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/1282.

Peradeniya.

2 June 1899.

Dear Mr. Ridley

Yours of 23rd May rec^d today.
we have no *Castilloa* seeds to
spare & badly want some for
ourselves.

With regard to cuttings, some
of the best Para rubber trees
here are from them. & 12-15
years old. I fancy cuttings
of lateral branches will not
do so well.

We should like some *Sapros
Rimplicii* seed very much
I leave for England on the

B9.1/1

B9.1/2

11th inst. hope to be back
on November 7

Yours sincerely

John Curtis

Botanic Gardens
Singapore
Nov. 4. 1905

Sir

I have the pleasure to forward herewith the first Annual Report on the experiments in Rubber Tapping made in the Botanic Gardens. It will be seen that the results of these experiments have proved certain very important facts, as to growth of trees, yield of rubber, the best methods of procuring and preparing latex, and other important points, and further the records made form a valuable basis for the continued researches of this and succeeding years.

It will be seen that the rubber prepared during the experiments fetched on sale in all cases the highest price in the market at the time, showing the care taken in its preparation.

The Assistant Superintendent Mr R Derry was indefatigable in carrying out these experiments.

which entailed a great deal
of extra work, the experiments
being carried out largely in
the early morning between 5.30
and ~~seven~~ 7 am, and in the
late evening till 9 pm, both
on week days and Sundays
and during my absence in
Christmas Island last year
and in the Native States &
Borneo the work fell
entirely on him.

Portions of the results, and
calculations have been already
published in the Agricultural
Bulletin and these are added
to the report sent in herewith.

I have the honour to be

Sir

Your obedient servant

Henry R. Pridley

Director of Gardens

The Hon Colonial Secretary

Botanic gardens,
Singapore
June 11, 1906.

Sir

I have the honour to state that in accordance with instructions I visited Malacca, and Province Wellesley to examine into the cultivation of *Taproca* in conjunction with Para rubber, and to submit the following journal of itinerary and observations on the combined cultivations of *Taproca* and other catch-crops with the rubber.

I left Singapore on Saturday June 9th by the S. Malacca arriving at Malacca on Sunday morning, (10th June 18.) I visited Ayer Keroh gardens in company with the Hon. Resident-Councillor. The Para rubber plants planted in Salang near this place in 1896 were doing poorly, the trees had made little growth and the leaves were pale and sickly looking. The biggest I saw and measured was only 19 inches round at three feet from the ground. In the reservoir gardens where the soil is better the Para rubber trees were growing well and fully up to size for their age. Here too were some good Ceara rubber trees, though not many were remarkable in size. The biggest measured 22 and 33½ inches in girth at three feet from the ground.

In passing I observed the
Guttapercha trees in the forest
by the road were making good
growth, and very thriving.

June 14, Accompanied by Mr. Firmstone
and Mr. Capeland, I started for Bukit
Asahan, in Mr. Tan Chey Yau's motor
car, at 9.30 am. On stopping for ^{breakfast} ~~breakfast~~
at Jasin, it was discovered that the
tire of one of the wheels of the car was broken
through, but we managed to reach the
estate of Bukit Asahan at midday.
On the way I observed the extensive
cultivation of rubber along both
sides of the road, and the extent
of the area under this cultivation and
its excellent growth impressed me
much. I was by no means prepared
for such a development of this
cultivation in this district. In previous
years when travelling on this road, we
passed through great tracts of Salang
but now these are nearly all gone
and replaced by tapia interspersed
with Para rubber which in most parts
has already grown well above the catch-
crop. ~~Many~~ In other parts I was struck
by the remarkable recuperation of the
ground by secondary growth, replacing
the former wastes of Salang. Mr. Firmstone
pointed out spots which ten years previously
had been planted with tapia, then covered
with Salang, on the abandoning of the tapia.

and which ~~now~~ ^{were} re covered by a
dense mass of secondary jungle
and fit for planting again, either
with *Sapisa* or rubber or both com-
bined. To this reforestation of Malaya
wastes I shall refer again later.

