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An Assessment of Organic and Inorganic Vegetable Farming in Benue Valley of North Central Nigeria (Implication For Agricultural Educators)

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ABSTRACT Benue Valley of North Central Nigeria is basically an agrarian zone with about 95% of her inhabitants engaged in agricultural businesses. This study assessed the performance of organic vegetable growers who utilized locally fabricated Biodigester along the river bank and inorganic vegetable growers who used chemical fertilizers on the high plain of Benue Valley. The study assessed vegetable production matrix of about 500 vegetable growers, using structured questionnaire and oral interviews. Their responses were analyzed through simple percentage, standard deviation and t-test. The results showed that there were vegetables of various kinds in the open market throughout the year, the result also revealed that the living standards of about 85% vegetable growers were enhanced significantly; especially the rural poor who basically practice organic vegetable farming. It was recommended that further endogenous practices be sought to geometrically enhance and sustain vegetable growers financially and nutritionally.

INTRODUCTION

More than 75 percent of Nigeria's population depends on agriculture. Agricultural potential is highest in the Benue Valley of North Central Nigeria with an annual rainfall from 1600 to 2500 mm per year and high fertile soil capable of accommodating variety of crops (Agbulu and Ekele, 2004).

The organic vegetable farmers at the Benue River Bank used locally fabricated Biodigester similar to the 'stomach model's of peru and Colombia in 1970s and 1990s respectively. This endogenous biodigester produces by-products of the anaembic decomposition, which is a conglomerate of liquid and solid frictions called boil and biosol respectively. Biol and Biosol are excellent fertilizers for a variety of crops, especially vegetables. Gomero and Valesquez (2000) reported that a small biodigester is enough to produce manure for the sustainance of crops through the growing periods. Endogenous biodigester used by the organic vegetable growers is simple, less expensive and materials needed are available locally.

The endogenous biodigester is made from a tabular polythene sheet of good quality. The tabular sheet, with a minimum length of five meters, is placed on a flat surface. Both ends are closed around two PVC papers (40 cm long, with a diameter of 10 cm) with rubber strings made of an old inner tube.

A plastic soda bottle (1.5 litres) is then cut in half and each of the halves are inserted and glued into the respective PVC pipes, closing one and leaving a small opening in the other. Before closing the Biodigester, farmers fill it with equal amounts of water and manure from cattle or other ruminants. It is then closed and allowed to ferment for two to three months. The gas that builds up is released by opening the screw lid of the top half bottle. This biodigester can produce up to 250 litres of liquid fertilizer every three months, depending on the climatic conditions in the area (RAAA, 2004).

The relevance of Biodigester in the Farmer Field location lies on its useability, accessibility and affordability from local materials. Using it, the rural poor can easily modify the nutrient content of the liquid fertilizer, for example by adding chopped alfalfa, fish entrails, marine sea weed or human urine to the Biodigester. The ready made Biol can also be enriched with mineral salts to provide additional nutrients to crops or for other purposes. For example, copper sulphate can be added to the liquid fertilizer to control diseases such leaf rust.

For effective utilization of boil and biosol, the concentrated boil has to be diluted by mixing four (4) litres of liquid fertilizer with 10 litres of water. After carefully sieving to avoid the clogging of the spraying nozzle, boil is applied with a black pack sprayer. The applicant can be directed to the foliage, the soil, seed and roots. Between three and five applications are required during the vegetative development of the plants. Biol can be applied to the irrigation just as one would apply compost.

Vegetable is a name given to any edible part of plant, particularly the herbaceous garden plants. These plants can either be annual or perennials. Other assorted vegetables include: Pepper, tomato, okro, green amarauthus, fluted bumpkin and telfaria. Vegetables are daily soup requirements, basically, for nourishment and maintenance of balance diet. Vegetable is a primary agricultural produce available in the market throughout the year. Vegetables specifically grown at the Benue Valley encompasses Amarauthus spinosis and fluted pumpkin.

