# Plant-Parasitic Nematodes and Food Security in sub-Saharan Africa (SSA)

## Context

Dominance of highly complex, smallholder farming systems.

Lack of quality inputs, improved techniques, improved cultivars, and pest and disease diagnostics.

Rising populations ☛ more food requirements, and declining per capita food availability.

Intensification of crop production systems ☛ elevated pests and diseases threats.

Escalating urbanisation ☛ emergence of peri-urban and urban systems with significant pest and disease pressure and unsustainable production practices.

Impacts of climate change on pests, diseases, crop productivity and water availability.

Tradeoffs in agricultural production intensification, food safety, health of people, animals and the environment due to improper use of pesticides.

## Nematodes in SSA

**Most important**
Species of *Meloidogyne* are widely distributed across SSA, infect just about all cultivated crops, often go unnoticed, probably the greatest biotic threat to agriculture across the tropics. Of these, root-knot nematodes are the most important.

**Complexity**
Nematode species in SSA are a diverse, complex community ☛ difficult to assess relative importance or pathogenicity of individual species.

**Diagnosis challenges**
Nematodes are difficult to diagnose due to their nonspecific, cryptic disease symptoms, lack of apparent damage, limited diagnostic capabilities, and inadequate understanding of nematodes and expertise to manage the pests. Nematodes are often misdiagnosed or attributed to other causes.


**Implementation challenges**
Infrastructural, policy, logistical and financial issues make it difficult to implement management solutions for nematdoes.

**Nematode characteristics**
- Infect, feed on and reproduce on an astonishing range of crops and plant species.
- Difficult to identify and have high fecundity and short generation times, and therefore spread rapidly.
- Nematode infection undermines resistance to other pests and diseases; predisposes plants to other pathogens that magnify losses and mask nematode damage.

**Climate change** will alter the geographical spread of nematode pests and lead to the emergence of new nematode problems.

**Neglect of nematology**
as a discipline with only limited instances where it is presented as a stand-alone topic, and inadequate attention to nematodes relative to other pests and pathogens.

**Seed systems**
The often-unregulated nature of seed supply systems and the informal exchange of infected planting material facilitates the spread of nematode pests.

**Economic loss**
Although there are no reliable estimates on the economic impact of nematodes in SSA, it is undeniably massive.

## Examples of nematodes on crops

**Banana** (and plantain) is one crop that can be used to demonstrate the impact of nematodes on crop production in SSA. Unless tissue culture plants have been used, it is presumed that every banana plant is infected with nematode pests. Feeding by nematodes creates root necrosis and death. Damaged root systems result in weakened plant anchorage, poor bunch weight, inability to support stems and plant susceptability to weather elements.

**Yam** is affected by both lesion nematodes and RKNs, with the former traditionally more significant. The lesion nematode, *Scutellonema bradys*, causes dry rot disease. However, there is growing evidence of increasing incidence of RKNs on yam and higher levels of damage. Recently, the aggressive RKN species *Meloidogyne enterolobii*, was recovered from yam for the first time in Nigeria.

**Maize** lesion nematodes and RKNs, and numerous other nematode species may may occur simultaneously, causing significant damage to production. Cereals, including maize, are often mistakenly viewed as poor hosts of RKNs, perhaps because of the lack of the typical galling symptoms that *Meloidogyne* spp. cause.

**Rice:** The cyst nematode, *Heterodera sacchari*, has been recorded on upland rice in West Africa, causing serious losses and, potentially, represents a major constraint for regional rice production intensification.

**Cassava**, probably best known for its ability to withstand most afflictions, is generally viewed as being unaffected by nematodes. However, the naturally knobbly roots conceal RKN galling damage, and roots infected early in the season appear to deteriorate and die. The absence of infected roots at harvest disassociates nematodes from the significant yield loss that they cause.

**Potato**: Numerous nematode species and genera are reported from potato. In SSA, RKNs and lesion nematodes appear to be the most important. The recent discovery of the potato cyst nematode in Kenya illustrates the serious threat of nematodes to this crop.

**Coffee:** There is scarce information on nematode species distribution and virtually none on their impact on production. However, based on knowledge from coffee producing areas elsewhere, it can be assumed that nematodes are responsible for significant damage to coffee production in SSA.

## Future outlook

There has been considerable progress since 1985, and the outlook is positive and optimistic. To hasten the pace towards holistic integration of nematode management in agriculture in SSA, shifts in attitude and practice are necessary.

Creation of public awareness and understanding across the agricultural landscape including farmers, extension services, policymaking bodies, donors and development partners, academia and the scientific community.

Establishment of networks or platforms towards building a critical mass of nematology expertise, while generating relevant activities and publicity. Good practice examples include:

- Nematology platform developed through *icipe* and IITA
- Nematology Initiative for Eastern and Southern Africa
- Nematological Society of Southern Africa
- Nigerian Society of Nematologists
- Specialised nematology training at Ghent University, Belgium

Knowledge advances on nematode management need to be fully integrated within agriculture, academia and policy.

Adequate coordination, motivation, and financial support is required to institute necessary agricultural policies.



Develop suitable, adoptable and relevant nematode management options, and make them available across SSA.

Stimulate wider and greater multidisciplinary interaction in open access journals, and beyond specialised scientific literature.

**Developed by *icipe* based on the review below:**
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