Farmers Training Notes **9**

CROPPING SYSTEMS
in Organic Agriculture

KOAN

Kenya Organic Agriculture Network

Cropping Systems *in Organic Agriculture*

A cropping system simply refers to any method adopted by a farmer in raising his or her crops. Cropping systems are grouped into two major categories.

- **Mono-cropping**
- **Multiple cropping**

1. MONO-CROPPING

When a farmer grows one type of crop on his/her farm or plot, tends it to maturity, and harvests it, we say that s/he is practicing mono (single) cropping. Monocropping is, therefore, the cropping system that involves growing of only one type of crop on a unit of land.

When the same farmer grows coffee, tea, pyrethrum or horticultural crops on single crop basis, it is a different matter altogether. S/he is practicing cash crop farming. Due to the nature of the management and harvesting practices, cash crops are best suited for the monocropping system, especially tea, pyrethrum and horticultural crops, be they fruits, vegetables or flowers.

Generally, and in Africa in particular, smallholder farmers growing for subsistence and local market outlets have never been comfortable with growing one type of crop on their farm units. Where smallholder farmers have tended to grow one type of crop on their farm, the decision has largely been influenced by, among others:

❖ **The crop's growth characteristics**

A good example is the sweet potato. This crop develops and rapidly covers the soil surface, making it impossible for other crops to develop. Sweet potato 'mats' have even been used to suppress troublesome weeds such as couch grass. A light feeder inspite of its numerous tubers and foliage, the sweet potato is a precious drought crop, livestock fodder and soil fertility enhancer. The nutritive value, especially of roasted sweet potato tubers, far surpasses that of the Irish potato, among others.

Other crops that cannot be grown in association with others due to their suppressive growth behavior include millets, pumpkins, and arrow roots.

❖ **Limited farm sizes**

In more densely populated parts of the country, some farm units are just mere plots, or strips of land. In this kind of situation, the farmer finds that growing two or more crops is a laughable exercise, as neither will yield any worthwhile output. Such 'farmers' opt to maximize on one type of crop especially vegetables such as kale, spinach or carrots, purely for the homestead kitchen. These smallholder farmers are usually peri-urban or squatters and often keep a few chicken in the compound or a dairy cow to bring in some little money from sale of eggs or milk. In the real sense, they have been forced into mono cropping by circumstances.

Advantages associated with mono cropping

1. It is possible for the farmer to tell in advance his/her expected output and hence expected income where the system is being operated commercially
2. Output is usually high since the farmer is only concentrating on one crop
3. Pests, diseases and weeds are easier to control especially where a farmer is employing an integrated approach towards their control

Disadvantages associated with mono cropping

1. Over time, pests, diseases and weeds build up and become a costly problem
2. In a severe pest or disease outbreak, the farmer may lose everything
3. Where a farmer is monocropping with heavy feeders, continuous impoverishment of the soil occurs
4. In the event that other farmers are also growing the same crop, the farmer has no control over market trends, especially during times of plenty
5. Only a single crop is harvested, resulting in a poor family diet
6. There is a high risk of total crop failure due to pests, diseases and drought

2. MULTIPLE CROPPING SYSTEMS

These are systems that involve planting of more than one type of crop on a unit of land.

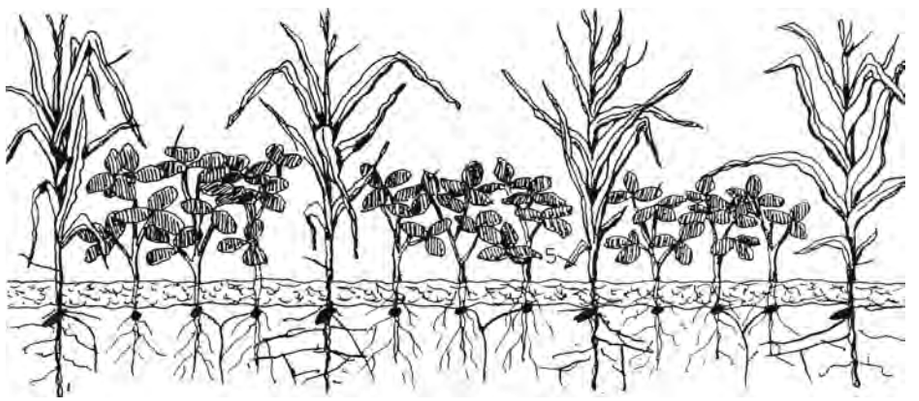
Multiple cropping systems are also refered to as inter-cropping or mixed cropping. There are several methods used in inter-cropping, each of which is determined by:

- Ecological characteristics
- Growing habits of specific crops
- Market demands
- Size of land
- Farmer's preference

The above five factors will thus be taken into consideration as planting guides when the farmers choose any one of the following systems within the broader multiple cropping systems.

