

Nutritional water productivity of Moringa under varying sustainable agronomic practices



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by

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Materials and Methods

- Split-split-plot, RCBD, 3 replicates and 3 factors:

- 1) Spacing (1.0 m x 1.0 m (S1), 1.0 m x 1.5 m (S2))
- 2) Organic soil amendment (kraal manure (100 - 150 t/ha) (F1), compost (100 - 150 t/ha)) – 30:1 C:N ratio)
- 3) Soil & water conservation (conventional rainfed (farmers' practices) (R1), grass-mulched and water stress (R2), plastic-mulched and water stress (R3), grass-mulched and well-watered) (R4))

- Treatments: S1R1F1, S1R1F2, ..., S2R4F1, S2R4F2



**10-year-old
Moringa trees**

Plastic-mulch →



Bare surface →



Grass-mulch →



Results and discussion

Table 1: Moringa leaf and biomass yield during the 2022 – 23 growing season.

Treats	1st Harvest	2nd Harvest	3 rd Harvest	4 th Harvest	Tot leaf yield	Total biomass
	kg/ha					
S1 R1 F1	4327efghijk	3636bc	3855abcde	2188abcdefg	14010bcd	27650abc
S1 R1 F2	4264efghijk	3401bc	3621abcde	1832bcdefg	13120cd	25370abc
S1 R2 F1	6935ab	4768ab	4500ab	2549ab	18750a	35130a
S1 R2 F2	7301a	4957ab	3627abcde	229abcdef	18180ab	33050a
S1 R3 F1	6312abcd	5828a	3623bcde	2627ab	18390ab	35090a
S1 R3 F2	6762abc	5274ab	4825a	2331abcd	19190a	34.67a
S1 R4 F1	4672defghijk	4900ab	4499abc	2788a	16860abc	33280a
S1 R4 F2	5058cdefghi	4657ab	3333bde	2345bcd	15390abc	31000abc
S2 R1 F1	3004ik	2459c	2554e	1438eg	9450d	18090c
S2 R1 F2	2998ik	2449c	2676bce	1460eg	9580d	18640bc
S2 R2 F1	5896abcdefg	5279ab	4287abcd	2156abcdefg	17620abc	36560a
S2 R2 F2	4223dfhijk	4902ab	344abcde	2316abcde	14880abc	31420ab
S2 R3 F1	6047abcde	5431ab	3587abcde	1600dfg	16670abc	37890a
S2 R3 F2	5412abcdefgh	4412abc	3567abcde	1534efg	14930abc	31500ab
S2 R4 F1	5913abcdef	5287ab	4201abcd	2497abc	17900abc	33760a
S2 R4 F2	4939bcdefghij	4663ab	3878abcde	2074abdefg	15550abc	33310a

Moringa water productivity

Table 3: Moringa water productivity during the 2022 – 23 growing season.

Treats	1st Harvest	2nd Harvest	3 rd Harvest	4 th Harvest	Tot leaf yield	Total biomass
	kg/m ³					
S1 R1 F1	4.528	2.43	3.236	3.331	3.258	6.43
S1 R1 F2	4.462	2.273	3.039	2.789	3.051	5.9
S1 R2 F1	7.816	4.003	4.528	4.251	5.106	9.567
S1 R2 F2	8.229	4.162	3.65	3.819	4.951	9.001
S1 R3 F1	4.768	3.895	2.868	4.36	3.924	7.488
S1 R3 F2	5.108	3.525	3.819	3.869	4.095	7.398
S1 R4 F1	4.419	3.562	3.544	3.805	3.802	7.503
S1 R4 F2	4.784	3.385	2.626	3.201	3.47	6.989
S2 R1 F1	3.144	1.644	2.144	2.19	2.198	4.207
S2 R1 F2	3.137	1.637	2.246	2.223	2.228	4.335
S2 R2 F1	4.866	3.513	3.685	3.977	3.986	8.271
S2 R2 F2	3.485	3.262	2.957	4.272	3.367	7.108
S2 R3 F1	4.568	3.63	2.839	2.656	3.557	8.085
S2 R3 F2	4.088	2.949	2.823	2.546	3.186	6.722
S2 R4 F1	5.592	3.843	3.31	3.408	4.036	7.612
S2 R4 F2	4.671	3.389	3.055	2.831	3.506	7.51

Moringa nutrients, nutrient yield and nutritional water productivity

Table 4: Moringa nutrient content, nutrient yield and nutritional water productivity.

Treats	Leaf yield	Beta carotene	Vitamin C	Vitamin E	Tot phenols	Tot flavonoid	Cond tannins
	Kg/ha	Nutrient content (mg/g)					
R1 F1	1813	23.52a	148.3f	291.9b	15.55b	6.59d	1.683d
R1 F2	1646	21.88a	414c	111.3e	10.94e	6.22e	3.08c
R2 F1	2352.5	6.56b	510.1a	103.3f	16.28a	8.9a	2.023d
R2 F2	2303	23.59a	188.8e	302.6a	14.95c	7.433c	3.937b
R3 F1	2113.5	24.28a	291.1d	163.8d	13.98d	5.58f	6.283a
R3 F2	1932.5	29.06a	451.9b	267.5c	16.23a	8.023b	3.1c
	ET	Nutritional yield (NY)					
	mm/45-day	Kg/ha					
R1 F1	119.162	43.512	270.137	529.396	29.008	12.691	3.626
R1 F2	119.162	36.212	681.444	184.352	18.106	11.522	6.584
R2 F1	107.875	16.4675	1202.128	244.66	39.9925	21.173	7.058
R2 F2	107.875	55.272	435.267	697.809	34.545	18.424	9.212
R3 F1	132.397	52.8375	617.142	346.614	29.589	12.681	14.795
R3 F2	132.397	57.975	873.49	517.91	32.8525	17.393	7.73
	ET	Nutritional water productivity (NWP)					
	m ³ /45-day	g/ha/m ³					
R1 F1	1191.62	36.515	226.698	444.266	24.344	10.651	3.043
R1 F2	1191.62	30.389	571.864	154.708	15.195	9.67	5.526
R2 F1	1078.75	15.266	1114.371	226.8	37.074	19.627	6.543
R2 F2	1078.75	51.238	403.493	646.869	32.024	17.08	8.54
R3 F1	1323.97	39.909	466.13	261.799	22.349	9.579	11.175
R3 F2	1323.97	43.789	659.751	391.18	24.814	13.137	5.839

Conclusions and recommendations

- The season received sufficient rainfall and water supply was withheld on occasions
- In general, the crop water use of the two investigated plant spacings remained nearly the same
- Cultivating Moringa trees using narrower (1.0 m x 1.0 m) or wider (1.0 m x 1.5 m) tree spacing did not have a significant influence on the crop productivity (yield, water productivity, nutritional water productivity)
- The nutritional quality of Moringa is not affected by water regimes
- Moringa is drought-resistant and can retain its nutritional values
- Recommendations:
 - Narrower Moringa tree spacing is encouraged for better productivity



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