

Research article

COMPUTING THE PERCEIVED EFFECTS OF LAND DEGRADATION ON MAIZE FARMERS IN ORIRE LOCAL GOVERNMENT AREA OF OYO STATE, NIGERIA

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ABSTRACT

Land degradation is a major environmental problem facing agricultural development in most areas in Nigeria. It often leads to loss of soil fertility and moisture stress, among others. The major occupation of the people in Orire local government area of Oyo state is maize farming. But recently, there has been a fall in sales of maize products in this area, thereby resulting into less income being generated by farmers. Several agricultural economists and scientists have investigated and proposed several techniques towards addressing this issue, but the challenges still linger in this part of Nigeria. These challenges brought about the need to study and compute the perceived effect of land degradation in Orire Local Government Area of Oyo State. Structured interview schedule was used in collecting data from the respondents and the statistical tools used in analyzing data were: mean frequency distribution percentage and probit model. The result shows that 60% of maize farmers are male, 50% of the respondent have been farming between 1-5 years, more than half of the respondents affirmed that there are norms against land degradation while 58.8% of the maize farmers are aware of land degradation. The significant determining factors of land degradation are: sex ($p < 0.01$), marital status ($p < 0.1$), farming experience ($p < 0.1$), land acquisition ($p < 0.04$), land degradation awareness ($p < 0.07$), cause of land degradation ($p < 0.04$), land management policy ($p < 0.12$), animal grazing ($p < 0.01$), cost ($p < 0.04$). The farmers recorded low income as a result of low yield to land degradation effect. Therefore, government should formulate policies that will reduce land degradation to improve the income generated and subsequently the standard of livings of farmers in this area of Oyo State.

Keywords: degradation, maize, farmers, deforestation, oyo, orire

I. INTRODUCTION

Land degradation is a major environmental problem facing agricultural development in most areas in Nigeria. Land degradation can be observed in many ways: by biophysical scientists, by those who have to dispense finances for mitigation, by economists and political scientists and from the point of view of land owners [1]. Land degradation is widely considered a global problem, associated with desertification in dry, semiarid and dry sub-humid zones, commonly called the 'dry lands' [2]. Uncertainty as to the extent and impact of land degradation is prevalent. Some sources routinely report that up to 70 per cent of all dry lands are 'desertified'; others suggest that the figure is no more than 17 per cent [3]. In sub-Saharan Africa, Land degradation issues have become a pandemic. This is evident in [4], where the researcher highlighted several challenges facing farmers in Africa, most especially in Nigeria. Nigeria has 60% percent of inhabitants practicing farming as their major occupation. Nigeria has six (6) geopolitical zones, with the major agricultural proceeds coming in large quantities from the North East and North West. Crops such as maize, soya beans, cowpea, cassava, okra and pepper, among others are being produced in little quantities in the South South and South West. Even though the agricultural products are few in the South West, where Oire Local Government in Oyo state is situated, the issue of land degradation affects the productivity of farmers in this area. This is as a result of some environmental conditions. Example of these conditions can be found in [5]. In order to investigate the effects of land degradation on maize farmers in Oire Local government of Oyo State, this research collected quantitative data and analysed the data using probit model so as to ascertain the perception of maize farmers on this endemic affecting their income. The rest of this paper is organized as follows: Section II discusses the literature review, and formed the background for this work, Section III presents the research methodology, Section IV presents our results, and the conclusion is presented in Section V.

II. LITERATURE REVIEW

Land degradation is the process of decay in the lands physical and biological resources, which continues until it reduces the land nutrients [2]. The process can be natural but it usually ends with new natural balance. Land degradation reflects imbalance between man and his environment. Man is always seen not as the trigger but the accelerator of land degradation processes which continues until land becomes unproductive and difficult to rehabilitate. Land can be viewed as a component of the ecosystem interacting with many components creates a dynamic balance within certain limits. Man can influence the balance when in need of production.

Land degradation is one of the most important environmental problems currently challenging sustainable developments in Nigeria. This problem is most acute where the environment is intrinsically vulnerable and where the population is losing control of its own resources, unless some local actions are taken[6].

Land degradation solution becomes very important because the land undergoing degradation its productivity reduced while the number of people in need of food, clothing and shelter are still growing.

