CHAPTER FIVE

EFFECT OF OLD AGE AND VACANCY ON PRODUCTIVITY

In the preceeding chapter we have talked about some of the possible factors responsible for productivity decline in Darjeeling tea. Empirical evidences suggest that the increasing age of the bushes is one of the most important contributory factors in limiting the productivity of the tea bushes in Darjeeling. When a tea bush becomes old, the proportion of unproductive tissues becomes more than that of the productive tissues. The productive tissues are responsible for the growth of the different parts of the plants including the green leaves that we harvest for manufacturing of tea. The unproductive tissues are the brown tissues through which the water, organic and inorganic chemicals are channelised from one part of the plants to the another. Therefore, when the unproductive tissues increases in proportion, the productive tissues perform the duty of supporting them by diverting the energy produced by the productive tissues (which otherwise could have been utilised for producing leaves) and thereby the left-over energy is utilised for producing green leaves. That ultimately affect the production of green leaves.[1] To comprehend the ill effect of age on productivity Hadfield (1971) conducted a study in 23 different gardens of Jorhat, Assam. From this study Hadfield came to the conclusion that "although the total crop has increased steadily over last 10 years the yield per hectare has remained virtually constant, and nearly all of the increase has come from either extensions or replantings. If we assume that the tea planted in the last 20 years is doing better than the tea it replaced, we must also assume that the some of the original tea is decreasing in yield at almost the same rate as the new tea is increasing".[2] That means, in the gardens under survey, the young tea planted in last 20 years were compensating the decrease in yield caused by the old age of certain bushes.

To what extent the aforesaid phenomenon is true in the case of Darjeeling tea, was a point of enquiry for the present study. And for that, gardens of different valleys and altitudes were randomly selected. Then data on age, yield per hectare for last 25 years (1971-1995), pruning style in each year etc., were collected. In order to identify the yield trend with the passage of time, three sections of each of the garden were randomly selected. For yield trend, the average yield per hectare of a section over a pruning cycle was calculated.

During the winter months when the tea bushes become dormant and do not

flush, different pruning operations are carried out in the tea gardens to get sustained yield over the years. It has been observed that if the tea bushes are not pruned consecutively for years together then both the production and the quality detoriates. To overcome this particular problem and also to have better and convenient crop distribution as per the demand of the market and to reduce the pest and disease attacks different pruning operations are done at different heights. These operations are Light pruning (LP), Deep skiffing (DS), Medium skiffing (MS), Light skiffing (LS) and Level off skiffing (LOS). The particulars regarding these operations are described below : (a) Light pruning (LP) is a trimming given 4-5 cm above the last pruning mark. (b) Deep skiffing (DS) is a trimming given at a height that is midway between the last pruning mark and the plucking level.

(c) Medium skiffing (MS) is a trimming given just below the majority of the crows feet. Generally, in Darjeeling, a section is kept light skiffed or level off skiffed for a year or two after light pruning. Then a crow's feet like structure develops during plucking. Medium skiff is given just below this crow's feet. (d) Light skiff (LS) is a trimming which is given at the current years tipping level (Tipping level is the level where the plucking starts). (e) Level off skiff (LOS) is the skiffing done at 5 cm above the current year's tipping level to level up the plucking table by removing any plucking stubs or old leaves that stick above plucking table. Besides the above, three other types of pruning which are also done in the tea gardens of Darjeeling are as follows :

(i) Collar prune (CP) - the pruning is done at the collar of the bushes removing almost everything above the ground.

(ii) Rejuvenation pruning (RP) is done between 20-35 cm height from the ground level in case of chinary and china hybrid type of bushes and 40-45 cm in case of Assam type of bushes. This type of pruning is done to rejuvenate a section whose yield is gradually declining due to very old age, vacancy etc.

