

## Composted Household Waste for Plant Protection in Peri-urban agriculture in 5 West African towns

Kessler<sup>1</sup> A. and Streiffeler<sup>2</sup> F.

<sup>1</sup>Humboldt-University of Berlin, Institute of Agricultural Sociology, Berlin, Germany

<sup>2</sup>Humboldt-University of Berlin, Institute of Agricultural Sociology, Berlin, Germany

### 1. Abstracts

In West African cities and towns like Dakar, Lome, Tsévié, Conakry and Timbi Madîna we observe different production systems depending on land tenure, water availability and market.

Peri-urban cash-crop farmers use a lot of inputs, fertilisers the same way as pesticides.

Droppings from industrial animal husbandry and organic industrial wastes (i.e. oil cake from cotton seeds) are valorised as fertiliser. They are available on the organic fertiliser market for transport costs and that's why they are cheaper as controlled composted household waste.

The awareness of farmers against diseases and pests depends on the production system. The vegetable farmers have high losses due to diseases and pests.

Composted household waste can be used for plant protection against fungi. As fungicides are more expensive than organic fertilisers compost can concurrence them.

Compost for plant protection is of several interests not just for the consumers of the agricultural products (higher quality) and their farmers but also for the cleanness of the cities.

### 2. Description of the 5 West African towns

The 5 West African towns are of different size and in different climatic conditions. We selected Dakar (Grand Commune de Dakar 2.5 mill. inhabitants) with sahelien climate (annual rainfall about 400 mm), Conakry (1.1 mill. inhabitants) in humid tropics (annual rainfall about 4,000 mm), Lome (1 mill. inhabitants) in tropics (annual rainfall about 800 mm), Tsevie a small town (40,000 inhabitants) 35 km north of Lome with a little bit more rain than Lome (annual rainfall about 1,200 mm) and finally Timbi Madina a village (4,000 inhabitants) with first signs of urbanisation in the highlands of the Fouta Djallon (annual rainfall about 1,800 mm) in the republic of Guinea.

### 3. Materials and Methods

We did standardised interviews to identify the situation at the beginning and the opinion of the farmers, household chefs and cleaning managers (housewives) in all 5 cities.

We monitored the process of implantation of waste collection in 4 quarters of Lome. We computerised the accountability of the waste collection to improve the monitoring of this process. We developed contracts at different levels.

We introduced waste separation in the household in some quarters of Lome and one quarter in Rufisque (suburb of Dakar). Therefore we developed extension materials for waste separation depending on the local language and the nutrition habits.

We started compost stations in Lome, Conakry, Timbi Madina and Tsevie. We produce compost in all 5 cities.

We did trials on station and on field for tomato in Dakar, sweet potato for leaf consumption in Conakry, potato in Timbi Madina, cassava in Tsevie and lettuce in Lome to analyse the efficiency of different compost and different extracts of compost to different diseases. We organised visits of these trials by the vegetable farmers and members of the composting teams, the extension services and NGO working on agriculture. These visits were accompanied by the test of the extension material for the use of compost extract in the different local languages.

In Lome we sell already compost to farmers. In the other cities most of the compost is still used for the trials.

### 4. Results

#### 4.1. Production systems

We observe rain fed and irrigated agriculture.

In rain fed agriculture farmers cultivate mainly traditional crops like

- maize (*Zea mays*) (Lome, Tsevie, Togo),
- cassava (*Manihot utilissima*) (Togo),
- Pearl millet (*Pennisetum typhoides*) (Dakar),
- okra (*Hibiscus esculentus*) (Dakar),
- groundnut (*Arachis hypogea*) (Dakar),
- roselle (*Hibiscus sabdariffa*) (Dakar),
- rice (*Oryza sativa*) (Conakry, Timbi Madina),
- hungry rice (*Digitaria exilis*) (Timbi Madina),
- Cow Pea (*Vigna*) (Dakar, Lome, Tsevie).

Rain fed agriculture is practised mainly on traditional owned land and on construction plots. We observe that construction plots are cultivated until the owner earned the money to construct the house.

On the other hand vegetables are cultivated as cash crops mainly:

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- Sweet potatoes for leaf consumption (*Ipomea batatas*) in Conakry,
- lettuce (*Lactuca sativa*) in Lome,
- onion for leaf and for bulb consumption (*Allium cepa*) in Lome, Dakar, Conakry,
- tomatoes (*Lycopersicum esculentum*) in Tsevie,
- Potatoes (*Solanum tuberosum*) in Timbi Madina,
- carrot (*Daucus carota*) in Lome and Dakar,
- cabbage (*Brassica Oleracea*) in Lome and Dakar,
- Egg plant for leaf and fruits consumption (*Solanum aethiopicum*) in Lome and Dakar.

Most of the vegetables are cultivated on government owned land in the capitals and on traditionally held land close to the capitals. Only close to Dakar we observe vegetable farms with title-deed land. Close to Dakar shortage of water has lead to the use of drip irrigation, pipe irrigation with tap water, high management capacities, high training levels of the farmers and high investment costs on title-deed land.

