

# Assesment of the Effect of Land Degradation in Dale Wabara District, Kelem Wollega Zone, Oromia Regional State, Ethiopia

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## Abstract

In Ethiopia land degradation is the main challenge for agricultural sector and food security in particular and economic development as a whole. In view of the magnitude and impacts land degradation on livelihood, the study was conducted in Kake Kebele. The main objective of the study was to investigate the magnitude and impacts of land degradation on livelihood of farming communities. 50 household heads were selected from each target kebeles by using simple random sampling technique. In order to achieve the objective of the study both primary and secondary data were generated. Primary data were generated through questionnaire, FGD, key informant interview and personal observation. The finding of the study indicated crop and livestock productivity are declining as a result of land degradation and this seriously affects the livelihood of the farming community. In addition to this water resource in the study area were drying up over time. The magnitude of land degradation is increasing over time because of high population pressure, frequent farming, and topographic nature. The livelihood of farming community is affected by land degradation in the study area. So, the agricultural office of the district should give greater emphasis on land management and on non-farm source of income and the researcher recommend others based on the finding that training should be given to the farmers regarding the use of compost and its preparation in order to increase crop productivity on their farmland. Focus should be given on searching of alternative soil and water conservation rather than focusing on terracing.

**Keywords:** Economic development • Food security • Land degradation • Magnitude

## Introduction

### Background of the study

Throughout the history of the world, one of the greatest and persistent threats to human existence has been environmental degradation. Land degradation is a decline in land productive quality caused by human activities and natural activities, has been a major global issue since the 20<sup>th</sup> century and it has reminded high on the international agenda in the 21<sup>st</sup> century.

Land is the primary means of production used to generate a livelihood for rural residents of most developing countries. Land is the main asset that farmers have to accumulate wealth and, equally importantly, what they transfer in the form of wealth to future generations. Land degradation includes all process that diminishes the capacity of land resources to perform essential functions and services in ecosystems. It is caused by two interlocking complex systems: the natural ecosystem and the human social system. Interactions between the two systems determine the success or failure of resource management.

The interaction between human societies and the resource bases upon which they depend can be characterized by the dynamic tension between three interacting elements that are: human population dynamics, natural resources (e.g. productive capacity), and technological progress and economic growth. The degradation of these resources is caused by the heavy pressure from the human and livestock populations, coupled with many other physical, socio-economic and political factors. Land degradation affects a large number of people over a significant portion of the earth's surface which has led to extreme poverty and hunger [1]. Around the world, land degradation can be viewed as any change or disturbance to land perceived to be undesirable that affect human activities like agriculture and settlements.

Land degradation is one of the most serious problems that threaten the livelihood of people across the world. As outlined, land degradation is the largest environmental problem in the Sub-Saharan African country. As the author argues, land degradation affects the livelihood of the people negatively in terms of decrease land productivity, severe erosion, desertification, lack of fire woods, increase sediment deposits, drying up of spring and water bodies.

According to Intergovernmental Panel on Climate Change IPCC, in Africa agriculture has been the main contributor to current economy ranging from 10% to 70% of Gross Domestic Product (GDP) and is highly affected by land degradation leading to exploitation of natural resources like forests, settlement and cultivating of fragile land, like hills and sloppy areas. Due to the information gap among people in Africa on land conservation, this has led to mismanagement of natural resources causing land use change, although this has been highly challenged by global warming throughout the world. Ethiopia is among the poorest country where land degradation caused damage to its inhabitants. This physical deterioration of its area had left millions of its population in suspicious how to live harmoniously with nature and smooth handling of their livelihood.

Land degradation in the Ethiopia (i.e. areas above 1500 m.a.s.l) has been concern for many years. Land degradation, which refers to the deterioration or total loss of the productive capacity of the soil for present and future, is a great threat for the future and it requires great effort.

### Statement of the problem

Land degradation in Ethiopia has become a serious problem affecting all spheres of social, economic and political life of the population. It is one of the major challenges to agricultural development and food security of the country. Ethiopia is one of the sub-Saharan African countries endowed with natural resources. However, resource degradation is one of the serious problems in Ethiopia persisting for a long period of time. About 85% of the population of Ethiopia is highly depending on agriculture to sustain their livelihood. However, the productivity of agriculture is being seriously affected by land degradation problems.