The work of Ravi et al., 2010 [7], suggests two broad type of land degradation, which are; over exploitation of land resources through over use fertilizer, soil acidification, pan information, soil erosion, overgrazing, eutrophication, over load of soil nutrient under investment in land which include degradation of existing components of land are not properly manage such as irrigation terraces, pollution trees alleys as well as load improvement that are not made due to lack of investment incentives.

LAND TENURE SYSTEM IN NIGERIA

Land tenure according to Eze *et al.*, (2011)[8], means the arrangement whereby people gain access to productivity opportunity on lands. It constitutes the rule and procedures governing the right, duties, and liberty of individual and groups in the use and control over the resources of land and water. The land tenure system defines the relationship among men in the use and control of land resource. The word "tenure" means the holding of property, especially real estate or by references to a superior. inherent on the world "held" is the idea of excluding others; another indispensable dimension of tenure is the period of time for which property is held [8]

Traditional land tenure system place major constrain upon achievement of efficient agricultural development. The holder of the land had become insecure due to a growing shortage of land and insecurity of expectation generated by the land policies of the government. The traditional system of land tenure presupposes abundances of land.

However, population pressure has reduces man land ratio especially in the southern part of the country where it is no longer possible to leave a fallow and continuous cultivation is now the rule [4]. Land degradation in maize

indirectly reduces the gross domestic product in Nigeria. Stavi et al. (2015) [9] summarizes that the agricultural sector is the largest employer in most developing countries and may rely on maize production as main sources of national income, low agricultural productivity necessitate importation of food and raw materials in order to sustain supply, which can be unfavourable to the economy. Barrow (2012), [10] estimates based on available secondary data, that global production is 15 – 20 percent lower as a result of all various effects of soil erosion.

PAST EFFORTS IN CONTROLLING LAND DEGRADATION

Different indicators have been used in the control of land degradation during research works conducted on the economic effect of soil degradation. See for example [7], [5] and [11]. Majority of research works on land degradation has focused on biophysical aspects of the problem especially soil erosion. In the analysis of land degradation, planning and design of desertification abatement programmes, experts have often used a range sophisticated mathematical techniques[12], while grossly under estimating or neglecting local opinion perception and economic factors. As a result of profound neglect of local opinion perception and adaptive strategies and the failure to enlist local support in project planning and implementation, many agricultural projects in arid and semi-arid areas have been expensive and ineffective [1]. Several researchers, particularly [13], have stressed both the richness of local perception and the need to take them into account in any development planning. Also, economic losses have been assessed by comparing the value of lost production, the value of inputs needed to compensate for fast nutrient or currents or discounted future income streams to farm income.

THE CAUSES OF LAND DEGRADATION

There is variation of land degradation from place to place, which is highly depending on the environmental condition of the area. Due to the marked variation in topography and altitudes, there are different agro-ecological riches or macroclimate within short distance [6]. Land degradation problem in rain forest zone could be in form of soil of soil erosion.

The direct causes of land degradation are apparent according to [9]. It includes production on steep slope and fragile soils with adequate investment in the soil conservation or vegetation cover erratic and erosive rainfall, declining use of fallow, limited application of external resources of plant, nutrients, deforestation and overgrazing, other major cause include many factors, which can be socio-economical institutional and policy factor, they are land tenure insecurity, population pressure poverty, fragile ecosystem, inadequate technology and socio-cultural factors. Also, direct causes are overgrazing, agricultural expansion, fuel wood gathering, commercial logging, infrastructure and industrial development and other factors affecting these are government policies relating to infrastructural development, input and credit supplies, market development [13].

III. METHODOLOGY

The study (research) area

The study was conducted in the Orire local government area of Oyo state Nigeria with it headquarters in Ikoyi-Ile. The major occupation of the people in that local government area is farming. In particular, cultivation of yam, maize, cowpea, cassava, okra, pepper and vegetables, fruit crops including: plantain, pawpaw, banana and pineapple, permanent tree crops including: mango, cashew, tobacco and citrus are the agricultural activities in the area. The study was therefore focused on rural areas where majority of famers are located. The research was conducted in the following villages, Olounda, Tewure, Ikoyi-Ile and Abogunde. The estimated population of the local government during 2006 census was about 200,000 with about 90% being farmers (both crops and animal's production).

