

# NEW BIOSPHERE AGRICULTURE



## MORINGA

### TECHNOLOGY & PRODUCT INFORMATION



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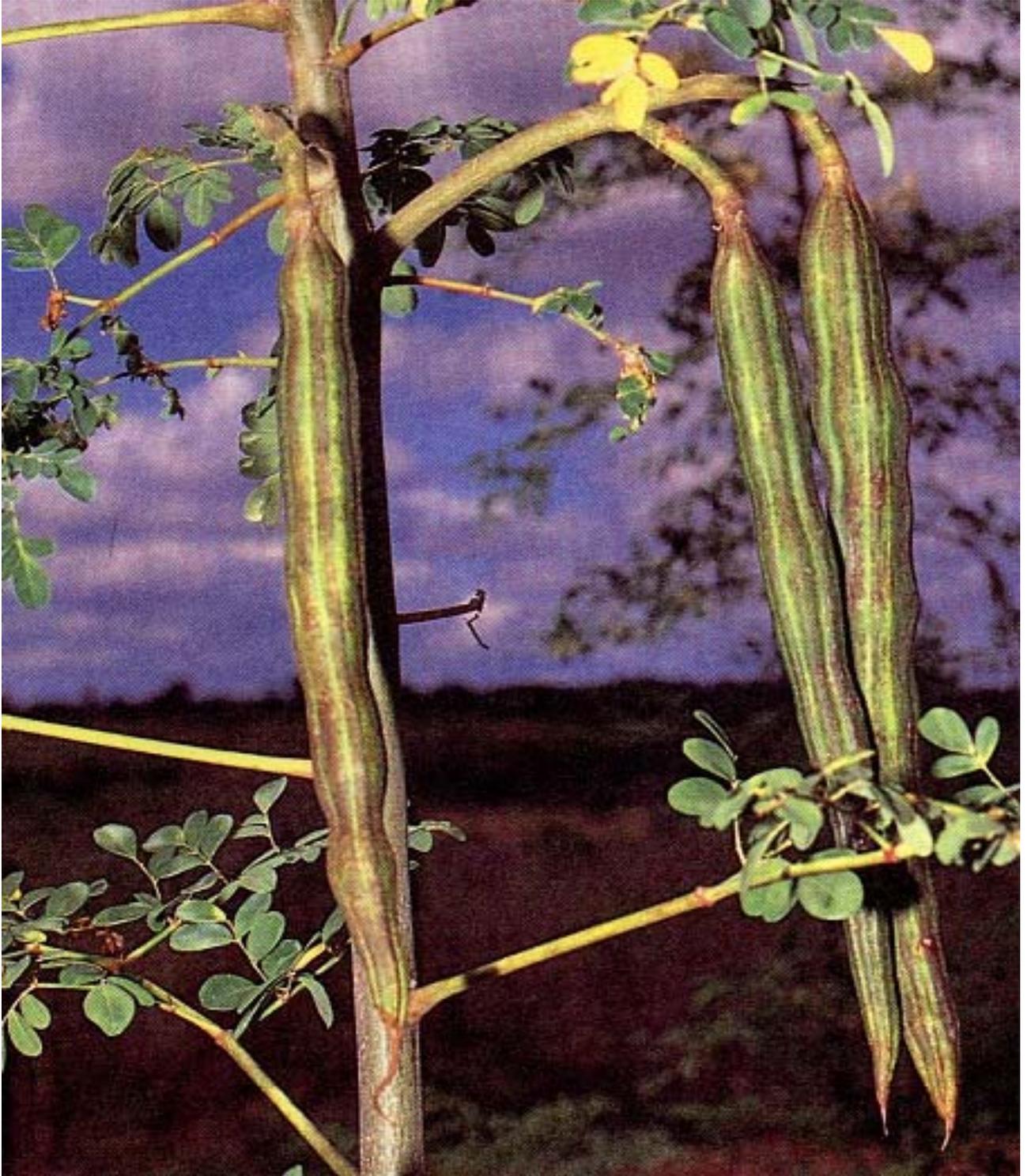
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## Moringa oleifera flower and seed



## Moringa oleifera seed pods



[http://www.moringa-oleifera.com.au/a/What is Moringa/Videos about Moringa](http://www.moringa-oleifera.com.au/a/What%20is%20Moringa/Videos%20about%20Moringa)

## ***Moringa oleifera* Lam.**

### **Moringaceae**

### **Horseradish-tree, Ben-oil tree, Drumstick-tree**



### **Uses**

Almost every part of plant is of value for food. Seed is said to be eaten like a peanut in Asia. Thickened root used as substitute for horseradish. Foliage eaten as greens, in salads, in vegetable curries, as pickles and for seasoning. Leaves pounded up and used for scrubbing utensils and for cleaning walls. Seeds yield 38%–40% of a non-drying oil, known as Ben Oil, used in arts and for lubricating watches and other delicate machinery. Oil is clear, sweet and odourless, never becoming rancid; consequently it is edible and useful in the manufacture of perfumes and hairdressings. Wood yields blue dye. Leaves and young branches are relished by livestock. Commonly planted in Africa as a living fence (Hausa) tree. Trees planted on graves are believed to keep away hyenas and its branches are used as charms against witchcraft. Bark can serve for tanning; it also yields a coarse fibre.

### **Folk Medicine**

According to Hartwell (1967–1971), the flowers, leaves, and roots are used in folk remedies for tumours, the seed for abdominal tumours. The root decoction is used in Nicaragua for dropsy. Root juice is applied externally as rubefacient or counter-irritant. Leaves applied as poultice to sores, rubbed on the temples for headaches, and said to have purgative properties. Bark, leaves and roots are acrid and pungent, and are taken to promote digestion. Oil is somewhat dangerous if taken internally, but is applied externally for skin diseases. Bark regarded as antiscorbic, and exudes a reddish gum with properties of tragacanth; sometimes used for diarrhoea. Roots are bitter, act as a tonic to the body and lungs, and are emmenagogue, expectorant, mild diuretic and stimulant in paralytic afflictions, epilepsy and hysteria.

### **Chemistry**

Per 100 g, the pod is reported to contain 86.9 g H<sub>2</sub>O, 2.5 g protein, 0.1 g fat, 8.5 g total carbohydrate, 4.8 g fiber, 2.0 g ash, 30 mg Ca, 110 mg P, 5.3 mg Fe, 184 IU vit. A, 0.2 mg niacin, and 120 mg ascorbic acid, 310 µg Cu, 1.8 µg I. Leaves contain 7.5 g H<sub>2</sub>O, 6.7 g protein, 1.7 g fat, 14.3 g total carbohydrate, 0.9 g fiber, 2.3 g ash, 440 mg Ca, 70 mg P, 7 mg Fe, 110 µg Cu, 5.1 µg I, 11,300 IU vit. A, 120 µg vit. B, 0.8 mg nicotinic acid, 220 mg ascorbic acid, and 7.4 mg tocopherol per 100 g. Estrogenic substances, including the anti-tumour compound, β-sitosterol, and a pectinesterase are also reported. Leaf amino acids include 6.0 g arginine/16 g N, 2.1 histidine, 4.3 lysine, 1.9 tryptophane, 6.4 phenylalanine, 2.0 methionine, 4.9 threonine, 9.3 leucine, 6.3 isoleucine, and 7.1 valine. Pod amino acids include 3.6 g arginine/16 g N, 1.1 g histidine, 1.5 g lysine, 0.8 g tryptophane, 4.3 g phenylalanine, 1.4 g methionine, 3.9 g threonine, 6.5 g leucine, 4.4 g isoleucine, and 5.4 valine. Seed kernel (70–74% of seed) contains 4.08 H<sub>2</sub>O, 38.4 g crude protein, 34.7% fatty oil, 16.4 g N free extract, 3.5 g fibre, and 3.2 g ash. The seed oil contains 9.3% palmitic, 7.4% stearic, 8.6% behenic, and 65.7% oleic acids among the fatty acids. Myristic and lignoceric acids have also been reported. The cake left after oil extraction contains 58.9% crude protein, 0.4% CaO, 1.1% P<sub>2</sub>O<sub>5</sub> and 0.8% K<sub>2</sub>O. Pterygospermin, a bactericidal and fungicidal

compound, isolated from Moringa has an LD<sub>50</sub> subcutaneously injected in mice and rats of 350 to 400 mg/kg body weight. Root-bark yields two alkaloids: moringine and moringinine. Moringinine acts as cardiac stimulant, produces rise of blood-pressure, acts on sympathetic nerve-endings as well as smooth muscles all over the body, and depresses the sympathetic motor fibres of vessels in large doses only.

