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References:

- <https://veggieharvest.com/herbs/parsley.html>
- <https://modernfarmer.com/2018/06/three-sisters-garden-planting-corn-beans-squash-together/>
- <https://www.pinoy-entrepreneur.com/2010/07/27/pigeon-pea-or-kadios-production/>
- <https://www.feedipedia.org/node/297>
- https://plants.usda.gov/plantguide/pdf/pg_caca27.pdf
- <https://www.hort.purdue.edu/newcrop/afcm/cowpea.html>
- <https://www.masterclass.com/articles/parsley-companion-planting-guide#8-companion-plants-to-grow-with-parsley>
- <https://www.westcoastseeds.com/blogs/garden-wisdom/companion-planting#:~:text=Amaranth%20%E2%80%93%20Plant%20with%20corn%20to,ladybird%20beetles%2C%20and%20parasitic%20wasps.>

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Corn Vegetable Farming System



CORN-VEGETABLE FARMING SYSTEM

INTRODUCTION

Many crops like corn and vegetables can be grown under a wide range of conditions; while others have more exacting requirements for water, temperature, and light. Thus, in one place several species can be grown throughout the year, but there are others that can be grown only during certain times of the year. Irrigation is an absolute necessity for many species, but a few can be grown under rainfed conditions. Corn and vegetables can grow in the wild or have to be cultivated. Distribution of species that are used as food and feeds may be worldwide or limited to specific areas of certain regions. They can be produced in fields of specialized production areas, outskirts of urban and peri-urban areas, villages, or in gardens around the home.



Sunflower + Corn + Main crop

- Sunflowers are planted along the borders of the cropping area.



C. WINDBREAK

A windbreak (shelterbelt) is a planting usually made up of one or more rows of tall crops, trees or shrubs planted in such a manner as to provide shelter from the wind and to protect soil from erosion. Fields are planted in rows of different crops surrounded by rows of trees and crop like corn, and sorghum among others. Likewise, windbreaks are linear plantings of trees and shrubs designed to enhance crop production, protect people and livestock, and benefit soil and water conservation. Windbreaks can provide valuable opportunities for vine and tree fruit growers, row crop farmers, livestock producers, and rural homeowners.

Corn + Amaranth + Maincrop

Corn is sown along the field borders.



CROPPING METHODS

A. BORDER CROPPING

Border or barrier plants are a management tool based on secondary plants used within or bordering a primary crop for the purpose of disease control, and insect attack among others. Use tall barrier crops like maize, sorghum, cassava, etc., so as to reduce the number of vector population entering the main crop.



B. TRAP CROPS

A trap crop, also known as a sacrificial crop, is a plant that you add to your garden to attract pests away from the main crops grown. The reasoning is this: just as many children will choose ice-cream over a plate of vegetables, likewise most garden pests have preferences for what they like to live on.

Moreover, the inherent characteristics of a trap crop may include not only natural differential attractiveness for oviposition and feeding, but also other attributes that enable the trap crop plants to serve as a sink for insects or the pathogens they vector. Successful deployment of trap crops within a landscape depends on the inherent characteristics of the trap crop and the higher value crop, the spatial and temporal characteristics of each, the behavior and movement patterns of insect pests, and the agronomic and economic requirements of the production system. Thus, trap cropping is more knowledge-intensive than many other forms of pest management.

CROPPING PATTERNS

A. COMPANION CROPPING/PLANTING

Companion planting/cropping can be described as the establishment of two or more plant species in close proximity so that some cultural benefit (pest control, higher yield, etc.) is derived. The concept embraces a number of strategies that increase the biodiversity of agroecosystems. Likewise, *companion planting* is based on the idea that certain *plants* can benefit others when *planted* in near proximity. Also, plants need good companions to thrive. Except for growth and fruiting, plants are relatively idle objects. They are rooted in one spot and don't seem to have much control over their environment. In fact, however, relationships between plants are varied - similar to relationships between people. In plant communities, certain plants support each other while others, well, just don't get along. Plants, like people, compete for resources, space & nutrients.

