14. *No. XIII Plot*, 1866, *A.*—4·10 acres, shola soil, nearly all Officinalis, growth good but planted originally too far apart, barked three times.

15. *No. XIV Plot*, 1866, *B.*—14·34 acres, shola soil, all Succirubra of very fine growth, barked six times; there was a good deal of Calisaya in this plot, but it all died out some years ago.

16. *No. XV Plot*, 1866, *C.*—12·45 acres, shola soil, Succirubra except a small quantity of very fine old Officinalis and some young Calisaya and Pubescens, growth of Succirubra very fine, barked six times, about one acre formerly planted with Calisaya, all dying or dead, was uprooted, yield of bark 730 lb, sale proceeds unknown; this block has been replanted with 2,000 young Calisaya and 600 young Pubescens.

17. *No. XVI Plot*, 1868, *A.*—3·71 acres, all shola, planted chiefly with Succirubra, has been burnt over more than once, now poor and very thin, only about 300 trees remaining, soil poor and scarcely worth replanting.

18. *No. XVII Plot*, 1868, *B.*—8·13 acres, all shola, about one-third facing west very much blown, planted with Succirubra, condition bad; about two-thirds facing east, Succirubra and Officinalis, about alternate trees very fair growth, all barked twice.

19. *No. XVIII Plot*, 1869, *A.*—9·96 acres, grass land, nearly all Succirubra, growth fair, particularly in lower portion, trees not barked; 400 Officinalis barked twice.

20. *No. XIX Plot*, 1869, *B.*—11·83 acres, grass land, all Succirubra, upper portion exposed and growth very poor and thin and should be uprooted and replaced by Officinalis, lower portion fair growth of Red barks for grass land, trees not barked.

21. *No. XX Plot*, 1869, *C.*—13·69 acres, grass land, 2 acres Officinalis, good growth, all barked, balance Succirubra not barked, fair growth for the soil, but should all be uprooted and replaced by Officinalis which may be said of all grass land planted with Succirubra in these plantations.

22. **No XXI Plot*, 1869. *D.*—13·26 acres, grass land except a small patch of shola land, all Succirubra except a few supplies of Officinalis, not barked, except the small bit of shola soil all poor growth and very thin in the upper portions, should be uprooted and planted with Officinalis.

*Major Walker's remarks on these two plots are evidently reversed.

23. **No. XXII Plot*, 1869, E.—12·18 acres, all shola land except a small corner of grass land (about 50 trees), all Succirubra except supplies of Officinalis, growth very good, not barked.

24. *No. XXIII Plot*, 1869, *E.*—11·54 acres, two-thirds shola, one-third grass land, all Succirubra except supplies of Officinalis, growth very good on the shola soil, fair on the grass land, trees not barked, 5 acres coppiced in 1879, balance scraped in 1880, 5 acres Succirubra coppiced in July 1879 (in the same manner as in Plot No. VII), 2,628 unbarked trees cut, all stools bled terribly, 973 dead and uprooted, 1,655 growth healthy, shoots 1 to 3 to each stool, 3 to 4 feet high, blanks from the uprootals to be planted with Pubescens.

Six acres 4,723 Succirubra trees scraped in September 1880 on the new Java principle, ~~Of the trees~~ none were mossed or covered in any way as it was not supposed to be necessary, 1,978 trees have failed to renew their bark, and the bark and cambium being apparently all dead it is supposed the trees must die, and some have already died; the remainder are renewing their bark satisfactorily, and might probably be scraped again in 1882, but not before.

25. *No. XXIV Plot*, 1869, *G.*—20·19 acres, all shola land, all Succirubra and Pubescens except supplies of Officinalis, not barked, splendid growth, Pubescens about 20 per cent.

26. *No. XXV Plot*, 1869, *H.*—9·20 acres, all shola except a small bit of grass land; shola soil planted with Succirubra, not barked, growth very good; grass land planted with Officinalis, all barked.

27. *No. XXVI Plot*, 1869, *I.*—2·55 acres, shola land, all Succirubra of very good growth, barked four times.

28. *No. XXVII Plot*, 1870, *A.*—11·52 acres, grass land, now two-thirds Officinalis and one-third Succirubra, originally planted entirely with Succirubra which mostly died out and was replanted in 1872-73, the remainder of the Succirubra should be uprooted and replaced by Officinalis or Pubescens, the Officinalis growth is not good owing to exposure and poverty of soil, but it will pay, not barked.

29. *No. XXVIII Plot*, 1870, *B.*—16·37 acres, grass land, an entire failure, uprooted and abandoned, and now pitted for planting Australian acacias for fuel.

30. *No. XXIX Plot*, 1870, *C.*—4·30 acres in three separate blocks—

First block.—Grass land, Officinalis, growth good, but too widely planted, barked twice.