## Description

Short, slender, deciduous, perennial tree, to about 10 m tall; rather slender with drooping branches; branches and stems brittle, with corky bark; leaves feathery, pale green, compound, tripinnate, 30–60 cm long, with many small leaflets, 1.3–2 cm long, 0.6–0.3 cm wide, lateral ones somewhat elliptic, terminal one obovate and slightly larger than the lateral ones; flowers fragrant, white or creamy-white, 2.5 cm in diameter, borne in sprays, with 5 at the top of the flower; stamens yellow; pods pendulous, brown, triangular, splitting lengthwise into 3 parts when dry, 30–120 cm long, 1.8 cm wide, containing about 20 seeds embedded in the pith, pod tapering at both ends, 9-ribbed; seeds dark brown, with 3 papery wings. Main root thick. Fruit production in March and April in Sri Lanka.

## Germplasm

Reported from the African and Hindustani Centers of Diversity, Moringa or cvs thereof is reported to tolerate bacteria, drought, fungus, laterite, mycobacteria, and sand (Duke, 1978). Several cvs are grown: 'Bombay' is considered one of the best, with curly fruits. Others have the fruits 3-angled or about round in cross-section. In India, 'Jaffna' is noted for having fruits 60–90 cm, 'Chavakacheri murunga' 90–120 cm long. ( $2n = 28$ )

## Distribution

Native to India, Arabia, and possibly Africa and the East Indies; widely cultivated and naturalized in tropical Africa, tropical America, Sri Lanka, India, Mexico, Malabar, Malaysia and the Philippine Islands.

## Ecology

Ranging from Subtropical Dry to Moist through Tropical Very Dry to Moist Forest Life Zones, Moringa is reported to tolerate annual precipitation of 4.8 to 40.3 dm (mean of 53 cases = 14.1) annual temperature of 18.7 to 28.5°C (mean of 48 cases = 25.4) and pH of 4.5 to 8. (mean of 12 cases = 6.5). Thrives in subtropical and tropical climates, flowering and fruiting freely and continuously. Grows best on a dry sandy soil. Drought resistant.

## Cultivation

In India, the plant is propagated by planting limb cuttings 1–2 m long, from June to August, preferably. The plant starts bearing pods 6–8 months after planting but regular bearing commenced after the second year. The tree bears for several years.

## Harvesting

Fruit or other parts of plant usually harvested as desired according to some authors, but in India, fruiting may peak between March and April and again in September and October. Seed gathered in March and April and oil expressed.

## Yields and Economics

While I have not located specific yield figures for Moringa, I feel, from personal observations, that its biomass and pod production should approach that of *Prosopis* growing in the same habitat. Hence, I would suggest a target yield of about 10 Metric Tonnes pods per hectare. Horseradish-tree is grown locally in India, Sri Lanka and elsewhere, and is consumed as a local product, either ripe or unripe. No commercial data are available.

## Energy

According to Verma et al. (1976), "saijan" is a fast growing tree being planted in India on a large scale as a potential source of wood for the paper industry. It seems doubtful that the wood and seed oil could both be viewed as fountains of energy. According to Burkill (1966), "The seeds yield a clear inodorous oil to the extent of 22 to 38.5 percent. It burns with a clear light and without smoke. It is an excellent salad oil, and gives a good soap... It can be used for oiling machinery, and indeed has a reputation for this purpose as watch oil, but is now superseded by sperm oil." Sharing rather similar habitat requirements with the jojoba under certain circumstances, it might be investigated as a substitute for sperm whale oil like jojoba. Growing readily from cuttings, the ben oil could be readily produced where jojoba grows. Coming into bearing within two years, it could easily be compared to jojoba in head-on trials. I recommend such.

## Biotic Factors

Fruitflies (*Gitona* spp.) have infested the fruits which then dried out at the tip and rotted. Leaves of young plants and freshly planted stumps are attacked by several species of weevils (*Myloccerus discolor* var. *variegatus*, *M. 11-pustulatus*, *M. tenuiclavis*, *M. viridanus* and *Ptochus ovulum*). Also parasitized by the flowering plant, *Dendrophthoe flacata*. Fungi which attack the horseradish-tree include: *Cercospora moringicola* (Leaf-spot), *Sphaceloma morindae* (Spot anthracnose), *Puccinia moringae* (rust), *Oidium* sp., *Polyporus gilvus*.

## References

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# Suggested Cultural Practices for Moringa

by M.C. Palada and L.C. Chang

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## Introduction

Moringa (*Moringa* spp.) is one of the world's most useful plants. This fast-growing tree is grown throughout the tropics for human food, livestock forage, medicine, dye, and water purification (Figs. 1, 2). It is known by several names in different countries, but is popularly called the "drumstick tree" for its pods that are used by drummers and the "horseradish tree" for the flavor of its roots.

Moringa is one of the world's most nutritious crops. Ounce for ounce, the leaves of moringa have more beta-carotene than carrots, more protein than peas, more vitamin C than oranges, more calcium than milk, more potassium than bananas, and more iron than spinach. Native to South Asia, this tree is becoming a vital source of nutrition in this region, where most of the world's poor people live. The multiple uses of moringa have attracted the attention of researchers, development workers, and farmers.

The following suggested cultural practices were developed at AVRDC in the Taiwan lowlands. Growers may need to modify the practices to suit local soil, weather, pest, and disease conditions.



Fig.1. Moringa is one of world's most useful plants



Fig. 2. Moringa flowers, pods, and foliage

## Climate and soil requirements

Moringa tolerates a wide range of environmental conditions. It grows best between 25 to 35°C, but will tolerate up to 48°C in the shade and can survive a light frost. The drought-tolerant tree grows well in areas receiving annual rainfall amounts that range from 250 to 1,500 mm. Altitudes below 600 m are best for moringa, but this adaptable tree can grow in altitudes up to 1,200 m in the tropics.

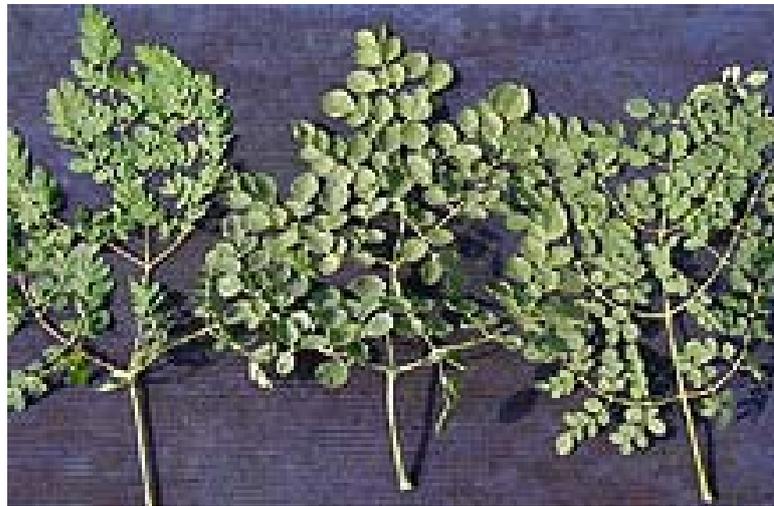
Moringa prefers a well-drained sandy loam or loam soil, but tolerates clay. It will not survive under prolonged flooding and poor drainage. Moringa tolerates a soil pH of 5.0–9.0.