At one spot I stopped the car and
examined a ~~large~~ field containing
the second crop of *Sapisa* in which
rubber had been planted. This field
had been ^{previously} secondary forest ~~previously~~,
and the soil was not exceptionally
good. The rubber plants were quite sound
and healthy and had made good
growth for their age. At another spot
I saw healthy tall rubber growing
interplanted with gambier, and noted
that the gambier was much more
carefully cultivated than was usually
the case in Malacca in former years.
The ground was clean, and the plants
properly tended.

After ~~our~~ luncheon at Bukit Asahan
I accompanied by Mr Burgess, Copeland
Armstrong and Fleming started to walk
round the ~~estate~~ estate, my attention
being chiefly directed to the cultivation
of *Sapisa* and rubber in combination,
and I may say at once that in the
greater part of this estate as well as that
of the country previously passed through
where rubber was in cultivation, the soil
was not what I should have selected
for the cultivation of the plant, being

some parts gravelly, in others a light red
soil, fairly or very fertile. I was therefore
not a little surprised at the good appear-
ance of the trees. The younger trees in
most parts were as full and as well grown
as in the soil of alluvial flat. The older
trees from six years old were of full
size and I was informed were giving
a full supply of good latex, near by the
whole of this estate is or has been
under tapioca. The first field visited
was a hilly and somewhat gravelly
one formerly under tapioca, and now
covered thickly with grass and weeds
and especially noticeable were the young
shoots of the tapioca coming up here
and there quite thickly. This field
formerly much neglected had been much
attacked by the *Terminax Gestivi*, and was
the worst part of the estate for this pest.
With all these disadvantages the trees were
well grown for their age and giving a
good supply of latex, showing that old
abandoned tapioca land is perfectly
well suited for rubber cultivation.
The next field visited contained growing tapioca
through which rubber trees had been inter-
planted. These were now 20 months old and
were sound and healthy plants averaging
10 feet in height, some being as much as
20 feet tall. I was informed that there
had been but little mortality among
the trees in this eight acre block.

Continuing through the estate I found the trees in most parts ~~quite~~ equal to those in other estates where no catch crop is grown, except in a few parts where the soil was extremely poor. At one very wet spot some trees had been planted, in Lalang these were yellow and weak, those however planted in the swamp on the opposite side of the road where there was no Lalang were dark green, and much more healthy. This seems to show that Lalang especially in wet ground is very injurious to rubber. However it will be seen later that it is by no means impossible to grow rubber through Lalang with excellent results. An instructive field comprised a dry hill covered with rubber, the seed of which had been sown at stake in Tapirica and at the same time, the trees were four years old, they were not as fully grown as they should have been for their age and were about as big as trees of three years old in suitable ground should be. This I attributed rather to the poverty of the soil than to any effect the Tapirica could have on them, they will probably be tapped next year. This experiment was especially interesting because of the ~~rather~~ very small cost incurred in the method of planting. Further on I saw a field which some years previously had been put under Tapirica cultivation, the owner however failed and this field reverted to Lalang, again it was planted with Tapirica and rubber.

was interplanted. The soil was poor, there had been a considerable mortality among the rubber plants but still there remained about 150 to the acre and these were mostly tall healthy plants. The land could have been worse treated by its former owner, but yet the trees were by no means to be despised.

Looking over the forest of rubber trees in this estate, all or nearly all grown in land which had carried or was carrying *Sapucaia* one could not say that the *Sapucaia* had caused any injury to ^{or delayed the growth of} the rubber but on the ~~contrary~~ contrary it apparently actually ^{plus} improved the poor soil on which the rubber plants were growing.

I saw no trace of the dangerous fungus *Phoma semitortosa* anywhere in Malacca nor did I hear of it, and I have seen but few estates elsewhere where it was not to be found? Nor indeed (except the *Termita* previously mentioned) did I see or hear of any pest animal or vegetable in this estate.

