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An Evaluation of Challenges Facing Smallholders in Ghana: A Case Study for the Aowin Suaman District

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Abstract
The majority of the Ghanaians populations live in rural areas where their livelihoods depend on smallholding agriculture. Smallholding farmers produce about 28.3% of GDP and 10% of all exports by value. It is estimated that 85% of cereals, 40% of rice and 100% of starch staple food, including significant exports and raw materials for local industries are produced by this type of farming system. Despite these contributions to food security, the sector is plagued with several challenges which militate against their success. Though, many researchers have discussed these challenges but failed to account for the magnitude and severity of these challenges with quantitative evidence as well as the sequential order of the problems. In an attempt to fill this gap, factor analysis methodology is used to evaluate the weight of each challenge confronting farmers in Ghana. With a semi-structured questionnaire, random sampling technique was used to select 381 farmers and interviewed. The findings revealed that five components containing 28 variables determine about 80% percent variations in the production of smallholders. These factors were named as managerial challenges (26.286% of variance), technological challenges (24.045% of variance), marketing challenges (15.685% of variance), extension services challenges (6.933 % of variance) and health related challenges (6.839% of variance). The magnitude of the factor loadings indicated that the 28 variables are having great toll of smallholders and implementing the output of these findings will significantly reduce all constraints facing farmers by 80%.
Keywords: Factor analysis, Marketing challenges, Principal component analysis, Percentage variance, Smallholders

Introduction

Globally, there are about 50 million commercial farmers as against 1.25 billion smallholders whose produce form half of the world agricultural gross product (Rosset 2001). Similarly, about 90% of total local food; 85% of cereals, 40% of rice and 100% of starch staple food, including significant exports and raw materials are produced by smallholders in Ghana (Ayitteh & Banini 2009; Nankani 2000). The sector can also boost of 28.3% contributions to GDP, 10% of all exports by value and more than 50% of the labour force (Ghana Statistical Service 2010; Bank of Ghana 2011; & Morrissey, Velde, Gillson & Wiggins 2005).

Smallholding agriculture sector plays key role in food and cash crop production, economic growth, poverty alleviation, job creation and rural ecosystem management in Ghana. With regards to natural resource management and territorial development, the sector's role is significantly conspicuous. This type of farming supports a higher percentage of the total populations through several activities including petty trading in farm products and the provisions of other related services (Hazell et al 2006;, Wiggins 2009;, Diao2010).

Nevertheless, in spite of these significant contributions to local food security, smallholding agriculture is characterized by price fluctuation, pests and diseases infestation, low financial power, low productivity and others. The sector is considered a high risk area by the financial sector due to the unpredictable nature of their production. Entire smallholding production is rain-fed, aggravated by climate change which makes financing more risky to commercial banks and other financial institutions. Land and labour productivity of small farmers are also low due to factors such as low quality of soil nutrient, rudimentary equipment usage, poor infrastructure, lack of consistent investment by both the government and private stakeholders to the agriculture sector. According to a study by Peasant Farmers Association of Ghana (2011) most of the irrigation facilities which could have served as alternative sources of water supply had been abandoned all over the country. The situation is aggravated by a ratio of one extension officer to 1200 farmers. This makes it almost impossible for most farmers to benefit from the services of agriculture extension officers to boost production.

A study by Sadati, and Fami, (2010) enumerated problems facing smallholders farming as land fragmentation, low access to agro-chemicals, poor road infrastructure and low level of mechanization. A similar study by Mehrabanian and Pourkakhaki (2007) highlighted low knowledge about modern technologies, low literacy rate and lack of access to advanced farm technologies, outmoded methods for cultivation, and high risk aversion as serious challenges holding back productivity of smallholders.

Many researchers have discussed problems facing all types of farmers in Ghana. Indeed available literatures show that there are many challenges confronting farmers. However, the available studies failed to account for the magnitude of the challenges facing them with quantitative evidence as well as the sequential

order of the problems; thus among the numerous problems, which of them severely affect their livelihoods and would be interested for policy makers to address them with urgency(Naamwintome and Bagson 2013). In an attempt to fill this gap, factor analysis is used to evaluate the weight of each challenge to smallholders in Ghana.