The crux of this study lies on the conflict situation in the open market in respect of vegetables that abound. It is not definite to assert the producers - Besides, no study has actually pinpointed the group that is responsible for the all year round supply of vegetables in the open – market. Could it be the organic vegetable growers or the inorganic vegetable growers? The study is specifically determined to: identify organic and inorganic vegetable growers; production activities of organic and inorganic vegetable farmers; types of vegetables grown; sources of inputs; problems affecting organic and inorganic vegetable growers, benefits from organic and inorganic vegetable farming.

Research Questions: The following questions will be addressed in this study:

1. What are the characteristics of organic and inorganic vegetable growers?
2. What are the production activities of organic and inorganic vegetable growers?
3. What are the types of vegetables grown by the organic and inorganic vegetable farmers?
4. What are their sources of inputs?
5. What are the problems affecting both organic and inorganic vegetable farmers.?
6. What are the benefits from organic and inorganic vegetable farming?

Hypotheses: Tested at 0.05 level of significance.

There is no significant difference in the mean responses of organic and inorganic vegetable farmers on the production activities of vegetables.

There is no significant difference in the mean responses of organic and inorganic vegetable farmers on the type of vegetables grown.

There is no significant difference in the mean responses of organic and inorganic vegetable farmers on the sources of inputs.

There is no significant difference in the mean responses of organic and inorganic vegetable farmers on the problems affecting their operational activities.

METHODOLOGY

The study was carried out in Benue State, in the North-Central Nigeria. Benue Valley. At the Bank of River Benue, the organic vegetable farmers occupy a strip from Wadata down to Agasha. These farmers utilize Biol and Biolsol manures specifically for the cultivation of Amaranthus spinosus and Fluted pumpkin. On the high plain of Benue Valley, the inorganic vegetable farmers utilize chemical fertilizer (Nitrogenous fertilizer) for the cultivation of Amaranthus Spinosus, fluted pumpkin and egg plants.

Benue Valley is the “Food basket” of the National and inherent are farmers who specialized in yam production, soya-beans, maize, Rice, Vegetables and host of other agricultural produce. Specifically, along the Bank of River Benue are the organic vegetable growers while at the high plain are the inorganic vegetable farmers. Biodigester made from polythene sheet is practically patronized by the peasants and rural poor in the chosen farmer field location. This category of farmers adopted the Colombia model made of a plastic barrel with a capacity of 250 litres. This has a long life-span and cannot be damaged by animals easily. It does not constitute wastage on the farm, unlike, the polythene sheet that has short life-span and often damaged by animals. The barrel is easy to handle and a total of 100 litres of liquid fertilizer can be obtained every two to three months.

The Biol produced contains many essential elements for plant growth, such as nitrogen, phosphorus, potassium and calcium. It also contains plant growth regulators such as auxine and gibberelin, as well as other substances that stimulate plant development. Both Biol and

Biosol favour rooting, rotting development of foliage and flowering, and active seed germination.

For this study, the Biodigester used was fabricated using the following materials:

a plastic funnel

200 litres of plastic drum.

Short length of PVC pipe

The 200 litres of plastic drum has a curved shape funnel. The funnel is an inverted one. The PVC pipe for inlet of manure mixed with water is pierced through the inverted funnel and firmly sealed. The inverted funnel is an outlet for gas that escapes from the fermenting manure. The plastic drum must carry inlet pipe below the liquid surface so that gas is not prematurely released. The contents are the same with the 'stomach model' of Peru. Appendix 1 is a typical illustration of a Biodigester.

One thousand (1000) vegetable farmers (organic and inorganic) were purposely sampled from two thousand and forty farmers at the River Bank and on the high plain respectively. This translates to five hundred farmers (500) purposively selected from each group.

Structured questionnaire and oral interviews were utilized in getting responses from the respondents. Research assistants were also employed for proper co-ordination and administration of research instrument using vernacular. Data collected was analysed using simple percentage, standard deviation and t-test.