June 13th I left Bukit Asakau with Mr Finnsone and Copeland, after inspecting the *Sapucaia* and rubber factories, in the motor car which however broke down after two miles but with the aid of horses & carriages borrowed from the Diamond Jubilee estate, & Mr Finnsone's & Mr Copeland's horses, reached Malacca that evening at 6.30 pm. On the way I examined

June 13. I left Bukit Asakan after in-
specting the factories of Sapioca
and rubber, and noting a Ceara
rubber tree measuring 47 inches in
girth at 4 feet from the ground, which
was growing in low ground near the
village. Starting with Messrs Furnstone
and Copeland ~~the~~ the motor car
broke down after two miles and had to
be left. Mr Furnstone and I walked on to
the Diamond Jubilee estate where I met
Mr Moorhouse. He took me over part of
the estate where rubber and Sapioca
were growing together. A large area
also formerly under Salween grass
was now cleared and planted up with
rubber. The young trees were growing
strong and well and were quite up to
the average of those grown in other places
where Sapioca is not grown, except
that where ~~there was~~ the Sapioca had
been removed & the trees were taller they
had suffered somewhat from wind. This
interplanting of rubber with the Sapioca
was quite recent here. After luncheon
with Mr Moorhouse, with the aid of his
horses & carriage and those of Mr Furn-
stone & Copeland we arrived at Kuala
at 6.30 pm. On the way I saw a con-
siderable extent of rubber with Sapioca
and also with gambier, all doing well.
At the 14th mile, I stopped for a short
time at Ayer Chermim, the estate of
Mr & Mrs Guan. This consists of

1000 acres of Sapuca interplanted with rubber. The Sapuca was now in the stage of the third crop. The rubber having been planted in the second crop and being now 15 to 18 months old. The soil somewhat sandy and dark coloured. The trees were all in excellent condition, well grown, healthy and of good size, quite equal to any I have seen elsewhere, and some remarkably good. A very large sum of money has been refused for this estate as the owner intends to work the rubber himself in a few years.

The following day I visited Bukit Sentang, and Bukit Duyong. The former little plantation was the first real rubber plantation started in the peninsula in 1896. Mr Tan Chey Yau, ^{the owner} accompanied me. The first trees planted were put at 50 feet apart, and these ten year old trees are remarkably fine. They are not as tall as those growing in lower ground, such as alluvial flat, but had formed very good trunks, and were giving 3 lbs of rubber including scrap, per annum. The rubber had been previously made up as sheet but Mr Tan Chey Yau was now making sheet. He gets a full price for his rubber. A caustic acid is not used. Indeed it appears that many planters are giving the process up, and allowing the rubber

Coagulate naturally, here after the rubber is set and pulled out, it is washed for a day in a water tank and brushed over with a brush, which seems to have the effect of removing the proteid & sugar, so that the odour produced by decomposition of the proteid specifically disappears.

Mr Van Clay has furnished me with a list of the measurement of the ten year old trees, a number of which I also measured myself. This list I give herewith

3 trees 28" dia.	2 trees 29" dia.	2 trees 30" dia.
1 " 31½" "	2 " 32" "	1 " 32½" "
2 " 33½" "	4 " 34" "	2 " 34½" "
7 " 35" "	1 " 35½" "	5 " 36" "
3 " 36½" "	5 " 37" "	1 " 37½" "
1 " 38" "	2 " 38½" "	5 " 39" "
2 " 40" "	1 " 41½" "	4 " 42" "
1 " 42½" "	3 " 43½" "	4 " 44" "
4 " 44½" "	3 " 45" "	4 " 46" "
1 " 46½" "	2 " 47" "	4 " 48" "
1 " 48½" "	3 " 49" "	1 " 50" "
1 " 51" "	2 " 51½" "	2 " 52" "
1 " 52½" "	3 " 54" "	1 " 55" "
2 " 55½" "	1 " 56" "	1 " 56½" "
1 " 57" "	1 " 58" "	1 " 73" "

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an extensive tract of rice field, and the trees on the edge of this have not done so well as those on the slope of the

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43 1/2	35	34	35	40	40	29	36 1/2	38 1/2	55 1/2	51 1/2	51 1/2
20 1/2	34	46	54	35	36	34 1/2	52	44	48 1/2	35 1/2	44
41 1/2	44	34	58	39	50	49	43 1/2	35	56 1/2	37 1/2	38
49	30	54	31 1/2	41	30	42	37	36 1/2	33 1/2	34	35
	52	44	38 1/2	45	36	45	55	44 1/2	30 1/2	54	37
	52 1/2	35	98 1/2	39	48	28	39	55	44 1/2	28	32
	34	45	49	52 1/2	48	44 1/2	29	36	36 1/2	46	42
			38	38 1/2	37	48	46	48	33 1/2	44	34

A brown shell like lead but showing large pits
 extending from near the ground we were
 survey 66 inches the stone 48 at 8 feet
 from the ground. The soil was the same
 rather light-colored soil common in
 Madras, and the ground seems to have
 been recently covered with soil. The
 adjoining land consisting of brick walls &
 masonry. At the foot of the hill trees
 are extensive trees of various kinds, and
 the trees on the edge of the house were
 more so with as there on the slope of the

hill, and have a tendency to fall.