Further, certain plants grow rapidly, crowd others and take more than their fair share of water, sun and nutrients. Some exude toxins that retard plant growth or kill plants. A common example of this is the Black Walnut (*Juglans nigra*), a tree that produces hydrojuglone. Juglone, also called 5-hydroxy-1,4-naphthalenedione (IUPAC) is an organic compound with molecular formula $C_{10}H_6O_3$. Juglone is derived by oxidation of the nontoxic *hydrojuglone*, 1,5-dihydroxynaphthalene, after enzymatic hydrolysis. Other plants are upstanding citizens and do good by adding nutrients to the soil, drawing beneficial insects into the garden or by confusing insects in search of their host plants.

Plant	Good Companions	Bad Companions
Maize/Corn	Sunflowers, Amaranth, Beans, Peas and other Legumes, Pumpkin, Squash, Cucumber, Melons and other Cucurbits, Parsley	Cabbage, Tomato, Celery

◎ Legumes + Corn

1. Bush beans generally require less maintenance and are easier to grow. Bush beans produce in about 50 to 55 days. Bush beans often come in all at once, so stagger your planting every two weeks.



2. Pole beans typically yield more beans and are mostly disease-resistant. Pole beans need their vines to grow and will produce for a month or two if you keep harvesting. Pole beans will take 55 to 65 days.



3. Lablab or hyacinth bean is a fast-growing legume that can provide fodder less than 3 months after sowing. Lablab requires a well-prepared seedbed where it can be drilled at 3-10 cm depth or broadcast.



fertility, in preventing soil erosion, and in suppressing weeds in upland farms. So far, there are no disease problems observed to attack pigeon pea in the Philippines. The crop can be grown on a wide range of soil types from lighter loams to the clay soils

Cucurbits + Corn

All require a sunny location and fertile, well-drained soil with a pH between 5.8 and 6.8. These plants produce long vines that range in length from 3 feet to 15 feet or more, depending on the variety and growing conditions.

- Zucchini generally takes 35 to 55 days from planting until harvest.
- Squash require 50 to 65 days to mature.
- Melons require 70 to 100 days to reach harvest.
- It generally takes 50 to 70 days for a cucumber to mature.

Planting cucumbers with corn provides the cucumbers with needed shade and support while the corn receives pest protection and nutritional aid. With the right timing and spacing, you can successfully produce these two warm-season vegetable crops together.



C. HEDGEROW INTERCROPPING

Hedgerow intercropping is an agroforestry practice in which perennial, usually leguminous trees or shrubs are grown simultaneously with an arable crop. However, other crops like corn, cassava, and sorghum among others can be used as hedgerows. The trees and other crops, managed as hedgerows, are grown in wide rows and the crop is planted in the interspace or 'alley' between the hedgerows. Also, *hedgerow intercropping*; combines trees with annual crops on the same piece of land at the same time. The tree and crop components are managed so as to be complimentary rather than competitive.

1. A refinement of alley intercropping that especially aims to conserve soil on sloping land. Permanent hedgerows are grown on or near the contour and pruned or shaped to form a continuous dense hedge. Hedgerows can consist of forage legumes, grasses, or crops.
2. The objective is to form a dense barrier to slow and dissipate run-off, increase filtration, and trap suspended soil. In areas where there is high rainfall or low infiltration, the hedgerow is planted just off the contour at a slope of 2-4 percent. This requires a drainage system to move water off the field to stabilize waterways. The drains are dug immediately above or below the hedgerow.
3. Pigeon peas can be used as hedgerows, planted in the contours while the corn seed is sown in the alley.
4. Is a minor crop. Pigeon peas are easy to grow, with abundant sun. They tolerate most soils and can survive with limited water. Perennial plant, usually lasting about 5 years. Pigeon pea is not only a vegetable crop but also for other agricultural purposes. It is a super crop for dryland agriculture because it is an excellent animal feed aside from being a protein-rich human food. It is also useful in increasing soil



4. Pigeon pea is an erect perennial, warm-season crop. It is a shrub that can grow to 12 ft tall, but usually only reaches 3 to 6 ft. The ribbed stem grows upright and is covered in short, soft hairs (pubescent) and is woody at the base. Its deep tap root is fast-growing. Pigeon pea does best when broadcast and covered or drilled into a well-prepared seedbed in rows 35 cm apart, at a depth of 2.5–10 cm.