FINDINGS AND DISCUSSIONS

Table 1 reveals the unique characteristics of organic and inorganic vegetable farmers. About 98% of the organic vegetable farmers used plant and animal refuse as manure, about 99% agreed that these manures are produced through locally fabricated Biodigester, 96% attested to the fact that fabrication of Biodigester requires high level of skills and endogenous knowledge and through this, about 98% of the farmers agreed that there is continuous supplies of vegetables to the open market.

In the same vein, about 93% of inorganic vegetable farmers utilized chemical fertilizers only. These farmers have no input or control in the manufacturing of these fertilizers as attested by 97% of them. Because of their inability to control inflow of these fertilizers, about 82% asserted that there is inconsistency in the supply of vegetables to the open market. About 81% of these farmers agreed that they do not require special skills to be proficient in the utilization of chemical fertilizers since manual guides simply explain methods of application.

It could be inferred from these findings that continuous supply of vegetables to the market as characterized by organic vegetable farmers highly depicts ever-available local materials for the construction of Biodigester that provides affordable Bio and Biosol (manure). As buttressed by Gomero (2000), a total of 100 litres of liquid fertilizer can be obtained every two to three months.

Table 2 reveals that about 100% of the organic vegetable farmers agreed that one of the top most production activities is the fabrication of Biodigester, followed by actual planting of vegetable seeds through Broadcasting as well as dip in the excavated holes (100%), clearing of grasses (96%), daily picking of vegetable leaves (86%) and application of manure (72%). As reported by Gomero, production activities of organic vegetables are participatory oriented.

Consequently, about 100% of inorganic vegetable farmers rated clearing of grass as the top most pre-production activity followed by

Table 1: Characteristics of organic and inorganic vegetable growers

S. No.	*Organic farmers variables*	*No. of farmers N = 500*	*Responses (%)*	*Inorganic farmers variables*	*No of farmers N = 500*	*Responses (%)*
1.	Organic farmers use plant and animal manure only	488	98%	Farmers use industrial and chemically manufactured fertilizers only	465	93%
2.	Materials used for the production of manure are fabricated plastic rubber and plant/animal wastes	493	99%	Farmers have not control over the fertilizers produced	486	97%
3.	Utilize endogenous materials only	340	68%	Farmers use exotic method applying fertilizers	361	72%
4.	Continues supplies of vegetables all the year round	489	98%	Supplies of vegetables to the market are not continuous	410	82%
5.	Skilled and knowledgeable to fabricate Biodigester	480	96%	Do not require skills.	403	81%

Table 2: Production activities of organic and inorganic vegetable growers

S. No.	Organic farmers variables	No. of farmers N = 500	Responses (%)	Inorganic farmers variables	No of farmers N = 500	Responses (%)
1.	Fabrication of Biodigester	500	100%	Clearing of grasses	500	100%
2.	Clearing of grasses	480	96%	Gathering and burning of grasses	241	48%
3.	Stumping/leveling	400	80%	Stumping and tillage	311	62%
4.	Raking/excavation of holes	489	98%	Heap/Ridge making	420	84%
5.	Planting of seeds inside the excavated hole/broadcasting.	500	100%	Planting of seeds on heaps	480	96%
6.	Daily application of water	320	64%	Non application of water	350	70%
7.	Application of Biol and Biosol by sprinkling.	360	725	Strip and ring method of fertilizer application	461	92%
8.	Daily picking of foliage leaves	431	86%	Vegetables harvested forth nightly	453	91%

x2=80.4

planting of seeds on heaps (96%); strip application of fertilizers (92%) and harvest of vegetables forth nightly (91%). Oral interviews and interactions held amongst the inorganic vegetable farmers revealed that most of the production activities (pre-post) are carried out individually.

Table 3 reveals that about 99% of organic vegetable farmers embarked on Fluted pumpkin; followed by Amanthus Spinosus (96%). The table also reveals that some farmers produce carrot (7%); pepper (4%) and tomatoes (3%) basically for household consumption.