Row Inter-cropping

This is the growing of two or more crops **at the same time** where one or more crops are planted in rows.



Row Inter-cropping

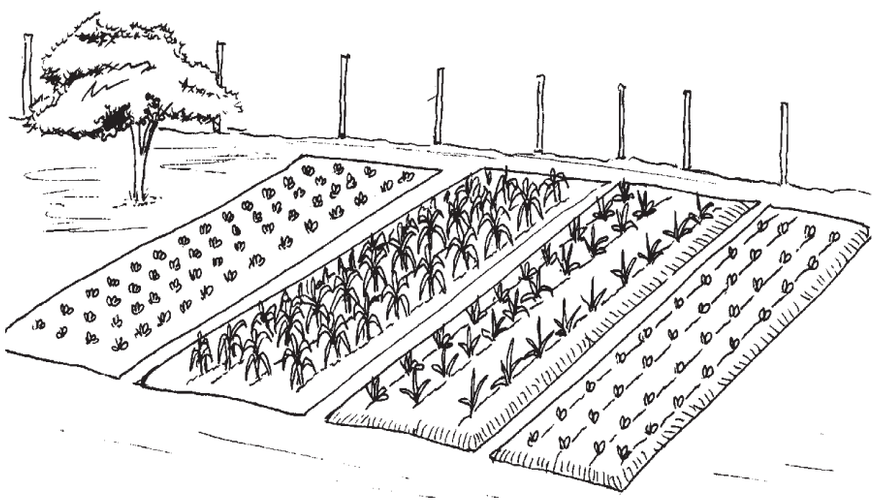
Row intercropping is very ideal for those crop plants that grow in light shade. These include groundnuts, beans, garden peas and cowpeas. The system is also effective in controlling a variety of insect pests in that they get confused when trying to locate their specific food sources. Good examples of row inter-cropping involve.

- Two rows of maize, followed by two rows of cowpeas
- One row of maize, followed by two rows of groundnuts
- One row of maize followed by three rows of groundnuts, and another row of maize followed by a non-row strip of cowpeas, alternatively.

When using this system of inter-cropping, it is important that the farmer does not use climbing varieties of the shorter crop as it will entwine around the tall crop and interfere with its development.

Strip inter-cropping

This system involves growing of two or more crops of different families at the same time in small portions or long narrow strips arranged side by side, with adequate passage spaces between them. This system is ideal for vegetables especially grown for both market and homestead kitchen.



Strip inter-cropping

As an agronomical procedure, no two rows of crops belonging to the same family should be planted next to each other. This way it becomes easier to control pests and diseases more effectively. In this regard, strong-scented crops like onion, garlic and leeks should be planted on strip edge.

Where a farmer using this system has made a good planting plan, it is very easy to:

- Adopt a sustainable rotational plan
- Provide water either through drip or overhead irrigation
- Determine expected output from each strip or portion
- Adjust his planting dates and seasons to comply with market demand.

Strip inter-cropping is applicable to both smallholder and large scale, cash-oriented or market-driven farmers.

Relay Inter Cropping

This system involves growing of two or more crops at the same time during part of the life cycle of each. It sounds like a complex system, but is quite simple to put into practice, if you consider the following steps carefully:

- The first crop, say cassava, is planted and tended up to the tuber development stage, i.e. when it has very young, tender tubers.
- At this stage, another crop, say groundnuts or cowpeas, is planted.
- As the cassava tubers near maturity the second crop is already developed.
- Using the mutual (friendly) shade from the cassava crop, this second crop will grow to maturity.
- As the second crop (cowpeas, groundnuts) is being harvested, some of the cassava tubers will also be ready for consumption. The farmer will use both the cassava and the cowpeas or groundnut at the same time.
- Given the biennial nature of cassava i.e. it will be in the farm for up to two years; another crop of either groundnuts or cowpeas; or even both will be planted for the second time and used with the cassava which is still yielding tubers.

This system, especially where cassava and cowpeas are grown in relay (one after the other), has been found to be very useful in drought-prone areas of Central, Eastern and Western Kenya.