2.0 Methodology and material of the Study

2.1.1 Profile of the study area

The research area was the Aowin Suaman District in the Western part of Ghana. The district lies in the mid-western part of the Western Region of Ghana between latitude five degrees twenty-five minutes and six degrees fourteen minutes North (5° 25' N and 6° 14' N) longitude two degrees thirty minutes and three degrees five minutes West (2° 30'W and 3° 05'W) (Aowin Suaman District Assembly, 2006).

To the South, the district shares boundaries with Jomoro District, to the East with Wasa Amenfi, to the North with Juabeso-Bia and Sefwi-Wiawso, and to the West with the Republic of La Cote D'lvoire (Aowin Suaman District Assembly, 2012).

The population of the study area is 192,527 base on 4.7% growth rate (Ghana Statistical Service 2010) with 312 settlements. Enchi and Dadieso are the two major towns; however, Enchi is the district capital. The population growth rate of 4.7% for district is higher than 3.2% which is the regional average. The high growth rate is may result from migrant farmers from other parts of the country who have relocate to the district in order to explore agriculture opportunities. The land area of the district is 2,717 square kilometers and this form about 11 percent of the region's total land area of 23,921 square kilometers (Ghana Statistical Service, 2010).

The population for this study comprises all smallholders in the Aowin Suaman Districts of the Western Region. The district population is rural with about 83.3% of the population dwelling in rural settlement whiles 15.7% of the population are urban. The occupation structure of the district indicates that 78% of the economically active populations are farmers who engaged in forestry and fishing activities (Aowin Suaman District Assembly, 2011). In addition to cocoa, the main cash crop grown, the district also produces oil palm, rubber, citrus and coffee on small scale. The major food crops grown include plantain, cassava, cocoyam, vegetables, rice yam and maize (Ghana Statistical Service, 2000).

2.1.2 Sample size and method of data collection

The target population was smallholders, thus farmers who produce to sell to meet financial obligations, their cash requirements, and consumed proportion of what they produce. The district was selected because appreciable proportions of cash and food crops are produced from the district. The district has 312 small towns and out of these, eight farming towns were selected randomly by drawing cards with the names of 312 towns written on them. Sewum, Achimfo, Jema, Amonie, Adonikrom, Abochia, Boinso and Dadieso were drawn randomly selected from the study. Fifty households were selected from seven towns with exception Jama where 31 households were sampled due to the small size of the town and also financial constraints making it 381 sample size. A semi-structured questionnaire was used as sampling instrument. In each of the selected farming communities, the third household was randomly selected for an interview. The study considered only the head of the households who is a smallholder for the interview.

2.1.3 Brief description of estimation techniques

The data obtained was inputted into Statistical Package for Social Science for analysis. Econometric tool for this research was factor analysis techniques. It is a general name representing classes of procedures primarily use for data reduction and summarization (Trachtenberg, 2009). Factor analysis is an interdependence technique in that an entire set of interdependent relationships is examined without making the distinction between dependent and independent variables (Trachtenberg, 2009). The rational for factor analysis for this study was to reduce and summarize the thirty three variables into smallest size with the aim of obtaining variables that have the highest contribution factor to each challenge. Factor analysis helped to explain the percentage variations in the individual challenges as well as the total percentage variations in the study. Based on the percentage variance, the researchers were able to determine which of the five main challenges was more pressing and severe to farmers. Factor analysis also aided in estimating the Eigenvalues and factor loadings of each challenge, and with factor loadings of each challenge, the researchers to identify among the variables, the most severe ones contributing much to that particular component.

3.0 Results and Discussion

3.1.1 Crops types and educational background of the study

Out of the 381 smallholders were sampled for the study, 117 representing 30.5 % are females whereas 264 corresponding to 68.8% are males. The average age of farmers is approximately 46 years. The proportion of both males and females who never had any form of formal education was 1.6% and 1.3% respectively. This implies that a total of 2.9% of the respondents are illiterate. 12.9% of the female had some primary education as against their male counterpart with 19.2% primary school education. The study reveals that 6.3% of females have had junior high education while their male matching part also stands 37.8% of junior high education. 19.5% of males

went to senior high school as against 1.3% females who had senior high education. The findings of the study indicates that the number of 106 (27.8%) of the correspondents grow food and vegetable crops. In this study, vegetable crops are: okra, tomatoes, garden eggs and pepper, and that of food crops such as cassava, plantain, yam, and cocoyam. The study considered cash crops as cocoa, rubber and citrus. Interestingly, 94 (24.7%) also grow cash crops and food crops. Farmers who cultivate cash and food crops, vegetable crops and also have livestock as a diversification strategies are 181 representing 47.5%. The entire sample grows food crops and this explains that they use some of the food from their farms to feed their families and sell the rest for cash.