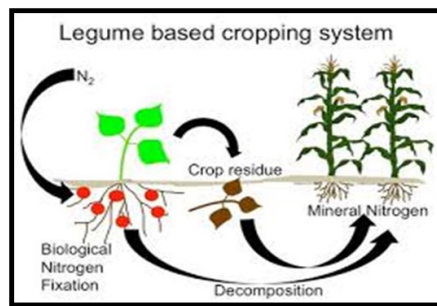


5. Cowpea is a warm-season, annual legume that exhibits a wide range of growth habits. Varieties may be short and bushy, prostrate, or tall and vine-like. Canopy heights can be 2–3 feet, depending on the variety. Fresh-market (green-mature) peas are ready for harvest 16 to 17 days after bloom (60 to 90 days after planting). Its long taproot and wide, vegetative spread make it an excellent plant for erosion prevention and weed suppression. Allelopathic compounds in the plant may help to suppress weeds. Cowpea can be used as forage, hay, and silage. When used as forage, it should only be lightly grazed after flowering. If there are several buds left after defoliation, the plant will regenerate. When used as silage, it can be mixed with sorghum, maize, or molasses to provide sugar for fermentation. In some countries, several varieties of Cowpea have been grown together for both food and feed.



◎ Nitrogen-Fixation

- Beans add nitrogen to the soil and corn is a heavy nitrogen feeder, depleting the nutrient from garden soil.
- Beans forms a symbiotic relationship with a specific soil bacterium (*Rhizobium spp.*). *Rhizobium* makes atmospheric nitrogen, and convert it into a soil-bound form that is useful to other plants by a process called nitrogen fixation. Fixation occurs in root nodules of the plant and the bacteria utilize sugars produced by the plant. It is especially useful to corn, which requires large quantities of the nutrient.
- Excess nitrogen (N) promotes lush vegetative growth, delays maturity, may reduce seed yield and may suppress nitrogen fixation. The plant will perform well under low N conditions due to a high capacity for N fixation. A starter N rate of around 27 lb/acre is sometimes required for early plant development on low-N soils.



2. Sorghum/corn, pigeon pea & sesame



3. Sorghum – Safflower & Maize –Chickpea



4. Planting maize in the long rains, then beans during the short rains



B. MULTIPLE CROPPING

In agriculture, multiple cropping or multi-cropping is the practice of growing two or more crops in the same piece of land during one growing season instead of just one crop. When multiple crops are grown simultaneously, this is also known as intercropping. This cropping system helps farmers to double their crop productivity and income. But, the selection of two or more crops for practicing multi-cropping mainly depends on the mutual benefit of the selected crops.

Threshing can be difficult in multiple cropping systems where crops are harvested together. It can take the form of double-cropping, in which a

2. Sequential Cropping

- Two or more crops are grown in succession one after another in a year. Some advantages are: 1) It produces a variety of crops, the legume improves the soil fertility, and rotation helps reduce pest and weed problems and 2) The residues from one strip can be used as soil cover for neighboring strips.

