# Using Diaper Residues to Improve Maize Productivity in Daloa, Côte d'Ivoire

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## Background & Objective

- The total population of Africa is estimated at 1.225 billion with 43% living in urban areas
- According to UN estimates, the population of Africa may reach 2.5 billion by 2050 with 43% living in urban areas
- The fastest urban growth is consequences of rural exodus and also births
- In Côte d'Ivoire the birth rate amounted to 35.74 births which generates human wastes like diaper
- Diaper remains environmental pollution after utilization
- Recycling this human waste must be considered in order to improve agricultural production and food security.

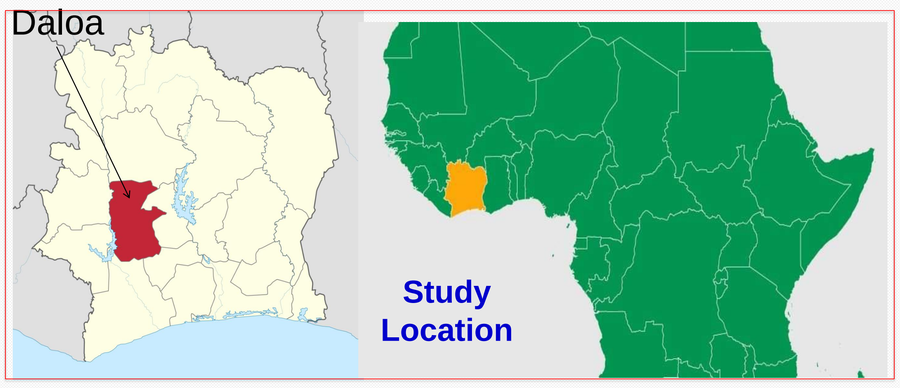
· **Urban waste management**

**Objective**: To determine the effect of solid waste on soil water conservation and maize productivity.

## Material & Methods

### ❑ Study area characteristics

The study area is Daloa (6° 52 N, 6° 27 W) in Côte d'Ivoire, West Africa. Cocoa is largely produced and maze cultivated for crops diversification and food security. The mean annual precipitation is 1300 mm and mainly comes between June to August, and September to December. The mean air temperature ranges from 23 to 37°C. Daloa population is estimated at 591,633 by National Statistics Institute.




### ❑ Estimation and projection of number of diapers used

Investigations on childbirths from 2015-2019 was conducted in maternity wards. Also 100 ladies met in hospital took part in the survey on number of diapers babies used by day.

### ❑ Experiments

The first experiment was conducted in dry season (October 2019-January 2020). 2-plot experiment of an amendment soil with diaper residue (2.5 t $ha^{-1}$ = 12-diapers/ 4m²) compared to sole-cropping was conducted relative to agronomic performance of maize.

The second experiment was conducted in rainy season (May-September 2020). The experimental design was a Randomized Complete Block with 4 treatments. -Diaper rate as factor (0, 0.5, 1.0 or 2.0 times the 12-diaper per pack) with 4 reps.

**Trial management with using of diaper residues as mulch** to increase soil water content

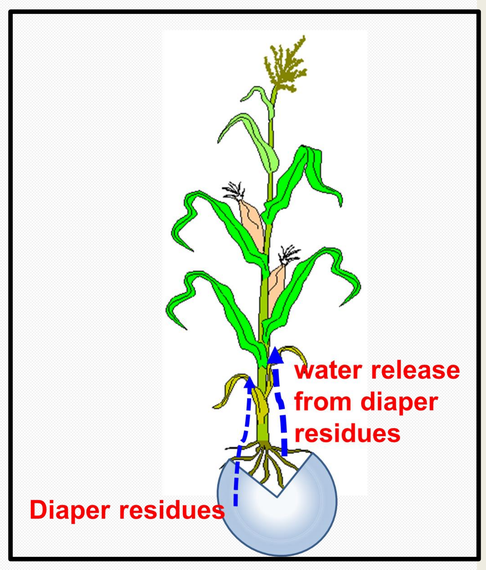
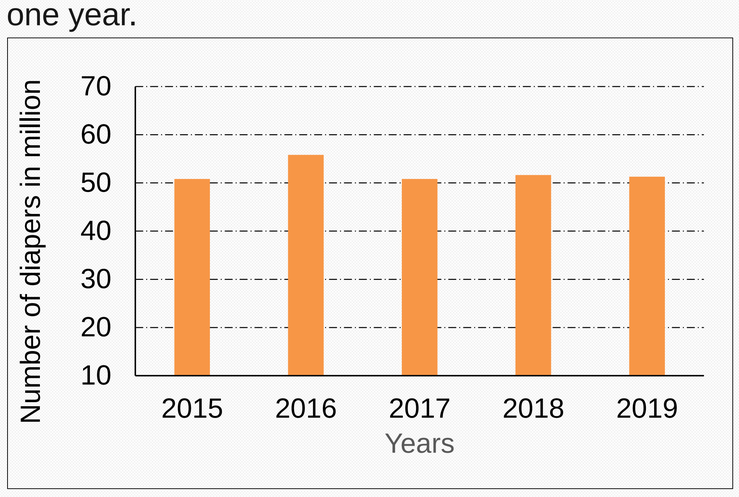



**Fig. 1: Water transfer through maize root**

## Results

### ❑ Growing use of diaper

The survey data indicates that 98% of ladies use 4 diapers by day for children until 4 years old. The estimation of number of diapers which could be used was calculated with childbirths in Daloa last 5 years (2015-2019). 9,042 is the average of babies born one year.




The results show that 50 millions is the minimum number of diapers that will be used 4 years from 2015 (Fig. 2). This is equivalent of more than 2000 tons of waste based on diapers.

