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Conflicts among Farmers and Pastoralists in Northern Nigeria Induced by Freshwater Scarcity

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Abstract

In recent times, freshwater scarcity in northern Nigeria has increased the prevalence of conflicts in certain parts between farmers and pastoralists because they are among those whose source of livelihood are most threatened. Competition for access to the diminishing freshwater resources often pitched both groups against each other. This paper describes situations that constitute freshwater scarcity and examines conditions under which such scarcity ignites conflicts among farmers and pastoralists in northern Nigeria. The research adopted a survey design of an ex post facto type. The sample population consisted of 150 farmers, 100 pastoralists, and 50 from government officials, NGOs and members of the public. These were selected from the three northern geo-political zones of Nigeria through purposive sampling technique. The instrument used was a structured questionnaire complemented by a semi-structured interview schedule. Reliability test of the questionnaire for internal consistency recorded a Cronbach value of 0.87. Data from 232 respondents were retrieved with 77% response rate which included 102 farmers (44.7%), 52 pastoralists (22%), and 78 other members of the public (33%). Analysis was done using Multiple Regression and Pearson Product Moment Correlation. Findings showed a significant positive relationship between freshwater scarcity and conflicts among farmers and pastoralists (R^2 =0.146); and struggle for access to sources of water, and not water scarcity *per se*, was found to be the most potent predictor of causes of conflict (β= -.278; t= -4.838). This paper found no support for the commonly held belief that demographic variables, like age, religion, tribe, socio-economic status and level of education cause conflicts. Results showed an insignificant relationship (R^2 = 0.054) of those variables with conflict among farmers and pastoralists. The study concludes that freshwater scarcity and conflicts instigate a loss of livelihoods to farmers and contributes to diffuse and persistent violence such as ethnic clashes and regional interstate conflicts.
Key Words: Freshwater Scarcity, Farmers, Pastoralists, Conflict, Northern Nigeria.

1. Introduction

Freshwater scarcity seems to be an under-estimated and under-discussed resource issue facing the world today. It is obvious that the world's water demand grows every year in order to meet up with its increasing population. Exacerbated by climate change, freshwater scarcity is creating security concerns in some parts of sub-Saharan Africa, especially in the semi-arid region. Visible signs that show intensification of water scarcity include hitherto flowing rivers running dry, wells going deeper to reach water, lakes shrinking, diminishing rainfall, shrinking arable lands for farmers, and less pastures and the drying up of drinking water sources like rivers and streams for pastoralists. The availability of water, a major resource needed for agriculture in sub-Saharan Africa, is decreasing as a result of changes in global climatic conditions. Agriculture provides the means of livelihood and economic sustenance for a majority of the population of the region. Farmers and pastoralists, who are the main agricultural practitioners, make significant contributions in meeting the nutritional needs of the region and thus contributing to food security. They are almost wholly dependent on water resources to sustain their vocations. In recent times, access to water and grazing land has become more competitive and has led the farmers and pastoralists into violent conflicts on a regular basis. This is a worrisome trend because both have co-existed inter-dependently for centuries, sharing the same fields for farming and grazing with a manageable level of tolerance and accommodation. This study examines the problem with a special focus on northern Nigeria which has a large population of farmers and herders and increasingly diminishing freshwater sources.

1.1 Objectives

The general objective of this study is to explore how freshwater scarcity engenders conflict between farmers and pastoralists in northern Nigeria. Furthermore, the specific objectives are to;

1. examine the extent to which conflicts between farmers and pastoralists are precipitated by demographic factors like: ethnicity, religion, educational level, occupation, and socio-economic status.
2. discover the relationship between freshwater scarcity and conflict between farmers and pastoralists in Northern Nigeria.
3. identify the effects the duration of rainfall, access and management of water sources have on the causes of conflict between farmers and pastoralists in northern Nigeria.

1.2 Research Hypotheses

The following null hypotheses were proposed for the study.

Ho_1 There is no significant effect of demographic variables (age, gender, ethnicity, educational level, and socio-economic status) on freshwater scarcity induced conflicts among farmers and pastoralists in Northern Nigeria.

Ho_2 There is no significant effect of freshwater scarcity on conflicts between farmers and pastoralists in northern Nigeria.