The inorganic vegetable farmers embarked on the following vegetables for commercial venture (Amaranthus Spinosus, 82%; fluted pumpkin, 85%; carrot, 62%; pepper, 54% and tomatoes, 63%) respectively.

Table 4 reveals that about 93% of organic vegetable farmers derived their inputs through communal contributions. About 81% and 83% accepted thrift and borrowing as their sources of getting inputs for the production of vegetables; while, 6% and 20% accepted free gift and communal contributions respectively.

Inferring from these findings it becomes pertinent to posit that inorganic farmers gained more favour from the government through subsidization of fertilizer prices and other inputs like exotic seeds and pumping machines. They have more access to loans from Banks, while the organic vegetable farmers rely heavily on community participation and providence.

Table 5 reveals that about 98% of organic vegetable farmers reported lack of finance as the topmost problem amongst others which include: lack of pumpkins engine (96%), inadequate transport system (93%); acquisition of plot (85%)

Table 3: Type of vegetable grown by farmers

S. No.	Organic vegetable farmers variables	No. 500	%	Inorganic vegetable farmers variables	No. 400	%
1.	Amaranthus Spinosis	481	96%	Amaranthus Spinosis	411	82%
2.	Fluted Pumkin	495	99%	Fulted Pumpkin	423	85%
3.	Carrot	36	7%	Carrot	310	62%
4.	Pepper	20	4%	Pepper	268	54%
5.	Tomatoes	15	3%	Tomatoes	315	63%
		x 41.80			X2=69.20	
		sb 45.51			SD2=12.12	

Table 4: Source of agricultural input by farmers

S. No.	Organic farmers variables	No. 500	% Responses	Inorganic farmers variables	No. 500	% Responses
1.	Communal contribution	466	93%	-Commercial institutions	445	89%
2.	Thrift	403	81%	-Thrift	461	92%
3.	Borrowing	415	83%	-Borrowing	448	90%
4.	Free gift	28	6%	-Free gift	31	6%
5.	Commercial institutions	101	20%	-Communal contribution	51	10%
		$\bar{x}_1 = 56.6$			$\bar{y}_1 = 57.40$	
		$SD_1 = 36.10$			$SD_2 = 40.37$	

Table 5: Problems affecting organic and inorganic vegetable forms

S. No.	Organic farmers variables	No. 500	% Responses	Inorganic farmers variables	No. 500	% Responses
1.	Acquisition of plot	424	85%	-Acquisition of plot.	401	80%
2.	Lack of pumping engine	481	96%	Irrigational problems	450	90%
3.	Lack of finance	491	98%	-Lack of pumping engine	461	92%
4.	Inadequate system of transportation	466	93%	-Lack of finance	490	98%
				-Lack of chemical fertilizer	498	100%

and inability to acquire loan (83%). In the same vein, about 100% of the inorganic vegetable farmers reported lack of chemical fertilizers as the topmost problem. From the table, it could be deduced that both organic and inorganic vegetable farmers are confronted with almost the same magnitude of problems. This points to the fact that both farmers require assistance from governments and philanthropists including non-governmental associations (NGOs). The researcher observed and gathered that land acquisition is a threat to their farming business.

Table 6 shows that through organic vegetable farming the benefit of mutual co-operation is paramount. This is in agreement with the principle of participatory rural appraisal (PRA) technique fully in use in the production of Biodigester and other endogenous practices in the contemporary society. Almost all the organic vegetable farmers attested to the following benefits of growing vegetables all the year round. Promotion of cultural ties, enhancement of group participation, nutritional enhances and upgradement of living standard. Moreso, about 98% and 91% supported nutritional enhances and upliftment of living standard. However, about 21%, 8% and 4% sparingly attested to mutual co-operation, group participation and promotion of cultural ties as benefits of growing vegetables. This confirms – the fact that farmers on the high plain of Benue Valley exhibit individualistic characteristics and self-centredness.

