



# Agrisys Tanzania

Leaflet #01

Farming practices and pest management





# FARM MANAGEMENT AND PESTS

Some of the most **common** insect pests in Tanzania, particularly found on cotton, maize, sugarcane, pumpkin, okra and bean plants are:

## APHIDS

*Aphidoidea*



## MEALYBUGS

*Pseudococcidae*



## LEAFHOPPERS

*Cicadellidae*



Natural pest control is essential to ensure that both **quantity** and **quality** of crop production is at its highest potential. It is more beneficial than chemical pest control, which often contaminates and damages non-target species (including humans), soil/water quality and the surrounding environment.



Integrating trees and other plants with crops is good because it:

- Increases natural enemies to control pests
- Increases pollinators to increase crop yield
- Increases microorganism abundance in soil to increase soil productivity
- Promotes balanced ecosystem

The use of local natural enemies and botanical plants (natural pesticides) is important as they are generally **affordable**, **effective** and **efficient** methods of pest control (see other posters).



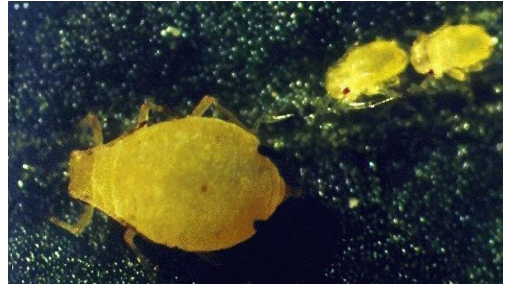
# COTTON APHID

(*Aphis gossypii*)

The cotton aphid is one of the most **common**, **adaptable** and **widely spread** pests. It feeds on the sap of young plants, deposits honeydew, can transmit viruses and, in high populations, can kill the crop.

## DESCRIPTION of the aphid:

- Range from yellow to very dark (almost black) green
- Yellow in hot, dry seasons & pale-dark green in cooler seasons
- Very small aphid- adults range from below 1-1.5mm in length and 0.34mm in width
- Most adults are wingless



©Timothy A. Elbert- *Aphis gossypii* adult and nymph

The pest is mainly found on crops such as **cotton**, **pumpkin** and **tomatoes**, but can also be found on **okra**, **beans**, **sugarcane**, **maize**, among many others.



## SYMPTOMS on crop:

1. **Yellowing** of leaves
2. **Puckering/curling** of leaves
3. Plants become covered with **black sooty mould**
4. Plants become **stunted** & stems **twisted**
5. Sometimes, virus **cotton blue disease**
6. Sometimes, presence of **ants** can be associated with cotton aphid

**Natural enemies** can be used to reduce the numbers of cotton aphids in the crop and reduce loss of crop yield, by **predation**. The ***Chrysoperla carnea*** (green lacewing) has shown to be very effective in controlling the aphid population in cotton.



The adult green lacewings are pale green in colour and around 12-20mm in length. The adults only feed on nectar, pollen and aphid honeydew but their **larvae** are the active predators of the cotton aphid. In order to survive, the lacewings require:

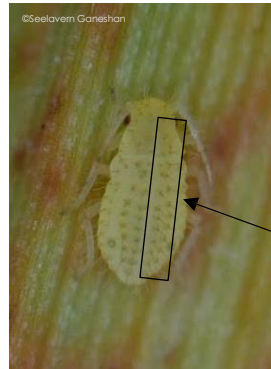
- A source of **moisture**, so larvae do not desiccate
- Planting of **flowering plants**, so adults can feed on pollen & nectar

Lacewings particularly like **Asteraceae** flowers (sunflower, cosmos, dandelion) or **Apiaceae** flowers (dill, fennel, angelica) so planting **along the margins** of the field or in **nearby** fields would be helpful for pest control.

# YELLOW SUGARCANE APHID

(*Sipha flava*)

The yellow sugarcane aphids are **widespread** in warmer climates, feed on the lower side of crop leaves, **inject toxins** in them and produce **honeydew**.

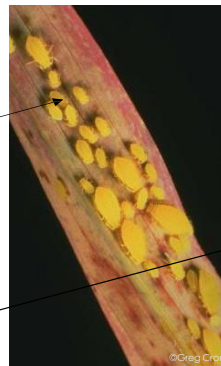


- Commonly **lemon yellow** but sometimes pale green in colour
- **Small** pests- around 2mm long
- Covered in **small spines**
- Two double rows of **dark spots** on back
- Both **winged** and **wingless** forms

The yellow sugarcane aphid is most found as a pest on crops like **sugarcane**, **millet**, **maize**, **rice** and **sorghum**.

