RUBBER PRODUCTION IN NIGERIA

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Uyovisere Edna
2000

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Introduction

Natural rubber, Para rubber, *Hevea Brasiliensis*, is a commercial tree economically grown in plantations. Para rubber plant is useful for the latex that bleeds from the stem in the event of wounding. The product of the coagulated latex is rubber. Rubber is used in the manufacture a number of industrial products which range from tires, balls, containers, shoes to bands and a lot of other items.

Rubber is important in the socio-economic life of many tropical developing nations, such as Nigeria and Brazil. Before the 60s, before the era of the oil boom, rubber was one of the agricultural commodities that were the main stay of Nigerian economy. The cultivation of rubber provided bulk employment for the people of the then Mid-West now known as the Edo and Delta states. However, rubber is not native to Nigeria. As the name suggests, it is an introduction from Brazil.

Agronomic Practices

Soil/weather requirement:

Rubber requires a well-drained, sandy loam, well-aerated permeable subsoil in which its root system can proliferate. Rubber cannot stand a waterlogged soil. A land drained to at least 1.2m is adequate for rubber.

Annual rainfall of at least 1700mm well distributed throughout the year with a short dry spell is ideal for the growth of the plant. Soil rich in nitrogen are preferred although phosphorous and potassium must also be available as well as trace elements.

Temperatures between 24^{0C} and 35^{0C} or more are needed for proper growth of rubber.

Land Preparation:

Land preparation for the cultivation of rubber can be carried out either manually or with the use of mechanical power. The choice of method depends on the available resources and the cost of equipment and labour.

Mechanical land preparation involves the use of heavy machinery to remove and pack heavy tress. The advantage in the use of mechanical power is in the short period required for clearing large expanse of land and neat packing of felled materials.

However, with the mechanical land clearing there is the possibility of compacting the fragile soils and removal of topsoil, which can lead to soil erosion.

In order to avoid these undesirable side effects in the use of mechanical power, experienced hands should be engaged to operate the equipment while it is also important to seek advise from knowledgeable extension agents.

Planting materials.

Rubber tree can be grown from 'ordinary seeds' (referred to as "illegitimate seeds),
from the so-called clonal seeds or budded seedlings of either the ordinary seeds or clonal rubber.

Planting through unbudded seedlings obtained from 'ordinary seeds' are not recommended. Most rubber plantations in Nigeria are planted with varieties of rubber referred to as clonal rubber.

A clone is a group of plants in which all the individuals are obtained by vegetative propagation from a single mother tree. Thus there are certain well-defined characters that are constant with a clone.

The budded rubber stump is obtained by grafting a scion of a high-yielding variety onto a seedling rootstock. The production of budded stumps requires reasonable capital outlay coupled with special techniques. This is why only commercially oriented producers go into rubber stump production. Most growers rather purchase their budded stumps from recognised sources.

Recognised sources include the Rubber Research Institute Iyanomo Benin, the Agric. Development Programme and other recognised producers.

Recommended Clones

A GTI Java Clone has the best all-round characteristics and can be planted with safety anywhere except where moisture levels are low.

PRION Java is a slow starter in terms of yield but has other good characteristics.

It has an excellent shading facility thus recurrent maintenancecost is reduced. This clone is susceptible to *Phytophthora* in high rainfall areas.
RRIM 600 Malaysia is a top yielding clone but is susceptible to both Phytophthora and Pink disease and should not be planted in areas of high wind velocity.PB5/51 Malaysia. RRIM 600 Malaysia yields less than the clone listed above is somewhat susceptible to *Oidium*. It is the most wind resistant of all clones developed for large scale planting. However it has a tendency toward brown blast disease and the bark renewal is below average.

Root stock nursery Establishment

A rootstock nursery is one in which healthy seeds are raised to produce the seedling material onto which, the scions are budgrafted.

The objective of a nursery is to be able to grow healthy young plants, which after budding are transplanted to the field. Nursery establishment requires careful planing and timing.
Pre-nursery: Rubber seed fall occurs in Nigeria between August and September. Fresh seeds from early seed falls are best for optimum germination. Fresh seeds lose 50% of the moisture content within a few days. Therefore seeds should be planted in the germination bed within 48 hours of collection. Do not select light and shrunken seed.

Seeds for germination can be prepared either from sand beds or box beds. The rate of germination in sand beds is much higher than in box beds. It is recommended that sand beds be used.

