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INSECTS AS SUSTAINABLE SOURCES OF PROTEIN

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Insects as Feed in West Africa

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Prospects and constraints for the small-scale production of fly larvae in West Africa

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KNOWLEDGE FOR LIFE

Animal feed in West Africa

Poultry and fish producers:

- Feed expensive (70% of the costs), esp. proteins (fish meal, soja, groundnut)

Animal feed in West Africa

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Smallholder farmers

- Scavenging poultry fed with grains (not always)
- Fish «fed» with organic waste (not always)
- Low growth and yields, high juvenile mortality

Animal feed in West Africa

Smallholder poultry farmers – Benin (data FSA)

- 44% give feed to their poultry
  - 7% buy protein feed

Animal feed in West Africa

Smallholder poultry farmers - Burkina Faso (Data IDR)

- 98.8% give feed to their poultry (rapid increase – pesticides?)
- 33% buy feed but only 3.6% buy feed with proteins

Farmers are aware of the protein issues

Occasional insect collection during outbreaks :

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Occasional insect collection during outbreaks :

Provision of termites to poultry

- Long tradition in West Africa
- 64% of poultry farmers use termites in Benin (FSA)
- 49-83% in Burkina Faso (IDR)
- 100% in Northern Togo (FFA, limited survey)

Solution: Producing insects

But:

- Only few insects are easily mass produced
- Very few insects can be mass-produced cheaply to concurrence classical protein sources

Ca. US$ 2 / kg

Flies

Three types of flies used for animal feed

House fly
(*Musca domestica*)

Black soldier fly
(*Hermetia illucens*)

Blow flies
(Calliphoridae)

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Suitable for farmers?

Benin (Pomalegni et al 2016):

- 6% of the poultry farmers already use house fly maggots
- 82% of them are willing to try and the majority are willing to pay
- 12% don't want to try

Use of fly larvae in rural areas

Use of fly larvae in rural areas

Farmers

Small enterprises
& livestock producers

House flies

Black soldier
flies

Use of fly larvae in rural areas

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House fly production system at IER, Mali

N’golopé Koné

Maggot's rearing beds (1m^2)

Day 1: Substrate in rearing bed for natural oviposition

Many substrates tested, e.g.

- Chicken manure (+ litter)
- Sheep/goat manure with fish offal
- Sheep/goat manure with blood
- Other organic matters …

Add +/- 20 l. water

Days 2 & 3: Substrate covered

Day 4: Larvae sifted from the substrate using different procedures

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Day 4 to 5: larvae left one day to empty their gut

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Day 5: larvae are dried in the sun

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Day 5: larvae are dried in the sun

Solar drier in Ghana

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Larvae can be given to animals fresh or dried

