

Better management practices (BMP) for vegetable production systems

<u>Vitamins & minerals</u>	<p>Bitter gourd <i>Momordica charantia</i></p> <p>C, magnesium, potassium</p>	<p>Bottle gourd (Calabash) <i>Lagenaria siceraria</i></p> <p>C, magnesium, potassium</p>	<p>Bokchoy <i>Brassica rapa</i></p> <p>C, calcium, potassium</p>
	<p>Carrot <i>Daucus carota</i></p> <p>A, C, calcium, potassium</p>	<p>Channa <i>Cicer arietinum</i></p> <p>A, C, calcium</p>	<p>Chilli <i>Capsicum annum</i></p> <p>A, C, E, potassium</p>
	<p>Egg plant <i>Solanum melongena</i></p> <p>A, C, magnesium, phosphorus, potassium</p>	<p>Lady finger <i>Abelmoschus esculentus</i></p> <p>C, calcium, potassium</p>	<p>Long beans <i>Vigna unguiculata</i></p> <p>A, calcium, phosphorus, potassium</p>
<u>Vitamins & minerals</u>	<p>Moringa (drum stick) <i>Moringa oleifera</i></p> <p>A, C, magnesium, potassium</p>	<p>Mustard leaves <i>Brassica juncea</i></p> <p>A, C, calcium, iron, potassium</p>	<p>Orange sweet potato <i>Ipomoea batatas</i></p> <p>A, C, potassium</p>
	<p>Papaya <i>Carica papaya</i></p> <p>A, C, potassium</p>	<p>Pumpkin <i>Cucurbita pepo</i></p> <p>A, C, potassium</p>	<p>Ridge gourd <i>Luffa acutangula</i></p> <p>A, C, magnesium, potassium</p>
	<u>Vitamins & minerals</u>		




Foreward

In Myanmar food insecurity and malnutrition are wide spread. About one third of the children are chronically malnourished. Large segments of the population cannot afford a healthy and balanced diet and the situation is worse in remote and particularly upland locations. More than two thirds of the household income is typically spent on food, yet diets fail to provide the nutrients required for a healthy life.

With support of the EU and the German Government, GIZ in cooperation with WorldFish provides technical assistance to strengthen aquaculture systems, improve livelihoods and access to a healthy diet for better nutrition. The integration of aquaculture, farming and vegetable production gives a plethora of benefits. It improves the productivity and sustainability of the systems, lowers the inputs cost, increases yields and improves communities' access to a healthy, wholesome and diversified diet.

MYSAP has developed extension services support materials and has promoted good practices on various subjects. The booklet presented here, which was a collaborative development of MYSAP and the USAID funded Fish for Livelihoods project, focuses on home based vegetable production as a contribution to diet diversification and better nutrition.

The purpose of the booklet is to provide easily understood illustrated information on improved vegetable production practices in a user friendly format, covering soils, fertilizers, production seasonality, water wise vegetable production and disease and pest control and management.





*Planting methods / How to cultivate vegetables?
Shade needs, Seeding age*

Loam to sandy loam soil, does not like waterlogged soil.
Row spacing 3-5 feet.
Plant spacing 2-3 feet.
Grow in a raised bed.
Direct seeding into a pit with a support pole.
Seedlings can also be used.
7-12 day old seedlings should be transplanted.

Loam to sandy loam soil, does not like waterlogged soil.
Row spacing 10-12 feet.
Plant spacing 6-8 feet.
Grow in a raised bed or a pit.
Direct seeding into the pit.
Creeper which grows on posts or trellis.
Seedlings can also be used.
7-12 day old seedlings should be transplanted.

Loam to sandy loam soil, does not like waterlogged soil.
Row spacing 3/4-1 foot.
Plant spacing 1/2-2/3 foot.
Grow in a raised bed.
Direct seeding into a pit.
Seedling should be transplanted two weeks after seeding.
Direct seeding is also possible.

Water requirement

Rainy season, daily watering is needed in the nursery.
After sowing, depends on water the holding capacity of the soil, 2-3 days interval for watering is enough.
In the dry season, daily watering is needed.

Raining season, daily watering is needed in the nursery.
After sowing, depends on water the holding capacity of the soil, 2-3 days interval for watering is enough.
In the dry season, daily watering is needed.

