## *Original Research Article*

# Determination of Socio-economic influence of tillage and termite on incidence, severity and yield of cassava in selected Owerri Agricultural zones, Southeast Nigeria.

Comment [A1]: Manuscript title should be as "Determination of Socio-economic influence of tillage and termite on incidence, severity and yield of cassava(*Manihot esculenta* Crantz.) in selected Owerri Agricultural zones, Southeast Nigeria".


**ABSTRACT**

The field investigation was conducted in 2015 in four selected Agricultural zones of Owerri, Southeastern Nigeria namely Ezinnihite Mbaise (Zone 1), Owerri North (Zone 2), Mbaitoli (Zone 3) and Owerri West (Zone 4). A random selection of thirty cassava farmers from each of the study areas was made. The sample size was made up of a total of one hundred and twenty (120) respondents. Data were collected through structural questionnaire administration to the respondents on the four selected zones and were analyzed using Descriptive Statistics such as the use of Percentages, Frequencies and Means. Result indicates that majority of the respondents sampled in this study practiced mounding for their cassava production. Also greater proportion of them (respondents) claimed that apart from other known endemic pests like grasshopper,mealybug, green mites etc., termite poses greater threat to their cassava farm. However, highest cassava yield occurred in areas where mounds and/or ridges were practiced. In view of the prevailing high water table of the sampled areas, farmers are advised to continue with the practice of mounding and/or ridging for their cassava production.



Key words: Tillage, Termite, incidence, severity, cassava, zones


Comment [A2]: grasshopper, mealybug,



## 1. INTRODUCTION

Cassava (*Manihot esculenta* Crantz.) is a perennial woody shrub with an edible root which grows in tropical and sub-tropical areas of the world. It has the ability to grow on marginal lands and can tolerate long dry spell [1]. However, cassava does well on well drained, rich and friable loamy soils [2]

In Africa, cassava provides a basic daily source of dietary energy and has gained popularity as one of the most important root crops in Nigeria especially in the Southern States [3] Cassava is the second most important staple food in sub-saharan Africa and accounts for more than 100 calories per day in the diet of an individual [4]

Cassava roots are processed into a wide variety of granules, pastes, flour etc. or consumed freshly boiled or raw. It is used in the production of starch, garri, 'foo-foo', wet and dry chips [3]. The fresh cassava tuber can be used considerably as a source of feed for livestock (sheep, goats, cattles, pigs etc.). In many rural households, cassava peel is fed to domestic animals [5]

Cassava can be planted on mounds, ridges, flat or bedding up. No-tillage, reduced tillage and conventional tillage have been tested in different ecosystems with variable results in terms of yield (Ofori, 1973 [7]. However, acceptable yields have been obtained for small farmers using zero tillage , while no significant differences in yields have been obtained between conventional tillage (plough and harrow) and different forms of reduced tillage (Ofori, 1973) [6].

Termites attack on field, tree crops and on forestry especially in the semi and sub-humid tropics cause significant yield losses [7, 8]. Termites however are serious pests to cassava especially in newly planted fields where they severely damage or weaken the cuttings resulting in poor stands establishment [9]. Yams and cassava which are grown from tuber and cuttings respectively are constantly attacked by *Amitermes,* a predominantly root feeding specie. *Ancistrotermes, Macrotermes, Odontotermes* and *Pseudocanthotermes* are also involved in damaging the maturing crops, as well as by hollowing out stems at ground level.

However, effort to carry out socio-economic influence of tillage and termite infestation and yield of cassava has not been made by our farmers, therefore the need to determine the socio-economic influence of tillage and termite on incidence, severity and yield of cassava in selected Owerri Agricultural zones of Southeastern Nigeria forms the objective of this research.

## 2.MATERIALS AND METHOD

Comment [A3]: 2. MATERIALS AND METHOD

The study was conducted in 2015 cropping season. It was carried out in Owerri Agricultural zone located at the South-western part of Imo State. Owerri is located between Latitude $4^0$ $40^i$ and $8^0$ $15^i$ N and Longitude $6^0$ $40^i$ and $8^0$ $15^i$ E [10]. It is of the humid tropics. It records means annual rainfall of about 18000 mm-2190mm which spans from early March to October. The minimum and maximum mean annual temperatures are $22.5^0$C and $31.9^0$C respectively with relative humidity of about 82.6%. [11]. The zone comprises ten Local Government Areas, namely; Aboh Mbaise, Ahiazu Mbaise, Ezinihite Mbaise, Mbaitoli, Ikeduru, Ngor-okpala, Ohaji/ Egbema, Owerri Municipal, Owerri North and Owerri West. Farmers in the zone are mainly small holders known for growing such arable crops as maize, melon, yam, cassava etc [12].