The management practices involved are low, moisture conservation is assured by the spreading canopy of cassava plants, and soil fertility enhanced and maintained by the legume crop growing below the cassava. Pests will have their life cycles broken by alternating one shorter crop with another, and the farmer is assured of produce, continuously.

Relay Inter Cropping

Multi-storey inter-cropping

This system incorporates growing of tall perennials with shorter biennial or annual crops. The system of row or random planting can be adopted but specific crops are planted at their own strip, plot or level. Crop plants that do not suffer from mutual shading can be planted under the perennials. It is important to mention here that this system is very intensive and is practicable in areas experiencing relatively high amounts of precipitation.

Examples of multi-storey inter-cropping

- *Sesbania sesban* as the tall deep-rooted crop interplanted with maize in rows, and beans or groundnuts in between
- Fruit trees in wide rows, and cassava, maize and groundnut in succeeding rows
- Bananas in wide rows in between cassava, maize, cowpeas or groundnuts.

Relay Inter Cropping

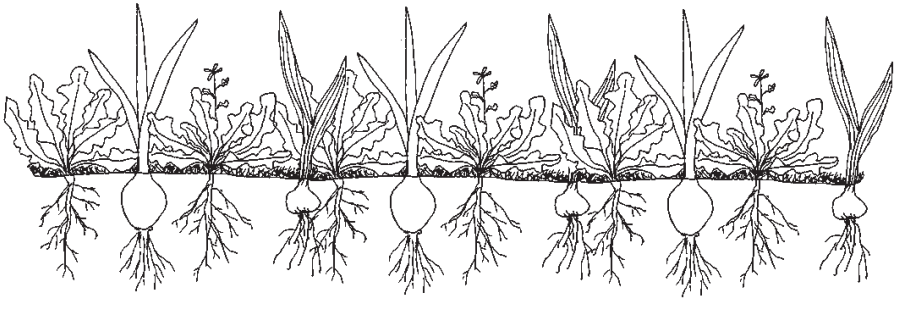
Advantages of multi-intercropping systems

- Due to the wide variety of crops grown, pests are discouraged as they have a problem identifying their specific host crops
- Farmers can source different types of food crops and livestock fodder throughout the year
- Biomass from leaf fall contributes significantly towards moisture conservation, accumulation of nutrient- rich organic matter and soil conservation.
- Accumulation of organic matter on the ground, which breaks down into valuable humus
- Soil moisture thus conserved prevents soil loss through erosion by wind or rain
- Deep-rooted crops bring up nutrients for use by shallow-rooted crops

- Nitrogen fixation by legumes grown in association with other crops
- Farmers escape total loss in the event that a disease or pest outbreak affecting one type of crop occurs
- Farmers are assured of food and fodder throughout the year.

Disadvantages of multi-intercropping systems

- May require high management skills to know the ecological requirements and growth patterns of the different crops. Most smallholder farmers lack this knowledge.
- With poor husbandry practices, output from some or all crops may be insignificant
- Not suitable for market-oriented crops as quality and quantity may be compromised by nutrient competition from other crops.
- Selective pest and disease management may prove difficult.
- Other crops may interfere with the harvesting of a specific crop upon its maturity.



Some of the material in this book was adapted from the books below:

1. Sustainable Agriculture – by ILRI
2. Natural Pests and Disease Control – by Henry Elwell and Anita Maas
3. Organic Farming – by John Njoroge
4. Soil Fertility Management - by John Njoroge

BOOKLETS IN THE FARMERS TRAINING NOTES SERIES

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Author	**Teresia W. Ndirangu**
Editor	**Samuel Waweru**
Illustrations and Design	**Anthony Mwangi**

Kenya Organic Agriculture Network (KOAN) is the National Coordinating Body for organic agriculture activities in Kenya. KOAN's mandate is to coordinate, facilitate and provide leadership and professional advisory services to all members and stakeholders in the areas of production, technical training, marketing, certification, lobbying and advocacy. It seeks to promote the organic agriculture movement in Kenya, to evolve and become a highly beneficial and integral industry with direct impacts on the environment, poverty reduction, employment and wealth creation.

For more information contact:

Kenya Organic Agriculture Network

P.O. Box 72641-00200, Nairobi, Kenya
ICIPE Complex, Kasarani.
Tel: 020-572-506-836 or 0704-428-465 or 0787-557-908
Email: koansecretariat@elci.org Web: www.koan.co.ke