Ho_3 There is no significant relative effect of duration of rainfall, sources of water, and management of water source on the causes of conflict between farmers and herders in northern Nigeria.

2. Literature Review and Theoretical Framework

Freshwater scarcity is presently generating concerns around the world. It has been brought to the forefront of international policy and has spurred some fruitful discussion on how to resolve the situation. According to United Nations Water (UN-Water, 2008) there are some twenty-five international organizations focused on water and water scarcity issues at the global level. Falkenmark, Berntell, Jägerskog, Lundqvist, Matz and Tropp (2007) declared;

> we are on the verge of a new and more serious era of water scarcity, and it is clear that we will face increasingly complex challenges. Water supply to different sectors will become more challenging as supplies of *blue water* (water in rivers and acquifers) become overstretched, while scarcity of *green water* (water in the soil) will limit food and biomass production.

Freshwater scarcity is a puzzling phenomenon when put side by side with the fact that the total surface of the earth itself is two thirds water. In a study carried out, Wenzlau (2010) stated even though the world is composed of over 70% water only about 3% of that is freshwater and a greater proportion of that is locked in glaciers and permanent snow, leaving only as little as 0.5% for use by nature and humans to meet domestic, socio-economic and ecological needs. Furthermore, even most of the 0.5 %, is stored in underground aquifers, some manifest as rainfall; some reside in natural lakes, man-made storage, and rivers. The study warned that climate change is disrupting, and will continue to disrupt the earth's hydrological cycle, changing the distribution of available freshwater resources in unexpected ways. The natural backlash will be scarcity in some parts of the world.

2.1 Types of Water Scarcity

Scarcity occurs when there is a lack of the minimum supply of Freshwater where it is vitally needed to support human health, sustain food production and fundamental ecological well-being. There are two types of water scarcity: physical and economic. Physical water scarcity occurs when there is a physical lack of water. Economic water scarcity describes a situation in which resources are abundant but where insufficient infrastructure and financial capacity prevent people from accessing the water they need. The World Health Organization's (WHO, 2009) *Fact File* on water scarcity substantiates this by reporting that there are parts of the world which have adequate amounts of rainfall and general freshwater and yet scarcity persists. Besides economic scarcity, The World Health Organization added that geographic or physical water scarcity, found in areas where there is no access to any freshwater sources, clean or otherwise, affects one-fifth of the global population, numbering approximately 1.2 billion people.

2.2 Causes of Water Scarcity

There are many conditions that cause freshwater scarcity. Some are natural while others are manmade. The following are examples:

- Growth in World Population: The world's population is growing at a very rapid rate and will lead to a growth in the demand for food. This would constitute the single most important cause of pressure on water resources. Over the last generation, most of the increment in food supply has been obtained by an expansion in irrigated farming. According to Duda, Menzies, Severin, Hume, Roland, Sundstrom, Zevgolis, and Zavadsky (2012) of the Global Environment Facility (GEF), irrigation and food production already use almost 80% of total freshwater resources.
- Contamination and Pollution. Pollution causes scarcity of normal water supplies as it destroys part of the water resource. This may happen to surface supplies or groundwater, and the pollution may be from industrial effluent, agro-chemical run-off from fields, the casual disposal of human waste, or the release of insufficiently treated sewage from municipal works (Morrison, Morikawa, Murphy, and Schulte 2009).
- Climatic Change and Variability: in certain parts of the world, climatic change reduces the amount of rain that falls and creates new deserts (Soto, 2009). This affects both rain-fed and irrigated agriculture. Crop damage and crop disease are all driven by rainfall and associated humidity (Ludi, 2009, Falkenmark, Berntell, Jägerskog, Lundqvist, Matz and Tropp, 2007).

2.3 How Freshwater Scarcity breeds Conflict

Konczacki (1978) and Jacobs (1980) posited that freshwater scarcity and insufficient rainfall are causes of social and economic ruins, conditions that leave the pastoralists at the mercy of the sedentary society of predominantly farmers. The same scarcity makes rain-fed farmers to expand their farms into cultivable pastoral land, which, according to Catterson (1990), brings about displacement of pastoralists. Because of limited land, the pastoralists and the farmers are constantly competing for the scarce resources. Untold hardship is increasingly experienced by those who become migrants as a result of desert encroachment as thousands of farmers and their families have already been forced to move off land that has become barren (Murray, 2007; Oyetade, 2007). Raleigh and Urdal (2009) opined that freshwater scarcity appears to exert a somewhat stronger effect, increasing the risk of conflict to six percent for areas with very high levels of scarcity. So, for the herders and farmers to meet their needs they have to migrate southward where there is more water and pasture (Obioha, 2005). Hence, with this pattern of movement existing or occurring there will be pressure over scarce resources which if not managed well will increase the risk of conflict.

