

285 Table 10: Total yield as influenced by chicken manure and inorganic fertilizer

Fertilizer rates	Total Yield (kg ha ⁻¹)			
	2015		2016	
	Omankwa	Obatanpa	Omankwa	Obatanpa
3 t ha ⁻¹ CM	1243.00	2790.00	4993.00	6298.00
65:38:38 kg ha ⁻¹ NPK	3386.00	5668.00	5159.00	6938.00
½ CM + ½ NPK	3204.00	4259.00	4677.00	6380.00
¾ CM + ¼ NPK	2795.00	3410.00	4988.00	5056.00
No fertilizer (Control)	1088.00	3266.00	2129.00	3163.00
Mean	2343.20	3878.60	4389.20	5567.00
LSD (0.05) Var	840.40 *		461.5 *	
LSD (0.05) Fert	1328.70 *		729.70 *	
LSD (0.05) Var x Fert	NS		NS	
CV (%)	35.20		21.10	

286

287 **5. Discussion***Too long. Reduce it.*

288 Maize growth and yield were affected by chicken manure and inorganic fertilizer. The higher
 289 number of maize plants established in both 2015 and 2016 cropping seasons might be due to the
 290 healthy seeds used as planting materials. However, the varietal difference showed the significant
 291 difference in percentage crop establishment during the 2015 cropping season. The lower
 292 percentage crop establishment in Obatanpa and Omankwa grown under ½ CM + ½ NPK than
 293 same varieties grown on other amended and control plots in both cropping seasons might be that
 294 organic manure applied at the same rate and time as inorganic fertilizer was not available to the
 295 plants and therefore not yet affective. This contradicts with the findings of [10] that nutrient
 296 from ~~mineral~~ fertilizers enhance the establishment of crop when both organic and inorganic
 297 fertilizers were combined. The higher number of leaves per plant of Obatanpa from 49, 63 to 77
 298 days after planting during the 2015 cropping season probably might be due to outstanding quality
 299 with respect to high vegetative growth. The lowest number of leaves per plant of Omankwa and

*why?**But the manure was used when**What did the breeders say about the numbers?*

Obatanpa grown under $\frac{1}{2}$ CM + $\frac{1}{2}$ NPK and $\frac{3}{4}$ CM + $\frac{1}{4}$ NPK from 63 to 77 DAP during the 2015 cropping season is an indication of slow release of nutrients from chicken manure. This findings contradicts those found by [11] that increasing the nitrogen rates resulted in more number of leaves produced per maize plant. The highest number of leaves per plant in both maize varieties grown on 3 t ha^{-1} CM at 77 DAP during the 2016 cropping might be attributed to the solubility, absorption and translocation of the absorbable nutrients by the plant for leaf synthesis as a result of chicken manure which decomposed. This agrees with [12] that application of 30 t ha^{-1} poultry manure to maize gave highest values of the growth in terms of number of leaves per plant. The significant increase in height of Obatanpa than Omankwa in plant height from 63 to 77 DAP during the 2015 cropping season might be due to differences in inherent characteristics of the variety. Omankwa growth in height that was favoured by amendments than the control at 35, 49 and 77 DAP during the 2015 cropping season is an indication that adequate nutrients, required to support early growth can be attained from organic fertilization, by enrichment with inorganic nutrients. This agrees with [13] that 40 -60 % of the organic N in poultry manure are normally mineralized within 90 days. The tallest plant height in Omankwa grown under $\frac{1}{2}$ CM + $\frac{1}{2}$ NPK at 49 DAP in both cropping seasons could be because of the combined effects of the chicken manure improving the physical soil conditions and NPK (15-15-15) also improving the nutrient status of the soil. This is in agreement with the findings of [14] who recorded higher plant heights of maize with the combined application of organic and inorganic fertilizer. The progressive increase in plant height of Obatanpa grown under amendment and the control during the 2016 cropping season with time up to 63 DAP and with a peak at the same period after which growth declined is an indication that the vegetative growth trend follows the normal growth curve of the maize plant. This could be attributed to the

?
See
my
comment
on p8/20.

Did you
do the
expt
to
confirm
or
deny
existing
work?