### ***Preparing the field***

Moringa requires thorough land preparation and a well-prepared seedbed. At AVRDC, moringa is planted on 30-cm-high raised beds to facilitate drainage. Bed widths being tested at the Center vary from 60–200 cm.

### ***Choosing a variety***

Among moringa species, *M. oleifera* and *M. stenopetala* are most commonly grown. *M. oleifera* is most widely cultivated and the focus of this guide. Varieties within *M. oleifera* differ in growing habit, leaf, flower, and pod characteristics (Fig. 3). Numerous accessions are being evaluated at AVRDC for superior production and nutrition qualities. Currently we recommend growers to use locally adapted lines. Characteristics of superior types include wide and dark green leaves, long and tender pods, bushy habit, and rapid regeneration after trimming.



*Fig. 3. Leaf characteristics of different accessions*

### ***Planting methods***

Moringa is planted either by direct seeding, transplanting, or using hard stem cuttings. Direct seeding is preferred when plenty of seed is available and labor is limited. Transplanting allows flexibility in field planting but requires extra labor and cost in raising seedlings. Stem cuttings are used when the availability of seed is limited but labor is plentiful.

#### **Option 1. Direct seeding**

Sow two or three seeds per hill at a depth of 2 cm. Two weeks after germination, thin to the strongest seedling per hill.

For leaf, pod and seed production, space plants 3–5 m apart between rows and plants. If using raised beds, form beds with 2-m-wide tops, and space plants 3–5 m apart in a single row (Fig. 4).

*Fig. 4. Wide rows are used for leaf, pod, and seed production*



For production of leaves only, space plants 50 cm within rows spaced 1 metre apart. If using raised beds, form beds with 60-cm-wide tops and space plants 1 metre apart in a single row (Fig. 5). For intensive production of leaves, space plants 10–20 cm within rows 30–50 cm apart. Closer spacing allows harvest of young edible shoots every two to three weeks.



*Fig. 5. Narrow rows are used for leaf production only*

### **Option 2. Transplanting**

Transplanting moringa consists of two steps: seedling production and field planting.

*Seedling production.* Seedlings can be grown in divided trays, individual pots, plastic bags, or seedbeds (Figs. 6, 7). Use of divided trays and individual containers is preferred because there is less damage to seedlings when they are transplanted.

A 50-cell tray with cells 3–4 cm wide and deep is suitable. Fill the tray with a potting mix that has good water-holding capacity and good drainage. Use peat moss, commercial potting soil, or a potting mix prepared from soil, compost or rice hulls, and vermiculite or sand. AVRDC uses a mixture of 67% peat moss and 33% coarse vermiculite. If you use non-sterile components, sterilize the mix by autoclaving or baking at 150°C for 2 hours.

Grow seedlings under shade or in a screenhouse with 50% shade. Sow two or three seeds per cell. One week after germination, thin to the strongest seedling. Irrigate seedlings thoroughly every morning or as needed (moist, but not wet), using a fine mist sprinkler to avoid soil splash and plant damage. Transplant seedlings one month after sowing.



*Figs. 6, 7. Seedlings grown in trays and clay pot*

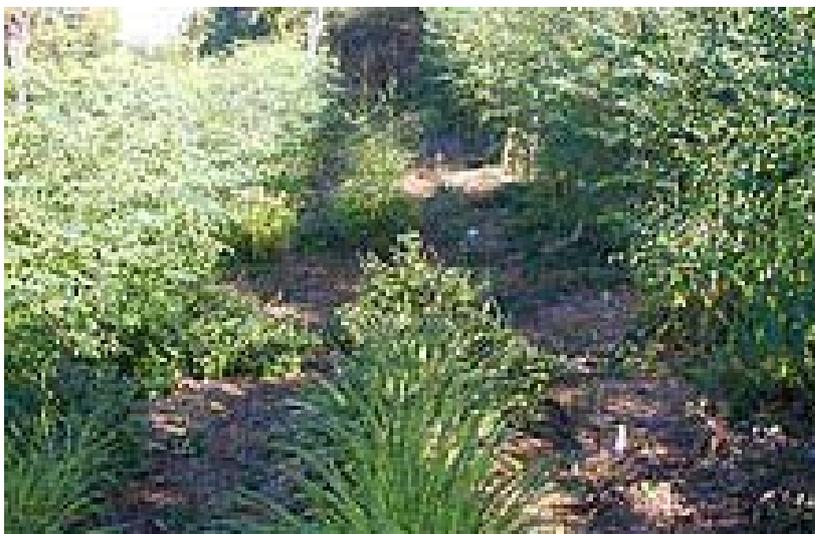
Pots or bags may be used to grow larger transplants. Fill the containers (0.5–1.0 kg by volume) with potting mix similar to that used in seedling trays. If potting mix is not available, use 3 parts soil to 1 part sand. Sow two or three seeds per pot or bag. One week after germination, thin to the strongest seedling. These plants are transplanted in the field after they reach 50 cm high (Fig. 7).

If seedlings are started in a raised seedbed, the soil should be partially sterilized by burning a 3–5 cm layer of rice straw or other organic matter on the bed. The burned ash adds minor amounts of P and K to the soil. Sow two or three seeds in holes spaced 10 cm apart in furrows spaced 25 cm apart. Cover seedbed with a fine-mesh nylon net to protect seedlings from pests, heavy rain, and harsh sunlight. Transplant seedlings one month after sowing or when they reach 20–30 cm high. Dig seedlings using a trowel taking care that roots are not damaged. Place the bare-root seedlings in a bucket containing water and transplant them as soon as possible.

*Field planting.* Spacings are similar to those recommended in the direct seeding method.

Moringa may also be planted 1 m apart or closer in a row to establish living fence posts. Trees can be planted in gardens to provide shade to vegetables less tolerant to direct sunlight. Moringa trees are also used to support climbing crops such as yam and pole beans. Trees are also planted in hedgerows forming

wide alleys where vegetables are planted within (Fig. 8). Choose vegetables that are adapted to alley cropping, such as shade-tolerant leafy vegetables and herbs, since moringa hedgerows are highly competitive and can reduce yields of companion plants significantly.



*Fig. 8. Moringa hedgerows in alley cropping system with lemongrass and herbs*

### **Option 3. Using stem cuttings**

Compared to trees planted from seed, trees from stem cuttings grow faster but develop a shallow root system that makes them more susceptible to moisture stress and wind damage.

Make stem cuttings using branches of a tree that is at least one year old. Use hard wood and avoid using young green stem tissue. Cuttings can be 45–150 cm long with diameters of 4–16 cm. Cuttings can be dried in the shade for three days before planting in the nursery or in the field. Cuttings are then planted directly or planted in plastic pots or bags in the nursery or screenhouse (Fig. 9). When planting directly, plant cuttings in light, sandy soil. Plant one-third of the length in the soil (i.e., if the cutting is 90 cm long, plant it 30 cm deep). Add a balanced fertilizer or compost to infertile soils to encourage root development. Irrigate regularly to keep the soil moist but not wet.

Cuttings planted in a nursery are ready for field planting after 2– 3 months. Follow the field planting recommendations mentioned for direct seeding and transplanting.