3.2 Data collected and sampling techniques

Primary relevant data was used, using well-structured questionnaires. The questionnaires are targeted toward the producer of maize in Orire local government area.

Simple sampling procedure was adopted for collection of data from major villages in the local government area. Eighty respondent is adopted from four villages i.e twenty respondent from each village was administered the questionnaire, in order to collect data on the socio-economic characteristic perceived effect of land degradation on maize production, place of residence during farming, number of farmland exploited, the farm distance covered, farm size and input used are taken and noted.

3.3 Data Analysis

The analytical technique includes:

- (a) The descriptive statistics such as frequency distribution, percentage and mean were used to analyze the socio-economic characteristics of the respondents
- (b) Regression analysis

The regression analysis was used to determine the relationship between total perceived effect on maize production(Y), the dependent variable and the correlated variables, socio-economic characteristic and others which are dependent variables.

Model Specification

Probit model was used. It represents another type of widely used statistical model for studying data with binomial distribution.

Probit Model = $\Pr(Y=1/x) = (x'B)$

Dependent variable

The dependent variables in probit model are dichotomous (e.g. whether or not land degradation occurs)

Independent variable

X1 = Sex

X2 = Marital status

X3 = Farming experience

X4 = Education

X5 = Land management

X6 = Land acquisition

X7 = Norms against land management.

X8 = Land degradation awareness

X9 = Causes of land degradation

X10 = Land management policy

X11 = Law against deforestation

X12 = Animal grazing

X13 = Cost

IV. RESULTS

The maize farmers in the study are majorly male making up to 60.0% while the remaining 40.0% are female. This shows that majority of the maize farmers in the area are male as it is revealed in table 1 below. This is because both male and female are considered in the study.

Table 1: Sex Distribution of the Respondents

Sex of Respondents	Frequency	Percentage
Male	48	60
Female	32	40
Total	80	100

Distribution of the Respondents by Marital Status

According to Table 2, half of the sampled populations (50.0%) of the maize farmers are married while 18.8%, 16.2% and 15.0% are single, widow and divorced respectively. This implies that no matter ones marital status, there are the tendencies to identify the causes of land degradation, the effects on maize production and the means of correcting the anomalies.

Table 2: Distribution of the Respondents by Marital Status

Marital Status	Frequency	Percentage
Divorced	12	15
Married	40	50
Widowed	13	16.2
Single	15	18.8
Total	80	100

Distribution of the Respondents by Educational Level

Table 3 indicates that 41.2% and 25.0% had primary and secondary education respectively, 17.5% had adult education while the remaining 16.2% had post-secondary education. This reveals that predominant of the respondents have a level of education which can translate in some level of efficiency on the part of the farmers in land degradation management.

Table 3: Distribution of Respondents by Education Level

Education Level	Frequency	Percentage
Primary	33	41.2
Secondary	20	25
Post-Secondary	13	16.2
Adult	14	17.5
Total	80	100

Distribution of the Respondents by farm size

The distribution of the maize farmers by their farm size in hectares is presented in table 4 below. 5.0% have more than 6 hectares while 56.2% and 38.8% have between 1-3 hectares and 4-6 hectares respectively. This means most of the farmers have a fairly large farmland to supply the needed maize to the yearning consumers but this may be thorn in the flesh of the farmers in managing the degraded land area where farming is taking place.

Table 4: Distribution of the Respondents by Farm Size

Farm size (Hectares)	Frequency	Percentage
1 – 3	45	56.2
4 – 6	31	38.8
>6	4	5
Total	80	100

Distribution of the Respondents by Farming Experience

The distribution of maize farmers by farming experience is shown in Table 5. It reveals that half of the respondents (50.0%) have been into farming between 1-5 years while the remaining 37.5% and 12.5%, between 6-10 years and greater than 10years farming experience respectively. This indicates that most of the respondent have good knowledge of this processes and procedures which will enhance the efficient management of the land through prompt interference in land degradation.

Table 5: Distribution of the Respondents by Farming Experience

Farming Experience (Years)	Frequency	Percentage
1 – 5	40	50
6 – 10	30	37.5
> 10	10	12.5
Total	80	100

Distribution of the Respondents by Land Acquisition

33.8% and 31.2% of the respondents as depicted by table 6 acquire their land through inheritance and rentage while the remaining 20.0% and 15.0% got their farmland through pledge and purchase. The type of land acquisition will determine the disposition of the maize farmers to managing land degradation.

