of poorer appearance and liquor.

Having thus exhausted all the possible methods of approach to increasing of the Fannings outturn by different rolling techniques, the next stage in the investigation was confined to alterations in the grading process. The results are set out below.

Effect of cutting the B.O.P.—An unconventional method was tried out. A Savage cutter was employed. The procedure adopted was to cut the fraction over a No. 18 mesh sieve, normally taken as B.O.P., sieve the cut leaf again and to repeat the operation a number of times. With each cut there was a progressive decrease of B.O.P. and a corresponding increase of fannings, but after the 5th cut the effect was not so noticeable. Working with a normal B.O.P. (Outturn of 67%) it was possible by this means to lower its percentage to 50 and increase the Fannings grade by 15%. The rest of the 2% of leaf was crushed to good saleable Dust in the process.

Increase in percentage outturn.

	Fannings.	Dust.
After first two cuts ...	6.7	0.8
„ third cut ...	2.5	0.4
„ fourth cut ...	2.3	0.4
„ fifth cut ...	2.1	0.4
„ sixth and seventh cuts ...	1.7	0.6
Total increase ...	15.3	2.6

This method seemed to be promising enough to produce an appreciable increase in the Fannings grade outturn, so a true comparison was made and the samples sent to Colombo tasters for their opinion. The B.O.P. was given 5 cuts, the effect of which was to alter the grade outturns as follows:—

B.O.P. dropped from 71 to 57%
 Fannings increased from 10 to 21%
 Dust increased from 5 to 6%.
 and Broken Mixed increased by 2%.

The result of cutting the B.O.P. was to change the appearance considerably. Liquors, however, were not affected, but as a result of the poorer appearance in the cut teas the B.O.P. was valued down 3 cents and the Fannings 4 cents. The effect of the cutting was to produce *brownish* teas. Although the cut B.O.P. was smaller and neater and more even it was rather nearer B.P. in appearance. The appearance of the Fannings grade but for the brownish character was considered quite good and would have sold well depending on market requirements.

Cutting the B.O.P. therefore was obviously not a worthwhile proposition, so the only method available was then adopted, namely, taking the Fannings grade through a larger mesh. Feeding the B.O.P. slowly over a sifter would also increase the outturn of Fannings but the final result is the same. A larger size Fannings is ultimately produced. Experiments were conducted with teas normally rolled, rolled by E.P. methods, and taken through different size roll-breaker meshes. In every instance the B.O.P. had a preferable make and the Fannings grade was much leafier than the standard (taken through No. 18 mesh). Liquors, remarkable to say, were again not affected, as a result of which the Fannings grade taken through the larger mesh received a higher valuation of about 3 cents more than the standard, but the B.O.P.'s were valued the same. The mesh used for these experiments was No. 14 and its effect on the grade outturns is shown by the following figures (average for all the experiments).

B.O.P. dropped from 69% to 53%
 Fannings increased from 11% to 27%.

The results are undoubtedly significant but under present market conditions it is not worthwhile to make the extra Fannings. A simple calculation shews this quite clearly. Taking the average valuations of these samples which were as follows:—

B.O.P's (same in both cases)	...	Rs. 2/79
Fannings through No. 18 mesh	...	" 2/73
" " " 14 "	...	" 2/76

1,000 lbs. of tea, so graded would realize the following prices:—

Teas through No. 18 mesh.		
69% B.O.P.	— 690 lbs.	Rs. 1,925.10
11% Fannings	— 110 lbs.	" 300.30
		Total Rs. 2,225.40
Teas through No. 14 mesh.		
53% B.O.P.	— 530 lbs.	Rs. 1,478.70
27% Fannings	— 270 lbs.	" 745.20
		Total Rs. 2,223.90

Admittedly, had the larger Fannings grade been valued much higher some advantage would have been gained but it must be borne in mind that for there to be any wide margin of preference for the No. 14 mesh teas the two B.O.P's would have to fetch at least the same price. The market today is, however, so difficult to forecast that had these experiments been conducted at a different time the larger B.O.P's (from No. 18 mesh) might have found more favour in which case the increased outturn of the Fannings grade would only have been obtained at the expense of the B.O.P. The fluctuation of market requirements is illustrated by the fact that the Fannings grade which had such a strong market in 1949 has now fallen off in demand possibly due to a glut of this particular grade as a result of over-production. A further illustration may be drawn from the type of Fannings now required. The chief criterion of value in 1949 was appearance, but today it seems to be the good liquoring Fannings that command the best prices.

The question of increasing the percentage of the Fannings grade is, therefore, one surmounted with innumerable difficulties and is mainly an economic one. Special market requirements, seasonal variations, the state of the market, and other factors arising from these, have all to be taken into account when making any change in the percentage of grades. Various methods bearing on the Fannings grade outturn have been described and the results given. Some have resulted in no change while others have caused an appreciable effect. Whichever method is adopted the guiding factor should be not the price obtained for the Fannings grade but the average for all grades. This point need hardly be stressed as it was conclusively shown that the improvement of one grade generally results in a lessening of some character in another.

SUMMARY.

1. Change of rolling technique in respect of pressure and number of rolls made little difference to the Fannings grade outturn.
2. E.P. rolling also made hardly any difference but the use of severe E.P. fittings to crush the leaf did bring about a considerable increase. This method, however, had an adverse effect on the main grades. There was also a marked increase in the Dust outturn.
3. Continuous rolling also gave an appreciable increase in the outturn of Fannings but the resultant teas were poorer than those from the orthodox rolling process.

4. The Fannings outturn was governed by the size of roll breaker mesh used, No. 6 mesh producing nearly twice as much Fannings as obtained from a No. 4 mesh. There was hardly any commercial difference between the Fannings obtained from No. 4 or No. 5 or No. 6 mesh, but the main grades from No. 5 mesh received the most favourable reports. As the influence of the size of the mesh was most shown in the outturn of the F.P. grade the true benefits of an increased Fannings outturn cannot be judged unless the market value of the other grades is taken into account.

5. Double roll breaking had a similar effect to a smaller roll-breaker mesh.

6. Forcing the grade by the employment of severe cutting battens caused an increase of the Fannings outturn without any ill effects to this particular grade, but the main grades lacked twist and liquors were inferior.

7. The importance of the Big Bulk outturn must not be lost sight of when interpreting results obtained by any change in rolling technique.

8. To obtain any appreciable effect by rolling, dhool outturns must be exceptionally high. To accomplish this result special battens have to be fixed to doors of normal Batten/Pressure cap rollers of larger fittings to E.P. rollers.

9. The effect of cutting the B.O.P. was to produce more Fannings but in doing so the B.O.P. grade was spoilt. To obtain an appreciable increase it was found necessary to cut the B.O.P. at least 5 times. Reducing the number of cuts would still have an adverse effect on the appearance but to a lesser degree.

10. The most promising method and the one that gave the most satisfactory results was that which employed the larger mesh in sifting. A leafier variety was produced which in turn resulted in a smaller B.O.P. Whether these two in conjunction would find more favour than a grainier type of Fannings and a larger B.O.P. would of course depend on the market.