The soil of the bed should be turned over and raised to a height of 15-25cm before being leveled. The width of the bed should not exceed 1.5m (5ft) with paths between the beds to permit easy movement around the beds. A layer of sand 6cm (2 inches) deep should be spread on the surface of the bed.

The freshly collected seeds to be germinated are pressed by the flat side downward at such a depth that the upper surface is just visible. The seeds should be very close to each other so that the bed can contain as many seeds as possible. The beds, usually constructed in shaded areas, should be mulched with grasses and watered daily.

As soon as the seed sprouts or the radicle emerges, the germinated seeds should be transferred into main nursery. Seeds that fail to germinate after 7 days should be discarded.

For a hectare, 180,000 seeds are required in a rootstock pre-nursery, this allows for 50% germination.

Main (field) Nursery

Two methods can be used in the main nursery: 1. the conventional bed and 2. the polybag method

Field Nursery:

Site Selection:

Select a location that is fully exposed to sunlight close to a readily available supply of water. A flat or near flatland with a loamy textured soil is ideal. It is important to avoid areas where flooding can occur and if possible the area should be close to the budded stumps (either on the beds or polybags are to be planted).

Field Preparation:

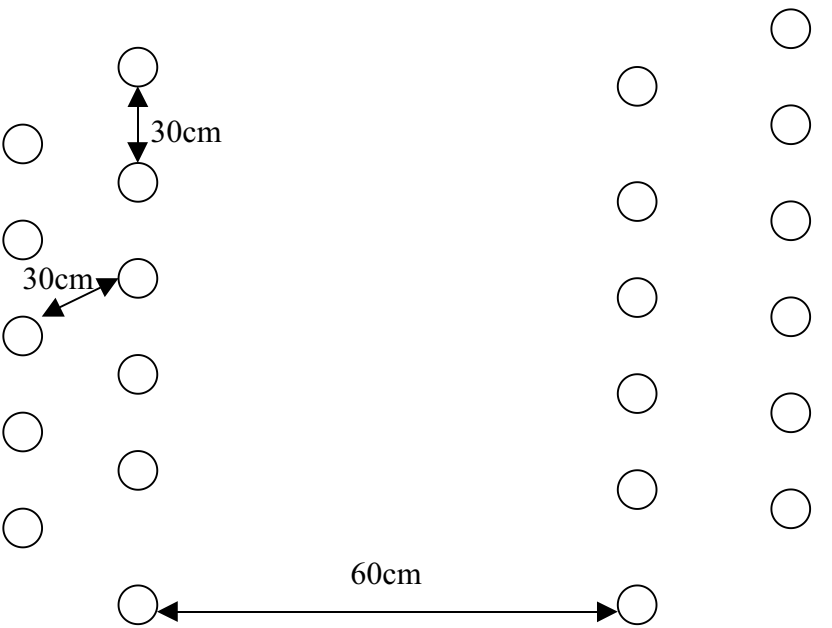
Cultivate the land by ploughing and harrowing to provide a good texture. Ploughing and harrowing should be done early enough before the heavy rains in July. If cultivation is done too late when the soil moisture is high, the puddled soil may result in excessive run-off leading to soil Erosion.

Field Nursery Layout:
A basic double-row system – 30cm between plants: 60cm between every 2nd row.

On a conventional bed and at a spacing of 30cm x 30cm about 90,000 seedling can be raised per hectare. The beds should be free of weeds either through hoe weeding or the use of herbicides such as gramozone or 'roundup' used at least two weeks before transplanting.

In the nursery lining can be done using a thin rope which is marked at the appropriate spacing of 30cm and laid along the proposed row.

Seed planting should be carefully done because of the delicate nature of the germinated seed. The germinated seed is placed in the shallow hole with the flattened end. Thus is then covered with a small quantity of soil.



Thining:

The first thinning is carried out after 3-4 months of growth. Stunted and any seriously disease infected seedlings are discarded.

The second thinning is done between the 7th and 8th month and this should reduce the population to about 45000, which is about ¼ of the original seed

Polybag Nursery Method:

Planting materials in polybags provides optimum degree of selectivity and polybagged stumps achieve much greater uniformity in growth at field planting. Provided they are well taken care of, polybagged budded stumps, attain maturity at least a year

In Nigeria, budding is done in the wet season, commencing from the late April and extends to mid-October. However the best periods to bud are:

(i) Early May until mid-July

(ii) Mid September until mid October (dormant budding)

Budding during the heavy rains i.e. (mid-July to mid-September) is not advisable because of the disease anthracose is very severe in wet conditions and throughout the nursery thus reducing the budding success severely.