*Fig. 9. Stem cuttings grown in clay pots and ready for field planting*



### ***Fertilizing***

Moringa grows well in most soils without additions of fertilizer. Once established, the extensive and deep root system of moringa is efficient in mining nutrients from the soil.

For optimum growth and yields, fertilizers are applied at planting time. Dig trenches around the base of the plant (10–20 cm from the base) and apply approximately 300 g of a commercial nitrogen fertilizer per tree. If commercial nitrogen fertilizer is not available, use compost or well-rotted farmyard manure at the rate of 1–2 kg/tree.

### ***Irrigating***

Irrigate newly transplanted trees immediately after transplanting to promote early root development. In dry and arid climates, irrigate regularly for the first two months. Once established, moringa rarely need watering. The well-rooted tree tolerates drought and needs irrigation only when persistent wilting is evident.

### ***Controlling weeds***

Cultivate the soil thoroughly before planting to suppress early weed growth. Apply straw and/or plastic mulch around the base of each young tree (Fig. 10). Maintain a weed-free planting by regularly cultivating between beds and rows.



*Fig. 10. Young planting with mulch around base of trees*

### ***Controlling pests and diseases***

Moringa is resistant to most pests and diseases, but outbreaks may occur under certain conditions. For example, diplodia root rot may appear in waterlogged soils, causing severe wilting and death of plants. Mite populations can increase during dry and cool weather. These pests create yellowing of leaves (Fig. 11), but plants usually recover during warm weather. Other insect pests include termites, aphids, leafminers, whiteflies, and caterpillars (Fig. 12).

Chemical control of insect pests should be used only when severe infestations occur. Choose a pesticide that targets the specific pest causing the damage, and avoid pesticides that kill or inhibit the development of beneficial organisms. Choose pesticides that last only a few days.

Cattle, sheep, pigs, and goats will eat moringa seedlings, pods and leaves. Protect moringa seedlings from livestock by installing fence or by planting a hedge around the plot.



*Figs. 11, 12. Mites cause general yellowing of leaves; close-up of caterpillar consuming leaf tissue*

### ***Pruning***

Moringa should be trimmed to promote branching, increase yields, and facilitate harvesting. If left to grow without cutting the main trunk, the fast-growing tree will grow straight and tall producing leaves and pods only on the primary stem. To encourage the development of many branches and pods within easy reach from the ground, prune the apical growing shoot when the tree is 1.0–2.0 m high. Use a sharp cutting knife, machete, or pruning saw to make smooth cuts. New shoots will emerge from just below where the cut is made (Fig. 13). Thereafter, cut the growing tips of the branches so that the tree will become bushier. Another pruning strategy is to cut back each branch by 30 cm when it reaches 60 cm in length. This will produce a multi-branched shrub.

If the tree is being grown for pod production, remove flowers during the first year. This will channel all of the young tree's energy into vegetative and root development (rather than energy draining pods), leading to more vigorous growth and productive yields in the future.

Older trees that are unproductive or too high for easy harvesting can be pruned at ground level. New shoots will emerge quickly from the base.

*Fig. 13. New shoots emerge from where pruning cuts are made, creating a bushier tree*



### ***Harvesting***

Leaves can be harvested after plants grow 1.5–2.0 m, which usually takes at least one year. Harvest leaves by snapping leaf stems from branches. Harvesting young shoot tips will promote development of side branches where cuts along the main branches are made. Allow plants to develop new shoots and branches before subsequent harvests. If plants are grown at closer spacing and higher density, cut plants about 10–20 cm above ground.

Older leaves will need to be stripped from their tough and wiry stems. These leaves are more suited to making dried leaf powder, since stems can be removed during the sifting process.

For fresh vegetables, tie harvested leaves in bundles and place them under shade to maintain freshness (Fig. 14). Moringa leaves can easily lose moisture after harvesting, therefore, harvest early in the morning and sell the same day, if possible.

The leaflets can also be dried in the sun for a few hours and then stored for consumption during the hot-wet season, a time when minerals and vitamins are most lacking in diets.

Flowers and pods are normally produced during the second year of growth. Harvest pods when they are young, tender, and green. They are eaten as green beans. Older pods are fibrous and develop a tough shell, but their pulp and immature seeds remain edible until shortly before the ripening process begins. Immature seeds can be used in recipes similar to green peas. Fresh or dried flowers are used for making teas.



*Fig. 14. Fresh moringa leaves and pods in bundles*

### ***Collecting and storing ripe seeds***

Mature pods contain ripe seeds that are used for planting the next crop or for extracting oil. When producing seed for oil extraction, allow the pods to dry and turn brown on the tree. Harvest pods before they split open and fall to the ground. Store seeds in well-ventilated sacks in a cool, dry, and shaded area. Seeds remain viable for planting for two years.

**MORINGA PLANTATION ESTABLISHMENT:**



Site Assessment



Site Management Planning



Land Preparation



Nursery



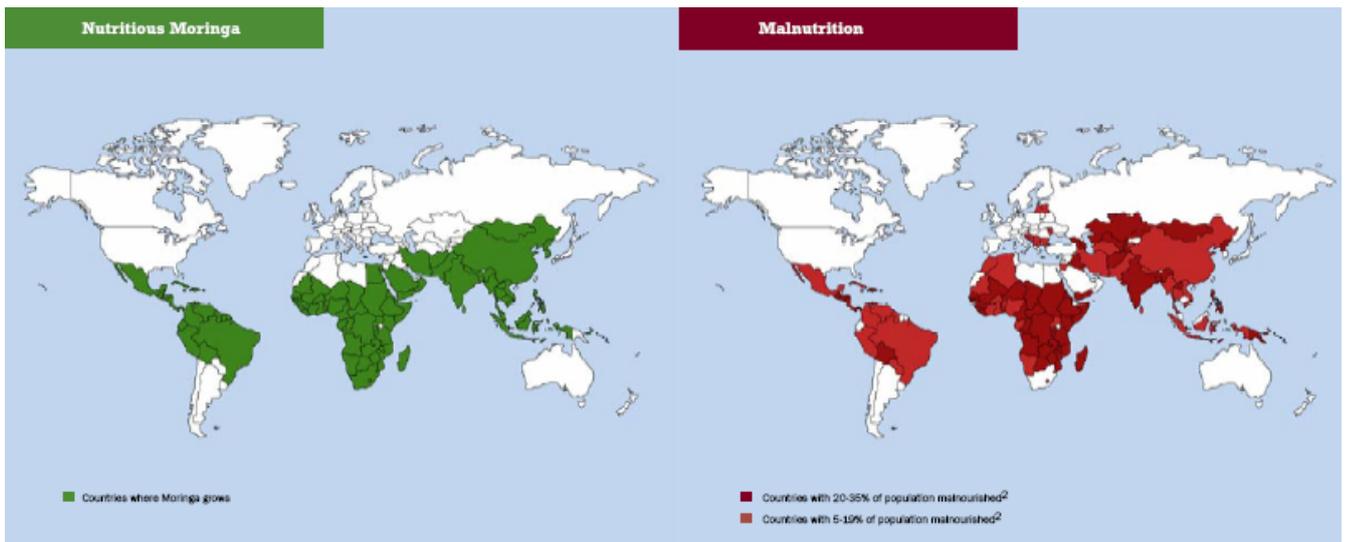
Tree Planting



Weed & Fertiliser Control

[http://www.moringa-oleifera.com.au/a/What\\_is\\_Moringa/Videos\\_about\\_Moringa](http://www.moringa-oleifera.com.au/a/What_is_Moringa/Videos_about_Moringa)