Dry larvae

By-product: valuable compost

System to be adapted to smallholder farmers

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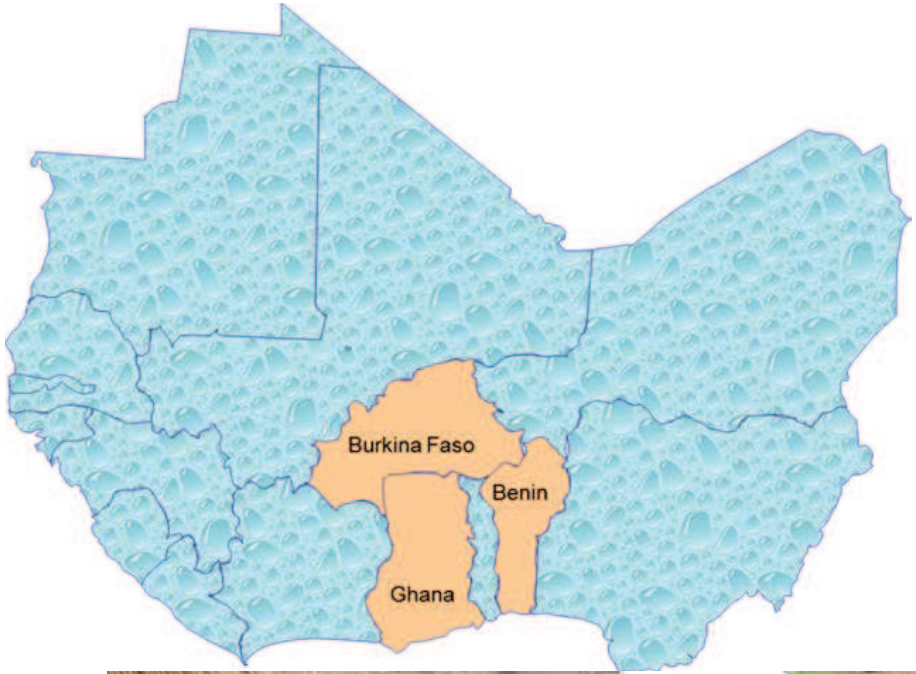
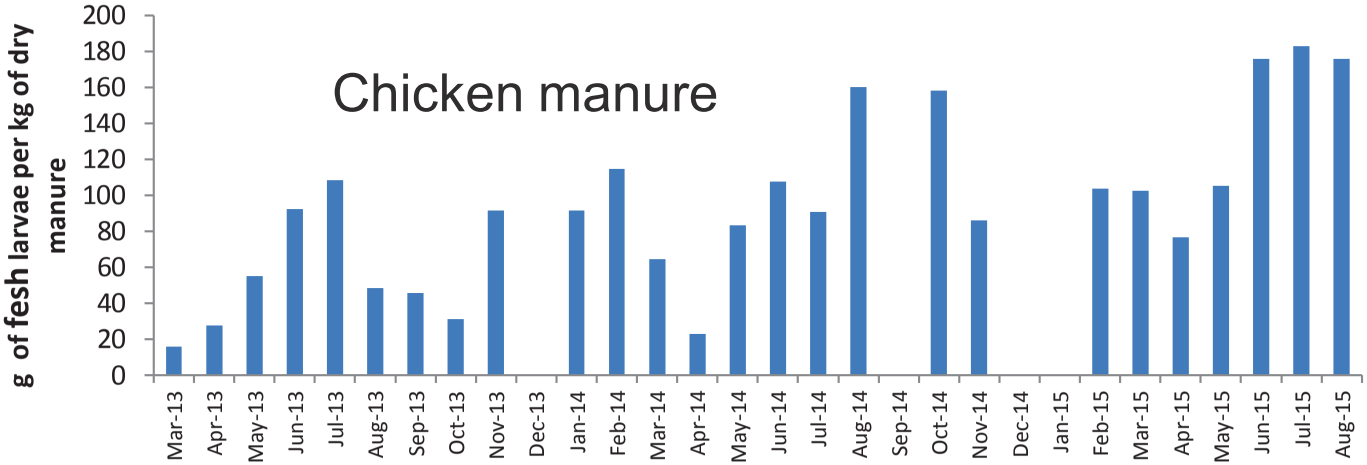
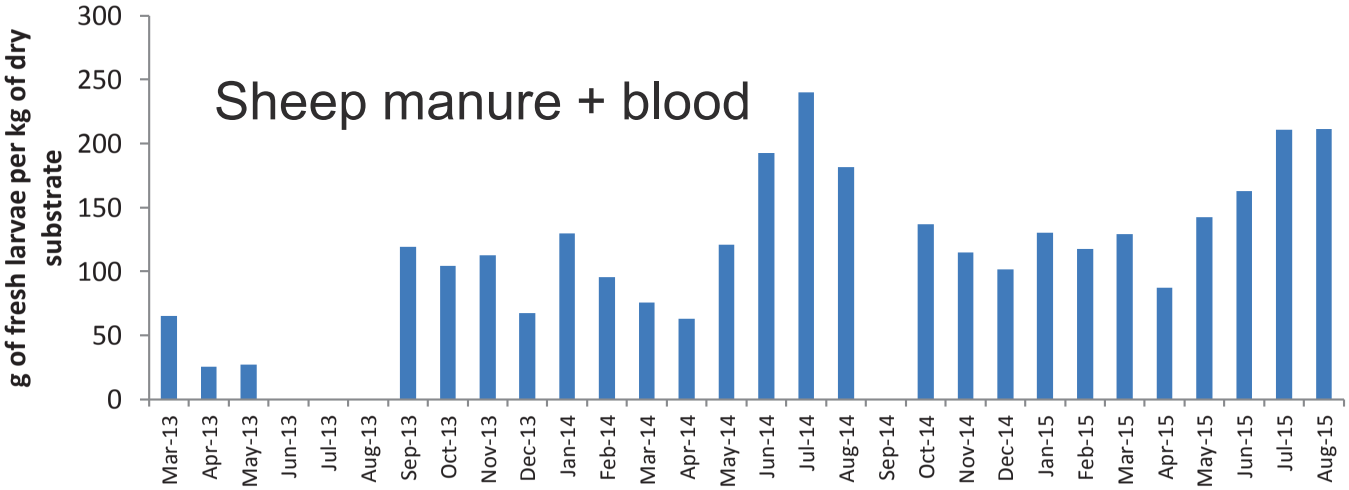