3.1.2 KMO and Bartlett's Test

Homogeneity of variables on smallholding farming challenges from the points of view of 381 farmers was determined using both Kaiser-Meyer-Olkin (KMO) and Bartlett's test. A KMO measure of sample adequacy of the study was estimated to be 0.876. It has a range of values from zero to one (0 to 1). Values below 0.50 are regarded as unacceptable. The higher the value approaches unity the more acceptable the data is considered. A KMO value of 0.876 strongly indicates that the data is highly acceptable for the study. Bartlett's test of Sphericity on the other hand was also used to test the hypothesis that the correlation matrix was an identity matrix. This implies that all the variables were uncorrelated in the population. For this study, an alpha level of 0.001 was chosen. Comparing the alpha level to the significance level from the data in table 4.1 which was 0.00, the null hypothesis which states that the population matrix is an identity metrics was rejected, making the data set an appropriate for factor analysis.

Table 3.1: KMO and Bartlett's Test

KMO	Bartlett's test of sphericity:
0.876	Significance level: 0.000
	Approx. chi-square: 12740

Source: Research field

A reliability scale of the data was also computed using Cronbach Alpha method. Cronbach Alpha coefficient was measured to be 0.837 indicating that the internal consistency of the data was satisfactory for factor analysis.

Table 3.2: Extracted Components: Eigenvalues, Cumulative and Percentage Variance.

Components	**Eigenvalues**	**% Variance**	**Cumulative variance**
Managerial challenges	7.360	26.286	26.286
Technological challenges	6.733	24.045	50.331
Marketing challenges	4.392	15.685	66.017
Health challenges	1.941	6.933	72.950
Extension service challenges	1.915	6.839	79.789

Source: Research field

3.1.3 Eigenvalues, percentage variance and cumulative variance criteria

Three criteria were used to establish the number of components that signify the data. These include Eigenvalues, Percentage Variance and the interpretability criteria. The Eigenvalue specify the relative magnitude of each component. The Eigenvalues criterion postulate all components with Eigenvalues greater than one should be included in the interpretation of the results, however, components with values less than one must be ignore in the results.

From the Table 4.2 above Eigenvalues for managerial, technological, marketing, health and extension services challenges are as follow 7.360, 6.733, 4.392, 1.941, and 1.915, respectively, they are all greater than one and for that matter they were retained. This subsequently represents the order of relative important of the various components.

Another criterion to retain a component involves ones that accounts for at least 5% or 10% specified percentage of variability in the data set (Ubaru, Akinyokun, Angaye, 2000). This is called percentage variance criterion. Cumulatively, the data should also account not less than 50% of the total percent variance. The higher the total cumulative variance the better the explanatory power of the data. In this study managerial challenge explains 26.286% of variations in the dataset, followed by technology 24.045%, marketing accounted for 15.685% variance, health related challenges recorded 6.933% variance and 6.839 % for extension services challenge. Together, this study explains approximately 80% of the total variations in the challenges facing peasant farmers in Ghana.

3.1.4 Interpretations criterion for factor loadings

Interpretation criterion was used to explain the factor loadings. This is where factor loading of each variable was interpreted against the empirical knowledge or theory underpinning the variables under investigation. Varimax, through orthogonal rotations was used to maximize the variance of the squared loading for each factor (Tryfos, 1979). The aim is to make some of these loadings as large as possible and the rest as small as possible in absolute value. The varimax method encourages the detection of factor loadings each of which was related to

few variables (Tryfos, 1979). Applying the Social Science Rule, factor loadings equal to or greater than 0.50 was considered meaningful (Ubaru, Akinyokun, Angaye, 2000).

Base on the Social Science Rule, the higher the value of the factor loading of a variable, the more decisive the variable is considered as a challenge to farmers in Ghana. On the contrary, the lower the factor loading of a variable, the less severe is the variable considered as a challenge to smallholders in Ghana.

