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PRODUCTION AND UTILIZATION OF “OGBONO” (*Irvingia gabonensis*)



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gabonensis*)**

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Chris Chinaka
J. C. Obiefuna

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Introduction

Irvingia gabonensis, popularly known as ‘ogbono’ and commonly called ‘African mango’ or “wild mango”, is an indigenous forest tree belonging to the group of plants classified as “non timber forest products (NTEP). In Nupe it is called “pekpeará”; “Ogwi” in bini; “Ogbono/ugiri depending on the variety in Igbo; “uyo” in Efik and “oro” (tree) ”apon” (kernel) in Yoruba. It belongs to the Irvingiaceae family of plants. The tree attains a height of up to 30 meters and about 1.0 meter in girth when fully developed. The leaves are simple and alternate, up to 10 cm long with deciduous stipules up to 1.2cm long, which leaves encircling scars on the branchlets. Flowers are tiny, white to greenish and appear in clustered axially racemes. The flowers are very sweetly scented. The fruit is slightly flattened, ellipsoidal drops with fibrous mesocarp and stony endocarp.

In the species “*gabonensis*” of *Irvingia*, well defined intraspecific taxa have been recognized; thus there are: *Irvingia gabonensis* var. *gabonensis* and *Irvingia gabonensis* var. *excelsa*. The pulp of the *Irvingia gabonensis* var. *excelsa* is said to be eaten although it is bitter and acrid with the flavour of turpentine and slightly slimy. On the other hand, the pulp of the *I. gabonensis* var. *gabonensis* is sweet, smooth in the mouth and has brittle pulp.

1.1 Ecophysiology:

The natural habitat of *I. gabonensis* extends from Senegal to Sudan and South of Angola. In Nigeria, the tree is found growing between latitude 4.15° and 8.00°N of the equator especially along streams and the banks of rivers and in village homesteads. The tree has adapted and now grows well even in the comparatively drier ecological zones of the northern edges of the derived savanna.

Site Selection

The tree grows well in a variety of soil types ranging from sandy clay loams to loamy clay soils.

Rainfall Requirement

It requires adequate rainfall of about 1000 mm per annum and abundant sunshine.

Maturity

Under natural conditions, the plant bears fruits between 15-20 years but under improved management, especially when budded seedlings are planted, the vegetative phase is considerably reduced and fruiting can start from 4 – 5 years while economic yield can be attained after 7 – 8 years from planting. The ever expanding deforestation constitutes a major threat to the trees in the wild while the activities of fruit collectors, further compound this negative impact on the natural regeneration of *Irvingia* trees because the fruits are removed and thus not given a chance to germinate and grow into new trees. These therefore call for the conscious and planned establishment of *Irvingia* plantations.

2.0 CULTIVATION PRACTICES:

2.1 Propagation:

‘Ogbono’ (*Irvingia gabonensis*) is commonly propagated by seeds. Increasing awareness have necessitated the development of propagation procedures for the plant in order to enhance its popularity, economic potentials and continued and regular production in traditional and future farming systems. In this regard, efforts are made at obtaining early flowering (and fruiting) through cultural management practices which include budding and ‘topping’.

2.2 Nursery:

Although ground nurseries could be used, polybag, basket or perforated tray nurseries are recommended. Movable nurseries e.g. polybag nurseries have the following advantages over ground nurseries:

- i) They save labour cost incurred during digging up for transplanting.
- ii) There is reduced risk of transplanting shocks
- iii) There is space economy.