Land degradation manifested in terms of soil erosion, nutrient depletion, gully formation, water scarcity, reduction in yield of crop and desertification becomes a serious problem in the highlands of Ethiopia,

particularly in Oromia region. It accounts for 45% of the total land area of the country and 66% of the total land area in Oromia region. Land degradation is an alarming problem in Oromia region where soil erosion leaving 20,000-30,000 hectares of land unproductive. So, Kake is one of woreda in Oromia region where land degradation affects its inhabitants. This is because of settlement and agricultural expansion on the expense of other land covers, high population growth and the dependency of the rural population on crop cultivation. In addition to these there are other factors which aggravate the problem in the topography. These includes traditional and continuous cultivation the land without fallow period, together with steep terrain, ragged topography, loss of top soil, erratic and intense nature of the rainfall and the use of crop by-products for livestock feed [2].

In general, the misuse and mismanagement of cultivated land by farmers causes serious land degradation in Kake Ganda. The production and productivity of the area deteriorated year after year and has become difficult for farmers to feed their families. As a result of land degradation the living standard of the population is worsening year after year. So, Land degradation is a serious threat in the Kake Woreda which is reflected in the form of soil erosion. Erosion is a major watershed problem causing significant loss of soil fertility and productivity. Increased sediment loads that shorten the useful life of the reservoir, the lives of other water-related structures, and increase the cost of maintenance and sediment remediation are off-site impacts of erosion. Previously many studies have been conducted on the same issues but many of the focuses on are on level of land degradation in kake and its effect on the community in target Kebele (the smallest administrative unit). Therefore, this study investigates the effect of land degradation kake Woreda.

### Specific objectives

The specific objectives of the study were:

- To describe the level of degradation as high, medium and low in the study area;
- To assess the effects of land degradation on the livelihood of farming communities;
- To identify perceived alternative options/ coping strategies used by the farming communities in the study area.

### Significance of the study

Ethiopia is one of the sub-Saharan African countries facing a serious land degradation problem, particularly soil erosion and a decline in land productivity. This in turn, affects the livelihood of the majority of the population. Therefore, the study was expected to contribute some information in the following way: The result of the study also expected to serve as a source of information for the researcher those who want to conduct further study on the issue. The result of this study furthermore expected to generate useful information to solve land degradation problem, particularly in the study area.

### Scope of the study

The scope of the study was limited to the in Dale Wabara district on land degradation and its effect on the livelihood of the farming communities. The researches identify and categorized the level of land degradation, its effects on the livelihood of the farming communities and also it identifies the coping mechanisms used by the community to reduce the effect of land degradation on their livelihood.

## Literature Review

### Land degradation

As it is a broad concept, land degradation has no single and universally accepted definition. Different organizations give different meanings to land degradation. World commission on environment and development: define land degradation as the loss of utility or potential utility, the reduction or loss or change of features or organisms which cannot be replaced. UNEP 2009: define land degradation as a reduction of resource

potential by one or combination of processes including water and wind erosion, acting on the land. FAO 1979: land degradation is a process which leaves the current or potential capability of soils. LADA 2009: the reduction in the capacity of the land to provide ecosystem goods and services and to assure its function over a period of time for its beneficiaries.

### Extent and magnitude of land degradation in Ethiopia

The Ethiopian highlands used to have an adequate fauna and flora, dependable soils, and climatic conditions. In the course of time, however, the highlands have become the most degraded area in Africa if not in the world. Due to the high degree of degradation, important renewable natural resources such as soil, water, forest and biodiversity are highly deteriorating in the Ethiopian highlands. Soils in Ethiopia are becoming resistant to fertilizer since they are degraded to the extent of not absorbing water with fertilizers thus resulting in low crop yield.

Land degradation especially in the highlands, has been identified as the most serious environmental problem in Ethiopia. Some 27 million hectares representing approximately 50% of the highlands are already significantly degraded. The remaining 50% of the highlands are highly susceptible to degradation.