In order to achieve the best results, the following should strictly be observed:

1. Do not bud in the rain when the materials are wet. Diseases are easily be transferred with wet materials.
2. Avoid budding during the dry season unless some form of irrigation or adequate watering is ensured.
3. Delay commencement of budding operations until the morning mists have subsided. This is to provide a dry surface on the budding materials.
4. Ensure that rootstocks attain a minimum diameter of 5cm and are vigorous.
5. Avoid budding to old or very large rootstock. The barks of old or large rootstock are inclined to split.

6. If a bud fails to pick do not rebud the same rootstock until the following season i.e. about 7 months after by which time the excised bark will have renewed.

Bud grafting Process

Bud grafting requires skill which, can be acquired through constant practice. Poor budding can be costly as time, energy and resources are wasted when there are budding failures.

Steps in Budding:

1. Wipe and dry dirt from the ground level 15cm of rootstock.
2. Make two vertical cuts, of about 2cm each of 0.75cm apart and allow the excluding latex from the cut to coagulate.
3. Prepare the bud patch by cutting from the budwood a strip of bark wood about 2cm long and 0.75cm wide, ensuring there is a bud and a leaf scar.
4. Gently raise the flap open and insert the bud patch with the leaf scar below the bud. Ensure that the bud patch is in the centre and there is minimal space remaining on the either side.
5. Press the flap back over the bud and bound in place with waterproof materials such as budding tapes or polyethylene plastic film.

   The tapes should be removed after about 3 weeks. In doing this gradually remove both tapes and twine. Cut off the flap at the bottom or top to reveal the graft. This is re-examined after about 7-10 days for green tissue on the patch. If green tissue is revealed with a gentle scratch, the patch has been successful.

Budwood Multiplication

In a nursery programme, it is important to ensure that there is an available supply of bud wood. This can be in the form of conventional brown bud wood or green bud sticks.

Bud wood nursery should be done one year in advance of preparing a field nursery so that an optimum supply of buds will be available for grafting.

Bud wood garden can be established in several ways:

(a) Purchase and planting of budded stumps of preferred clones from a reliable source. Ensuring that each clone is well demarcated, if more than one clone is purchased.

(b) Planting out germinated seeds and conventionally bud them 9-10 months later Using bud wood obtained from elsewhere.

that all other stock shoots are pruned regularly retaining the scion emerging from the bud patch.

Regular weeding and fertilizer application should be practised. Fertilizer application should be carried out after weeding to make the plants more receptive to nutrient uptake.

It is good to mulch each plant or mulch along planted rows at the onset of dry season. Good mulch application can do much to prevent shoot from busting out prematurely.

Field Planting

Field Preparation:

When a suitable land for rubber has been selected, field preparation for the budded materials, is very important. Field preparation for large rubber plantations include survey and tracing where the land is divided into blocks, and construction of access paths or roads.

In both large and small farms, underbrushing and felling of trees is done to expose the land. Burning follows slashing of all growth. Burning is particularly recommended on a new land for rubber, burning is an important part of root disease control. Disease pathogens in logs and stumps are greatly reduced by burning these materials off.

Field and land preparation should be carried out in the dry season and concluded before the rains.

Planting

Planting should be done with at least one year old budded stumps either in polybags or bare-root stumps.

The planting density varies, but a 6.6 x 3.3m spacing is recommended.

This would give 450 trees per ha. The adequate dimension of a planting hole is 60cm x 60 x 60cm.
Planting must be done very early in the season so that a good root system can develop before the dry season. Early planting will also ensure that supply of any failures can be done by the middle of the wet season. It should be noted that supplying after more than 11 to 12 months after the original planting should not be attempted.

Maintenance & Cultural Practices

Fire Trace: fire trace is best before the dry season. Fire trace should be made the whole way round the farm with the width not less than 30m.

Weed Control

The surroundings of the rubber plant should be regularly weeded. Weed control can be manually, chemically or mechanically.