Table 6: Distribution of the Respondents by Land Acquisition

Land Acquisition	Frequency	Percentage
Inherited	27	33.8
Rented	25	31.2
Pledge	16	20
Purchase	12	15
Total	80	100

Distribution of the Respondents by Land Management

Based on the distribution of the respondents by land management, Table 7 relayed that 52.5% used communal method of land management while 47.5% used private methods on land management. This indicated that the land is almost evenly being managed both privately and communally.

Table 7: Distribution of the Respondents by Land Management

Land Management	Frequency	Percentage
Privately	38	47.5
Communal	42	52.5
Total	80	100

Distribution of the Respondents by whether land is mortgaged

According to table 8, more than half of the respondents (62.5%) mortgage their land i.e. give their land for finance or credit while the remaining (37.5%) did not mortgage their land.

Table 8: Distribution of the Respondents by whether land is mortgaged

Mortgaged Land	Frequency	Percentage
Yes	50	62.5
No	30	37.5
Total	80	100

Distribution of the Respondents by Land Holding Period

It is revealed in table 9 that 38.8% and 36.2% have been using their land for 1-3years and 4-7 years respectively while the remaining 25.0% had been holding the land for 8-11 years. This will determine the extent to which the farmers will have knowledge of the land terrain and the rate at which it is degrading and the perfect methods to tackle the menace.

Table 9: Distribution of the Respondents by Land Holding Period

Land Holding Period	Frequency	Percentage
1 – 3	31	38.8
4 – 7	29	36.2
8 – 11	20	25
Total	80	100

Distribution of the Respondents by Norms against Land Management

According to table 10 shown below which depicts the distribution of respondents based on whether there are norms impeding land management, more than half of the respondents (62.5%) affirmed that there are norms against land management, which has greatly affected land management while the remaining 37.5% do not see any norms against land management.

Table 10: Distribution of the Respondents by Norms against Land Management

Norms against Land Management	Frequency	Percentage
Yes	50	62.5
No	30	37.5
Total	80	100

Distribution of the Respondents by Land Degradation Awareness

According to table 11, 58.8% of the maize farmers are aware of land degradation while the remaining 41.2% are not aware. This implies that more than half of the respondents are aware of land degradation which means they will take prompt actions to stop further degradation.

Table 11: Distribution of the Respondents by Land Degradation Awareness

Land Degradation Awareness	Frequency	Percentage
Yes	47	58.8
No	33	41.2
Total	80	100

Distribution of Respondents by their Perceived Land Degradation Indicator

According to Table 12, 6.25% of respondents believe that root exposure indicates land degradation in their farms, while 31.25% believes that changes in leaf's colour signifies land degradation, 40% believes low yield productivity means their land has degraded, while 21.25% chose loss of top soil as their indicator. 20% of respondents believes stunted growth of maize produce means their land has degraded, while 6.25% chose others.

Table 12: Computed Farmers' perceived Indicator of Land Degradation

Farmers' Perceived Indicator	Frequency	Percentage (%)
Root Exposure	5	6.25
Change in maize leaf colour	25	31.25
Low Yield Productivity	32	40
Loss of top soil	17	21.25
Stunted growth	16	20
Others	5	6.25
Total	100	100

Distribution of the Respondents by Cost

Table 13 shows the cost incurred by the maize farmers, 50.0% and 46.2% used between #25,000 - #30,000 and greater than #30,000 respectively while the remaining 3.8% expend less than #25,000 on cost. The mean cost is #29,874.38 while the standard deviation is 2,564.287.

Table 13: Distribution of the Respondents by Cost

Cost	Frequency	Percentage
<₦25,000	3	3.8
₦25,000 - ₦30,000	40	50
>₦30,000	37	46.2

Mean = #29,874.38, Standard Deviation = #2564.287

Distribution of the Respondents by Law against Deforestation

Table 14 reveals the distribution of the respondents by presence of law against deforestation. It indicates that 63.8% are of the opinion that there exists laws guiding against deforestation while 36.2% are not aware of any such law. This is a good omen to having reduced factors which can lead to land degradation as those aware of the law will feel reluctant to participate in land degradation though the enforcement might be another determining factor.