In Lome and at the border of some lakes close to Dakar (Pikine) ground-water is available all over the year in about 2 – 5 m depth therefore illiterate and people with low levels of skills can manage small vegetable farms.

The different tribes consume different meals. As the main production is for the local market the vegetable production is adapted to local consumption habits. Only about 5 % is produced for export to Europe. Next to Dakar there are industrial enterprises for processing beans, okra and other vegetables.

#### 4.2. Fertiliser Market

Due to egg and chicken production in the capitals poultry manure is very common as organic fertiliser. Cow manure is less frequent. In Lome organic waste from the cotton industry is used for soil improvement. Chemical fertilisers are available in the capitals. Therefore peri-urban and urban vegetable farmers of the capitals use a lot of organic and inorganic fertilisers.

#### 4.3. The Importance of Plant Protection for the urban and peri-urban farmers depending on the production system

Awareness of farmer of diseases and pests

Production system	Awareness of diseases		Awareness of pests	
	Yes	No	Yes	No
Rain fed agriculture (Tsevie)	65 %	35 %	76 %	24 %
Vegetable farming (Lome)	76,5 %	23,5 %	93 %	7 %

Vegetable farmers are more aware of diseases than traditional rain fed farmers.

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Level of utilisation of plant protection products

Production system	Using plant protection products	
	Yes	NO
Rain fed agriculture (Tsevie)	14 % of all farmers	86 % of all farmers
Vegetable farming (Lome)	100 % of all vegetable farmers	nobody

Vegetable farmers treat diseases and pests where as traditional rain fed farmers rarely do.

#### 4.4. Potential Market of Compost as fungicide

In the interviews with 400 vegetable farmers in Lome we found losses due to pests and disease for onions and lettuce as follows:

- Onion: 8 400 FCFA/ bed average price without pests or diseases  
3 805 FCFA/ bed average price with pests and diseases (45 % of the price without pests or diseases)  
4 594 FCFA/ bed average losses (**55 % of the price** without pests or diseases)  
(Average size of a bed 21.2 m<sup>2</sup>, average amount of 16 beds per onion farmer)
- Lettuce: 4 704 FCFA/ bed average price without pests or diseases  
1 371 FCFA/ bed average price with pests or diseases (29 % of the price without pests or diseases)  
3 333 FCFA/bed average losses (**71 % of the price** without pests or diseases) (Average size of a bed 20.6 m<sup>2</sup>)

The average losses hide that lettuce farmer may not harvest at all in case of diseases or pest attacks. These losses occur even as farmers treat frequently with pesticides.

#### 4.5. Costs of treatments

The cheapest reported fungicide was about 750 FCFA/unit (Kocide 101) which is supposed to be enough for one treatment of all beds of lettuce of one farmer.

In the average a lettuce farmer has 9 beds of lettuce. So an average lettuce farmer has to treat 185 m<sup>2</sup>. He will need about 2,5 kg of compost to treat this surface once. 2,5 kg of compost are estimated to be sold for 250 FCFA.

Compost will be cheaper then chemical fungicides.

#### **4.6. Attitudes of vegetable farmers for compost**

Compost is seen as an organic fertiliser like manure. Ewe and Mina (tribes in the South of Togo) farmers don't mind about using compost out of household waste. This is even understandable by their languages. The words for "duping place" and "compost" or "fertiliser" are related (ex: *afu* – *afukpo*). They differ well between manure and compost. But they have difficulties to differ the vocabulary between fertiliser and compost.

In Wolof and Fulfulbe language they have difficulties to differ manure, fertiliser and compost.

But only 19 % of the vegetable farmers in Lome guessed that compost can be used against diseases. Farmers very rarely associate the use of compost with disease protection, but they understand the idea of using compost against diseases after explanation (Kessler, A. and Helbig, J.).

#### **4.7. Profitability of Compost Production**

Production of 7,5 t of compost in Lome costs about 500.000 FCFA per month waste collection included. Packing material for fungicide selling will cost another 40.000 FCFA per month.

If compost is sold at organic fertiliser prices and the households pay 1,000 FCFA per household waste collection fees they will earn 425.000 FCFA per month. So there will be a deficit of 75.000 FCFA each month. For fertiliser selling subsidies are required to the amount of 75.000 FCFA per month. If compost is sold as fungicide 2,5 kg for 250 FCFA and households pay 1,000 FCFA per household waste collection fees they will earn 1,025,000 FCFA per month.

By selling compost as fungicide one can have a profit of 485.000 FCFA per month.

### **5. Conclusions**

Vegetable farmers are aware and treating diseases and pests. For the vegetable farmer compost will be cheaper than chemical fungicide. Due to economic arguments farmers would buy compost for treatment.

Compost is seen as a organic fertiliser like manure. Compost production is expensive. It will be profitable only if compost can be sold as plant protection product against fungi. Compost is not competitive against organic fertilisers like manure.

Therefore extension is essential for compost production for plant protection.

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## **7. References**

Kessler, A. and Helbig, J., Adding Value to Compost from Urban Household and Market Refuse in Lome, in Drechsel and Kunze, Waste Composting for Urban and Peri-urban Agriculture, in press;