Four out of the ten Local Government Areas were randomly selected for the study. The selected areas are; Ezinihite Mbaise in Owutu Community, Owerri North in Azaraubo Community, Mbaitoli in Obinnoha Community, and Owerri West in Obinze Community. These areas were selected based on the quantum of cassava cultivation that was being carried out by farmers. A random selection of thirty cassava farmers from each of the study areas who had admittedly been producing cassava for the past ten years was made. The sample size was made up of a total of one hundred and twenty (120) respondents.

Data was collected through structured questionnaire administration to the respondents on the four selected local Government Areas.

All Data collected were analyzed using Descriptive Statistics such as the use of Percentages, Frequencies and Means.

## 3. RESULTS AND DISCUSSION

Comment [A4]: Separate Results and discussion

The Socio-economic study of different tillage (zero, flat. ridge and mound) methods carried out by cassava farmers in four sampled agro-ecological zones in Owerri were shown in Table 1. Result reveals that majority of the respondents sampled in the study area claimed that Owerri North (zone 2), predominantly practice mounding for their cassava production (46.66%). 33.33% of them in Ezinnihite Mbaise (zone 1) and Owerri West (zone 4) respectively as well as 26.66% in Mbaitoli (zone 3) concurs to this claim. Also, 16.67% proportion of the respondents carried out ridging across the zones, while 50.00% (zone 3) and 43.34% (zone 1) of them showed higher preferences to multiple tillage methods (Multiple responses). In the same Table, a fewer proportion of the respondent (6.67%) in zone 4 and 10.00% (zone 1), agreed to have the knowledge of zero and flat tillage methods respectively.

The predominant use of mounds by respondents in Owerri North (zone 2), Owerri West (zone 4) and Ezinnihite Mbaise (zone 1), suggests that mound making for cassava cultivation was an inherited age long traditional tillage method. This is probably anchored on the belief that large heaps of sand (mounds) usually result in high tuber yield. Also, this could possibly be attributed to the prevailing high water table (lowlands) of the area. This is in line with the finding by [13], who stated that in the lowlands, cassava is usually grown on mounds which alleviate water logging and cassava root rot. Equally, high responses to the use of multiple tillage methods by respondents probably implies that the farmers in this study area use different methods at different periods of the year depending on the prevailing weather condition. On the other hand, the non-challant attitudes towards the use of zero and flat tillage methods by respondents probably indicate that both were not only unpopular but also unconventional to them.

In a similar development, Table 2 shows the distribution of cassava yield according to the tillage method used. Majority of the cassava farmers in zone 2 (43.33%) and zone 4 (40.00%) accepted that the use of mounds in cassava cultivation gives higher yield. Also, 33.33% (zone 1) and 26.68% (zone 3) of them affirmed this claim. Similarly, 43.33% (zone 1) and 46.67% (zone 4) of the respondents accepted that ridge making results to high cassava production output. Equally, large proportion of respondents in zone 2 (40.00%) and zone 3 (33.33%) agreed that best yield comes from the use of combination of two or more tillage methods (Multiple responses). In the same vain, 3.33% (zone 3) and 13.33% (zone 4) of the respondents claimed that better cassava yield result comes from zero and flat tillage methods respectively.

The high cassava yield obtained with mounds and/or ridges, shows that the bulk of cassava planted in these zones under study were done either on mounds or ridges probably to reduce the risk of flooding and also achieve the desired high yield. This agrees with [14] who reported that cassava cuttings planted on ridges or mounds had the highest yield.

Result in Table 3 shows the distribution of different types of insect pests attack (incidence) on cassava farms in the sampled area. The Table reveals that larger proportion of respondents (50.00%) in zone 1 and zone 4 respectively claimed that the bulk of insect pests that attack cassava were as a result of termites infestations. This view was upheld by respondents in zone 2 (30.00%) and zone 3 (16.67%). However, there was marked evidences of pests attack on cassava by a number of insect pests (Multiple responses) such as termites, mealybug and grasshoppers especially in zone 3 (73.33%). Also in the same Table, grasshopper was implicated as pest of cassava in zone 1 (23.33%), zone 2 (30.00%) and zone 4 (16.67%). It was equally gathered from the respondents that mealybug and green mites infestations were not a limiting factor to cassava production across the sampled zones.