Hypothesis - tested at .05 level of significance.

Hypothesis 1

H_0: There is no significant difference in the mean responses of organic and inorganic vegetables farmers on the production activities of vegetables.

Analysis of this hypothesis reveals that there is significant difference between the production activities of both organic and inorganic vegetable farming. It is evident in the calculated t value of 4.11 and critical ratio of 2.15 (see Table 7). This result proved the fact that organic vegetable farming is unique in its operational activities that involve use of Biodigester and local methods.

Hypothesis 2

H_0: There is no significant difference in the mean responses of organic and inorganic vegetable farmers on the type of vegetables grown.

Analysis of this hypothesis shows that the there is no significant difference between the types of vegetables grown by the organic and inorganic vegetable farmers because they attend the same market for their commodities. The consumers demand apparently determines the sameness of vegetables grown (see Table 7).

Hypothesis 3

H_0: There is no significant difference in the mean responses of organic and inorganic

Table 6: Benefits from organic and inorganic vegetable farming

S. No.	Organic farmers variables	No. 500	% Responses	Inorganic farmers variables	No. 500	% Responses
1.	All year round supply of vegetables	493	99%	-All year round supply of vegetables	118	24%
2.	Nutritional enhancer	490	98%	-Nutritional enhancer	456	91%
3.	Enhancing living standard	489	98%	-Enhancing living standard	491	98%
4.	Encouraging mutual cooperation's	466	93%	-Lack of finance	490	98%
				-Lack of chemical fertilizer	498	100%

Table 7: T-test analysis of the production activities, types of vegetable grown, source of inputs and problems affecting the operational activities of organic and inorganic farmers.

Variable	*Organic farmer*		*Inorganic farmer*				
	X	*SD*	*X*	*SD*	*Df*	*T-ratio*	*T-cal*
Production Activities	87.00	27.80	80.40	37.00	14	2.15	1.74
Types of Vegetables grown	41.80	2071.16	69.20	146.89	14	2.15	4.11*
Source of inputs	51.60	3203.56	57.40	1629.74	14	2.15	0.04
Operational Problems	76.67	1056.90	88.86	116.21	14	2.15	-9.23

*T= significant at $p < 0.05$, x- mean, SD – Standard Deviation, Df – degree of freedom, T-cal = calculated, t-ratio

vegetable farmers on the sources of inputs.

H_0: Analysis of this hypothesis holds common sources of deriving essential inputs both material and financial for production of vegetables (see Table 7).

Hypothesis 4

There is no significant difference in the mean responses of organic and inorganic vegetable farmers on the problems affecting their operational activities.

Analysis of this hypothesis reveals that there is no significant difference between problems encountered by the farmers. This shows that all the farmers encounter high difficulties in exhibiting the entire production activities both at the river valley and on the plain land.

CONCLUSION

Locally-fabricated Biodigester is an adaptive technology from peru and Colombia. The organic vegetable farmers adequately utilized it for the production of manure. Effective and judicious application depends on training and re-training of practical farmers.

Vegetable farming is apparently a household practice. Every household in the global world requires vegetables of various kinds as nutritional enhancer replenishment of broken down tissues. Therefore, it becomes a primary concern of all human beings to propagate and conserve vegetables for animals, the vegetarians, industrial sectors. Sustainability and affordability of vegetables all the year round require adoption of low-cost technology that demand locally sourced materials and less strenuous stalls.

1. Farmer Field Schools should be established in all local government Headquarters in Nigeria, where able-bodied men and women interested in farming will be trained and educated on the fabrication of Biodigester.
2. Soft loan should be made available to those in the business of farming especially, the organic and inorganic vegetable farmers.
3. The Government policy on land use act should be reviewed to allow vegetable farmers have access to land along River Banks of Benue Valley.
4. Interested philanthropists, non-government organizations and Foreign donor agencies should join the crusade of world wide nutritional enhancer" (vegetable production).

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