In manual or hoe weeding, scrapping the soil away from the plant can create a depression round the plant that might prevent runoff of water. This should be avoided.
The loss of top soil should be prevented in manual weeding by ensuring that only the weed are scrapped off and that no damage is done to the plant by the blade of the hoe

Mechanically weeding a rubber farm is possible if only the equipment is available and the spacing of the rubber plants allows it. A slasher mounted on a light tractor with a good operator can work faster than manual weeding. This has to be supplemented however with manual weeding to ensure that the immediate environment of rubber tree is weed.

Herbicides	Rate
2,4 - D, Dalopon or glyphosate (Round up)	0.5 liters in 200 liters of water
	125ml in 100 liters of water
Amitole	0.5 liters in 200 liters of water

Gramozone 0.5litres in 200 liters of water *Eupatoruim odoratum* (Siam weed)

This is a noxious weed of the family compositae, which needs This is a noxious weed of the family compositae, which needs a special attention. It seeds freely and if not checked and controlled can dominate wherever it becomes established. If burning has not succeeded in controlling this weed herbicide use can control it if carefully applied.

- Use 2 liters of Tordon or Hedonal in 200 liters of water on Eupatoruim infested area and spot spray if necessary about 3-5 weeks.

In general, Herbicide application is required during the set season when the weeds are growing vigorously. Herbicide applications may be bimonthly depending on the growth of weeds.

Fertilizer Application

The type and quantity of fertilizer to be used depend on the nutrient status of the soil.

Whatever fertilizer programme is used, it is important to ensure that the applications are correctly placed around each plant. Split application of the dosage is recommended instead of putting full dose at a single application.

Year of Application	Fertilizer type	Rate/ha	Remark
1 year before planting	I) Superphosphate	500kg	This is an advance application and can be broadcast and properly mixed with the soil.
	ii) Murate of Potash	50kg	
	I) Urea	50kg	
Year of Planting	ii) Supper phosphate	250kg	
	iii) Murate of potash	40kg	
2nd year	Urea	35kg	
	Superphosphate	200kg	
3rd & 4th year	No application		Much depends on the age and appearance of the tree.

Mulching

The young rubber tree should be mulched particularly at the beginning of the dry season and usually around the second or third week in November. Mulching is to retain moisture during the long dry season. Slashed cover crops can be used, placed close to the base of the tree but should not be in contact with the growing plant. Mulching reduces moisture loss, erosion and prevents destruction of soil structure.

Prunning

As soon as the plants are established regular rounds of removal of side shoots should commence. All shoots other than the scion emerging from the bud-patch must be pruned off. When two shoots sprout from the bud, only one should be retained. In the first three months of planting, pruning should be done at 7-10 days interval and thereafter on monthly basis. Pruning prevents diversion of nutrients to vegetative growth of unwanted shoots.

Supplying

By the second year, a uniform stand of rubber should be aimed

at. Materials to be used in supplying must be healthy and should be of about the same age with the other plants if not older. Supply of vacant points should be done as early as possible during the wet season to permit sufficient time for consolidation before the dry season.

Points that still contain vacancies after two years of growth can still be supplied with careful selection of stumps.

Thinning Out

Thinning is the removal of potentially unproductive trees. The retention of these types of trees is uneconomic, as such trees will deprive vigorously growing trees of available nutrients. Trees can be identified as unproductive if the girth is below the minimum expected of the age, or trees affected by root diseases or damaged by wind, lighting or fire.

Diseases and Pests of Rubber Diseases

The diseases affecting the root system of rubber are the most destructive diseases of rubber in Nigeria. The forest trees are the major sources of infection because they are hosts to the disease causing pathogens. When the trees are felled for planting, most of the diseases persist in the roots and stumps and spread to new rubber plants. Hence stumping and burning of new plantations or farms reduce the incidence of root disease.

The panel diseases make tapping difficult and consequently reduce the productive life span of such affected trees.

The leaf diseases are more important in the nurseries because they cause die -back and reduce the budable seedling.

Insect Pests

The only major insect pests of rubber are the termites. Damage is done on newly planted seedbeds where buds are eaten up and the young roots are destroyed.

Control - Termite attack is serious only during the dry periods.

Good watering regime is a good way of preventing attack in the nursery.