2.4 Theoretical Framework

The subject of natural resource scarcity, environmental sustainability and degradation within the overarching phenomenon of climate change has been addressed by several theoretical formulations. This work is using the theory of the Tragedy of the Commons and the Neo-Malthusian theory of Environmental Scarcity and conflict.

2.4.1 Theory of the Tragedy of the Commons

The theory of the Tragedy of the Commons states that when a resource is collectively owned by a group of people, each will exploit the resource, overusing it, ignoring the group's collective interest, and thus ultimately destroy the resource. The theory postulated by Hardin (1968). He explained the 'tragedy' by using the example of a pasture which is open to all to use. This open pasture is used by herdsmen to allow their cattle to graze and each herdsman will continue to add cattle to the pasture so as to expand the amount of proceeds coming from their herd. The Commons dilemma stands as a model for a great variety of present resource problems such as freshwater scarcity and pollution, land degradation, and the depletion of non-renewable energy sources. So, in terms of Hardin's theory, the earth's atmosphere is the 'common'. The 'tragedy' is the damage done to the atmosphere that causes global warming, climate change and environmental scarcity shared by all. As the resources become scarcer, competition and conflict over them will increase.

2.4.2 The neo-Malthusian Theory

The neo-Malthusian theory predicts that world population would soon exceed the resource base and lead to serious environmental destruction, widespread hunger and violent conflicts. Thomas Homer-Dixon (1998) is the most influential scholar of the neo-Malthusian position. He and other scholars like Blitt (1998) and Kaplan (1994) argued that resource scarcities can cause violent intra-state conflict under unfavorable conditions (Homer-Dixon, 1999). He used three hypotheses to link environmental changes with violent conflict. First, he suggested that decreasing supplies of physically controllable environmental resources, such as clean water and good agricultural land, would provoke conflicts. The second hypothesis stated that large population movements caused by environmental stress would induce "group-identity" conflicts, especially ethnic clashes. The third hypothesis suggested that severe environmental scarcity would simultaneously increase economic deprivation and disrupt key social institutions, which in turn would cause "deprivation" conflicts such as civil strife and insurgency (Homer-Dickson, 1994).

3. Research Methodology

3.1 Research Design

This study adopted a survey research design, *ex post facto* type, which provides a general framework for the collection of appropriate data that explores how freshwater scarcity engenders conflict between farmers and pastoralists. It uses an eclectic approach of both quantitative and qualitative to gather data and information on knowledge about freshwater scarcity, occurrences of conflicts and policies about the use of land and water resources.

3.2 Sources of Data

To generate data to address the objectives of the research, primary and secondary sources were used. Sources of primary data included farmers, pastoralists, local government officials, officers of the Nigeria security agencies, community leaders, representatives of farmers and herders associations, and government and non-governmental

organizations directly related to farmers-pastoralists work. These sources provided information from the principal actors in the face to face encounter with freshwater scarcity issues. Secondary data was collected from publications like books and journals, and reports from the Commission for Nomadic Education, the Library of the National Water Resources Institute, Kaduna, the Agricultural departments in the local governments visited, and the Pastoral Resolve (PARE) national office in Kaduna.

3.3 Study Area and Population of Study

Northern Nigeria is vast, arid, and less densely populated than the southern part of the country. It is composed of 18 states of the 36 states of the Nigerian Federation. The region has a plurality of cultures. According to Abbass (2011), this phenomenon creates potential areas of conflicts with every group projecting its interests in resource allocation, access, management, and control. Agriculture is the major source of the northern economy, and is mainly rain-fed until the past few years when the government launched the *fadama* irrigation schemes. The weather pattern that occurs seasonally has some 3-5 months of rainfall and a prolonged dry season.