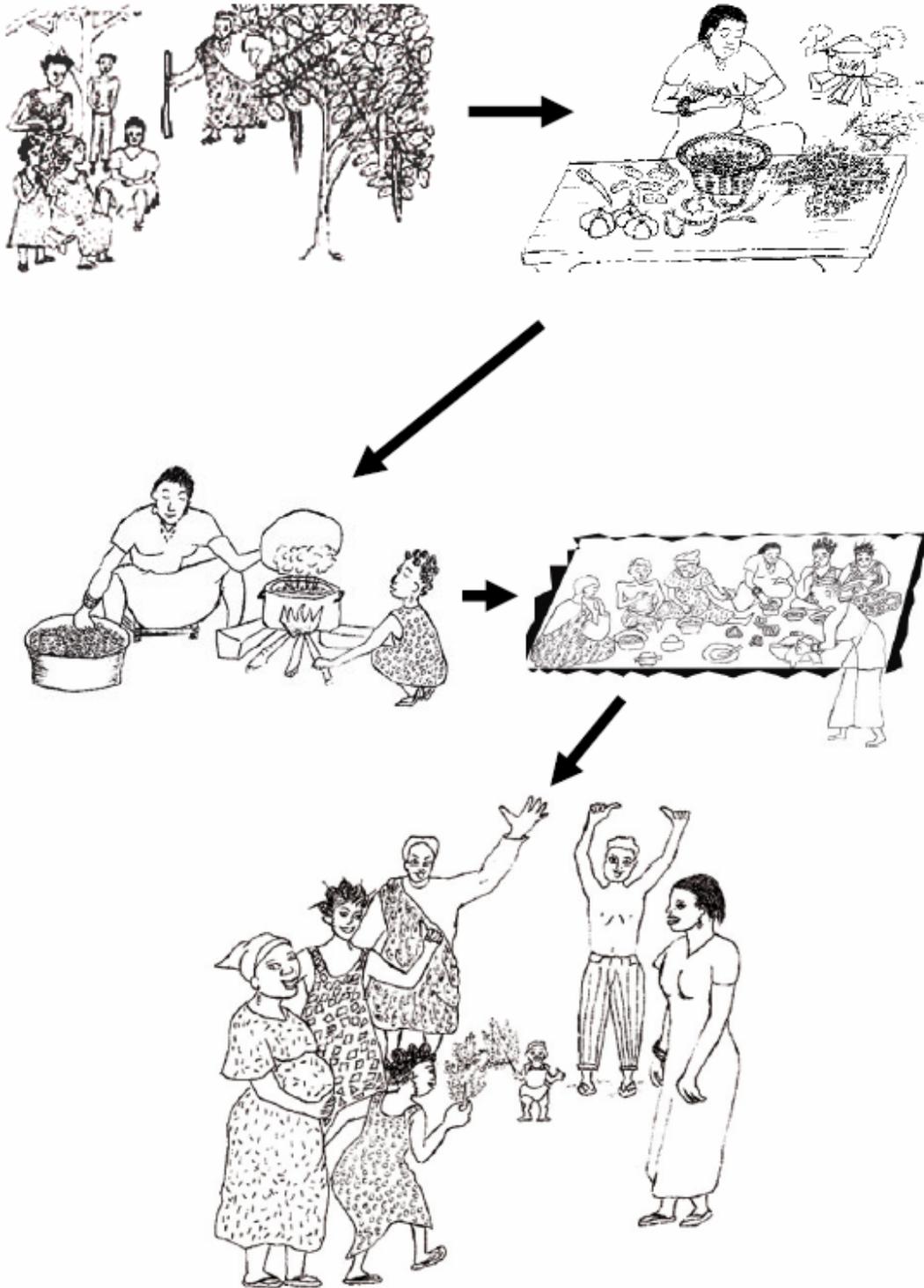


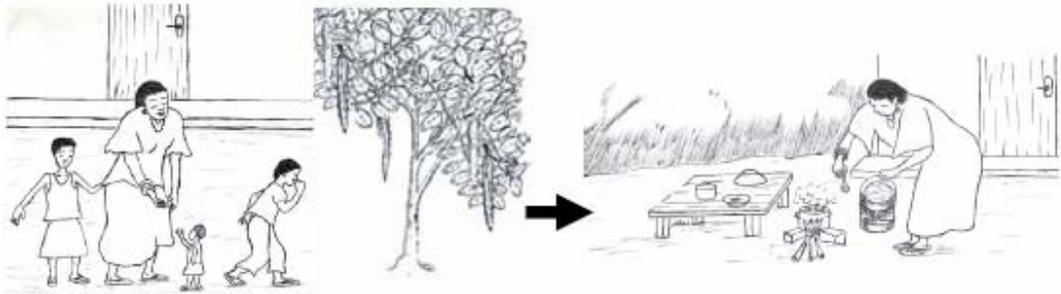
The Moringa tree grows...

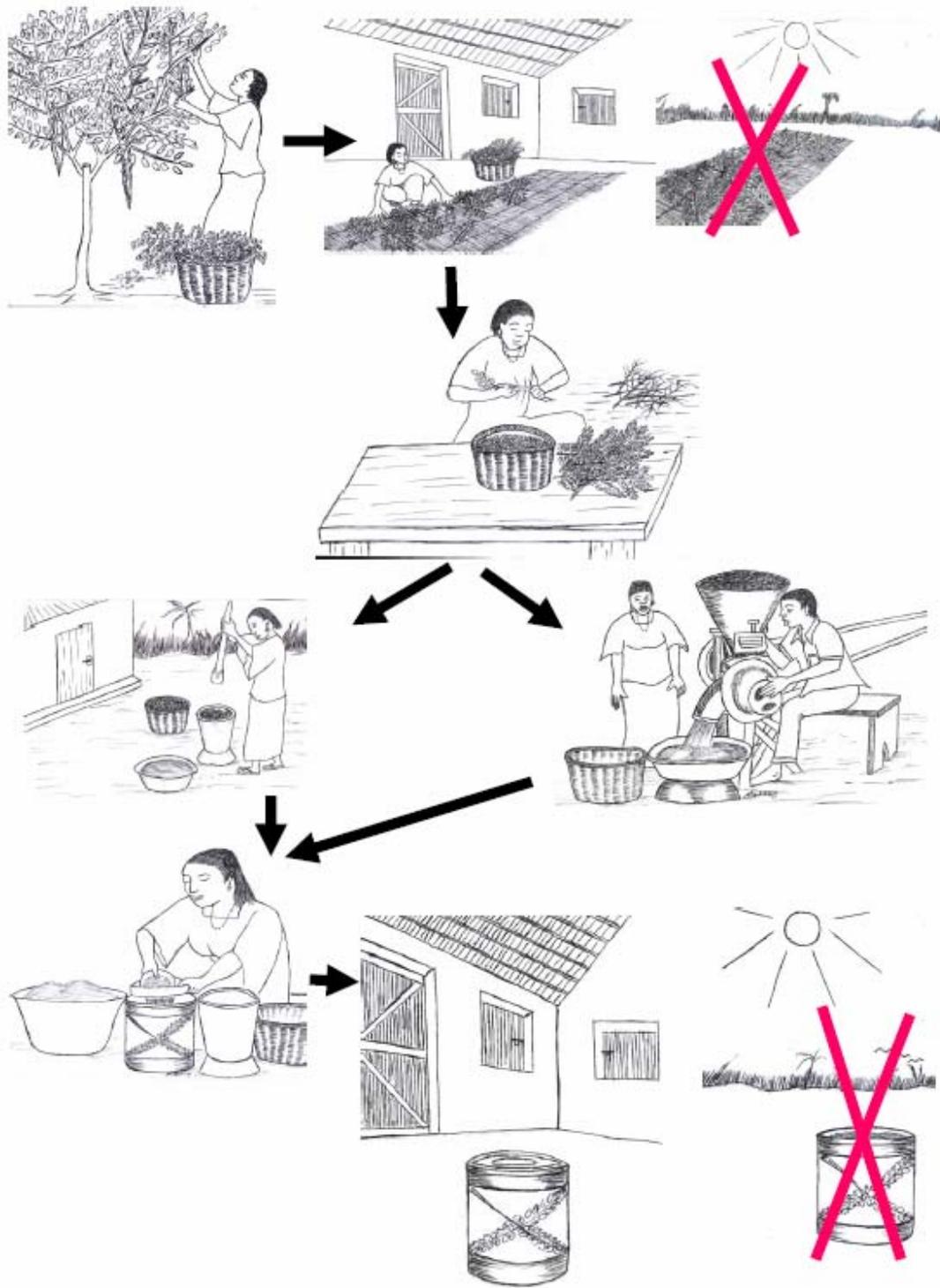
...precisely where people need it most.