If polybag nurseries are to be used, polybags not smaller than 15mm gauge, 12cm diameter and 25 cm deep are recommended. This should be filled with top soil up to at least 14 cm from the base. The top 10cm should be filled with saw dust leaving 1 cm on top as catchment area during watering (Figure 1)

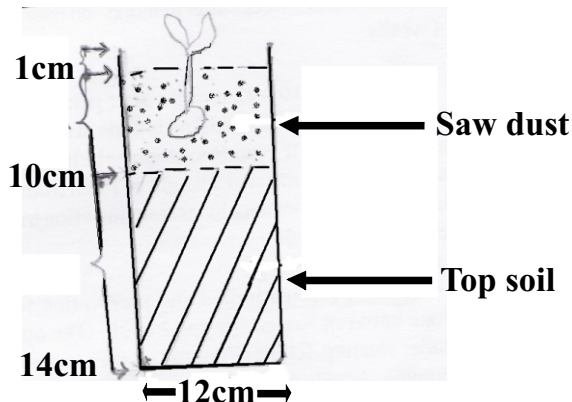


Fig. 1: Polybag Nursery

Seed extraction and Nursery establishment

Tree-ripened fruits (that have fallen by themselves) are selected. It is advised not to germinate fruits that have been plucked from the tree. Seed extraction is by carefully cutting out completely the fleshy pericarp (pulp), and washing the nut using sand and water.

Allowing the pulp to rot naturally and washing in water reduces the germination percentage by about 20%. Dry the nuts in a shade for one or two days. Prolonged drying for more than a week results in decreased seed viability. Avoid sun drying. Plant seeds within two or three days after extraction. To avoid the incidence of damping-off treat seeds with Benlate or other potent fungicides before sowing. After sowing, move the polybags to a shade and arrange in 10 x 100 or 20 x 50. Water daily. Avoid over-watering to prevent water logging and damping off disease. Apply fertilizer when nutrient deficiency symptoms e.g. chlorosis are noted. Apply water soluble fertilizer, NPK dissolved in water from time to time. 1 kg NPK may be applied in about 6 doses for 2000 seedlings. Germination starts 3 weeks after planting and may continue for another 4 weeks.

2.3 Budding:

10 – 12 months after germination, the seedlings are ready for budding. Budding is done at about 15 – 20 cm height using the inverted “T” cut. Rootstocks to be budded should not be less than 0.5cm in diameter at a height of 15cm from the soil surface. Obtain budwood from healthy mature flowering trees. It is recommended to bud during the rainy season.

2.4 Land Preparation:

Land preparation for field planting is done between November and March. The operation involved include: clearing, felling of unwanted trees, cross-cutting, packing and burning. After burning, marking out of the planting sites follows. The spacing of 7m x 7m is recommended. This gives a population of about 200 stands in a hectare. After marking out, dig planting holes 60 cm x 60 cm x 45 cm. Fill the holes with well decomposed organic matter and top soil two weeks before transplanting. Do not put inorganic fertilizer into planting holes at transplanting of seedlings. This may be harmful to the young seedlings.

2.5 Field Establishment:

10-12 months after budding, seedlings are ready for transplanting. Seedlings are ready for field planting 20 – 24 months after sowing in the nursery. Transplanting is done in the early part of the rainy season as soon as the rains stabilize – i.e. May – June in the rain forest zones; and June – July in the savanna. Seedlings should be transplanted with the ball of earth around the roots of the plant. If budded seedlings are planted, regularly check and prune off all side shoots from the stock.

2.6 Fertilizer Recommendation:

Fertilizer application starts one year after field establishment. If the planting holes were well prepared (with well decomposed organic matter and top soil), no chemical fertilizer is required in the first year of establishment. Within the next year (1-4 years after planting) and if the soil is fairly rich to rich, an application of 0.25kg/stand of NPK (15:15:15; 10:10:20 or NPK Mg 12:12:17:2) or any other compound fertilizer having NPK may be applied. Fertilizer application should be done during the rainy season. If however the soil is poor, the dosage could be increased to 0.5kg/stand. The plants are ring weeded before broadcasting the fertilizer around each stand once a year.

2.7 Topping:

This is a management practice whereby all the growing shoots of the plant are shaped by clipping (pruning or training). In *Irvingia*, this is a “taming” process. In the traditional system constant bush burning and farming activities take care of “topping”. Topping has the following advantages:

- a) It gives the tree the desired shape – “dome” instead of the conical shape that the tree is naturally prone to.
- b) It exposes more leaves to sunlight thereby enhancing photosynthesis and facilitating more fruit formation.

- c) It encourages early flowering
- d) It controls the height of the plant.