3.4 Sample and Sampling Procedure

For the collection of data, the three northern geo-political zones of Nigeria were purposively selected. The north-west zone is host to several specialized agricultural and livestock institutions like the Institute of Agricultural Research and the International Livestock Centre for Africa (ILCA). It is also home to the United Nations accredited National Water Resources Institute. The north-east zone has one of the largest populations of nomadic Fulani in Northern Nigeria and has a large population of crop farmers. It is a major transhumant route for cattle coming from as far as Chad, Niger, and Cameroun. The north-central zone is a major transhumance route for herders and a point of convergence between sedentary farmers' incoming herders from the far north at the onset of the dry season. Clashes between the two different groups are prevalent in the area. Six local government areas, two each from the zones were purposively selected for the study as a result of the prevalence of conflicts in their localities. These include Kachia, Chikun, Tafawa Balewa, Doma, and Lafia Local Government Areas.

3.5 Research Instrument

Two research instruments were developed for data collection. The first one was a structured 37 item questionnaire titled "Questionnaire on Freshwater Scarcity and Conflict Patterns among Farmers-Pastoralists in Northern Nigeria." The questionnaire had a four- point-rating scale ranging between Strongly Agree, Agree, Disagree, and Strongly Disagree. The interview section contained open-ended questions for farmers, pastoralists, local government officials and community leaders on the sources of water, how freshwater scarcity affects farmers and pastoralists, and policies that regulated the use of land and water sources by the farmers and pastoralists.

3.6 Reliability and Validity

For validity of the study, theories were considered very important tools for conceptualizing variables because they provided the basis for understanding the dynamics of the theme of the study. The questionnaire was assessed by experts and a pilot test was carried out among the Hausa community in Sabo-Sagamu, Ogun State, Nigeria. Items that were ambiguous were removed and the wordings of the questions were restructured to make them clearer. The reliability of the questionnaire was carried out to ascertain the internal consistency. After the pilot test, we recorded a reliability Cronbach alpha value of 0.87.

3.7 Data Collection Procedures

Field work for data collection was done through administration of questionnaires and interviews. In all, three hundred copies of the questionnaire was administered to farmers, herders, and complimented by a robust interview of various individuals and focused groups. Civil servants and Local Government Authorities in the affected areas were interviewed. Key informants provided information and opinions on the causes and factors that lead to conflicts between the farmers and herders in their various communities and the possible solutions to such problems. A total of two hundred and thirty-five (235) questionnaires were retrieved for analysis.

3.9 Data Analysis

The data were analyzed using inferential statistics of Multiple Regression and Pearson Product Moment Correlation statistical techniques. This was done using Statistical Package for Social Sciences (SPSS) with a cut–off set at $p = 0.05$ level of significance.

4. Results and Discussion

Table 1: The Effect of Demographic Variables on Freshwater Scarcity Induced Conflicts among Farmers and Pastoralists in Northern Nigeria.

Model Summary of the multiple Regression Analysis of the effect of demographics on freshwater scarcity conflicts among farmers and herders

Regression	**Analysis of Variance.**					
Analysis	**Source**	**SS**	**MS**	**DF**	**F**	**P**
R = 0.233	Regression	138.361	27.672	5		
R^2 = 0.054	Residual	2419.056	12.534	193	2.208	<.05
SE = 3.540	Total	2557.417		198		

Significant at 0.05 alpha level.

The null hypothesis, which stated that demographic variables like age, gender, ethnicity, educational level, and socio-economic status, will not significantly combine to influence freshwater scarcity induced conflicts between the farmers and pastoralists. The total variance accounted for by demographic is 5.4% (R^2 = 0.054). Analysis of variance shows that this value is not significant (F = 2.208, P < .05). Therefore, the outcome of the finding sustains the null hypothesis. It implies that demographic factors do not have a strong relationship with the conflict between farmers and pastoralists due to freshwater scarcity. This is contrary to findings by Raleigh and Urdal (2009), Baechler (1999), Moore (2005) show that factors like poverty and low-income levels, lack of education, and ethnicity, coinciding with political instability and weak institutions, have become an unholy mix in accentuating conflict potentials of environmental scarcity. A study of Rwanda by Baechler (1999) found ample evidence of correlations between rural poverty, environmental stress in rural areas, discriminated access to resources, and conflict. Conclusions may be drawn then that the poor, that is, those who have no education but only gain income out of agriculture, may likely exhibit a higher likelihood to enter into conflict over scarce resources whenever they felt marginalized with regard to access to water and land. Therefore, even though according to the findings of this study demographic factors do not cause conflicts, they however play a key role in compounding the conflicts.