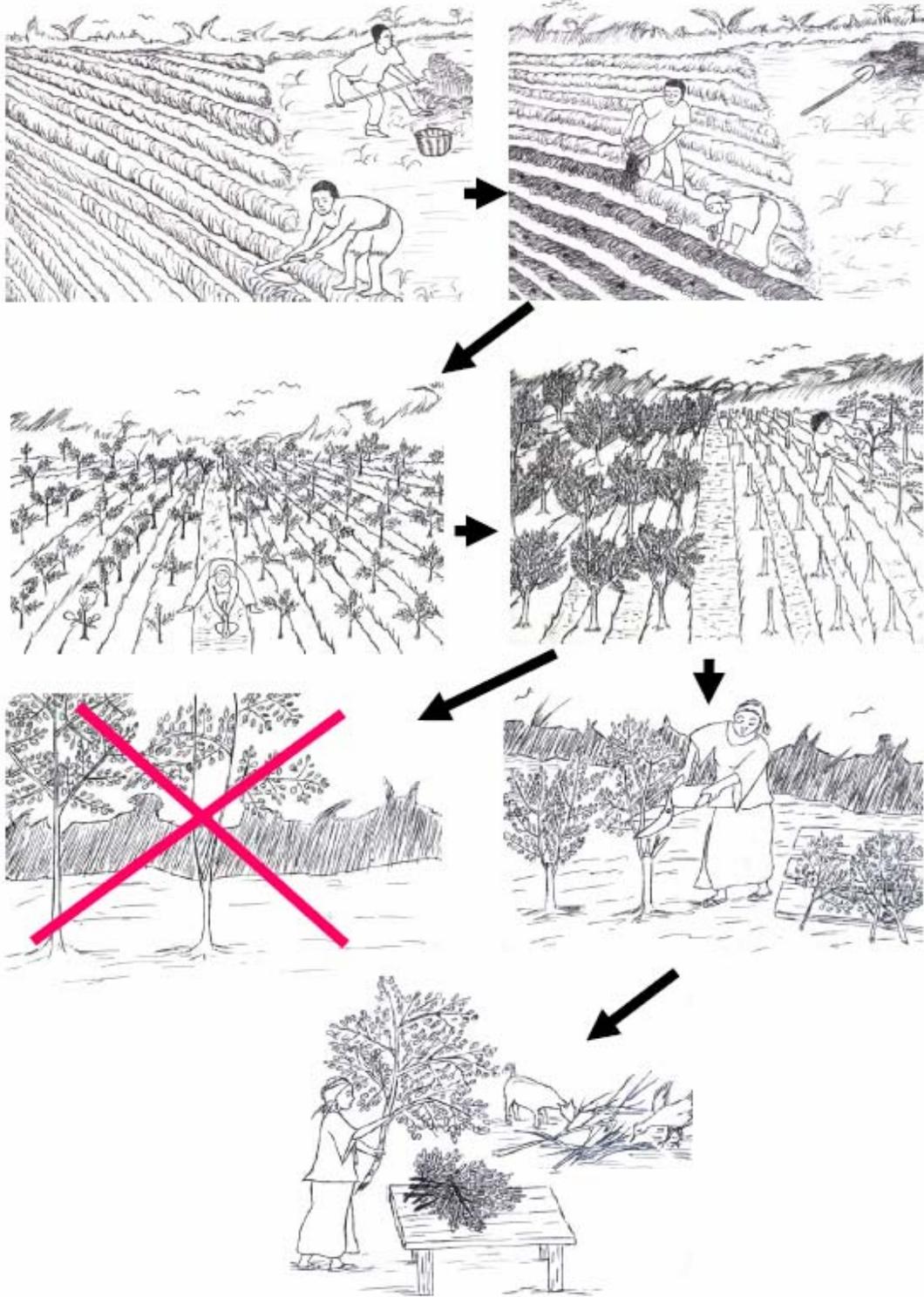
		
<b>Leaves:</b> Nutrition Medicine	<b>Pods:</b> Nutrition Medicine	<b>Flowers:</b> Medicine
		
<b>Seeds:</b> Water purification Medicine Cooking oil Cosmetics Lubricant	<b>Bark:</b> Medicine  <b>Gum:</b> Medicine	<b>Roots:</b> Medicine

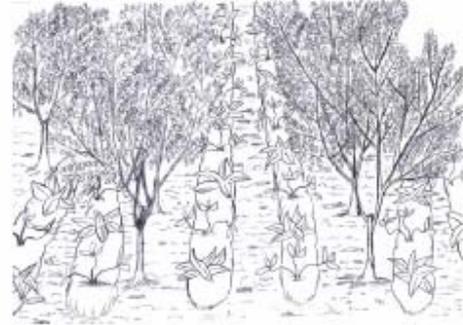
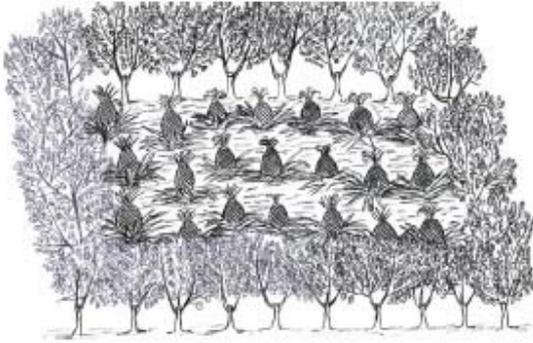
**MORINGA – APPLICATION in EMERGING ECONOMIES:**

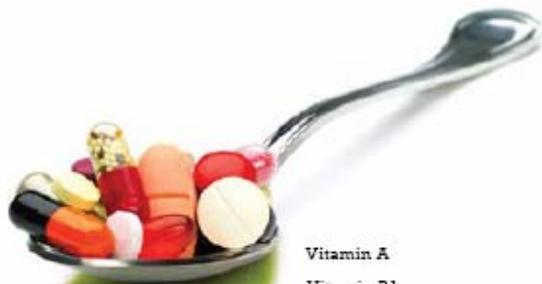












- Vitamin A
- Vitamin B1
- Vitamin B2
- Vitamin B3
- Vitamin C
- Calcium
- Chromium
- Copper
- Iron
- Magnesium
- Manganese
- Phosphorus
- Potassium
- Protein
- Zinc

7 times the Vitamin C of Oranges



4 times the Vitamin A of Carrots



4 times the Calcium of Milk



3 times the Potassium of Bananas



2 times the Protein of Yogurt



**MORINGA PLANTATION for LEAVES**



Processing building and Moringa plantation



View of the Moringa plot in full production



Moringa leaf harvest



Moringa leaf harvest



Leafy branches just harvested



Leaf driers and baskets



Separating Moringa leaflets from the branches



Grinding dry leaflets (left) and separating fresh leaflets (right)