Table 1: Rubber Diseases, symtoms and control

Disease ROOT DISEASES	Symptoms/Damage	Control
1. White root disease Caused by Rigidoporus Lignosus (Klotzsch).	It accounts for 90% of all mortality due to root diseases There is general discoloration of the leaves with later die-back of branches. White and thread- like materials are found on all infected roots.	i) During field preparation, remove and burn logs and stumps because they are the major source of infection. ii) On a growing rubber tree, remove dead or dying trees entirely. iii) Use of fungicides a) Apply as a soil drench to the affected area. b) FOMAC 2 apply all over the root of the infected tree.
2. Brown Root Rot Disease Phellinus noxius	Wilting, yellowing and death Of tree. Brown threads (mycelium) aggregates into a tough mass and secretes a gum like fluid.	i)Remove infected plants and burn. ii) Inspect roots of plants close to diseased trees and excavate infected roots. Burn all excavated roots.
3. Armillaria root not Armillaria mellea	This is restricted to the southeastern part of Nigeria. Attacked trees exhibit spongy rotten bark.	Control like in white root disease.
4. Black stripe Caused by Phytophthora palmivora	Vertical lines develop above the tapping panel which later coalesce into lessons preventing regeneration of the tapped panel	Avoid the use of susceptible clones such as RRIM 600, PR 107, PB 86, RRIM 605, RRIN 607 RRIM 623. Use tolerant clones. Apply Difolatan 80 W.P. weekly on the tapping panel with a brush.
Mouldy Rot Disease Ceratocystis Fimbrata	This is also a disease of the tapping panel. It occurs mostly in the wet season. Disease can spread through taper's knives.	-Thin properly and avoid too close planting. -Use disinfected knives. Use Difolation to disinfect. -Weed regularly to reduce density of undergrowth and reduce dampness. The disease is unable to thrive in conditions of low humidity.
1. Bird's eye leaf spot Dreschlera hevea .	The disease is confined to nurseries and bud wood gardens. Infection does not result in death but in defoliation and weakening of the seedlings. It causes delay in reaching maturity. Circular spores with transparent centre occur on leaves.	- Weekly spray of 1.8 kg FERMATE in 90 litres of water, or Dithane – M-45
2. Gloeosporium Leaf Disease Colletorichum Gloesporoides.	It is a serious disease of trees in the second and third year of life. It does not kill but if uncontrolled, it can cause repeated defoliation and die back. It is very active during the wet seasons.	Apply preventive spray or dusting of Dithane – M-45.

Application of Furadan 3G, sprinkled round the seedling can prevent termite attack.

Parasites

Mistletoes - These are flowering parasitic plants of the family *Loranthus* sp. The leaves arise from slender twisted branches running over the surface of the host stem connected to it at intervals.

Control:- Remove affected branches during the dry season when the mistletoe is more distinct and before flowering.

Thonningia gall This is a fleshy herb with root galls measuring about 18cm. The galls arrest the growth of rubber. It is relatively new and was recently identified at the Rubber Research institute, Iyanomo

Conclusion

The success of natural rubber production depends on the following practices:

- Start plantation with improved clones acquired from reputable sources
- Select sites with well drained deep soil
- Prepare the land for planting
- Plant timely (from June to July)
- Space appropriately (3.5 X 7.0 for 450 trees/ha)
- Plant cover crop (preferably *Pueraria phaseoloides*)
- Control weeds regularly along the avenues using herbicides, and hoe to ring weed 1m around the plant
- Supply only when there are missing stands
- Initially plant more trees than needed and gradually thin down to 450/Ha
- Apply fertilizer to immature rubber at the rate of 1 bag of NPK/Ha at the ratio of 2:1:1 before the rains
- When 70% of the trees attain 52cm in girth, open field at 150cm from ground for tapping
- Tap properly to produce good quality latex
- Remove all dirt in latex to obtain high grade crumb, sheet or crepe.

Report any observed abnormality to the local extension agent closest to you. For further enquiries contact the NAERLS zonal office closest to you. The NAERLS zonal offices as are follows:

The Director RRIN, PMB 1049, Benin City may be contacted for more information.

BIBLIOGRAPHY

Uraih, O.B.C. (2001). Nursery management and budding techniques. Proceedings of a National Training Workshop on Nursery Management on and budding techniques, held at Iyanomo, 18th-21st, Sept. 2001.

Rubber Research Institute of Nigeria (RRIN). 14 Steps to grow Rubber. RRIN production

Rubber Research Institute of Nigeria (RRIN). Supplying. Advisory circular No4 (formerly No. 3)

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