(iii) Medium pruning (MP) - the pruning is done at 40-45 cm height from the ground level in case of chinery and china hybrid type of bushes, and 45-55 cm from the ground level in case of Assam type of bushes (See Fig. 5.1). This type of pruning is done to reduce the height of the tea bushes of the sections when the same becomes unmanageable for plucking and for renewal of the top frame. Generally lighter forms of cut i.e. DS, MS, LS or LOS follows pruning i.e. LP, MP, CP or RP. A pruning cycle is the period between two successive pruning. If

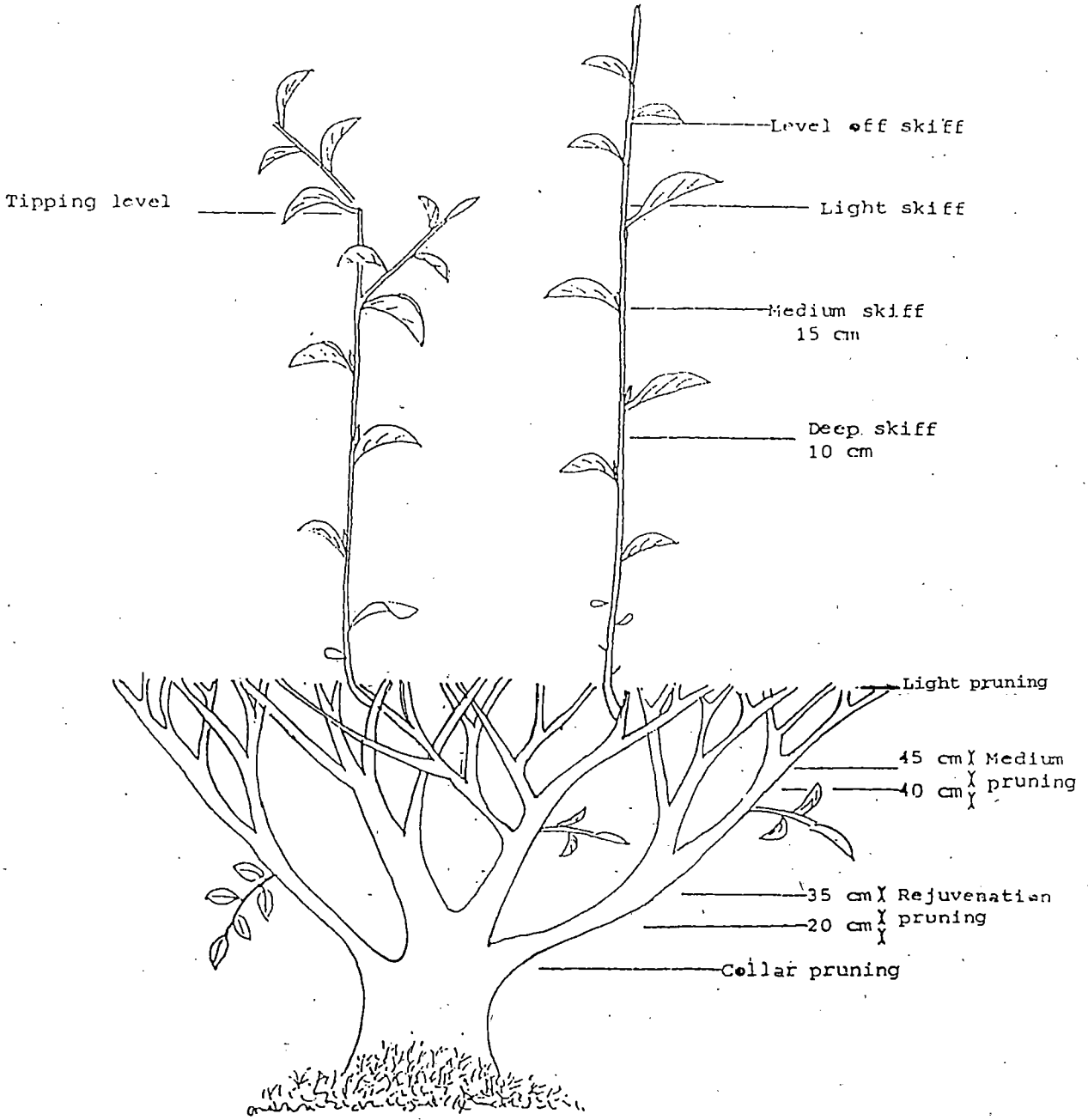

Fig. 5.1 : Different types of pruning & skiffing of a tea bush

a pruning cycle of LP-DS-MS-LOS is followed then it is a pruning cycle of 4 years. If the same is of LP-DS-LOS, it is a pruning cycle of 3 years. While calculating the average yield, the yield from LP year to the year before next pruning year i.e. the whole pruning cycle was taken. As the LP operation is not done in all the sections within the same year, and no fixed pruning cycle is followed in all the sections or even in the same sections continuously, the yield per hectare was calculated accordingly. Moreover, it is a fact that the same sections give different types of yield under the different type of pruning opeations.[3] Table 5.1 shows the average yields of selected sections in different pruning cycles.