Table 14: Distribution of the Respondents by Law against Deforestation

Law against Deforestation	Frequency	Percentage
Yes	51	63.8
No	29	36.2
Total	80	100

Distribution of the Respondents by Degree of Land Management Programme launch

According to table 15, 36.2% and 33.8% reported that land management programme is being launched regularly and occasionally respectively in the study area while others could not ascertain the degree at which such programmes were held. This implies that we have those that are conversant with the need to effectively manage their farmland to improve on the output of the maize production.

Table 15: Distribution of the Respondents by Degree of Land Management Programme launch

Land Management Programme Launch	Frequency	Percentage
Regularly	29	36.2
Occasionally	27	33.8
Others	24	30
Total	80	100

Probit Analysis of the Determinants of Land Management in the Study Area

The log likelihood of the probit model is -31.24802 while the LR Chi2 is 48.41 and statistically significant at $P < 0.01$. This means that the determinant factors are a good fit to the model. The result in table 16 implies that sex, marital status, farming experience, land acquisition, land degradation awareness, causes of land degradation, land management policy, animal grazing and cost are significant determinant of land degradation at varying degree of

significance level. The negative signs of sex, farming experience, land degradation awareness, causes of land degradation, land management policy and animal grazing means a unit increase in any of the aforementioned lead to 3.2386, 1.3681, 1.0564, 3.6730, 0.6825 and 1.4265 decrease in land degradation. All but animal grazing and causes of land degradation are in accordance to the apriori because any increase in land grazing by animals and the continued increase in causes of land degradation will definitely result in increased land degradation. Marital status, land acquisition and total cost have positive signs and it means increase in these will result in increase in land degradation.

Table 12: Probit Analysis of the Respondents

S/N	Variables	Coefficient	Standard	t-Value error	Probability
1	Sex	-3.2386	1.2979	-2.5	0.013***
2	Marital status	1.2718	0.7285	1.75	0.081*
3	Farming Experience	-1.3681	0.7776	-1.76	0.079*
4	Education	-0.2095	0.2226	0.2226	0.2226
5	Land Management	0.5924	0.6221	0.95	0.341
6	Land acquisition	0.5127	0.255	2.01	0.044**
7	Norms against land management	0.7675	0.6917	1.11	0.267
8	Land degradation awareness	1.0564	0.584	-1.81	0.070*
9	Causes of land degradation	-3.673	1.2634	-2.91	0.004**
10	Land management policy	-0.6825	0.4347	-1.57	0.1116*
11	Law Against Deforestation	0.9531	0.8054	1.18	0.237
12	Animal Grazing	-1.4265	0.5482	-2.6	0.009**
13	Cost	0.0002	0.0001	2.01	0.044**
14	Constant	3.6006	2.8222	1.28	0.202__