## Symptoms of infestation include:

- Abnormal colouration of leaves (**purple**)
- **Yellowed/red** or **dead** leaves
- Can **reduce growth**
- **Sooty mould fungus** on honeydew
- Severe damage, plant **lodging** or stalk **rot**
- Damage on **underside** of leaves



*Cheilomenes lunata*



Sunflower

To reduce numbers of yellow sugarcane aphids and loss of crop, some **ladybird** species in Tanzania such as ***Cheilomenes lunata***, and species of ***Scymnus***, among many others, should be protected, as they are natural enemies. Both adult and nymph forms are predators and in order for them to survive and aid pest control, they require:

- **Moisture** for survival of larvae
- **Shelter** from harsh climate
- Source of **pollen**, so **flowering plants** required

Similarly to the green lacewing, most species of ladybird are attracted to **Asteraceae** flowers (sunflower, cosmos, dandelion) or **Apiaceae** flowers (dill, fennel, angelica). Making sure plants like these are present will help keep the local natural enemies control the pests.



# INDIAN COTTON JASSID

(*Amrasca biguttula biguttula*)

The Indian cotton jassid is also known as the Indian cotton leafhopper, green jassid, cotton leafhopper or okra leafhopper. It attacks the crop all year round by **sucking its sap** and **laying eggs** within the soft plant tissue.



- **small** (adults ~0.6-3mm long)
- **winged** species (both jump & fly)
- **yellowish green** in colour with **black spots**
- shiny & almost transparent

The cotton jassid feed on the underside of crops like **beans, sorghum, maize, cotton** and **okra**, among others.

## SYMPTOMS of infestation:

- **Discoloration** of leaves
- **Curling** of leaves sometimes resulting in **dropping off**
- Outer zones turn **yellow-red-white**
- Can retard plant growth & **reduce yield**
- **Sooty mould** can grow from secreted honeydew



Jumping spider (Salticidae)



Angelica flowering plant

To reduce green jassid populations, natural enemies like the species of **ladybird, ants** and **spiders**, should be encouraged to remain in the environment. To support these species to feed on the jassids:

- **Flowering plants** like sunflowers or angelica should be planted nearby (either along the margins of the field crop or in neighbouring fields)
- Sources of **water/moisture** must be present (to support eggs, nymphs & adults)

**Biological pesticides** that come from plants like the **neem tree**, have also proved useful as a form of pest control, to increase crop yields.

# NEEM PLANT

(*Azadirachta indica*)

The neem plant is very **resilient, inexpensive**, can grow almost anywhere and is usually grown from the seed (but can do from cuttings or root suckers). Most of the parts of the tree can be used, for **medicinal, cosmetic** and **natural insecticide** purposes. The products of the neem tree also generally have a **low toxicity** to non-target organisms.



## DESCRIPTION of the plant

- Can grow up to 30m tall with deep roots
- **Flowers** which attracts **pollinators**
- Ripe fruit are **yellow-green** and have a seed which contains kernels
- Can live up to more than **two centuries**
- Thrives under **hottest conditions**
- Grows well on **dry, infertile sites**, above sea level
- Require **sunlight** and regular moisture



The neem tree is important as it is very useful in the form of a **biopesticide**, to control crop pests, by:

- **Repelling** insects from crop
- **Preventing feeding** on the crop
- **Disrupting** insect **growth, metamorphosis** and **reproduction**

How to extract the biopesticide compounds from the neem plant:

1. **Collect** the matured fruit and remove seeds
2. **Clean** the seeds and **dry** them out (spread out in sun)
3. **Pound** the seeds to remove the shell and get the kernels
4. **Crush** the kernels by pounding (using pestle and mortar)
5. **Sieve** through the pounded pulp to get greenish brown powder
6. **Stream** the powder by placing over boiling water for 15-20 minutes
7. **Press** the product to extract the oil
8. **Dilute** 0.25ml of the neem oil with 20litres of water as an aerial spray
9. **Spray** over the crop leaves



Mature neem fruit (1)



Neem dried seeds (2)



Crushed kernel powder (5)



Neem oil (7)

The neem spray will be particularly beneficial to insect pests such as the **cotton jassid**, the **cotton aphid** and the **yellow sugarcane aphid**, among many others, to reduce their populations and increase crop yield.



# CROP PROTECTION FROM PESTS

During household surveys conducted in Katurukila, Kidatu, M'angula B, Mgudeni, Msalise, Msolwa St., and Sanje in 2020, many farmers reported that pests and diseases seriously affected their agricultural activities over the last 3 years and that crop pests and diseases will be a big risk to agricultural activities in the future.