I was informed that previous to the planting of this hill with rubber, the rice fields had almost gone out of cultivation on account of the raid made on the rice by rats & pigs living in the wood. These pests have now disappeared and the fields have again been cultivated and produced last year an exceptionally good crop of ^{paddy} rice. Bukit Duyong is a gravelly, unpromising hill full of large blocks of laterite. It was bought by the present owner, a Chinese man, as a grave yard, but he planted it up with Para rubber and also *Hillughbeia ferina*. The latter is a failure growing in the form of slender twigs as it does at the Botanic Gardens. One apple and fruit trees had been planted on the ground but were poor and withered. The Para rubber had as might be expected made but a poor growth, yet such is the vitality of this plant, that the owner was getting two pounds a tree on an average, ~~and~~ the trees being only five years old, and the whole plantation 25 acres was giving him, I was informed 2000 dollars a year. He was making his rubber up in sheets partly cut into strips for convenience of drying.

Next day (June) I drove with Mr
Frimstone to the abandoned garden
at Bukit Selukor, where a small
number of trees had been planted
in 1889. The soil was that
of the usual camping land, flat &
rather low lying. The trees were planted
in ~~rows~~ two rows not parallel, just
close together. They were much taller
than those of Bukit Sinitang but not
much bigger in girth. I measured
the largest which gave at the usual
height (3 feet from the ground) girths of
74, 72, 70, 60, 60, 55

A number of trees of later date planted
in wet swamp, were very poor and
weak.

I left Malacca by train ~~at~~ at mid-
day for Kuala Lumpur, arriving at
6 pm, and remained the night there.
June 17, left Kuala Lumpur at 6.40 am
and arrived at Sibong Debah at 5 pm.
There Mr Turner met me.

June 18, I went in the morning with
Mr Turner to Tali Ayer estate, where I saw
rubber planted through sugar cane.
The trees were planted 18 feet by 15
apart in rows with two rows of cane left
between each row of rubber. They were
from 16 to 18 months old and measured
from 7 to 9 inches in girth, and thoroughly
strong and healthy.

In the evening I visited some fields of rubber tapioea ~~etc~~ planted with rubber. The soil was good flat land but in no way exceptional. The trees were quite regular in height & growth there having been but few specimens requiring replanting. I measured some of the bigger trees, some 2 years and three months old measured, 12, 15, 15 inches respectively, and the three year old tree measured 19 & 21 inches. There is a very large area in this district under tapioea and rubber combined and more is being planted, but all through the growth is as good as could be desired, and there are certainly no signs of any damage being caused by the tapioea, either by interfering with the growth, or by injury caused by digging out the tapioea roots.

Next day (June 19) I visited the plantation near Caledonia where along the railway the trees had been planted in Salang. In this plantation I had seen some years before when the ground was covered with a high growth of Salang. This grass had not been dug out but merely mown down from time to time. The rubber trees had effectually killed it out, a few small patches of half dead Salang were all that was to be seen of it. It seemed to grow & die out under the shadow of the rubber

trees. The trees 5 years & 4 months old gave in measurement, 27, 30, 33 & 35 inches girth. They were being tapped and giving good results. The system of coagulating and drying is as follows the latex is poured into a barrel, from which it runs into a long narrow wooden trough perforated at regular distances, the a tray being put under each opening, into which the latex runs. It is set without the use of acid, and dried on wire netting after rolling out. The drying house, a temporary one of corrugated iron, attains a considerable temperature during the hot part of the day, which contributes to the rapid drying of the rubber.