Among the successful factor loadings on managerial challenges, difficult in controlling pests (0.929) ranked first and appeared the overall fourth among 28 challenge facing smallholders in this study. It means pests infest farmers' crops and this reduces farm produce. Again farmers lack formal managerial skills (0.921) such as farm planning, undertaking cost benefit analysis of their farm and keeping financial records of farms to enhance production decisions.

Lack of access to finance (0.912) loaded significantly. Overall, it is the seventh factor among twenty-eight factors and third in magnitude on the managerial component.

TABLE 3.3: Factor loading Results

	Factor loadings
Managerial Challenges (variables loaded in the factor)	
Difficult in controlling pest	0.929
lack of formal management skills	0.921
Lack of access to financial credit	0.912
Inability to control diseases	0.912
Low productivity	0.907
Lack of access to government subsidies	0.899
Traditional land tenure system	0.893
Existence of traditional agriculture beliefs	0.879
Difficulty in processing produces	0.870
Technical Challenge: (variables loaded in the factor)	
Poor irrigation facilities	0.926
Lack of access to seedlings	0.923
Low level technical knowledge in farming	0.920
low level access to information on modern technology	0.916
Lack of access to farm machines	0.911
Low usage of animal manure	0.908
Lack of access to pesticides	0.902
Lack of technology to control weeds	0.902
Marketing Challenge (Variables loaded in the factor)	
lack of access to ready market	0.948
lack of access to storage facilities	0.941
low price of agricultural produce	0.936
poor road infrastructure	0.921
lack of access to transportation	0.919
Extension services challenge: (Variables loaded in the factor	
low extension services program on TV or Radio	0.860
Few numbers of extension officers in the district	0.825
lack of educational workshop for peasant farmers	0.662
Health challenge Variables loaded in the factor	
lack of health care delivery canters	0.809
poor food diet	0.808
lack of potable drinking water	0.699

Source: Research field

This result conform to a study by IFC (2013) and USAID (2015) that banks consider smallholders business as unattractive owing to insufficient physical collateral, lack of bookkeeping records, and the small size of loan requested by smallholders.

Similarly, Mohanty, (2005) and Manav, (2006) studies asserted that the factors responsible for farmers committing suicides in China are mainly financial pressure from money lenders and the repercussions of these challenges have stripped many small farmers of their self-sufficiency and thrown them into despair. Inability to control diseases also recorded a factor loading of 0.912. According studies by Harvey et al 2015, IFC 2015 and Garrity et al 2012, smallholder farmers regularly face disease outbreaks and pest damage, especially during storage as a result of extreme weather event such as changes in temperature and humidity. These reduce their livelihood and make the more susceptible to disasters and increase incidence of poverty among smallholders, especially in developing countries.

According the finding from this paper, land productivity of smallholder is very low (0.907). This has

interconnection with all the other twenty-seven variables in the model. Some of the underline causes are rudimentary method of farming, lack of access to high yield seedlings/seeds, low financial power, inability to control diseases and pests infestation, poor irrigation systems and all the other variables in table 3.3. This result is in consistent with a study by Salami et al. (2010) asserts that farmers' low productivity (0.907) is due to lack of training of farmers to boost their skills and equip them with innovation and technology adoption**.**

Traditional land tenure (0.921) is another vital variable which restrains farmers' productivity. This finding is in line with a study by International Finance Corporation, (2013), Tenaw et al, 2009 and Economic commission of Africa (2009) that land ownership systems in Africa is problematic and it acts as constraint to farmers to access loan from the bank. Their studies further highlighted that less than 2% of Africa women farmers have no ownership right to framer land and this is an obstacle to food security in the Africa Continent. Farm lands in Ghana are typically owned by traditional leaders and tribes, and are fragmented in many rural districts. Parents keep on dividing lands among their children as their inheritance and this has fragmented several lands. Access to sizeable hectares of land to expand their production is a problem. This finding also supports a related study by Salami et al (2010) which explains that uncertainty of land tenure system, uneven access to land, and lack of a system to reassign rights and secure plots, have resulted in poor development of smallholder in Iran.

Another revelation from the study indicates that 'lack of agricultural subsidy' loaded appreciably (0.899). Farmers do not have access to subsidy. A study by Lappé et al, (1998) founds that United States of America and UK farmers' receive over $18 billion yearly subsidies. But the opposite is the case in developing nations. There is no subsidy as incentives of any form for Ghanaian farmers, this coupled with weak credit systems make farming very difficult and unattractive in the country.