Issues related to the natural oviposition substrate system

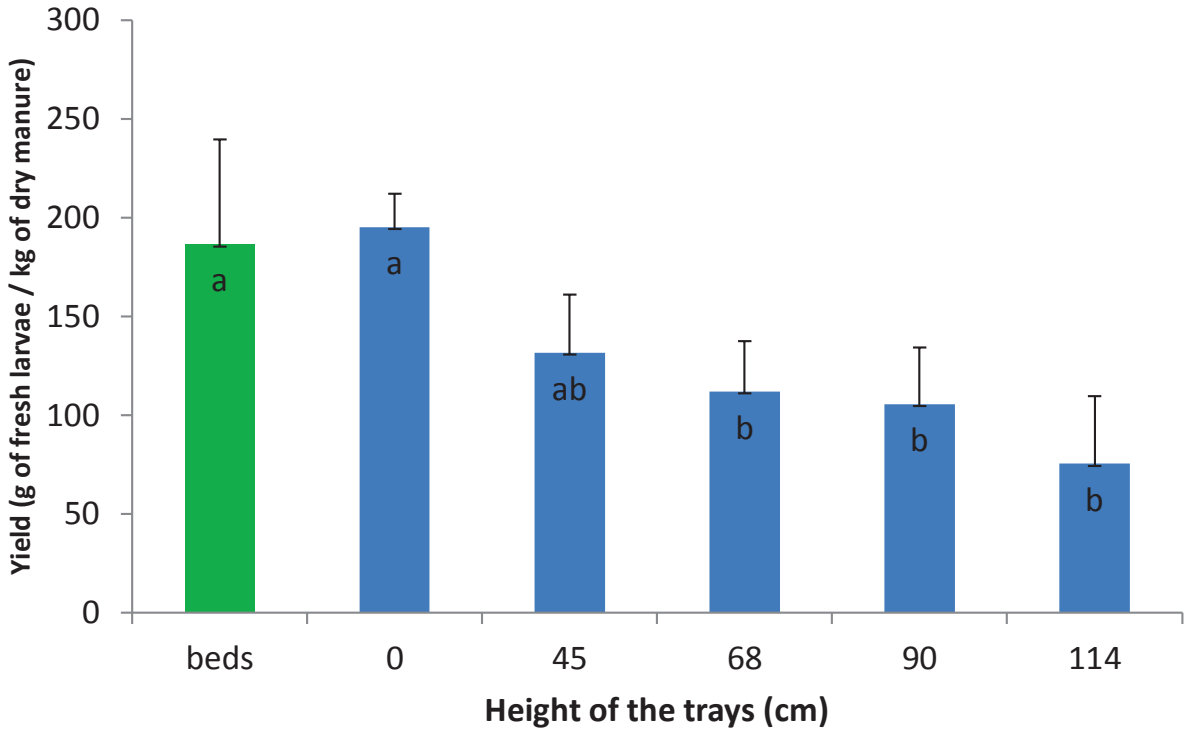
1. Yield fluctuates with season





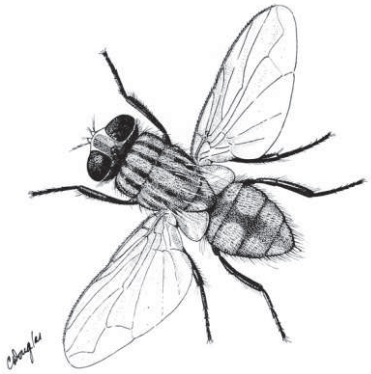
Issues related to the natural oviposition substrate system