Between the second and third year, and towards the end of the rains, do the first topping (pruning). This is achieved by cutting back all the growing shoots. Repeat this yearly for the next 3 – 4 years.

2.8 Interplanting:

Within the first five years of field life and until the *Irvingia* closes up all the “elbow spaces”, food crops such as yam, cassava, cocoyam, and vegetables can be planted within the *Irvingia* stands. Ginger will grow well planted under *Irvingia*. Spreading crops especially sweet potato is highly recommended as interplant because apart from the edible sweet potato roots, the sweet potato will also serve as a soil cover to check erosion and to control weed growth. At full cover of *Irvingia*, only crops like ginger, cocoyam and sweet potato which are shade tolerant can be interplanted with *Irvingia*.

2.9 Irrigation:

Seedlings transplanted in May/June or June/July depending on location, may be adversely affected by the following dry season (Nov-March) especially if the dry season comes early and extends to March – April of the following year. During this time, it is recommended to mulch round the stands with grass and supply 20-25 litres of water per tree per week. This will enhance survival rate and early productivity.

2.10 Replacement of Dead Plants

Plants that fail to survive, should be replaced the next rainy season. This practice should continue until all the missing stands are filled up. Before replanting, the dead plants and the planting holes should be properly checked to find out the cause of the death. If the death is caused by a disease or pest, adequate measures should be taken to ‘clean up’ the planting site and planting material before and after replanting.

3.0

PLANT PROTECTION:

3.1 Diseases:

Most of the diseases of *Irvingia* are nursery diseases. These include:

a) Damping off: *Irvingia* is susceptible to damping off disease caused by two fungi – *Pythium* spp. and *Phytophthora* spp. Serious damping off especially when germinated in unsterized soils is a very common feature. The seedlings remain susceptible till the cotylendons drop 3 – 4 weeks after planting (WAP).

Control Avoid waterlogging conditions in the field or nursery. Spray affected plants with Bordeaux mixture (Copper Sulphate mixed with lime) at the rate of 2kg/ha at 0.4g of powder per litre of water. Efficient treatment requires complete wetting of affected parts. Dithane M-45 or Furadan could equally be used only on seedlings infected after the cotylendons had opened and the first 2 leaves appear light green in colour.

b) Leaf spots: there are two types of leaf spots –

- (i) Chlorotic to necrotic spots caused by two fungi - *Rhizoctonia* spp and *Collectrotirichum* spp; and
- (ii) Reddish purple spots caused by *Rhizoctonia* spp. These are controlled as stated for damping off.

3.2 Pests

(a) Insects pests: Young seedlings are attacked by grasshoppers, caterpillars, scale insects etc. Leaf miners and fruit borers occasionally attack mature plants.

Control

These pests are controlled by spraying monthly with any broad spectrum insecticide like Ultracide, Gamalin 20, Rhonalin 20EC, Mocap 10 G etc. Purple blotches on leaves of *Irvingia gabonensis* var *excelsa* delays on set of fruits.

This is caused by armoured scale insects. The control equally is by spraying monthly with any potent insecticide.

(b) Rodents: - Rodents can attack newly transplanted stands of *Irvingia* and destroy them.

Control

Baiting with rodenticides (e.g. Chlorophacinone) is a recommended control measure, otherwise, setting of traps could keep off rodents from newly established fields.

(c) Epiphytes: The mistletoe (*Visum* spp) is a green parasitic shrub which grows attached to trees in a ball like bush. In *Irvingia*, like other fruit trees (Citrus, kola etc.), this parasitic plant systematically kills the host plant from branch to branch until the entire plant dies.

Control

The control is by physically removing and burning the weed or by cutting off the affected branch.

(d) Weed control: In the first 2 years of field establishment, it is recommended to ring weed 1 meter from the base of the plants. In situations where the trees have been interplanted with food crops, the entire field should be clean weeded as the need arises but at least twice a year. If the field is not intercropped with food crops, slash the inter row (as the need arises) to keep down weeds.