Existence of traditional agriculture beliefs is a variable which measures traditional beliefs such as taboo which prohibit farmers from going to farms on specific days in the year with the beliefs that the gods of the land visits the farms on these given days. These traditions still exist in some society. The factor loading was 0.879 and it indicates that traditional agriculture beliefs noteworthy.

Difficulty in processing farm produce (0.893) is also an evident challenge. As stated in Salami, Kamara and Brixiova (2010) study, electricity in farming communities is costly and frequently not available; this has discouraged investment in irrigation, cold storage facilities and processing of farm produce. For example during the harvest season, farmers harvest a lot of food in their farms. Some include tomatoes, garden eggs, pepper, okro, maize and others but unfortunately for them they lack the technology to process any or store, buyers purchase them cheaply and this affect their income considerably.

The second important component is technical challenge. The weighted variable under this component is poor irrigation facilities (0.926). Lack of access to seedlings (0.923), low level technical knowledge in farming (0.920) and low access to farm information (0.916) loaded appreciably as indicated from table 3.3 above. Farmers find it difficult to get latest hybrid seedlings/seeds which have high yield and short production cycle, though government is trying hard to distribute free fertilizers and cocoa seeds to farmers, it appear significant number of farmers have not benefited from these schemes. Technical knowledge such as application of agrochemicals to crops and even the effect of exposure to these chemicals to farmers are challenge to farmers. A similar research by Fami et al (2009) in Iran uncovered low levels of technical knowledge in farm recording a factor loading of 0.782. Comparatively, with factor loading of 0.920 in Ghana, technical knowledge of farmers is relatively poor as compare to that of Iran. Farmers hardly get farm information on new hybrid of seeds and agrochemicals which could be of great value to their production. Other variables such as lack of access to farm machines (0.911), low usage of animal manure (0.908), lack of access to pesticides (0.902) and lack of technology to control weeds (0.902) loaded significantly. Among farmers who have livestock, animal manure is not enough to serve as substitutes for fertilizers. Pesticide and weedicide are on the limited use by farmers. This can be explained by low financial power of smallholding farmers. Farmers do not also have machinery such as tractors, combine harvester and other to till their lands as high factor loading signifies.

Marketing component contained six variables but five loaded appreciably. Lack of access to ready market is the number one challenge facing smallholding farming (0.948). It recorded the highest factor loading. This is followed by lack of access to storage facilities (0.941) and cheaper cheap agricultural produce price (0.9360) as the third most important factor holding the farmers back to succeed in their enterprise. Muzari, Gatsi & Muvhunzi (2012) identified that is it disadvantage for smallholders farm to purchase hydride inputs even if they have the financial power considering the high cost involved, coupled with cheap price of agricultural produce after harvest with no supportive storage technology.

Poor road infrastructure (0.921) has restrained frequent transportation to some rural agricultural communities: Lack of access to transportation also recorded a factor loading of (0.919). These challenges compel farmers to sell their produce at cheaper prices (0.9360) to middlemen who get to farm producing communities. Low price of agricultural produce also occur as a result of lack of storage facilities (0.941). Farmers are forced to sell their produce to middleman no matter how much the price may be small. If they do not, especially when the produce is perishable products, this could easily result to post harvest losses. Another

compelling circumstance comes to light when farmers are in need of money to settle family obligations such as children school fees, hospital bills and debt obligations. Circumstance like this makes farmers to sell the goods at lower price.

Low extension services program on TV or radio (0.860), few numbers of extension officers in the district (0.825) and lack of educational workshop for farmers (0.662) were the retained variables on extension services component**.**

There is a ratio of 1: 1200 in terms of agric extension officers to farmers in Ghana, according to Peasant Farmers Association of Ghana. This study supports this claim empirically because it reveals that there are few extension officers in the districts. The last on this component was lack of educational workshop in districts by government and NGOs. Other occupation such as teaching, government ministries and others, occasionally organizes workshops to equip staffs on modern knowledge about their jobs, but farmers do not have access to such training.