Packing dry leaf powder into plastic bags



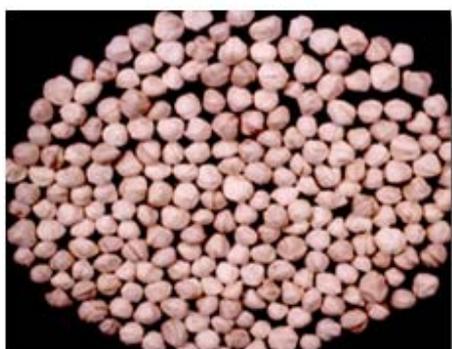
### **OUR PRODUCTS:**

Fresh drumstick fruit  
 Drumstick powder  
 Moringa oil  
 Moringa seed  
 Moringa seeds(PKM1 and PKM2)  
 Moringa leaf powder  
 Moringa leaf  
 Moringa pickle  
 Moringa tea powder  
 Moringa fruit powder  
 Moringa seed kernel  
 Moringa cake powder  
 Moringa root  
 Moringa soup powder  
 Moringa Juice powder  
 Moringa capsule



### **MORINGA SEED**

Moringa oleifera seeds are used for agricultural, food and industrial purposes. Specific varieties of Moringa Oleifera Seeds like PKM1 and PKM2 are used for plantation. The Industrial grade seeds are utilized in Oil Extraction and other related processing industries.



### **MORINGA SEED KERNAL**

Moringa Seed Kernels are used for Oil Extraction purposes and edible usages. The Kernels are highly pure and fleshy with high quality. With our hi-tech and modernized equipments the seed husks are removed and separated the kernels by our well trained team to make the supply in time.



### MORINGA SEED CAKE

Used for water purification, moringa seed cake is a natural coagulant. It is used as a replacement for proprietary coagulants to meet the need of water and waste water technology.



### MORINGA LEAF

Rich in nutritive value, moringa leaf are shadow dried and used in pharmaceutical and food industries.

The moringa leaves contain high amounts of Vitamin A (four times more than carrots), Vitamin C (seven times more than oranges), protein (twice that of milk), calcium (four times more than milk) and potassium (triple the amount in bananas).



Although Moringa leaf powder is commonly used to make a sauce and has many uses in India's natural Ayurvedic medicine, most health professionals and nutritionists are unaware that the young seed pods and seeds (which taste like asparagus), and flowers (which taste like mushrooms) can also be eaten.

As a nutritional additive, add two or three spoonfuls of powder to rice, soups and sauces just before serving. Small amounts of leaf powder will not have a marked effect on the taste of the sauce. In India juice from leaves is believed to have a stabilizing effect on blood pressure and treats anxiety.

In India an infusion of leaf juice is believed to control glucose level in diabetes. Mixed with honey and followed by a drink of coconut milk 2 or 3 times a day, leaves are used as a remedy for diarrhoea, dysentery and inflammation of the colon. Leaf juice, at times added with carrot juice used to increase urine flow. Eating leaves is recommended in cases of gonorrhoea on account of the increasing of urine flow. Leaf juice at times is used as a skin antiseptic. In India, leaves are used to treat fevers, bronchitis, eye and ear infections. Eating leaves is believed to increase a woman's milk production and prescribed for anaemia.



#### MORINGA LEAF POWDER

Moringa Leave's Medicinal qualities.

Juice from the leaves is believed to have a stabilizing effect on blood pressure and is used to treat anxiety. It is believed to control glucose levels in cases of diabetes. Mixed with honey and

followed by a drink of coconut milk 2 or 3 times a day, leaves are used as a remedy for diarrhoea, dysentery and colitis.

Leaf juice, sometimes with carrot juice added, is used as a diuretic. Eating leaves is recommended in cases of gonorrhoea because of the diuretic action.

Leaves and buds are rubbed on the temples for headache.

A poultice is made from fresh leaves and applied to reduce glandular swelling.

Leaf juice is used as a skin antiseptic.

Leaves are used to treat fevers, bronchitis, eye and ear infections, scurvy, and catarrh (inflammation of the mucus membrane).

Leaves are considered to be anthelmintic (able to kill intestinal worms).

Leaves are used as a purgative.

Eating leaves is believed to increase a woman's milk production and is sometimes prescribed for anaemia.

Nutritional Value of Leaves and Pods:

Analysis of moringa pods, fresh (raw) leaves and dried leaf powder have shown them to contain the following per 100gms of edible portion:

Pods	Leaves	Leaf Powder
Moisture (%)	86.9	75.0
Calories	26	92
Protein (g)	2.5	6.7
Fat (g)	0.1	1.7
Carbohydrate (g)	3.7	13.4
Fiber (g)	4.8	0.9
Minerals (g)	2.0	2.3
Ca (mg)	30	440
Mg (mg)	24	24
P (mg)	110	70
K (mg)	259	259
Cu (mg)	3.1	1.1
Fe (mg)	5.3	7
S (mg)	137	137
Oxalic acid (mg)	10	101
Vitamin A B Carotene (mg)	0.11	6.8
Vitamin B Choline (mg)	423	423
Vitamin B1 thiamin (mg)	0.05	0.21
Vitamin B2 riboflavin (mg)	0.07	0.05
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Oxalic acid (mg)	10	101
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Vitamin B Choline (mg)	423	423
Vitamin B1 thiamin (mg)	0.05	0.21
Vitamin B2 riboflavin (mg)	0.07	0.05
Vitamin B3 nicotic acid (mg)	0.2	0.8
Vitamin C ascorbic acid (mg)	120	120
Vitamin E tocopherol acetate (mg)	-	-
Arginine (g/16g N)	3.6	6.0
Histidine (g/16g N)	1.1	2.1
Lysine (g/16g N)	1.5	4.3
Tryptophan (g/16g N)	0.8	1.9
Phenylalanine (g/16g N)	4.3	6.4
Methionine (g/16g N)	1.4	2.0
Threonine (g/16g N)	3.9	4.9
Leucine (g/16g N)	6.5	9.3
Isoleucine (g/16g N)	4.4	6.3
Valine (g/16g N)	5.4	7.1



### MORINGA CAPSULE

3 month supply of Moringa capsules. 3 bottles of 60 capsules each. 100% natural / 100% safe.

Latin name: Moringa Oleifera

English name: Drumstick (or) Horseradish tree.

Ingredients: 100% Moringa leaves.

Content: 60 caps, 120 caps and 180 caps/bottle.

Direction: 1 caps each time, 2 times a day.

These are all natural, no additives, fillers or synthetics added.

We fill capsules with 100% certified Moringa powder.

Moringa is the Tree of Life.

This delicious plant may provide the boost in energy, nutrition and health you've been seeking!!

It can rebuild weak bones, enrich anaemic blood and enable a malnourished mother to nurse her starving baby. Ounce for ounce it has calcium of 4 glasses of milk, the Vitamin C of 7 oranges, and the potassium of 3 bananas.

Doctors use it to treat diabetes in West Africa and high blood pressure in India.

Moringa is reported to contain properties which help rheumatism, arthritis and other joint afflictions as well as being cardiac and circulatory stimulants. Biological studies have confirmed that the herb, Moringa, has anti-inflammatory, antispasmodic and diuretic activities.



### MORINGA OIL

Cold processing method is used to extract oil from moringa seeds. Known as the most stable natural oil, it is a good source of Behenic acid in nature and is used as a preservative in food industries.

Process Method :

The oil is obtained by cold pressing method.

Appearance :

The oil is liquid at ambient temperature, translucent and pale yellow in colour.