Table 5.1 : Average yield of different sections in different gardens by years in kg/ha

Garden A **Section No. &** **Year of planting**	**Pruning cycles (years)**				
Section No. A1 (1867)	1971-73	1974-79	1980-81	1982-87	1988-91
	1030.0	1026.0	959.0	997.0	909.0
Section No. A2 (1870)	1975-78	1979-88	1989-93		
	1149.0	929.0	821.0		
Section No. A3 (1925)	1979-86	1987-90	1991-95		
	958.0	876.0	630.0		
Garden B **Section No. &** **Year of planting**	**Pruning cycles (years)**				
Section No. B1 (1868)	1980-85	1986-90			
	1102.0	938.0			
Section No. B2 (1927)	1978-86	1987-91			
	1518.0	1053.0			
Section No B3 (1948)	1976-83	1984-87	1988-92		
	1243.0	1132.0	1084.0		

Garden C Section No. & year of planting	Pruning cycles (years)			
Section No. C1 (Unknown more than 100 years)	1983-87	1988-92		
	817.0	788.0		
Section No. C2 (Unknown more than 100 years)	1981-85	1986-90		
	695.0	632.0		
Section No. C3 (Unknown more than 100 years)	1981-84	1985-89		
	754.0	683.0		
Garden D Section No. & year of planting	**Pruning cycles (years)**			
Section No.D1 (1876)	1984-88	1989-93		
	1170.0	1069.0		
Section No.D2 (1876)	1980-84	1985-89	1990-94	
	1034.0	1030.0	799.0	
Section No.D3 (1875)	1982-85	1986-90	1991-95	
	1448.0	1353.0	919.0	
Garden E Section No. & year of planting	**Pruning cycles (years)**			
Section No.E1 (1864)	1976-78	1979-82	1983-88	1989-93
	769.0	901.0	726.0	665.0
Section No.E2 (1864)	1980-83	1984-90	1991-94	
	803.0	798.0	626.0	
Section No.E3 (1884)	1972-86	1987-89	1990-91	1992-94
	870.0	759.0	677.0	535.0

Source : *Data collected by the author.*

From the above table we see that in case of Garden A, the yield of section No. A1 came down from 1030 kg/ha to 909 kg/ha over the time. In case of section No. A2 and A3 also we see the similar declining trend. In case of garden B, the

yield of the sections No. B1, B2 and B3 came down from 1102kg, 1518 kg and 1243 kg per hectare to 938kg, 1053 kg and 1084 kg respectively with the passage of time. In case of Garden C, In all the sections i.e C1, C2 and C3 , as the bushes grew older over the years, the yield came down from 817 kg, 695 kg and 754 kg to 788 kg, 632 kg and 683kg respectively. In the Gardens D and E also all the sections depicted the same declining trend of yield over the years. So we observe a gradual fall in yield in all the sections of all the gardens with the passage of time. As the bushes grew older the yield came down. That further supports the fact that old age is a crucial factor in limiting the yield of Darjeeling tea.

The old age is detrimental to productivity of tea can be further probed with the support of field data. A few sections of Garden A, which were planted in different years were selected for this study. The average yield of a pruning cycle of said particular sections having same type of pruning in the same years was calculated. The obtained figures are presented in table below :

Table 5.2 : Average yield of different sections planted in different years for a particular period for the same pruning cycle followed

Garden A	**Year**	**Pruning & Yield in kg/ha**			**Average yield of the pruning cycle**
Section No.	1987	1988	1989	1990	
A3 (Planted in 1925)	LP 375	LS 963	LS 1063	LS 1102	875.75
A4 (Planted in 1865)	LP 482	LS 623	LS 732	LS 716	638.25

Source : *Data collected by the author.*

Both the sections in garden 'A' were planted in the same spacing of 120 cm x 120 cm with the same China-hybrid type of tea. But the section No. A4 was planted in 1865 and the section No. A3 was planted in 1925. These two sections were under the same pruning cycle of LP-LS-LS-LS. But it is interesting enough to note that the average yield for the period 1987-1990 in the case of Section No. A3 was relatively better and 37.21% higher than that of Section No. A4, which was older one. This again supports the fact that old age is having a negetive bearing on the yield of the tea bushes.