2. Need of a large ground surface



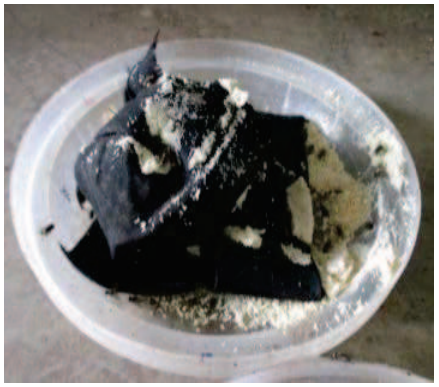
Issues related to the natural oviposition substrate system

3. Potential health issue with the increase of flies around the production system



Can adult rearing solve these issues

In theory yes but …



Can adult rearing solve these issues

In theory yes but …

- An efficient and reliable adult rearing system requires
  - Specific facilities with reliable conditions
  - Expertise
- Producing eggs is costly

Black soldier fly - *Hermetia illucens*

Black Soldier fly production system FfA and U. Stirling

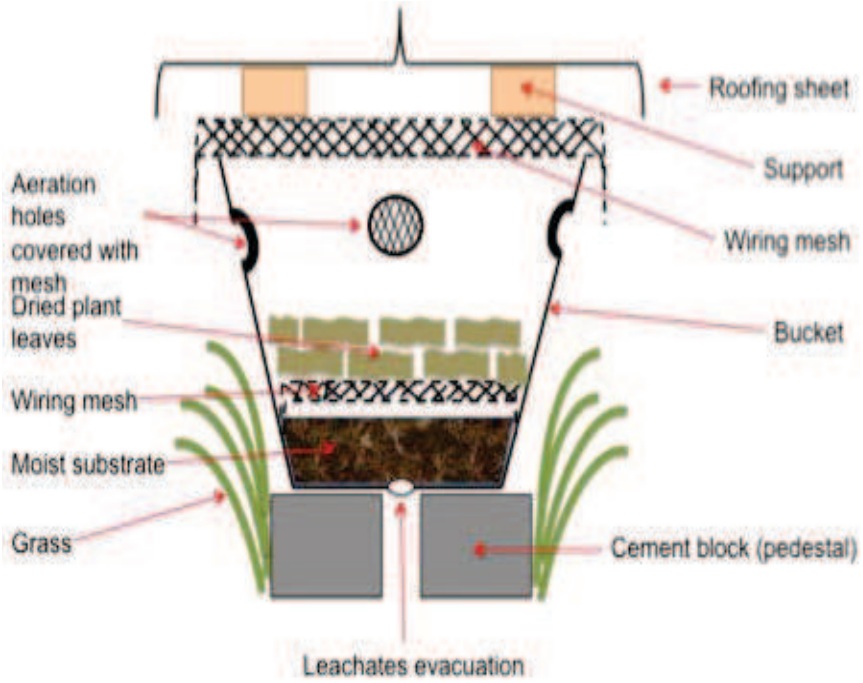
Emilie Devic

Basile Bouwassi

Gabriel Koko

Adult rearing and egg production

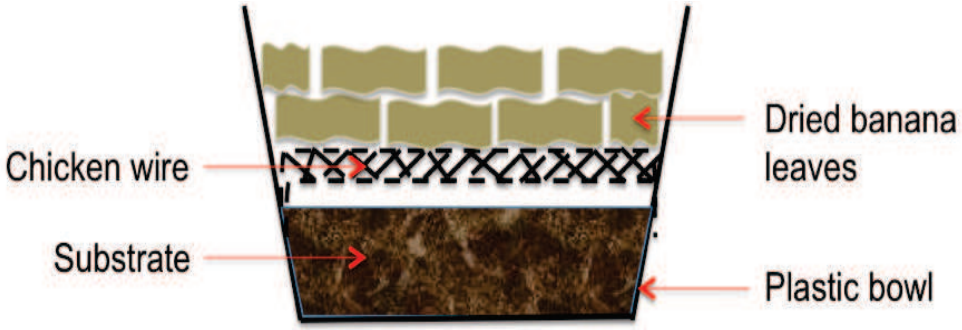
Capture of local fly populations



Adult rearing and egg production

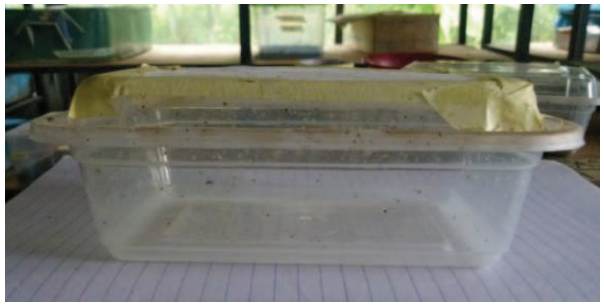
Mating in the sun

Egg collection



Larval rearing

5 days in nursery



8 days in rearing containers

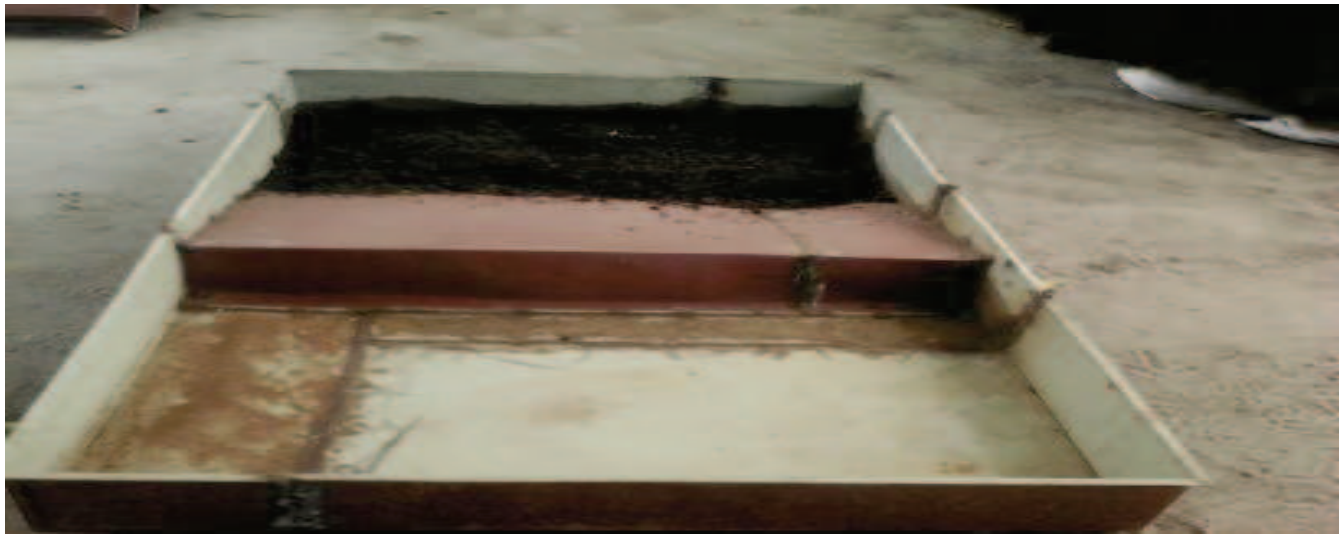
Substrates:

- Manures
- Brewery wastes and other agro-industrial wastes
- Market and domestic wastes
- …

Extraction of larvae

Drying of larvae

Pupae and adult production



Black soldier fly - *Hermetia illucens*

Advantages and disadvantages of small BSF vs. House fly systems

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- Safer, no vector of disease, no human nuisance
- Heavier, high and constant yield
- Grows on more substrates
- Uses less ground surface than HF natural oviposition system
- Prepupae migrate out of the substrate by themselves

-

- More complicated than HF natural oviposition systems, longer to establish; egg production critical
- Slower development
- Naturally less abundant, natural oviposition more difficult
- Migrating prepupae less digestible, lower % proetin
- Larvae are more difficult to use alive
- Longer to dry

General concerns regarding the production of flies as feed by farmers

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Economic viability

- African systems can already provide maggot proteins at ca. the same price as fish meal (see KULeuven presentation) – more efforts are needed to lower the costs.
- Important to:
  - Minimise the costs of substrates and substrate provision
  - Feed with living larvae (house fly)
  - Valorise the residues
  - Improve techniques at all stages
- Avoid disseminating a technique that is not yet economically profitable or technologically up and running

General concerns regarding the production of flies as feed by farmers

Social acceptability

- Many consumers are reluctant to eat fish or chicken fed with fly larvae.

General concerns regarding the production of flies as feed by farmers

Health and safety

Thank you for your attention

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