S1 Changes in Surface Runoff as 1 ha (10,000 m^2) Farmland is Transformed into a Residential Area

Rainfall partitioning in farming systems in the semi-arid tropics of sub-Saharan Africa: rainfall (100%), plant transpiration (40%), evaporation from soil and loss by interception (20%) surface runoff (20%), deep percolation (20%) (Helmreich and Horn 2009).
Rain falling from the sky is partitioned in three main components: Evapotranspiration (ET), Infiltration (I), and Runoff (R) (Equation (S1)) (Uppala and Dey 2021):

$$P = ET + I + R \quad \text{(S1)}$$

The maximum amount of rainwater that could be encountered from a roof top is given by Equation (S2):

$$Q = A \times P \times C \quad \text{(S2)}$$

where Q (m^3) is the amount of harvestable water, A (m^2) is catchment area, P (mm) is total amount of rainfall, and C is the runoff coefficient.

Table S1. Changes in rainfall partitioning (infiltration and runoff) as 1 hectare (10,000 m^2) of farmland is transformed into a residential area.

Area	**Q**	**I**	**R_0**	**R_{city}**
(m^2)	**(m^3)**	**(m^3)**	**(m^3)**	**(m^3)**
0	0	1200	1200	1200
400	146.4	1152	1152	1298.4
800	292.8	1104	1104	1396.8
1200	439.2	1056	1056	1495.2
1600	585.6	1008	1008	1593.6
2000	732	960	960	1692
2400	878.4	912	912	1790.4
2800	1024.8	864	864	1888.8
3200	1171.2	816	816	1987.2
3600	1317.6	768	768	2085.6
4000	1464	720	720	2184
4400	1610.4	672	672	2282.4
4800	1756.8	624	624	2380.8
5200	1903.2	576	576	2479.2
5600	2049.6	528	528	2577.6
6000	2196	480	480	2676
6400	2342.4	432	432	2774.4
6800	2488.8	384	384	2872.8
7200	2635.2	336	336	2971.2
7600	2781.6	288	288	3069.6
8000	2928	240	240	3168
8400	3074.4	192	192	3266.4
8800	3220.8	144	144	3364.8
9200	3367.2	96	96	3463.2
9600	3513.6	48	48	3561.6
10,000	3660	0	0	3660

For the calculations, 1 ha is considered as the total surface area, initially covered by a vegetation. The initial runoff (20% of P) is 1200 m^3, the initial infiltration as well (20% of P). Because I = R = 20% the decrease of both parameters with decreasing permeable area is the same. They decreased from 1200 m^3 to 0 m^3.
The key features of the calculations is that the Q value increases and corresponds to the augmentation of the runoff volume if it is not stored. Past efforts to evaluate the pertinence of RWH for flood mitigation were not based on the mass balance of water. Whether made observation were satisfactory or not was dependent on the infiltrated and stored fraction of Q. The zero-runoff approach advocates for maximizing Q and controlling its infiltration and eventual discharge.

S2 Rainwater harvesting in Yaoundé

Equation 1 is used with the following parameters: A = 150 m^2 roof area per residence, P = 1628.3 mm/year, and C = 0.9.
The yearly harvestable volume of water per residence is 219.8 m^3, corresponding to 0.602 m^3 per day. The number of residences necessary to collect 300,000 m^3 water per day is 300,000/0.602 = 498,475. Assuming that each residence is inhabited by 7 citizens, that water is collected by 3,489,325 people. RWH from roof only is considered and the surface necessary to harvest it is just 498475 residences multiplied by 150 m^2 roof area = 74,771,233.8 m^2 or 7477.1 ha or 74.8 km^2. This represents only 41.54% of the urban area of Yaoundé (180 km^2).
These calculations clearly show that RWH self-reliant water supply of Yaoundé is possible.

References

1. Helmreich B, Horn H. Opportunities in rainwater harvesting. *Desalination* **2009**, *248*, 118–124.
2. Uppala P, Dey S. Design of potential rainwater harvesting structures for environmental adoption measures in India. *Polytechnica* **2021**, *4*, 59–80.