In order to ascertain the possible ill-effects of old age on productivity, the same experiment was designed in another way. The productivity of five highest yielding sections and five lowest yielding sections (according to order of merit) during the period 1981-1995 was recorded from a few randomly selected gardens. The findings in detail are given in Table 5.3

Table 5.3 : Average yield in kg/ha of 15 years (1981-95), year of planting and age of five highest and lowest yielding sections of different gardens

Garden A

Section No.	Average yield of 15 years	year of planting	Age as on 1995
A5	1165	1958	37
A6	1139	1964	31
A7	1016	1960	35
A8	961	1925	70
A9	891	1964	31
A10	861	1868	127
A11	849	1865	130
A2	848	1870	125
A12	844	1864	131
A4	630	1865	130

Garden B

Section No.	Average yield of 15 years	Year of planting	Age as on 1995
B4	1359	1893	102
B5	1316	1896	99
B2	1275	1927	68
B6	1250	1960	35
B7	1237	1961	34
B8	545	1827	168
B9	520	1829	166
B10	497	1835	160
B11	449	1853	142
B12	386	1839	156

Garden F

Section No.	average yield of 15 years	Year of planting	Age as on 1995
F1	1957	1969-70	25-26
F2	1345	1949	46
F3	1255	1922-31	64-73
F4	1208	1919	76
F5	1164	1920	75
F6	934	1883-85	110-112
F7	929	1883	112
F8	887	1883	112
F9	835	before 1883	More than 112 yrs.
F10	829	1889	106

Garden D

Section No.	Average yield of 15 years	Year of planting	Age as on 1995
D4	1703	1971	24
D5	1179	1977	18
D6	1166	1966	29
D7	958	1970	25
D8	912	1970	25
D3	862	1875	120
D9	810	1876	119
D10	806	1876	119
D11	687	1876	119
D12	668	1876	119

Garden G

Section No.	Average yield of 15 years	Year of planting	Age as on 1995
G1	1148	1901	94
G2	1128	1919	76
G3	1032	1924	71
G4	1015	1917-18	77-78
G5	916	1916-17	78-79
G6	371	Exact year not known as records could not be available. But from the older people working in the garden it was known that planting was done between 1815 to 1880	
G7	362		
G8	334		
G9	329		
G10	312		

Source : Data collected by the author.

From the above tables we see taht in case of Garden A the sections which were younger in age i.e A5, A6, A7, A8 and A9 yielded higher than those which are older in age i.e A10, A11, A2, A12 and A4. The section No A5 which is 37 years old gave the average yield of 1165 kg/ha for 15 years which is almost double than the average yield of the section No A4 which is 130 years' old as on 1995. In Garden B also we observe the same trend of yield and the younger sections like B4, B5, B2, B6 and B7 outyielded the older sections i.e B8, B9, B10, B11 and B12. In Garden F we again notice that the sections which are more than 100 years old i.e F6, F7, F8, F9 and F10 were lower in yield than the sections which were less than 100 years in age like F1, F2, F3, F4 and F5.In Garden D also we see the same phenomenon i.e the younger sections outyielded the older sections. In Garden G, the sections No G6, G7, G8, G9 and G10 are very old sections which were planted between 1815 to 1880 and their average yield also varied between 312 kg to 371 kg per hectare only which is much lower than the average yield of the younger sections of the garden like G1, G2, G3, G4 and G5 which were planted between 1901 to 1924 and produced 1148 kg, 1128 kg, 1032 kg, 1015 kg and 916 kg per hectare respectively. Therefore we see that in all the five selected gardens the highest yielding sections were comparatively younger in age. In contrast the lowest yielding sections were older in age with some minor exceptions. This supports the fact that old age is a limiting factor for productivity.

Further, there are reasons to believe that old age may be an important limiting factor for productivity but this is not the only factor. Because if it would have been the one and only factor responsible for the declining yield, then the Section No. B4 of Garden B which was planted in 1893 should have given less yield than the sections like B2, B5, B6 and B7 which were planted later. For the same simple reason the section No. A2 of Garden A, planted in 1870, should have given more yield than section No. A10 which was planted in 1868.