Table 2: The Effect of Freshwater Scarcity on Conflicts between Farmers and Pastoralists

Model Summary of the multiple Regression Analysis of the effect of freshwater scarcity on farmers and herders conflict patterns

Regression	**Analysis of Variance.**					
Analysis	**Source**	**SS**	**MS**	**DF**	**F**	**P**
R = 0.382	Regression	134.028	44.676	3		
R^2 = 0.146	Residual	784.525	3.566	220	12.528	<.05
SE = 1.888	Total	918.554		223		

Significant at 0.05 alpha level.

Findings indicated that freshwater scarcity taken against the farmers-pastoralists conflicts gave a coefficient of multiple regressions R of 0.382 and adjusted R^2 of 0.146, the standard error (SE) was 1.888 and f-value of 12.538 which was significant at an alpha level of .05. Therefore, freshwater scarcity accounted for 14.6% of the variance observed between the dependent and the independent variables. Therefore, the null hypothesis which stated that there is no significant effect of freshwater scarcity on farmers-pastoralists conflicts cannot be sustained by these findings; hence, the hypothesis was rejected in favor of the alternate one. It means then that freshwater scarcity in its various forms has a strong influence on conflicts between farmers and pastoralists. This finding is substantiated by Gardner (2010) and the Stockholm International Water Institute, (SIWI, 2008) who reported that water scarcity is growing in urgency in many regions as population growth, climate change, pollution, lack of investment, and management failures restrict the amount of water available relative to demand. Specifically, over 1.4 billion people live where water supply cannot meet both their agricultural and environmental needs. “Already approximately 3,500 square kilometers of Nigerian land turns to desert each year, forcing both farmers and herdsmen to abandon their lands” (Campbell, Gulledge, McNeill, Podesta, Ogden, Fuerth, Woolsey, Lennon, Smith, Weitz, and Miz, 2007). In addition, Raleigh and Urdal (2009) found that freshwater scarcity appears to exert a somewhat stronger negative effect which increases the risk of conflict in areas with very high levels of scarcity. To support this assertion, Montenegro (2012), and Brown, Hammill, and Mcleman, (2007) reported an 18-month study of Sudan by the United Nations Environment Program (UNEP), which concluded that the conflict in Darfur had its roots in water shortages, as a result of disappearing pasture and evaporating water holes. In another study of the depleting Lake Chad basin and the population that depends on it for their livelihood, Onuoha (2008) noticed a particularly worrisome trend. Increasingly, there is the rising incidence of conflict between and among fishermen, pastoralists, farmers and sometimes state security agents, and the tendency of the conflicts to degenerate into large scale intra-ethnic, intra-state and inter-state conflicts. These are likely to worsen considerably as resource scarcities interact with, or exacerbate other conflict-related social variables. In addition, Ibrahim (2011) reported that conflicts are most serious in Niger, Mali and Burkina-Faso, where many sedentary groups have also been forced to relocate due to water scarcity.

Table 3: The Effect of the Duration of Rainfall, Sources and Management of Water Sources on the Causes of Conflict between Farmers and Pastoralists.

Coefficient of relative contribution of duration of rainfall, sources of water, and management of water source on the causes of conflict

Model	**Un-standardized Co-efficient**		**Standardized Co-efficiency**		
	B	**SE**	**Beta**	**T**	**Sig.**
Constant	33.059	.950		34.784	.000
Duration of rainfall	-1.049	.462	.158	-2.270	.024
Sources of water	-.522	.108	-.278	-4.838	.000
Management of water source	-1.619	.336	-.336	-4.819	.000