In light of the increasing population and the low levels of urbanization, all projections indicate that land degradation in Ethiopia bound to be proceeding at aggravated rates unless significant progress is made in conservation, rehabilitation restoration practices.

In general, the extent of land resources degradation in Ethiopia, especially the degree of soil erosion, nutrient depletion and deforestation in high land areas of the country lost due to land degradation which has different causes behind it. Because of the rapid extent of degradation, resources such as soil, forest and biodiversity are highly deteriorating in Ethiopian highlands. This problem is further aggravated by the expansion of agriculture to marginal areas. Land degradation, particularly soil degradation has significant negative impacts on productivity of lands because degradation and productivity of the soil are inversely related; that means when degradation is high the productivity is low. This productivity of soil is significantly affected in Ethiopia due to the serious soil degradation in the country. It indicates that the soils in the agricultural areas of the country are not fertile to support the livelihoods of the people.

### The effect of land degradation

The livelihood of rural people is directly linked to the utilization of land resources for food production, energy sources, and shelter. Mismanagement of these resources reduces the livelihoods of those who are dependent on these resources. The majority of the Ethiopian population (85%) relies on land resources for their livelihood, mainly through land cultivation.

In Ethiopia, the issue of land degradation is so vital since the livelihood of the biggest portion of the country's population and the overall economy of the country depend on agriculture. Land degradation is seriously affecting agricultural production and food security of the country's population. Nowadays, it is becoming one of the most important problems of food security in the country. This is for the reason that, the high degree of land degradation in Ethiopia, especially the degradation in the form of soil erosion is one of the major environmental problems that have negatively affected the performance of agricultural sector as the overall economy. Accordingly, the livelihood of the Ethiopian population is threatened by the increasing trend of land degradation.

The impact of land degradation on Ethiopia's agricultural economy is very large. Ethiopia is losing 30,000 hectares of land on annual basis due to degradation and so far more than 2 million hectares have already been severely damaged. The country is losing a significant volume of soil every year due to soil erosion. The annual loss of soil in highlands of Ethiopia was estimated to range from 20 to 100 tons/hectare per year which leads to an annual productivity loss on cropland of 0.1% to 2% of total production for the country.

Land degradation is by-product of environmental change results in increasing migration, increasing price of farming inputs, decrease in soil fertility, decreasing arable land and all of these affecting the ability of households to provide sufficient livelihood for their family, thus aggravates the risk of out-migration, reduction of agricultural productivity, lack of enough food, reduction of economy, starvation. In general, the impacts of land degradation can be classified as ecological and socio-economic effects.

### Ecological impacts

Land degradation has multiple and complex impacts on the global environment through a range of direct and indirect processes affecting a wide range of ecosystem functions and services [3]. The main environmental impacts of land degradation include a rapid loss of habitat and biodiversity modifications of water flows and sedimentations of reservoirs and coastal zones.

According to project development facility, land degradation has many environmental impacts at regional and global level. Degradation of forest and woodlands have impacts on global biodiversity, change in forest cover and wetlands are impacting the flow of major rivers, large-scale loss of forest cover, changes in air circulation patterns and affect global climate change.

### Socio-economic effects

Land degradation threatens food security for many of the poorest and most food insecure living in Asia, Africa, and Latin America. It also causes poverty, a decrease in ecosystem resilience and provision of environmental services. In addition to this land degradation adversely affects the health, well-being, and livelihood of individuals. According to project development facility, economic implication of land degradation is severe in sub-Saharan African countries. This is because 65% of the population lives in rural areas and the main livelihood of 90% of the population is agriculture. Soil erosion is the most serious problem in Ethiopia. Land degradation is one of the major causes of low and declining agricultural productivity and continued food insecurity and rural poverty in Ethiopia. The highlands of Ethiopia are affected by deforestation and soil degradation, which erode the resource base and increase the repeated food shortage caused by drought.