While making a further probe into the matter it was identified that the section No. B4 of Garden B had less vacancy than the other younger sections. Similarly within the same Garden A the section No. A10 had less vacancy than the section No. A2. Thus it appears that the factor of 'vacancy' is also playing an important role in determining the productivity of Darjeeling tea. It is true equally both for the old and the young bushes. With the advancement of age of the plants, their mortality becomes inevitable and that causes vacancy. Thus more vacant patches are found in the sections which are older in age and those

adversely affect the production. To find out the effect of vacancy on productivity, the vacancy situations in the best yielding and the lowest yielding sections of Garden A and some other gardens as well were studied. The findings are given below in Table 5.4

Table 5.4 : Percentage of vacancy in the highest and lowest yielding sections of Garden A

Highest yielding sections	*Yield (kg/ha)	Percentage of vacancy	Lowest yielding sections	*Yield (kg/ha)	Percentage of vacancy
A5	1165	0.25	A4	630	5.0
A6	1139	0.50	A12	844	4.0
A7	1016	1.0	A2	848	9.0
A8	961	0.25	A11	849	7.0
A9	891	1.0	A10	861	3.5

* Yield is the average yield for the period between 1981-95

Source : *Data collected by the author.*

From Table 5.4 it is well evident that in the garden 'A' the lowest yielding sections are having more vacancy than the highest yielding sections. In this context it needs to mention that the Garden A is one of the good gardens of the district and where vacancy is less even in the lowest producing areas. The ill-effect of vacancy on productivity may be better understood from the difference in the proportion of vacancy between the highest and lowest yielding sections of the following gardens as shown in Table 5.5.

Table 5.5 : Percentage of vacancy in the highest and lowest yielding sections of gardens H, G, F and B

Highest yielding sections	*Yield (kg/ha)	Percentage of vacancy	Lowest yielding sections	*Yield (kg/ha)	Percentage of vacancy
Garden H					
H1	1034	3,28	H6	473	16.91
H2	1023	1.92	H7	586	11.17
H3	1012	5.61	H8	601	11.82
H4	1008	2.71	H9	689	23.06
H5	918	8.95	H10	698	18.15
Garden G					
G1	1148	10	G10	312	25
G2	1128	2	G9	329	5
G3	1032	2	G8	334	25
G4	1015	5	G7	362	30
G5	916	10	G6	371	15
Garden F					
F1	1957	-	F10	829	13.29
F2	1345	3.28	F9	835	9.75
F3	1255	4.15	F8	887	18.62
F4	1208	2.56	F7	929	4.81
F5	1164	6.00	F6	934	6.27
Garden B					
B4	1359	3.00	B12	386	8.00
B5	1316	6.00	B11	449	8.00
B2	1275	6.00	B10	497	8.50
B6	1250	5.00	B9	520	8.00
B7	1237	6.00	B8	545	6.00

*Yield is the average yield for the period between 1981-1995.

Source : *Data collected by the author.*

Table 5.5 depicts that in Garden H, the highest yielding sections are having less vacancy than the lowest yielding sections. Same phenomenon is observed in case of Garden B also except sections No B7 and B8 which are having the same percentage of vacancy. But if we consider the age of these two sections then we see that section No B7 which produced 1237 kg per hectare was only 34 years' old whereas the age of section No B8 was 168 years as on 1995. In case of Garden G and F also, in general the highest yielding sections are having lower vacancy percentage except some minor exceptions like Section No. G9 of Garden G and Section No F7 of Garden F. But a careful examination of Table 5.3 will reveal the fact that Section No. G9 of Garden G is an old section of

unknown age and Section No. F7 of Garden F is 112 years old. Although these two sections are not having much vacancy the yield is less because of their old age.

On the whole the two factors viz. old age of the bushes and the vacancy are undoubtedly bringing down the productivity of Darjeeling tea industry.

Notes

1. Baruah, D N (1971), P. 32

2. Hadfield, W (1971), P. 2

3. In the past the bushes used to be pruned annually. Later on different types of skiffing were introduced to have increased production. Generally following are the gain in crop from various forms of skiffing over annual pruning.

Deep skiff	:	10-15 per cent
Medium skiff	:	15-20 "
Light skiff	:	20-25 "
Level skiff and unprune	:	25-30 "