**Fig. 2 : Estimation of number of diapers used**

### ❑ Diaper residues improve soil water content

The experiment during dry season shows higher water content in soil with diapers residues (Fig. 3). This result indicates that using diapers residues as mulch improve soil water content between 60% to 3 times before irrigation.

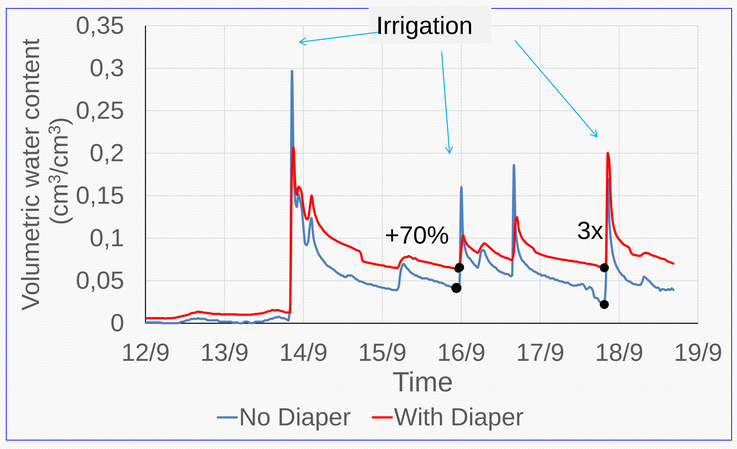



**Fig. 3 : Daily variations at 10 cm depth of soil water content**

### ❑ Diaper residues increase agrronomic productivity

During the dry season yield response was significantly higher ($p < 0.0038$) with diaper residues than control plot (Fig. 4). Indeed the weight of fresh maize grain per ear on diaper plot was over 2 times higher than no diaper plot, respectively, 164 and 59 g. The difference is highlighted by the size of ears, roots and the number of maize grain (Fig. 5).

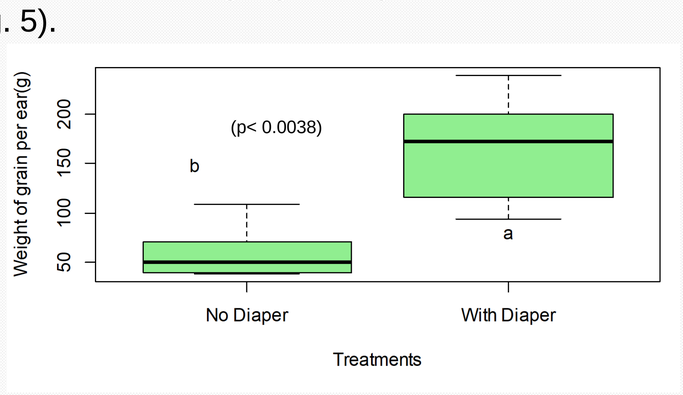



**Fig. 4 : Impact of soil treatments on maize yield**

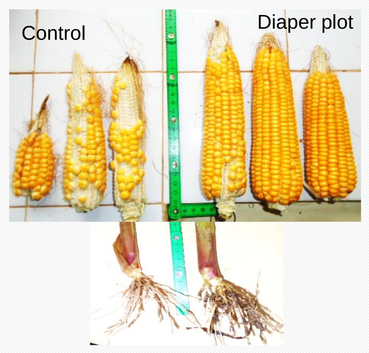
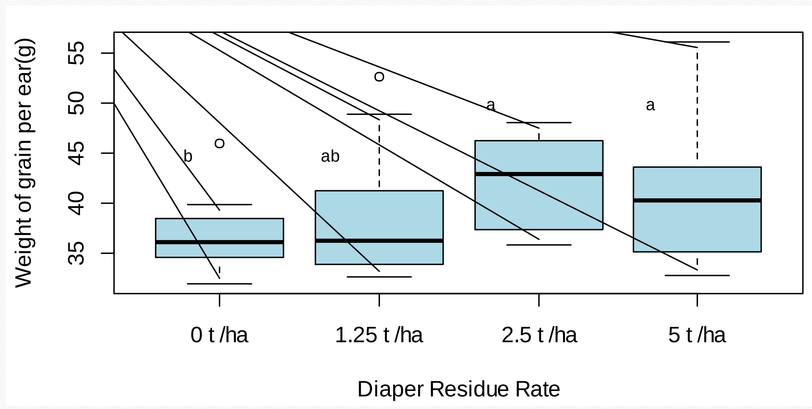



**Fig. 5 : Effect of soil treatments on maize ears and roots**

Fig. 6 shows that the amendment of diaper residues had no significant effect ($p < 0.05$) on maize yields during rainy season. But there was significant effect between rates of diaper residues at $p<0.1$. Thus, the application of 2.5 t/ha increased of 17% the yield of maize (dry grain).

**Fig. 6: Effect of the presence or absence of diaper residues rate on maize yield during rainy season**




## Conclusions

- ❑ The data on the use of diapers shows that the number will become increasingly high
- ❑ The management of diaper as domestic waste remains a challenge in urban areas
- ❑ Agronomic data indicate diaper residues reduce water stress for maize during drought periods
- ❑ An important advantage in rainfall variability context to increase crop yield stability and reducing risks for farmers.
- ❑ Results of maize growth according to soil water content show the beneficial water transfer

### Perspectives

Further study to determine the complete influence of diaper residues on soil properties is needed to explore their contribution to water flow.

Because of many components of diaper investigation is needed to determine what become materials

Finally, investigation is needed to create unity of diaper used transformation for crop production

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