## FARMERS USING PESTICIDES

Farmers reported that caterpillars are doing the most damage to their crops, followed by flies. Farmers with more pest damage use more pesticides.

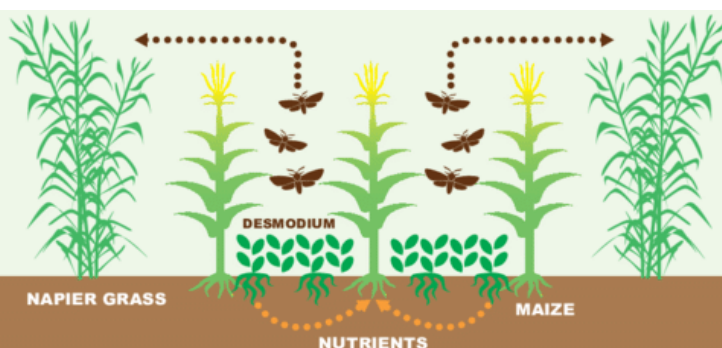
Farmers mostly use pesticides on maize and sugarcane crops. More synthetic inputs do not seem to be associated with lower crop damage by insects.



## FALL ARMY WORM ON MAIZE CROPS

Intercropping maize with Silverleaf or Greenleaf *Desmodium* can help to repel pests like the fall army worm. Planting Napier grass as a border crop which attracts the fall army worm can help reduce the pest and increase maize yields.

Leaving margins around the field to provide habitat and food sources for natural enemies can also reduce numbers of fall army worm.





# CLIMATE AND CROP HEALTH

## SUGARCANE



Sugarcane is resistant to high temperatures but less water decreases sugar content, this may happen in the future as rainfall is decreasing.

Growing trees with sugarcane will increase moisture below the canopy and increase shade.

## MAIZE

### MAIZE AND HEAT STRESS

The optimum temperature for maize growth is 30-34 °C.

When the ground temperature is too hot or there is drought:

- Maize growth declines
- Leaf health is reduced
- Pollination declines
- Maize yields decline.

Maize is most **vulnerable to heat stress after planting** and before the leaves cover the bare ground.



### MAIZE AGROFORESTRY

Tree cover does not reduce the crop health of maize.

**Growing maize with leguminous trees like mfulu or mlenda** can reduce temperatures and increase soil health.

Covering the ground with **crop residue or cover crops** such as lablab, pumpkin, pigeon pea can help reduce the ground temperature and increase maize yields.



# TREES HELP ADAPT TO DROUGHT AND FLOODING

Trees help to lower **temperature** and **humidity variation** in the wet and dry season because there is less direct sunlight and wind under the canopy.



## CROP TEMPERATURES

Climate change is making it hotter and the rains less predictable.

At higher temperatures, the soil dries out faster and there can be more pest damage and decreased crop yields.

**Planting trees can stabilise crop temperatures** and increase the humidity under the canopy. This can **reduce changes in soil moisture** and prevent the soil drying out so quickly.



# TREES IN THE LANDSCAPE

Household surveys conducted in Katurukila, Kidatu, Mang'ula B, Mgudeni, Msalise, Msolwa St., and Sanje in 2020, show that farmers who recognise the benefits provided by nature on the farm and surrounding area have **a greater number of trees** and **more different types of trees** on their farm.

## REASONS FOR HAVING TREES ON THE FARM ARE:

- Fuelwood
- Fruit
- Shade
- Timber
- Clean air
- Charcoal



## TREE PLANTING

Most farmers had not planted any trees on their farm in the year before the survey.

Some of the reasons for this include:

- Shade reducing crop yield.
- The farm is too small.
- Not the land owner.

In the year before the survey most farmers did not have any problems because of trees.

## NATURAL AREAS OUTSIDE THE FARM

Most farmers think that natural areas outside the farm such as moist forest, miombo forest and grassland provide them with benefits such as rainfall, clean air and clean water.

Most farmers do not think they have enough access to natural land to meet the needs of their household.



# AGRISYS TANZANIA PROJECT INFORMATION

AGRISYS Tanzania is a project ([agrisystanzania@gmail.com](mailto:agrisystanzania@gmail.com)) to research biological and human well-being benefits that can be provided by agroforestry in tropical landscapes. They work to:

1. Identify the key benefits of agroforestry
2. Identify the agricultural potential of agroforestry landscapes
3. Study sustainable agriculture practices and their link to human well-being