In the afternoon I went with Mr Turner to Penang, and went to the top of the Hill for the night. Next day (June) inspected the Hill gardens, and after descending the Waterfall gardens which were in good condition, and several improvements being made, in the evening I went with Mr Turner to Teluk Anson by the Lady Weld steamer, arriving 6 am on June - and drove out to Selaba estate where I saw rubber planted among bananas. The rubber was rather too close to the bananas in the first field and the latter, two rows to one of rubber seemed to have shaded the rubber trees rather too much. The other fields were planted in a more

Open manner, The trees were all young but growing well, The bananas gave a profit of 20 dollars an acre.

I then went to two other estates in which rubber was interplanted in sugar, and in land that had been planted with sugar, and was now covered with grass and weeds, The trees were all doing thoroughly well.

I left Teluk Anson again that night and arrived early next morning, visited the garden again, and left that night in the P. & O. steamer Dewnaha which arrived in Singapore about 9 o'clock on June 23, having been delayed by quarantine owing to a case of plague on board at Colombo.

The

Having seen a very considerable amount of rubber plants out of different ages which had been grown in Tapioca and taken measurements of the larger and older ones I have no hesitation in saying that Hevea Braziliensis can be successfully cultivated with Tapioca as a catch-crop, and that I have been unable to find anything to show that they grow more slowly or in any way are inferior to those grown in ordinary cleared forest land. So long as the Tapioca is not allowed to cover up or fall on the young plants no harm is done and I am rather inclined to think that the Tapioca actually fastens the growth of the rubber by protecting the young plant from the action of the weed and excessive sun, and to a large extent aids in preventing denudation of the soil by rain. Nor could I find that any harm was done by digging out the roots of the Tapioca, as I had thought likely. The roots of the young rubber seem to penetrate in most soils suitable for Tapioca to a great depth, so that the Tapioca roots can be removed without injury to those of the rubber. When rubber plants are planted simultaneously with the first crop of root Tapioca little harm in any case could accrue if the Tapioca is kept at a little

Distance from the rubber, as till the
fourth year when the Tapioca is usually
abandoned the roots of the rubber
are not mixed up with those of
the Tapioca to such an extent that
they are liable to injury from dig-
ging out the Tapioca,

Even in the case seen at Butel-
Asaban where the rubber seeds were
planted at stake in the Tapioca, the
growth was satisfactory, ^{considering the} ~~though~~
in this case the soil was decidedly
bad, but assuming that the
soil is ~~is~~ fairly good, did I find
that the mortality among the
young plants was great. In some
^{parts} of the plantations visited ~~where~~
~~where~~ the rubber planted in Tapioca
was not up to the average, but
this appeared to be entirely due
to the very poor, often heavily dunned
soil, and as even poor ground is
often used for Tapioca when it occurs
in the middle of an estate rather than
left unused, it seemed that the
idea that rubber was delayed by
cultivation with Tapioca for a year was
nearly due to its having been planted
in these patches of bad ground, the
fault being due to the soil and
not to the Tapioca. The few trees in
Mr. Turner's estate at Calidocia, showed
that the Tapioca did not affect the
growth of rubber, ^{unusually} when the soil was
suitable,

Mr Hill, who visited the Straits
in 1900 was very enthusiastic on the
cultivation of the two plants together
on the ground that Hevea being
a forest tree, and not accustomed to
grow naturally on bare ground, ~~was~~
The only attempt to combine the two
cultivations however that we saw
at that time was a failure due to the
careless neglect of the young rubber
plants which had been crowded out
by the ~~two~~ close planting of the Tapioca

The question of the possibility of success-
fully combining the cultivation of the
two plants simultaneously is one of
the utmost importance to Malacca.
Tapioca is not only a staple industry
of the country of itself but the
use of the Tapioca refuse depends
the extensive and important pig-
rearing industry, which I understand
is increasing largely on account
of the opening up of the railway
by which pigs can be transported to
the Federated Malay States. But
in addition to this is the very im-
portant fact that by the aid of
Tapioca, and by that aid only, the
poorer class of Chinese are ~~not~~
enabled to cultivate rubber.

The average Chinaman of Malacca
cannot wait for 4 or 5 years, or even till
the rubber which he has planted comes

into bearing, He must be earning
something meanwhile. He requires
a catcher that will pay expenses,
and he finds it in *Stapioea*.
Thanks in great measure to the
cultivation clause, and to the success
of some Chinese in growing ^{and}
preparing rubber for market, great
interest is being shown in the
cultivation of rubber, not with a view
to sell the land as a rubber estate
later, but with a genuine desire to
the part of the proprietor to grow
the plant for profit.