323 remobilization of restored carbohydrates in filling the cob or ear. The shorter plant height in
 324 control plants at 77 DAP than amended plots during 2015 and 2016 cropping seasons shows that
 325 inorganic fertilizer provides plant with immediate plant nutrition while slow mineralization of
 326 poultry manure supplies plant subsequent plant nutrient. The significantly higher dry matter
 327 accumulation of Obatanpa at 21 DAP and from 49 to 77 DAP than Omankwa during the 2015
 328 cropping season was favoured by tall plants produced. This agrees with [15] that more plant
 329 height due to better usage of sunlight in competing with weeds have positive effect on total dry
 330 matter. Omankwa growth in dry matter accumulation that was favoured by application of 65:
 331 38:38 kg ha⁻¹ NPK at 49 DAP during both cropping seasons is an indication of mineralization
 332 and fast release of N.P. and K which promoted vigorous foliage growth and favoured the
 333 synthesis of more photo-assimilates. The lowest dry matter accumulation of both maize varieties
 334 grown on control plot from 49 to 77 DAP in both cropping seasons shows that the presence of
 335 nutrients in the soil help in dry matter accumulation. The lower dry matter accumulation of
 336 Obatanpa grown on 3 t ha⁻¹ CM than the other amended plots from 49 to 77 DAP in both
 337 cropping seasons might be due to slow release of nutrient by chicken manure.

338 The significant increase in number of cobs per plot with Omankwa grown under ½ CM + ½ NPK
 339 than the other amended and control plots during the 2015 cropping season is an indication that
 340 adequate nutrients from organic and inorganic fertilization is required to support early cob
 341 growth. This agrees with the findings of [16] that combination of organic and inorganic fertilizer
 342 results into synergy and improved conservation and synchronization of nutrient release and crop
 343 demand, leading to increased fertilizer efficiency and higher number of grain/cob. The greater
 344 number of cobs per plot with Obatanpa grown under 65:38:38 kg ha⁻¹ NPK as compared to ¾
 345 CM + ¼ NPK during the 2015 cropping season is attributed to fast release of mineral nutrient

Discussion
should
dwell
on
the
science
behind
your
results.

See
line
325

346 from the inorganic fertilizer. Higher rates of inorganic fertilizer application produced better
 347 response with respect to higher number of cob possibly because higher rates satisfied the crop's
 348 requirement [16]. The longest cob length of Omankwa and Obatanpa grown under 65:38:38 kg
 349 ha^{-1} NPK during the 2015 cropping season might be due to fast release of N, P and K. The
 350 inorganic fertilizer provides source of necessary macro nutrients in available forms, thereby
 351 improving the biological properties of the soil [17] which might have accounted for the longer
 352 cob length obtained in inorganic fertilizer treated plots as against organic manure and the control.
 353 The longer cob length of Obatanpa than Omankwa in both cropping seasons might be due to
 354 differences in variety and its response to climatic conditions experienced during the cropping
 355 periods.

356 The significant thicker cob diameter with Omankwa and Obatanpa grown under $\frac{3}{4}$ CM + $\frac{1}{4}$ NPK
 357 and 65:38:38 kg ha^{-1} NPK over the control might be due to the application of high rate of
 358 chicken manure and NPK to both maize varieties which have resulted in high inherent nutrients
 359 in the manures which promoted broader grain size and heightened meristematic activities that
 360 favoured the enlargement of cob. The thicker cob diameter with Obatanpa than Omankwa
 361 during the 2016 cropping season is attributed to differences in variety. The lowest cob diameter
 362 with Omankwa and Obatanpa grown under control during the 2016 cropping season confirm the
 363 deficiency of OM, N and P in the soil and poultry manure as effective source of plant nutrients.
 364 Addition of poultry manure and mineral fertilizer made more nutrients available to maize plants.