(e) Fire Tracing: Bush fire which is a regular feature during the dry season can destroy a newly established *Irvingia* field. It is recommended to cut a fire trace 6 meters wide round the plantation during the dry season to create a fire corridor round the plantation each dry season.

4. HARVESTING AND UTILIZATION:

Fresh ‘Ogbono’ comes into market between June and August and is most scarce between March and April. The two varieties of *Irvingia* have different flowering/fruiting cycles, thus: (Table 1)

Table 1: Flowering and fruiting of *Irvingia* spp

Variety		Flowering	Fruiting
I.	<i>Gabonensis</i> var. <i>gabonensis</i>	Nov. – March and June	April – July and Sept – Oct.
II.	<i>Gabonensis</i> var. <i>excelsa</i>	Sept. – Oct.	December – March

When *Irvingia* fruits mature, they fall to the ground and are collected for processing. Mature fruits can equally be plucked manually or mechanically. Picking of ripe *Irvingia* fruits is an organized annual event in areas where *Irvingia* grows in the wild on communal lands.

4.1 Processing:

After picking, the fruits are heaped and the pulp (mesocarp) is allowed to ferment for about 7 – 10 days. Thereafter, the seeds are washed off with water and at times with some sand. In freshly harvested *Irvingia*, the pulp can be manually removed with sharp knives to extract the seeds. The pulp so removed could be processed into other products while the seeds are dried in the sun or by fire. After drying the seeds are split into two flat white cotyledons (kernels) and further dried before marketing.

The seeds may be stored in calabashes, pots or sacs at room temperature for upward of 6 – 8 months. The kernels (cotyledons) are the *Irvingia* of commerce.

Yield

An average kernel yield of 25 kg/stand of *Irvingia* is considered good. Kernel yields could be up to 30-35 kg/plant in good years and could go as low as below 20kg in bad fruiting years.

4.2. Utilization

The kernels of *Irvingia* contain 54-67% of fatty matter. Thus *Irvingia* can classify as an oil crop. The kernel serves as condiments used in thickening and flavouring soups. The more the ground kernel “draws” in soup, the more acceptable it is. Thus, *Irvingia gabonensis* var. *excelsa* which “draws” more than the var. *gabonensis* is more acceptable in soup making.

The fresh fruit of the *I. Gabonensis* var. *gabonensis* is sweet and edible, and is suitable in the manufacture of jams, jellies and fruit juices. The pulp of the var. *excelsa* is bitter and inedible.

The kernel of *Irvingia* is used in making a fatty paste called “dika”. This is the principal ingredient in the making of “Gabon chocolate” or “Dika bread”. Thus the *Irvingia* fruit is often called “dika nut”. When fully dried, the kernel shells are good firing materials. The bark of the tree is bitter and is added to palmwine as a preservative.

In traditional religion, some tribes use the split shells of the fruit in divination; giving a favourable omen if one falls flat and the other cover side up. The wood is pale brown, very hard, fine grained and immune to termites. It is used in building canoes from the trunk; pestles for yam mortars; house posts etc. The tree is useful for afforestation and erosion control.

Conclusion

Dependence on supply of *irviugia* from the wild is not susitable. Concious and planned *irviugia* plantations establishment is highly advotated in line with the following stages:

- *Establish nurseries using ploybags
 - *Use tree-ripened fruits that have fallen by the themselves to establish nurseries
 - *Set the nurseries under shades
 - *Apply water-solute fertilizers from time to time using 1kg NPK in about 6 doses for 200 seedlings
 - *Bud at 10-12 months
 - *10-12 months after budding, plant out in the field
 - *Plant at 7m x 7m to give about 200 stand
 - *Apply recommended fertilizer annually starting from one year after field establishmen
 - *Start topping from between the second and third year of establishment for the next 3-4 years
 - *Interplant with food crops untill full canopy is established
 - *Under dry conditions, mulch and water
 - *Replace dead stands.
 - *Check for pests and dieases and control as recommed
 - *Keep plantation relatively weed free
- Create fire corridor during the dry season
- *Pick fallen mature fruits or pluck mannually

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