The implication of termites as major pest of cassava in zone 1 and zone 4 indicates that soils in these areas were naturally infested with termites and therefore pose great threat to profitable cassava production. Apart from termites, other insect pests like grasshoppers, mealybug, and green mites were also identified to cause economic damage to cassava. [15] stated that in lowlands when there is three or more months of dry spell, arthropod pests population increase and cause considerable yield reduction in cassava field.

Table 4 describes the degree of termites damage (severity) to cassava in different zones under the study area. None of the respondents across the zones except zone 3 (13.33%) did agree that there was no termites infestation in their cassava farms. 53.34% (zone 1), 30.00% (zone 2) and 50.00% (zone 3) proportion of the respondents claimed that termites damage in their cassava field were in the range of 1-20% (slight infestation), while majority of them in zone 2 (40.00%) was in the range of 21-40% (moderate infestation) and 50.00% (zone 4) was in the range of 41-60% (extensive infestation). Equally, a fewer proportion of the respondent in zone 2 (6.67%) and zone 4 (16.67%) agreed that the degree of termite infestation in their field was in the range of 61-80% (very extensive infestation), while none of them agreed to have experienced total crop failure (completely infested) in their cassava farm as a result of termites infestation. However, the Table also reveals that mean termite damage in cassava field were 22.50% (Zone 1), 31.83% (zone 2), 16.43% (Zone 3) and 47.17% (Zone 4).

The Classification of degree of damage (severity) arising from termites on cassava in the zones under study into three categories (slight, moderate and extensive) of infestation, implies that, though termites were identified as serious pest of cassava its damage to cassava was estimated to be in the range of 34-50% [16].

**Conclusion/recommendation**

Majority of respondents sampled in the study practiced mounding as their traditional tillage method of cassava cultivation. Mounding produced highest cassava yield in these zones. Across the zones also, termites was implicated as major pest of cassava and caused considerable yield reduction.

It is therefore recommended that farmers operating under these investigated agricultural zones in Owerri, Imo State, Nigeria should continue with the practice of mounding and/or ridging for

their cassava production. This will go a long to improving their crop yield output as it blends effectively with the prevailing high water table of the area.

A follow-up research will be carried out to determine the devastating capacity of termites on different parts and phases of cassava production as well as on the choice of control measures suitable for check-mating the menace of the pest (termites) on these areas investigated.

**Table 1: Frequency and Percentage Distribution of Different Tillage Practices Adopted According to Zones**

| | Zone 1 | | Zone 2 | | Zone 3 | | Zone 4 | |
|---|---|---|---|---|---|---|---|---|
| **Tillage** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** |
| Zero | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 6.67 |
| Flat | 3.00 | 10.00 | 2.00 | 6.67 | 2.00 | 6.67 | 3.00 | 10.00 |
| Mound | 10.00 | 33.33 | 14.00 | 46.66 | 8.00 | 26.66 | 10.00 | 33.33 |
| Ridge | 4.00 | 13.33 | 5.00 | 16.67 | 5.00 | 16.67 | 5.00 | 16.67 |
| Multiple rep. | 13.00 | 43.34 | 9.00 | 30.00 | 15.00 | 50.00 | 10.00 | 33.33 |
| **Total** | **30** | **100** | **30** | **100** | **30** | **100** | **30** | **100** |

**Source: Computed from Field Survey Data (2015).**

Zone 1: Ezinihite Mbaise

Zone 2: Owerri North

Zone 3: Mbaitoli

Zone 4: Owerri West

**Table 2: Frequency and Percentage Distribution of Yield by Tillage Method According to Zones**

| | Zone 1 | | Zone 2 | | Zone 3 | | Zone 4 | |
|---|---|---|---|---|---|---|---|---|
| **Tillage** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** |
| Zero | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 3.33 | 0 | 0 |
| Flat | 0.00 | 0.00 | 0.00 | 0.00 | 1.00 | 3.33 | 4 | 13.33 |
| Mound | 10.00 | 33.33 | 13.00 | 43.33 | 8 | 26.68 | 12 | 40 |
| Ridge | 13.00 | 43.33 | 5.00 | 16.67 | 10 | 33.33 | 14 | 46.67 |
| Multiple rep. | 7.00 | 23.34 | 12.00 | 40.00 | 10 | 33.33 | 0 | 0 |
| **Total** | **30** | **100** | **30** | **100** | **30** | **100** | **30** | **30** |