Density at 20°C = 0.908 Viscosity at 20°C = 92.6 cP

Melting Point = 21°C Smoke point = 230°C

Iodine Index=68 Saponification Index = 192

Fatty Acid Composition :

Fatty Acid Percentage

Myristic 14:0 0.1

Palmitic 5.0

Palmitoleic 16:1 n-9 1.4

Stearic 18:0 5.2

Oleic 18:1 70.7

Linoleic 18:2 1.5

Arachidic 20:0 3.7

Eicosenoic 20:1 2.3

Behenic 22:0 8.1

Tetracosenic 24:0 0.1

Cerotic 16:0 1.3

Oil Quantity :

Moisture Content = 0.043 %

Acidity Oleic = 0.3 %

Peroxide index = 3.5 meq / Kg

Resistance to Oxidation (Rancimat): Induction Time at 100°C > 87 hours

Induction Time at 130°C = 10.6 hours

Contaminants:

Iron = 15 ppm

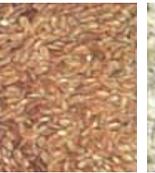
Copper < 5 ppm

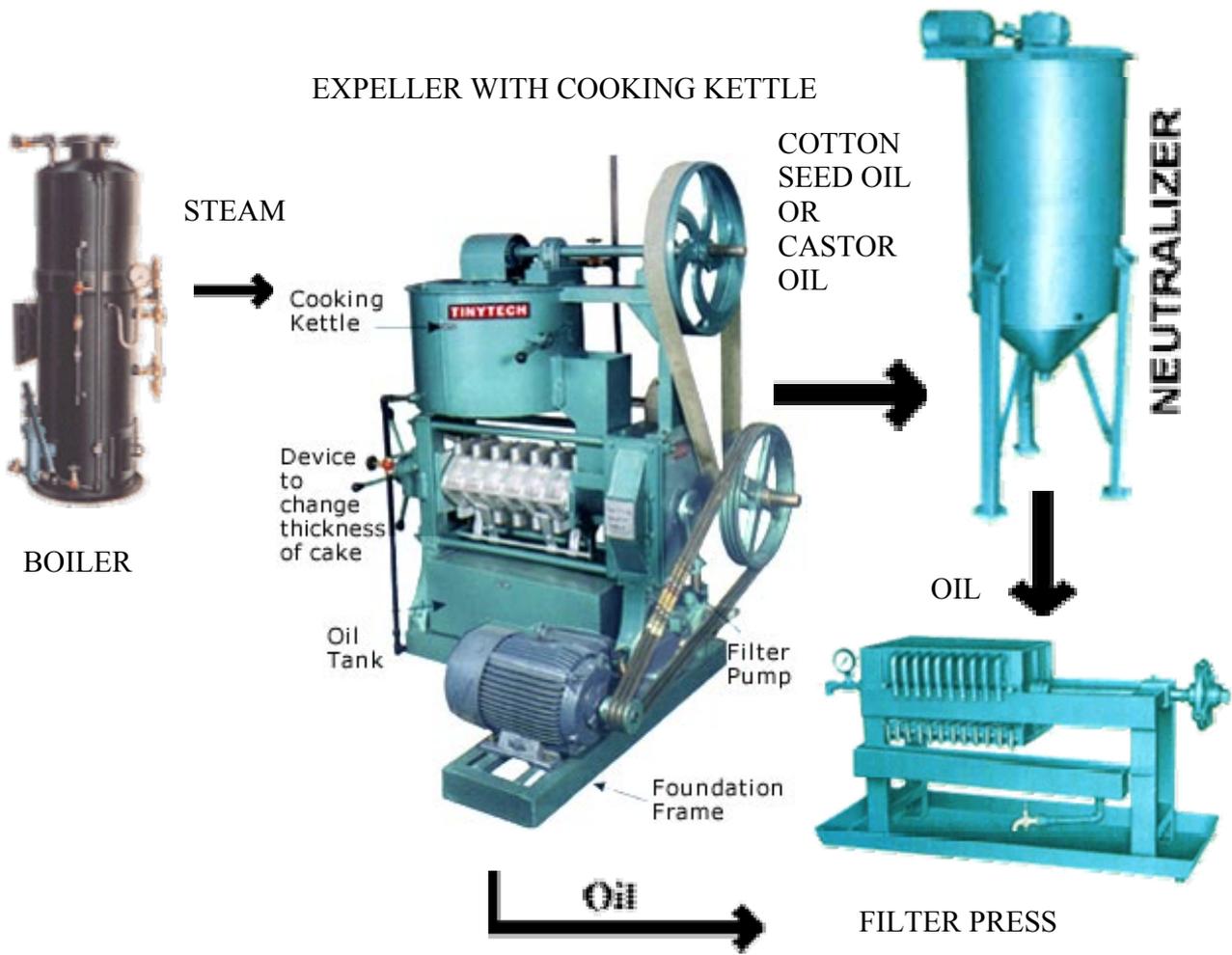
Phosphorous = 13 ppm

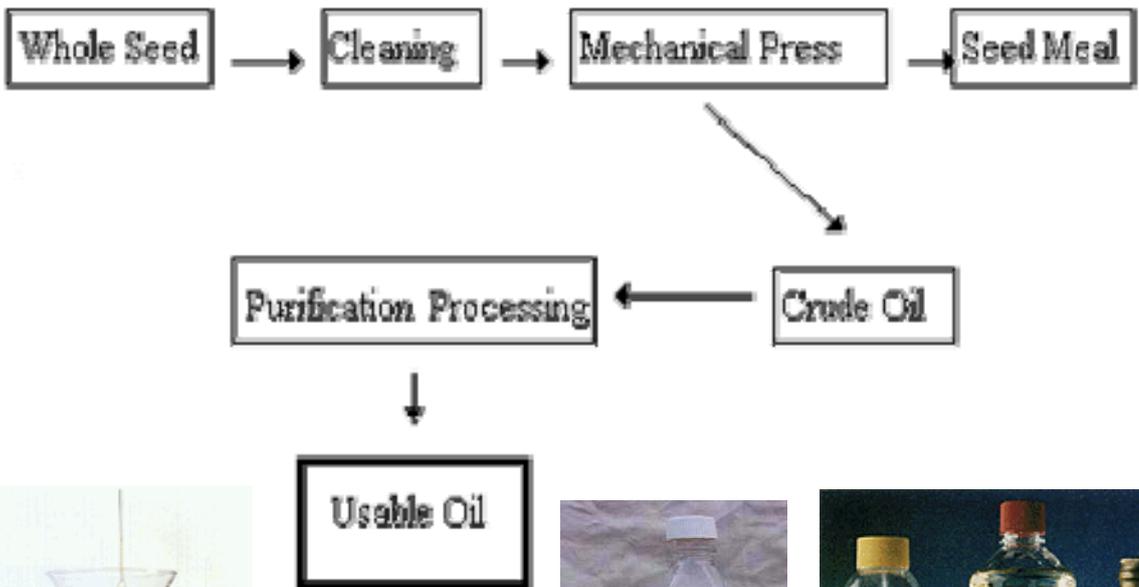
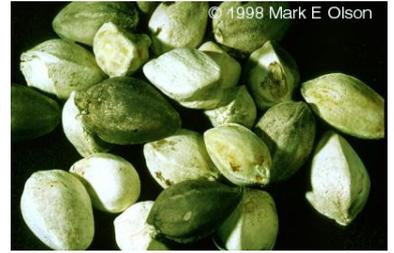
# TINY OIL MILL



## Oil Seeds & % of Oil

PALM KERNEL	SESAM	RAPSEED	MUSTARD	LIN SEED	COTTON SEED	SOYA BEAN	PALM FRUIT
							
38 to 45%	50 to 56%	38 to 45%	38 to 45%	40 to 50%	18 to 22%	18 to 22%	20 to 22%
↓							





**WATER TREATMENT with MORINGA**



**LIVING FENCES with MORINGA**