365 The significant increase in 100 seed weight of Omankwa grown on amended plots except $\frac{3}{4}$ CM
 366 + $\frac{1}{4}$ NPK over the control during the 2015 cropping season could be due to higher rate of
 367 nitrogen in chicken manure and inorganic fertilizer that resulted in higher nutrient release for
 368 heavier seed weight than the control. The heavier 100 seed weight of Obatanpa grown on

Did not
you
know
the
crop
requirement

369 amended plots than Omankwa grown on the same treatment in both cropping seasons might be
 370 due to differences in variety and its response to soil mineral nutrient. Maize grain yield was
 371 significantly increased with fertilization. The significant increase in grain yield of both maize
 372 varieties grown on 65:38:38 kg ha⁻¹ NPK in both cropping seasons is an indication of early
 373 release of mineral nutrient from inorganic fertilizer which was made readily available to plants
 374 for their growth and development. Inorganic fertilizer provides source of macro nutrients in
 375 available forms which must have accounted for the better yield performance obtained in
 376 inorganic fertilizer treated plot as against the other amended and control plots. ~~An increase in~~
 377 ~~crop yield with inorganic fertilizer application to maize was reported by [18]. Similar result was~~
 378 ~~reported by [19] that inorganic fertilizer improved yield over 50% than their unfertilized~~
 379 ~~counterparts.~~ The superiority of plants that received inorganic fertilizer over other plants with
 380 respect to higher grain yield could also be attributed to better yield enhancement credited to
 381 inorganic fertilizers over other nutrient sources. ~~It is also consistent with the findings of [20] on~~
 382 ~~Cayene pepper. Abundant evidences that inorganic fertilizers can improve yield of maize crop~~
 383 ~~significantly has been reported by [21].~~ The greater grain yield of Obatanpa grown on amended
 384 and control plots than Omankwa grown on the same plots in both cropping seasons is attributed
 385 to inherent characteristics of the variety and its response to soil nutrient and climatic conditions
 386 experienced during the cropping periods. ~~This is consistent with the findings of [22] and [23]~~
 387 ~~who reported that grain yield is usually influenced by genetic quality of individual variety.~~

Delete

388 6. Conclusion

389 Obatanpa which was outstanding in maize grain yield, cob diameter and length should be grown
 390 by farmers. Farmers who prefer mineral fertilizers for increased grain yield and thicker cob
 391 diameter of maize should apply 65:38:38 kg ha⁻¹ NPK, although continuous application of

why base decision on one-off expt.

chemical fertilizer may not sustain the growing field for future generation as well as human health. Farmers who practice organic agriculture in transitional agro-ecological zone of Ghana should apply 3 t ha⁻¹ CM and ¾ CM + ¼ NPK to enhance maize grain weight, cob length and cob diameter respectively. Substitution of some portion of chemical fertilizers along with organic manure will maintain and sustain soil health as well as improve economic stability of farmers.

397

398 7. References

Update the references for a paper to be published in 2017!!!

- 399 1. FAO. Fertilizer and the future. IFA/FAO Agriculture Conference on Global food security
400 and the role of Sustainability Fertilization. Rome, Italy. 16th-20th March, 2003: 1-2.
- 401 2. Dutt S. *A Handbook of Agriculture*. India: ABD Publishers. 2005:116-118.
- 402 3. Iken JE, Anusa A, Obalaju VO. Nutrient Composition and Weight Evaluation of some
403 newly developed maize varieties in Nigeria. *J. of Food Tech.* 2001; 7: 25-28.
- 404 4. Oyewole CI, Oyewole AN. Crop production and the livestock industry, the interplay: A
405 case study of poultry manure and crop production. Proceedings of the 16th Annual
406 Conference of Agricultural Society of Nigeria. 2011: 124-127.
- 407 5. Dekisissa T, Short I, Allen J. Effect of soil amendment with compost on growth and
408 water use efficiency of amarnnath. In: Proc. of the UCOWR/NIWR Annual Conf. Int'l.
409 Water Resources : Challenges for the 21st Century and Water Resources Education, July
410 22-24, 2008. Durham : NC.
- 411 6. Garg S, Bahla GS. Phosphorus availability to maize as influenced by organic manure and
412 fertilizer P activity in soils. *Bio-sources Tech.* 2008; 99 (13): 5773-5777.
- 413 7. Prabu T, Narwadkar PR, Sanindranath AK, Rafi M. Effect of integrated nutrient
414 management on growth and yield of okra. *Orissa J. Hort.* 2003; 31: 17-21