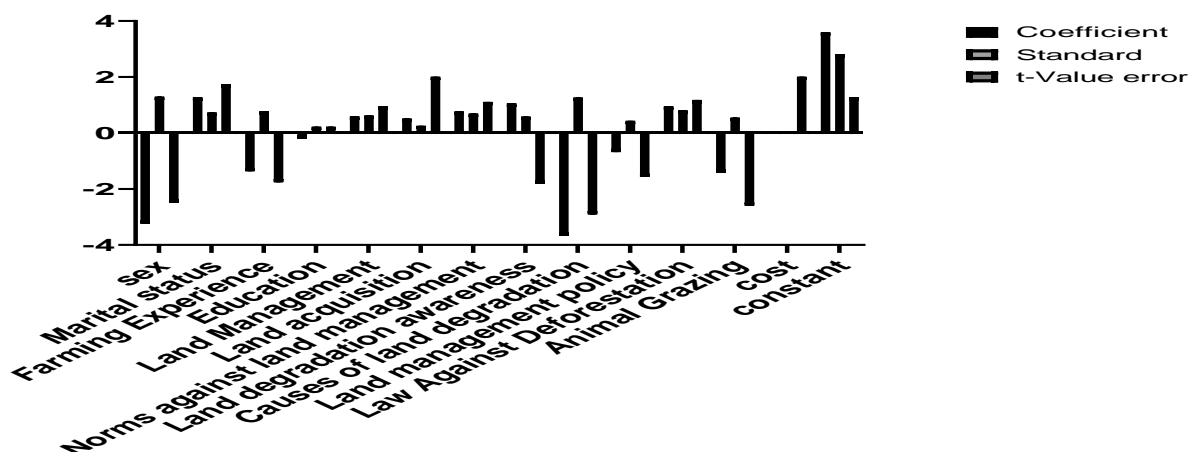


Figure 1: Graphical representation of Probit Analysis

Number of Observation = 80

Log Likelihood = -31.24802

LR $\chi^2(13) = 48.41$

Prob > $\chi^2 = 0.0000$

*** = Significant at 1%

** = Significant at 5%

* = Significant at 10%

FINDINGS

In the findings it was discovered that 60% were male and 40% were female, the greater percentage being male brought about high yield productivity and deals with the effects of land degradation. 50% married, 15% divorce, 16.2% widowed and 18.8% single, high percentage of the farmers are married i.e family labour is used which suggested that farmers employ their wives and children on the farm. Majority of the farmers were educated while 41.2% were educated through primary school holder, 25% of the farmer passed through the secondary school, 16.2% of the farmer passed through post-secondary school while 17.5% of the farmer passed through adult school of learning, this suggested why majority of the farmers, value sending their children to school than working on the farm. Distribution of the respondent by farm size shows that farmers have a fairly large farmland to supply the needed maize to the yearning consumer but this may be a thorn in the flesh of farmers in degraded land where farming is taking place. The study suggested that majority of the respondents have substantial years of experience of farming system more than half of the respondents have less than 5 years of farming experience. In findings, the greater percentage of farmers being a native of the study area permit them to have access to the land through inheritance, 33.8% inherited, 31.2% rented, 20.0% pledge and 15.0% purchase land, this type of acquisition determines the disposition of the maize farmers to managing land degradation.

However, community own the high percentage of land in the study area and it is given out to farmer to cultivate on it in form of rent, pledge or purchase. However, 62.5% of the farmer also mortgage their land. More than half of the respondent i.e 62.5% affirmed that there are norms against land management which as greatly affected land management while 37% do not see any norm against land management. Majority of the maize farmer i.e 58.8% are aware of land degradation while 41.2% are not aware which implies more than half of the respondent are aware of land degradation which means they will take prompt action to stop further degradation. 63.8% of the respondents were aware of law against deforestation and the law guiding deforestation and 36.2% are unaware with the knowledge of the law having reduced the factors which can lead to land degradation. The regression analysis shows that sex, marital status, farming experience, land acquisition, land degradation awareness, causes of land degradation, land management policy, animal grazing and cost have -3.2386, -1.2718, -1.3681, 0.5127, -1.05164, -3.6730, -0.6825, -1.4265 and 0.0002 as their coefficient and are significantly at $p < 0.01$, $p < 0.1$, $p > 0.1$, $p < 0.05$, $p < 0.1$, $p < 0.05$, $p < 0.1$, $p < 0.01$ and $p < 0.05$ respectively.

V. CONCLUSION AND RECOMMENDATION

The effect of land degradation on maize production are to be deduced from the research conducted in the study area, that reveal that degradation of land have greatest effect on maize production and also on agricultural income of the farmer as field decrease which may eventually bring about low level of income also economic instability, so we should not take slightly the long term economic threat of accelerations of land degradation.

However, this should not deter land economists and policy makers but rather inspire them to focus greater attention on soil quality management as a natural resources issue for sustainable agriculture in Nigeria.

Recommendations

Due to the research carried out and also findings in the study area, it was evident that land degradation has led to reduction in the yield of maize production. Hence, policies should gear towards solving these problems. The following recommendations are therefore suggested.

- The land reform measure in the form of land improvement should be implemented to enhance mechanized farming that would boost maize production and agricultural productivity.
- Afforestation programme should be enhance that government provides funds to encourage farmers to practice the agro forestry system which will eventually prevent land from degradation.
- Another source of energy should be sort for which would reduce deforestation that will have positive impacts on the soil.
- Land reform that will bring general improvements should be adopted.
- Encouragement of crop rotation practiced by the farmer will help in conserving the soil fertility and eventually bring high productivity.
- Incorporation of compost and mulching should be adopted instead of constant and continuous application

of non-organic fertilizer, as the residual effect of fertilizer has adverse effect on the soil

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