Daily watering is needed, unless it has rained.
Water sprinkling is the best way.

Pest / disease management

Major pests:
Pumpkin beetle and fruit fly.
Common diseases:
Powdery mildew, leaf blight.
Control:
IPM, homemade pesticide and fungicide.

Major pests:
Spotted cucumber beetle.
Common diseases:
Leaf blight, downy mildew, Gummy stem blight.
Control:
IPM, homemade pesticide and fungicide.

Major pests:
Aphid, flea beetles, cutworms.
Common diseases:
Downy mildew, leaf spot.
Control:
IPM, homemade pesticide and fungicide.

Fertilizer dosage

Depends on the soil type and fertility,
Manure: 1-1.5 tons/acre.
NPK: 100 to 150 kg N, 100 to 150 kg P and 50 kg K/acre.
Compound fertilizers are also recommended for use like 5-10-5 with N, P and K, rather than single element source fertilizers.

Depends on the soil type and fertility,
Manure: 1-2 tons/acre.
NPK: 100 to 150 kg N, 100 to 150 kg P and 50 kg K/acre.
Compound fertilizers are also recommended for use, rather than single element source fertilizers.

Depends on the soil type and fertility,
Manure: 1-2 tons/acre.
NPK: 100 to 150 kg N, 100 to 150 kg P and 50 kg K/acre.
Compound fertilizers are also recommended for use, rather than single element source fertilizers.
Folia fertilizers are also recommended for use.



Loam to sandy loam soil, does not like waterlogged soil.
Row spacing 1/2 foot.
Plant spacing 1/3 foot.
Grow in a raised bed.
Direct seeding.

Website reference for soil management:

https://m.facebook.com/permalink.php?story_fbid=1954040518173503&id=1478600715717488



Field crop.
Alluvial soil, loam to sandy loam, does not like waterlogged soil.
Row spacing 1-1.5 feet.
Plant spacing 0.5 foot.
Direct sowing.

Website reference for soil management:

<http://www.yara.com.mm/farmer-toolbox/soil-analysis>



All soil types, high yields in loam to sandy loam soil, does not like waterlogged soil.
Row spacing 1.5-2 feet.
Plant spacing 1 foot.
Grow in a raised bed.
40 to 45 day old seedlings are needed for transplanting.

Water showering at the time of sowing to the vegetative stage if it is grown in a raised bed. Depends on the soil water holding capacity, in fields regular irrigation is needed.

Field crop. Proper land preparation and sowing are needed, so that 2-3 times irrigation are needed, depends on the soil water holding capacity.

Field and home garden growing crop. Daily watering is needed. If field cultivated, 3-4 times irrigation are needed. During the raining season, there is no need to water.

Major pests:

Carrot weevils.

Common diseases:

Carrot leaf blight, soft rot.

Control:

IPM, homemade pesticide and fungicide.

Major pests:

Armyworm, aphid, cutworm, pod borer.

Common diseases:

Chickpea wilt, blight, stem rot, damping off.

Control:

IPM, homemade pesticide and fungicide.

Major pests:

Aphid, thrips, beetles.

Common diseases:

leaf spot, soft rot, wilt, anthracnose, blight, powdery mildew.

Control:

IPM, homemade pesticide and fungicide.

Depends on the soil type and fertility,
Manure: 2-3 tons/acre.
NPK: 100 to 150 kg N, 150 to 200 kg P and 50 kg K/acre.

Compound fertilizers are also recommended for use like 5-10-5 with N, P and K, rather than single element source fertilizers.

Depends on the soil type and fertility,
Manure: 2-3 tons/acre.
NPK: 100 to 150 kg P and 50 kg K/acre.

Compound fertilizers are also recommended for use, rather than single element source fertilizers. Folia fertilizers are also recommended for use.

Depends on the soil type and fertility,
Manure: 2-3 tons/acre.
NPK: 100 to 150 kg N, 50 to 200 kg P and 50 kg K/acre.

Compound fertilizers are also recommended for use, rather than single element source fertilizers. Folia fertilizers are also recommended for use.