Four factors were loaded under health challenges component but three loaded significantly and it included: lack of health care delivery centers, poor diet or poor nutritional level and lack of potable drinking water. The proximity of health care centers (0.808) to rural communities is very crucial one. Many rural communities where smallholders live are far from health care centers, hence patients commute long kilometers coupled with bad roads to access health care.

From the study, farmers' productivity is low and this leads to low income of farmers, for that reason, they are unable to purchase meat, fish, eggs and other food ingredients to enrich their diet. Poor diet (0.808) may also make them susceptible to sickness and it also accounts for the reasons why some kids in the rural settings suffer from 'kwashiorkor'.

Lack of potable drinking water (0.699) is a problem in farming communities. Many rivers which used to serve multi-purpose have been seriously polluted by small scale miners and others too, trees which used to protect the rivers from direct sun impact have all been cleared. Mechanical bole water is too expensive for them. This accounts for water related diseases some rural farming communities in most part of the country.

4.1 Conclusion and Recommendations

In many rural communities in Ghana smallholders farming systems is the backbone of their survival and it also provide food security to the nation. With the current advancement in agriculture production in other parts of the world, the study has shown that managerial, technological, marketing, extension services and health related issues are challenges confronting farmers. It has further indicated the magnitude of the problems using percentage variance and factor loadings. In all, the strength of the study is great, as 80% percent of challenges facing farmers are explained by the study.

Among the most important challenges under managerial are pests and diseases management, financing, government subsidies, formal management (book keeping), acquisition of land in addition to processing farm produce are huge burden to farmers. These have largely accounted for low productivity of most farmers. In order to solve managerial challenge, the study recommends the government to provide subsidies in a form of hybrid seedlings, weedicides, pesticide and other agrochemicals for disease control, and training in farm management; this will equip farmers with some formal management skills. Government can support farmers also by providing some financial programs such as direct electronic deposit checking, funds to be paid in future and long term loan (Fami et al 2009). Farmland acquisition policy must also be enacted by the state to control land instead of traditional systems where farmlands are allocated on tribal and family basis.

The second limiting factor for smallholding farming development as indicated by the study is technical challenges. In addressing these challenges, government should construct dams for new irrigation facilities and also renovate the abandoned ones. There is the need to increase the number of extension services officer to impact technical knowledge which include information on modern technology in farming on farmers. The study further suggests that farmers should form associations where government can provide farm machines need by farmers. They can use it in turn to work in their farms. This will reduce the cost of every farmer own farm machinery. Farmers should be trained on how to prepare animal dropping to serve as manure which has no negative impact on the soil in the long term.

Marketing and extension services were identified as the third and fourth challenges restraining smallholding farming systems to develop. In addressing marketing challenges, the Ministry of Agriculture should invest in technologies which will help farmers to process agricultural produces and also help establishes processing factories at the centre of the communities. With good roads infrastructure by the state and availability of transportation, farmers from afar can transport their produce to the centers for processing. The problem of low price of agriculture produce can be deal with by government fixing a minimum price during bumper harvest and purchasing the surplus or the excess quantity supply and store in silos. Government can sell the surplus when demand becomes high.

Storage facilities and post harvest losses can be solved if government equips and task agriculture

research institutions with resource to come out with technologies that can be used to store agriculture product. For instance farmers still use traditional method of smoke to store rice, maize, and beans which is not effective. Sometime weevils destroy most of the produce and this lead to post harvest losses.

In attempt to solve the problem of extension services challenges, government needs to train more extension officers and equip them with the requisite logistics. Also, government can establish extension offices in vintage location in the farming communities so that farmers can easily have access to them anytime they have problems in their farms instead of them staying in the districts capitals where virtually no major farm activities take place. Additionally, the study recommends that government need to organize farmers workshops at the districts level to equip community leaders who are farmers with modern farm knowledge. The leaders can train other farmers in their communities. In addition government must sponsor agriculture informative programmes on televisions and radios. Poor diet loaded and lack of health care centers very significantly under health challenges.

If the challenges of farm management, farm technology, marketing, extension are well addressed, farmers will have enough income and can afford other food ingredients to overcome challenges of poor diet. Government should build clinics in these communities and also reconstruct roads so that the serious sickness can be easily transferred to the district hospitals. Finally, community's leaders must appeal to nongovernmental organisation that provides water bore hole for communities. If this done, it will reduce related water diseases and sickness in these communities.

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