Second block.—All shola land, mixture of Succirubra, Officinalis, Calisaya, Javanica and Anglica, not barked, growth good, except the Calisaya. The Anglica and shrubby Javanica of no value.

Third block.—All shola, chiefly Succirubra with a few Officinalis, growth good, not barked.

31. *Naduvatam Buildings.*—A drying house and new store have been sanctioned at Naduvatam; the work is progressing very slowly, less than one lakh of bricks having been made; owing to the want of this building only a small crop can be collected this coming season.

The general condition of the buildings, other than the stores, is good; the lines for the coolies are also in good order; the house now occupied by the Overseer and the one occupied by the Clerk should have an iron roof substituted for the grass one.

32. *State of Naduvatam Plantations.*—The Naduvatam plantations certainly show very fine growth, and though I inspected them at the beginning of May after an unusually dry April and at the end of a long season of drought when all the grass hills were as brown as the roads, they were in splendid condition and healthy foliage; taking into consideration the mistake of too wide planting, I think they are all that could possibly be expected and in every way satisfactory. In planting up a large area like this site, it is of course impossible always to avoid too great exposure to wind, bad soil, bad drainage, &c., and there are here and there failures from these causes; but this could not be otherwise; and even in many places where the growth is poor it pays well at the prices bark is now realizing.

33. *Fencing.*—A considerable expenditure is necessary in fencing in several of the plots, if they are to be properly kept up; as the Sámbur are most troublesome, it will well pay.

34. *Wide planting.*—The great mistake here as elsewhere has been the wide-planting. It was probably supposed that the trees would grow to a far larger size than they now promise; but even supposing that this had occurred, there was the established fact that such large trees as Teak and Eucalyptus had to be planted 6′×6′ and afterwards gradually thinned out, otherwise good growth could not be secured: wide planting causes crooked growth and often no fair boll and gives the wind an unfair advantage. The planting was originally 12′×12′, but reduced gradually afterwards down to 8′×8′ and 7′×7′. I am of opinion that the planting of "Succirubra" should always be 5′×5′ or certainly not more than 6′×6′ and that the first thinning (alternate lines ~~leaving~~ leaving the trees 10′×5′ or 12′×6′) need not take place till there would be some yield from the bark, and that at the final thinning the trees may stand 10′×10′ or 12′×12′. "Officinalis" should be planted 4′×4′ or perhaps even closer; intermediate planting is always very precarious owing to the shade and drip of existing trees, and 25 or even 50 per cent. very often appear to fail. Throughout the plantations one sees evidence of the great mistake wide planting has been.

35. *Is barking injurious or not to the trees?*—There is certainly no proof that barking in any way affects the health of the trees. I was formerly of opinion that

it did, and fancied I detected it in the appearance of the trees, so I was prejudiced in a way, but I made most careful inspection of both barked and unbarked trees both from a distance and close, and could detect no difference in foliage or any way else, and it is a fact that the trees barked seven to eight times are some of the healthiest and finest in growth, foliage and every way, in the plantation, and that they are now flowering and seeding less prolifically, and that the barked trees have grown quite as well, if not better, from coppice, which shows that their root system must be quite as healthy; this is also Mr. Rowson's opinion.

Mr. Rowson thinks that the trees appear to suffer somewhat for a month or six weeks after being stripped, getting somewhat yellowish in leaf, but that they rapidly recover, so that if inspected just after the barking a prejudice might easily be entertained against the system.

Trees that have been barked several times often bear fewer branches, but this is owing to the pruning and to branches having been broken off; the foliage is just as thick as in unbarked trees.

Some trees do fail to renew their bark after being stripped, but it is very uncommon, and it is very rare to find a really healthy tree die out from its effects.

The bark renews just as rapidly in the subsequent strippings as it does in the first, and there is no perceptible difference in its thickness, the renewal is always more rapid on rich soil than on poor. Carelessness in barking prevents immediate renewal and may cause the death of a tree.

36. *Elevation for "Succirubra."*—The "Succirubra" does not attain the same size at Naduvatam as it does in Wynaad and elsewhere at lower elevations; it grows to about 50 feet in Ecuador, and on the Tinnevelly ghâts at 3,000 feet it has been measured 52 feet in height; at Naduvatam no trees are quite 40 feet: 5,000 to 6,000 feet is probably too high an elevation for large growth, but it is said (I do not know how far correctly) that the bark at these higher elevations is more valuable; in any case "Succirubra" pays well on shola soil at Naduvatam.

37. *Longevity of "Succirubra."*—"Succirubra" is probably not a long-lived tree, but we cannot state the age it will attain when left unbarked, or when barked until we have actual data, and a good quantity of unbarked trees must be left for this purpose.

38. *Method of harvesting.*—With the established facts that the eight times barked trees are still perfectly healthy and that the renewed bark is far more valuable than the natural bark, it would not be advisable to adopt any other system than the present one, the credit of which entirely belongs to Mr. MacIvor; and it should, I certainly think, be pursued as long as the trees appear healthy, but trees showing signs of decay should be either coppiced or uprooted.