*Planting methods / How to cultivate vegetables?
Shade needs, Seedling age*



Several types of soil, does not like waterlogged soil. Row spacing 3-4 feet. Plant spacing 2-3 feet. Transplant the seedlings 25 to 30 days after sowing.



Most soil types but does not like waterlogged soil. Row spacing 1.5-2 feet. Plant spacing 1-1.5 feet. Direct seeding.



Loam to sandy loam but does not like waterlogged soil. Row spacing 2.5-3 feet. Plant spacing 1.5-2 feet. Direct seeding with a pole stand. If bush type there in no need to use pole stand. Direct seeding.

Water requirement

Field and home garden growing crop. Daily watering is needed. If field cultivated, 3-4 times irrigation are needed. In the rainy season, there is no need to water.

In the monsoon season, there is no need to water. In the dry season, daily watering is needed.

In the monsoon season there is no need to water. In the dry season water every 3-4 days or weekly.

Pest / disease management

Major pests: Shoot borer, aphid, whiteflies, flea beetle, potato beetle, stink bug.
Common diseases: Wilt, leafspot, blight.
Control: IPM, homemade pesticide and fungicide.

Major pests: Apids, armyworms, beetles, spider mites.
Common diseases: Powdery mildew, fusarium wilt, mosaic.
Control: IPM, homemade pesticide and fungicide.

Major pests: Aphids, army worm, cut worm, bean beetle, stinkbugs.
Common diseases: Rust, leaf spot, anthracnose, root rot, white mold, blight, damping off, mosaic.
Control: IPM, homemade pesticide and fungicide.

Fertilizer dosage

Depends on the soil type and fertility, **Manure:** 3-4 tons/acre. **NPK:** 100 to 150 kg N, 100 to 150 kg P and 50 kg K/acre. Compound fertilizers are also recommended for use like 5-10-5 with N, P and K, rather than single element source fertilizers.

Depends on the soil type and fertility, **Manure:** 3-4 tons/acre. **NPK:** 100 to 150 kg N, 100 to 150 kg P and 50 kg K/acre. Compound fertilizers are also recommended for use, rather than single element source fertilizers.

Depends on the soil type and fertility, **Manure:** 1-2 tons/acre. **NPK:** 50 to 100 kg P and 50 kg K/acre. Compound fertilizers are also recommended for use, rather than single element source fertilizers. Folia fertilizers are also recommended for use.



Any soil type, except sandy soil and waterlogged soil. Growing practices vary.
High density: plant and row spacing - 2 to 3 feet. (harvest leaves only)
Medium density: plant and row spacing - 6 to 7 feet.
Normal density: plant and row spacing - 20 feet by 20 feet. Grow in pits. Transplant the cuttings (vegetative propagation) and direct seeding.

Several types of fertile soil but does not like waterlogging. Row spacing 1 foot. Plant spacing 0.5 foot. (Spacing varies with species) Some varieties can be grown by direct sowing. 2 weeks to 25 day old seedlings.

Loam to sandy loam soil but does not like waterlogged soil. Row spacing 1.5-2 feet. Plant spacing 0.8-1 foot. Use cuttings and direct sowing. Use tuber cuttings.

Sow early in the monsoon season, no need to water.
Website reference for home-made pesticide:
https://greenwaymyanmar.com/posts/How_to_make_organic_pesticides

Daily watering is needed, it likes water showering.
Website reference for manure and organic fertilizer:
https://greenwaymyanmar.com/posts/easy_making_of_organic_liquid_fertilizer

Field or home garden crop. Depends on soil water holding capacity, weekly watering is enough. If field grown, irrigate or water 4-5 times per crop.

Major pests:
 Hairy caterpillar, pod fly, aphid, whiteflies.
Common diseases:
 Root rot, stem rot.
Control:
 IPM, homemade pesticide and fungicide.

Major pests:
 Aphid, flea beetle.
Common diseases:
 Powdery, downy mildew, leaf spot, rust, stem rot, mosaic.
Control:
 IPM, homemade pesticide and fungicide.

Major pests:
 Stem borer, white grub.
Common diseases:
 Root and stem rot, leaf spot, black rot, Wilt.
Control:
 IPM, homemade pesticide and fungicide.

Depends on the soil type and fertility,
Manure: 3-4 tons/acre. Compound fertilizers are also recommended for use like 5-10-5 with N, P and K, rather than single element source fertilizers. Two times per year 100-150 kg compound fertilizers with manure.