Some years ago crossing Malacca
from Mount Opier to Malacca town
I passed through vast tracts of useless
Salang, especially near Jasin, on
the occasion of this last visit the
face of the country was altogether
altered and unrecognizable, the Salang
has been replaced by *Stapioea* through
which appear the tops of healthy stout
young rubber trees. In a few years
this formerly desert wretched country
will be covered with a forest of
Hevea brasiliensis. The future of
Malacca depends on this cultivation
and the possibility of putting a large
area of waste land under rubber
in a country where there are few
even moderately rich natives depends
entirely on the simultaneous cultivation
of *Stapioea*. It would therefore
be most regrettable if the planting

of tapioca were prohibited or seriously
discouraged in Malacca,

There are still however large tracts of
Salang grass wastes in this country
and it is of considerable importance
to consider how these may be reclaimed
at the lowest possible expense. The cost
of digging out the roots is in many
cases prohibitive, and though Mr
Turner has been remarkably
successful in cultivating rubber
through Salang in such a way
that with little expense, the grass
has disappeared beneath the
shade of the rubber trees, and
Mr Macintosh at Deakin and Jubilee
estate is combatting it with the aid of Tapioca
the less wealthy Chinese cultivators are
not in a position to follow up these
methods with large areas of grass
Salang waste however throughout
Malacca if cut down by fire for
some years revert gradually to
secondary scrub. This scrub
consists almost exclusively of
shrubs and small trees the seeds
of which are dispersed by birds
prominent among which ^{plants} are the
shrubs *Decaspermum*, *Mussaenda*
Grewia, *Tetracera assa*, *Indrostima*
and many other such plants.
The ground thus recuperated is again
easily put under the cultivation
of Tapioca and rubber, so that

if duly protected from fires the
Salang wastes would in time dis-
appear, to be replaced by cultivated
ground.

The firing of these Salang fields
seems to be almost invariably
due to the practice of ^{road coolies and} cartmen
travelling along the roads, of
lighting fires in the grass to cook
their rice, nearly all the compla-
intations can be traced to ~~some~~
~~the~~ the edge of some well used
cart road. Would it not be
possible to prevent this reckless
injury to the land?

I would suggest that on the
commonly used ~~the~~ roads along the
edges of which Salang occurs, spots
should be marked out, at distance
say of ^{two} miles or at which fires
for cooking food could safely be
made, and that it should be
made compulsory on the ^{road coolies} cartmen
men and other travellers to use
these fireplaces, and there only.
This plan which I suggested to
the Hon. Resident Councillor
he thought would be quite feasible.
The areas to be guarded are not
as extensive as might appear, as
it is only the edges of the Salang
wastes, abutting on main roads
that would require guarding.

Another point of some importance
in recuperating land seems worth
calling attention to, and that is the
necessity of preserving patches or
strips of woodland at intervals
throughout the settlement. Unless
this is done not only will there
be no protection for the birds
which play so important a part
in reclothing with secondary
scrub the waste lands, but there
would be no sufficient supply
of trees or shrubs the seeds of which
could be dispersed by the birds.

It is true that on large estates under
European management the fields are
commonly divided up by small
belts of jungle which are preserved
but under native management
all these woods & coppices would
be cut down to add a few acres to
the estate. This is not advisable
not only on account of the
reasons above stated but also
because in extensive areas under
cultivation of any one plant there is
always a risk of some pest attacking
the cultivated plants and spreading
by the woodland belts sweeping
over a large area. It was impossible
to avoid rotting areas under Japanese
which were too extensive & too
little broken up by woodland belts
to be absolutely safe.

In conclusion referring again to
~~the~~ the cultivation of *Tapioca* and
rubber combined, the subject
which it was the chief object
of my visit to investigate, I may
say that all the planters whom
I met in ~~Malacca~~ the colony
Mr Turner, Mr Burgers, Copeland
Mr Moorhouse, Tan Chey Yau
and Kong Guan all agreed with
me that the cultivation of the
two plants combined was a
complete success, and that
the rubber was in no way injured
or delayed in growth by the
Tapioca.

I have to

Sd. Mary H. Keston

Yours

The General