39. *Coppicing.*—The marginal paragraphs, if referred to, show the results of the coppicing at Naduvatam in 1879; the coppicing process was very well carried out, the stools being sawn through about 3 inches above the ground and adzed over with a convex surface to nearly flush with the ground; the growth is very healthy and promising wherever the coppice has succeeded.

Paragraph 7, No. VI Plot, 1864, C.
" 8, " VII " 1864, D.
" 24, " XXIII " 1869, F.

In the 1864 planting, 2,319 "Succirubra" trees, all previously barked four times, were carefully coppiced early in June 1879; 185 stools have died, 2,134 are growing luxuriantly.

In the 1869 planting, 2,628 unbarked "Succirubra" trees coppiced in the same manner in July 1879; 973 stools died, 1,655 growing luxuriantly.

Here we have a great anomaly: trees fifteen years old have succeeded from coppice with a far better percentage than trees only ten years old; this is quite opposed to my experience in the coppice of any other trees, the growth being generally far more successful in the younger trees; old or even mature trees often failing altogether to make coppice growth beyond a few twigs which die off, when saplings or young trees of the same species grow most readily; this is always the

case with "Teak" and "Babul." Again, it is noteworthy that the four-times barked trees have succeeded from coppice with a better percentage than the unbarked trees.

Both these data however are more or less valueless, as the 1869 planting was coppiced nearly a month later than that of 1864 the sap was therefore more up and the trees bled much more which may account for the extra failures.

The coppicing of both years was carried out too late, and I am inclined to attribute the failures to this cause as the stools bled terribly: if the coppice had been in April or early in May, it is probable there would have been no failures at least of healthy trees.

Of the old coppicing experiments carried out more roughly, where fifty-seven unbarked "Succirubra" trees of 1862 planting were clean coppiced in October 1873, all suckers removed, twenty-two have died, thirty-five have grown well and are about twenty feet high, and of fifty-eight trees of the same year coppiced in May 1873, but the suckers left standing, only one stool is dead; and of 200 "Succirubra" of the same year in another block coppiced in May 1871 (when nine years old) suckers left standing, only one stool died; the 199 again coppiced in March 1881 (when 10 years old) no regrowth yet, but sufficient time has not elapsed. The yield of green bark in 1871 was 1,350 lb., but in 1881 it was 3,365 lb., which is noteworthy; and of 115 "Succirubra" of the same year, but of poor growth and unbarked, coppiced in May 1875, thirty-three stools died, the surviving eighty-two about 9 feet high and $5\frac{1}{2}$ inches in girth.

I do not think we should carry out any further coppicing in blocks, but only coppice trees showing signs of decay. I observed here and there dead trees in the different plantations. A tree should never be allowed to die; as its bark then yields no alkaloids; they should be coppiced or uprooted when the signs of decay are evident. It is an established fact that if a sucker or shoot is left when the tree is coppiced it never dies, and when trees have no shoots one can easily be produced by slightly injuring the bark close to the ground. It is also an established fact that if trees are coppiced in June or July, when the sap is well up, there must be many failures owing probably to the excessive bleeding that takes place. We have not sufficient data to say whether trees coppiced in April or early in May will all grow again without any failures.

40. *Uprooting.*—I do not think that this is to be thought of as a harvesting system, but I would uproot all "Succirubra" on grass land at Naduvatam and elsewhere, where it is advisable to replace it with "Officinalis" or "Pubescens." It is doubtful how far seedlings will succeed on land immediately after it is uprooted; it will probably be found necessary that it should remain fallow for a certain period.

41. *Scraping.*—As to the new Java method of scraping, we want, I think, more experience. This first attempt (*vide* paragraph 24) has, it will be seen, proved a failure with "Succirubra," and caused the loss of a great number of trees; it would probably not fail if the trees were mossed or grassed over after the scraping, but one of its advantages was the supposition that the expense of this would be unnecessary. I am inclined to think that the trees are much more likely to suffer from the complete scraping than from the partial barking in alternate strips; we have yet to learn if the scraped bark is more valuable in the market than the stripped bark.

42. *Grass, a substitute for Moss.*—For the last two years Mr. Rowson has employed the coarse Lemon grass of the hills (*Andropogon Martini* and *Schœnanthus*) as a substitute for moss for covering the trees after stripping off the bark; it appears to answer in every way as well as moss, the bark never failing to renew; the grass of course lacks the hydrometric properties of moss, and it is possible that bark renewed under it may not be so replete with alkaloids. But I see no reason to fear this; the grass costs only about one-third what moss does, and moss might in time be exterminated; the moss must act like a sponge round the tree in wet weather when the bark is growing most rapidly, and considering how replete the bark itself is with moisture, this is, I think, more likely to be injurious than beneficial; all that is probably required being protection from solar influences and from