◎ Recommended Companion Cropping

1. Amaranth, Parsley and Sunflower + Corn

- Amaranth/ "*kalunay*" can be harvested in its vegetative stage for human consumption. Matured amaranth can be used as a feed for animals. It can be given as forage and silage.
- Attracts predatory ground beetles.
- Parsley is ready to cut or harvest in about 70 to 90 days after planting. Harvest parsley leaves any time during the growing season, cut them off at the base of the plant.
- Corn is vulnerable to corn earworms, cutworms, and armyworms. Flowering parsley will attract parasitic wasps and tachinid flies, which hunt these and other types of worms.
- They attract helpful pollinators. Sunflower seeds limit weeds—the effect of this "allelopathic" chemical is believed to inhibit the growth of nearby plants, like weeds. They're beautiful and have edible seeds. Sunflower roots help with contaminated soil. Companion planting with sunflowers attracts pollinators and this helps when growing vegetable, salads and herbs. And pollinated flowers will produce seeds for next year's planting.



second crop is planted after the first has been harvested. In the Garhwal Himalaya of India, a practice called "baranaja" involves sowing 12 or more crops on the same plot, including various types of beans, grains, and millets, and harvesting them at different times. Due to this, multiple cropping became more prevalent in Asian countries

Adopting the practice of multiple cropping on a large scale can help in reducing the food crises of a country. The overall cost of input decreases, cost spent on fertilizers, irrigation, labor, etc. reduces because of growing two or more than two crops on the same field. Risk of weed growth, pest and disease infestation reduces because of mutual relationship within the crop. This results in better farm management and increased income of the farmer.



◎ Considerations in Multiple Cropping

1. Plant the corn first so it gets a head start. Sow the seed eight inches apart in a 3-foot diameter circle on top of the bed. When using pole beans/lablab beans/cow peas or beans that need trellis, the corn plants should be about 6-8 inches tall, after the pole bean seeds is sown in each hill. Plant one seed between each corn seedling, with one seed planted about 3 inches from each cornstalk. The cornstalks act as a trellis for the beans (the plant's thin tendrils don't get in the way of the growing ears). Planting cucurbits as a cover crop is also an applicable (corn+legumes+cucurbits). Type: Inter-Relay Cropping.



2. When using other legumes like mung bean or snap beans that does not require staking, sow the corn and bean seed at the same time. Sow the bean seed in the furrows while the corn seeds in the ridges. Type: Inter cropping.
3. When using creeping such as squash or melon (act as cover crops). Plant the corn first so it gets a head start. Once the cornstalks are 6 to 8 inches tall, plant the squash seeds. The squash seeds are sown at the edge of the bed; the seeds should be about 12 inches from the closest cornstalks, but space these widely, with about 24 inches between each. Type: Inter-Relay Cropping.
4. Planting cucumber as a companion plant requires trellis. Plant one seed between each corn seedling, with one seed planted about 3 inches from each cornstalk. As the cucumber vines grow direct the tendrils toward the nearest cornstalk; you can tie them to the stalk with a piece of twine to ensure they clamber upwards, rather than along the ground. Type: Inter-Relay Cropping.



◎ Variations of Multiple Cropping

1. Mixed Cropping

Two or more crops are randomly grown at a given time without any distinct arrangement.

In agriculture, a multitude of mixed cropping systems can be identified on the basis of their composition, design and management. The agroecological areas involved in species mixing extends, in theory, to all cultivated zones, be they temperate or tropical, dry or humid. In what follows, the multispecies systems described consist of growing several crops simultaneously in the same field, or more generally, of mixing several plant species within the same field: field crop species, pasture species, trees, or combinations of these. Multispecies systems have been the subject of numerous typologies and classifications that may include various criteria such as (i) the permanence of a specific crop assemblage or, conversely, the frequency of land-use rotation, (ii) the intensity of intercropping, i.e. the number, type and level of spatio-temporal occurrence of crops within the field, and (iii) the percentage of tree canopy cover in the field (Garcia-Barrios, 2003). The existence of trees with crops (agroforestry) is an important feature and, within that category, the specific arrangement of species, which refers to the simultaneous or sequential arrangement of trees and crops, or the spatial structure, which refers to the mixed or zonal arrangement.