**Source: Computed from Field Survey Data (20**

**Table3: Frequency and Percentage Distribution of Pest Incidence by Type According to Zones**

| | Zone 1 | | Zone 2 | | Zone 3 | | Zone 4 | |
|---|---|---|---|---|---|---|---|---|
| **Pest incidence** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** |
| Termites | 15.00 | 50.00 | 9.00 | 30.00 | 5.00 | 16.67 | 15.00 | 50.00 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Mealybug | 4.00 | 13.33 | 1.00 | 3.33 | 2.00 | 6.67 | 0.00 | 0.00 |
| Green mites | 2.00 | 6.67 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Grasshopper | 7.00 | 23.33 | 9.00 | 30.00 | 1.00 | 3.33 | 5.00 | 16.67 |
| Multiple rep. | 2.00 | 6.67 | 11.00 | 36.67 | 22.00 | 73.33 | 10.00 | 33.33 |
| **Total** | **30** | **100** | **30** | **100** | **30** | **100** | **30** | **100** |

**Source: Computed from Field Survey Data (2015).**

**Table 4: Frequency and Percentage Distribution of Degree of Damage by Termites According to Zones**

| | **Zone 1** | | **Zone 2** | | **Zone 3** | | **Zone 4** | |
|---|---|---|---|---|---|---|---|---|
| **Degree of Damage** ( % ) | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** | **Frequency** | **Percent (%)** |
| 0 | 0.00 | 0.00 | 0.00 | 0.00 | 4.00 | 13.33 | 0.00 | 0.00 |
| 1-20 | 16.00 | 53.34 | 9.00 | 30.00 | 15.00 | 50.00 | 0.00 | 0.00 |
| 21-40 | 10.00 | 33.33 | 12.00 | 40.00 | 11.00 | 36.67 | 10.00 | 33.33 |
| 41-60 | 4.00 | 13.33 | 7.00 | 23.33 | 0.00 | 0.00 | 15.00 | 50.00 |
| 61-80 | 0.00 | 0.00 | 2.00 | 6.67 | 0.00 | 0.00 | 5.00 | 16.67 |
| 81-100 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **30** | **100** | **30** | **100** | **30** | **100** | **30** | **100** |
| **Mean** | | **22.5** | | **31.83** | | **16.43** | | **47.17** |

**Source: Computed from Field Survey Data (2015).**

**INTERPRETATION:**

0%- No Infestation
1-20%- Slight Infestation
21-40%- Moderate Infestation
41-60%- Extensive Infestation
61-80%- Very Extensive Infestation
81-100%- Completely Infested

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**Appendix**

Sample of the structured questionnaire administered to the respondents on the four selected local Government Areas

**SECTION A** (Biodata)

1. **Name of Respondent:**……..
2. **Age:** ……..
3 **Gender:**……
4 **Marital Status:**…….
5 **Educational Attainment:**

**(i) B.Sc. (ii) M.Sc. (iii) Ph.D (iv) Any other**

6 **Occupation**

(i) Farming (ii) Trading (iii) Civil Servant(iv) Any other

7 **Farm location**
   a. TOWN
   b. VILLAGE
8 **Farm Size**
9 **Number of Farm Organization you belong:**……
10 **ANY OTHER INFORMATION:**……..

**SECTION B** (Specific Objectives)

a.**CASSAVA CULTIVATION**

i**. Do you grow Cassava in your Farm?**

Yes ( ) No ( )

ii. **If yes, what variety (ies)**

- TMS 30555
- TMS 30572
- TMS 4(2)1425
- NR 8083
- ANY OTHER

**iii. What method(s) of Tillage Practices do you adopt?**

(a) Zero (b) Flat (c) Mounds (d) Ridges (e) All of the above

**iv. In order of preference which of the above named tillage practices produce best yield?**

**v. What problems do you often encounter in your cassava Farm?**

**b. PESTS**

**i. Do you encounter pests problems in your Farm?**

Yes ( ) No ( )

**ii. If yes , name the common pests that attack the crop**

(a) Grasshopper (b) Mealybug (c) Green spider mites (d) Termites (e) Any other

**iii. In which of these tillage practices do you record termites attack most**?

(a) Mound (b) Flat (c) Zero (d) All of the above

**iv. Do you recognize more than one kind of termites in your field?**

Yes ( ) No ( )

**v.** If yes, specify names

**vi. Specify the major losses that you experience from termites attack**

**vii.**What is **the degree of damage caused by termites**

a. 0% No Infestation
b. 1-20% Slight Infestation
c. 21-40% Moderate Infestation
d. 41-60% Extensive Infestation
e. 61-80% Very Extensive Infestation
f. 81-100% Plant completely Infested

**viii. Quantify the economic loss from termites**

(a) Readily (b) Significantly (c) Difficult (d) Not at all