Depends on the soil type and fertility,
Manure: 1-2 tons/acre.
NPK: 100 to 150 kg N, 50 kg P and 50 kg K/acre. Compound fertilizers are also recommended for use, rather than single element source fertilizers. Folia fertilizers are also recommended for use.

Depends on the soil type and fertility,
Manure: 3-4 tons/acre.
NPK: 150 to 200 kg N, 100 to 150 kg P and 50 kg K/acre. Compound fertilizers are also recommended for use, rather than single element source fertilizers. Folia fertilizers are also recommended for use.

*Planting methods / How to cultivate vegetables?
Shade needs, Seedling age*



Loam to sandy loam soil but does not like waterlogged soil.
Row spacing 8-10 feet.
Plant spacing 5-7 feet.
Transplant seedlings.



Loam to sandy loam soil but does not like waterlogged soil.
Row spacing 5-6 feet.
Plant spacing 2-3 feet.
Direct sowing or seedling transplantation.
Crawls on the ground and climbs up posts and trellis frames.
15 day old seedlings should be transplanted.



Any soil type, except waterlogged soil.
Loam to Sandy loam soil, no waterlogged soil is the best soil type.
Row spacing 4-5 feet.
Plant spacing 2-3 feet.
Direct seeding, with pole and stand.
15 day old seedlings can also be transplanted.

Water requirement

Daily watering at the seedling stage.
Watering is not needed in the monsoon season.
In a field, monthly irrigation is sufficient.

Daily watering at the seedling stage.
If the soil has good water holding capacity, only a few weeks after transplanting, is watering needed.

Website reference for water management:
<https://www.thefarmermedia.com/news/15978>

Website reference for IPM:
https://greenwaymyanmar.com/posts/components_of_integrated_pest_management

Pest / disease management

Major pests:
Fruit fly, thrips, mites, white fly.
Common diseases:
Leaf spot, wilt, canker, black spot, root rot.
Control:
IPM, homemade pesticide and fungicide.

Major pests: Aphid, beetles, bug, vine borer, thrips.
Common diseases:
Powdery, downey, gummy stem blight, anthracnose, leaf blight, wilt.
Control:
IPM, homemade pesticide and fungicide.

Major pests:
Beetles, vine borer.
Common diseases:
Powdery, downey, leaf spot.
Control:
IPM, homemade pesticide and fungicide.





















Fertilizer dosage

Depends on the soil type and fertility,
Manure: 2-3 tons/acre.
NPK: 150 to 200 kg P and 50 kg K/acre.
Compound fertilizers are also recommended for use like 5-10-5 with N, P and K, rather than single element source fertilizers.

Depends on the soil type and fertility,
Manure: 4-5 tons/acre.
NPK: 100 to 150 kg N, 150 to 200 kg P and 50 kg K/acre.
Compound fertilizers are also recommended for use, rather than single element source fertilizers.

Depends on the soil type and fertility,
Manure: 1-2 tons/acre.
NPK: 100 to 150 kg N, 100 to 150 kg P and 50 kg K/acre.
Compound fertilizers are also recommended for use, rather than single element source fertilizers.
Folia fertilizers are also recommended for use.

Table of best growing season & harvest time

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Best season to grow Harvest time
			 All year, if water is available  2-2.5 months after planting (most species)									Bitter gourd
			 All year, if the weather is favorable  2.5-3 months after planting									Bottle gourd
			 All year round in hilly region with cooler weather  45 - 60 days after sowing									Bokchoy
			 All year round in hilly region with cooler weather  Depends on the variety, 60 to 150 days after sowing									Carrot
			  3.5 to 4.0 months after sowing seed									Channa
			 If water is available it can grow all year  1.5 months after transplanting, depending on the variety									Chilli
			 But can be grown all year if there is no waterlogging  30 days after flowering									Egg plant
			  60 to 75 days after sowing									Lady Finger
			 Monsoon and Winter  60 to 90 days after sowing									Long beans
			 Sow the seeds or cutting  Most flowering month – February, March and April To collect the pod, 20-30 days after flowering. To collect the leaves, all season available.									Moringa