Results revealed that the predictor variables in the model; the beta values and the significant t-values corresponding to each of the variables against the criterion variable (causes of conflict). Out of the three independent (predictor) variables sources of water was the most potent predictor of causes of conflict between the farmers and pastoralists (β= -.278; t= -4.838; P < 05). Management of water sources was the next potent predictor of causes of conflict between the farmers and herders (β = -.336; t= -4.819; P < .05), while Duration of rainfall is in the third position (β = .158; t = -2.270, P < .05). The null hypothesis that stated that there is no significant relative effect of duration of rainfall, sources of water, and management of water source on the causes of conflict between farmers and herders was therefore rejected by this finding. Respondents in interviews indicated that they have rain for only 3-4 months per year. Most water used comes from the combined sources of stream, river, and wells. The management of water source is done by the community. Even in the midst of scarcity, there is enough participation at the community level to manage equitable distribution of the resources in a traditional manner. Nyong and Fiki, (2005) reported that declining rainfall in Burkina Faso has led to growing fights between animal herders and farmers with competing needs. Moore, (2005) submits that inter and intra-community conflicts increase as the natural resource base shrinks due to higher population pressure and diminishing annual rainfall. The disputed resources revolve around access to land, but are particularly focused on specific rights to cultivate or graze, water and move livestock. Evans (2010) cited a study undertaken by Miguel, Satyanath, and Sergenti (2004) which found a strong causal relationship between lower economic growth (measured via rainfall) and increased conflict risk. The study discovered that a decline in annual rainfall increased the risk of civil conflict the following year by more than one half.

5. Summary Conclusions and Implications

The general objective to study focuses on how freshwater scarcity engenders conflict between farmers and pastoralists in northern Nigeria. The specific findings in this study reveal the following:

a. A significant relationship exists between freshwater scarcity and conflicts among farmers and pastoralists. Results from data analysis gave a coefficient of multiple regressions R of 0.382 and adjusted R^2 of 0.146, the standard error (SE) was 1.888 and f-value of 12.538 was significant at an alpha level of .05. Therefore, freshwater scarcity accounted for 14.6% of the variance observed between the dependent and the independent variables.
b. Water resources in the study area are shrinking. Farmers and pastoralists are finding it more difficult to sustain their vocations. This increases mobility by the nomadic herders which in turn pitches them against the sedentary farmers.
c. Sources of water, management of the water sources, and duration of rainfall were found to be the most potent predictors of causes of conflict between the farmers and herders. Most of the population studied depends on rainfall, streams, rivers and wells for their freshwater needs.

From the foregoing, conflict induced by freshwater scarcity seems interminable. The relationship between freshwater scarcity and conflict is complex, because it interacts with many factors such as occupational characteristics, ethnic cleavages, religious affiliation, levels of income and education, to fuel conflict. From findings, it seems the pastoralists are more disadvantaged because they need to constantly be on the move to find water and pastures for their animals. Sedentary farmers, in their desire to expand their farms to grow more food and increase their income, have encroached on grazing lands and stock routes and blocked access to water points that were traditionally for the herders. To assert their rights of access to those resources, the pastoralists drive their animals into croplands, which they either consume or destroy.

It is evident from the study that conflict, for whatever reasons, undermines the social order and is a threat to peace, human security, and national stability. Freshwater scarcity, combined with persistent conflict destabilizes the farming communities and impedes food production, thus threatening food security. Freshwater scarcity

induced conflicts affect the economic growth of the nation at the grassroots negatively by hampering local production and causing over-reliance on food imports.

We may conclude also that able-bodied men and women, be they farmers or pastoralists, who would have been engaged profitably in food production, are displaced from their places of vocation. Because of this loss of livelihood, many of the unemployed youths in the rural areas move to cities. They add to the congestion in the slums and become easy targets for the potential armies of future conflicts, ready for mobilization against targeted ethno-religious, linguistic, national or regional cleavages in a particular society. An example is the *Boko Haram* menace in northern Nigeria and the *al-shabbab* in Somalia.

6. Recommendations for Policy and Practice

The following are recommendations of the study on policy and practice.

1. The farming and pastoral groups must learn to respect each other's rights in their interactions. The farmers should avoid encroaching on the stock routes mapped out for the pastoralists, while the pastoralists on the other hand must avoid the indiscriminate destruction of crops in the farms.

2. Conflicts between the two parties must be constructively resolved by the government to ensure peaceful co-existence and inter dependence. Conflicts between the farmers and pastoralists have a more direct impact on food security.

3. States on the fringes of the Sahara should intensify their afforestation programs in order to slow down, if not completely stem the advance of the desert. Planting trees, or any form of vegetation could actually help check the encroachment of the desert.

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