## Materials and Methods

### Description of the study area

The study was conducted in Dale Wabara District, Kellef Wollega Zone, Oromia Regional State, Ethiopia October 2019 to June 2021. The geographic location of the district is between 11°34'N to 11°12'N latitude and 37°33'E to 38°11'E longitude. The capital of the district is Kake and 1470 km western of Finfinne/Addis Ababa and 20 km west of Dabidollo town. Dale wabara shares boundaries to the East by Sadi Canka District, to the West by Gawo Kebe District, to the North by Yama Logi Wale District, and the South by Babo Gambel. The elevation ranges from 1784 to 3408 m above mean sea level. The climatic condition is cold and hot which is known as dega commonly. Most of the local populations are farmers and they use mixed farming system. The most cultivated crops in the study area are barely, wheat and bean. Generally, Agriculture was the major means of livelihood in the area on average farm size of about one hectare.

### Population

According to the Dale Wabara Health Office, the total population of the Dale Wabara District was 198,879. Based on the information, different ethnic groups living in Dale Wabara District. These are Oromo, and Amhara. Generally, the major ethnic group is Oromo followed by Amhara, who are the main indigenous people, and the working language is Afan Oromo.

### Research design

Both qualitative and quantitative approaches were employed to achieve the objectives of the study. In data collection, the research design was cross-sectional design. As a result of limited time and resource for study cross-sectional design was desirable to obtain detail information regarding existing livelihood situations of farmers across the study area. Cross-sectional survey constitutes were a collection of data from sample households in Kake (the smallest administrative unit of Oromia) single point in time on aspects of household characteristics and livelihood strategies.

### Sample selection and sampling technique

To get the necessary information and the representative population; this study were used the combination of the purposive and random sampling technique. In order to select Kake Ganda catchment purposive sampling technique were applied. On the other hand; systematic sampling technique was used to select sample household heads. According to information obtained from agricultural office of Kelem Wollega Zone the catchment encompasses seven villages [4]. Thus the four villages were randomly selected. Samples were taken from each village considering household head gender (male and female).

### Data collection instruments

Household questionnaires were used to obtain information from a sample of household heads of the four selected villages. It was important to generate quantitative data from sample household heads in the villages and the most efficient way of obtaining views from farmers. In the survey, household demographic characteristics, socio-economic characteristics, issues related to land degradation and its impact on the livelihood of farming communities and adoption mechanisms were obtained.

### Interview

Key informant interview used to gather qualitative information regarding to the problem. Through this instrument, information regarding experts from agricultural offices, development agents, Ganda land use managers and Ganda administrator would be obtained. Key informant interview was important in getting information related to the level or magnitude of land degradation each target village and its effect on the livelihood of farmers.

### Methods of data analysis

In this study, both qualitative and quantitative methods of analysis were applied. Qualitative information recorded on notebooks from key informant interview were organized and constructed coherently and analyzed in word description form. Accordingly, information obtained from key informant interview with kebele District agricultural office workers, kebele administrator and Development Agents (DAs) was organized in the form of verbal/narrative information. Quantitative data was analysed by using descriptive statistical analysis, i.e frequency distribution and percentages.

## Results and Discussions

### Demographic characteristics

In this study age, gender, marital status, family size and educational background of the respondents were analyzed by using cross-tabulation techniques of analysis (Table 1).

Character	Total No_	Percentage (%)
Age		
15 -64years old	54	0.9
≥65	6	0.1

Total	60	1
Gender		
Male	39	0.65
Female	21	0.35
Tota	60	100
Educational background		
No formal education	32	0.53
44652	24	0.4
44778	4	0.07
Total	60	100

**Table 1.** Socio-demographic characteristics of the respondents.

Out of 60 informants (39 (65%) males and 21 (35%) females) were involved. The age of respondents were categorized under two age groups; the young, between 15-65 years old were (90%) and the elders, ≥65 years old were (10%). Generally, most of the respondents 65% were not able to read and write in the study area (Table 2).

Age	No	%
Crop production only	1	0.02
Mixed	48	0.96
Livestock production	-	-
Trade	1	0.02
Total	50	1

**Table 2.** Economic activity of the household heads.

As shown in the above table 48(96%) of the sample household heads depend on mixed economic activity to sustain their livelihood. However, Farmers who depend on only crop production constitutes only 1 (2%) of the sample respondents. Those household heads depend on only livestock production constitutes only 0(0%). This indicates that most of the farmers in each target kebele engaged in small-scale farming using simple farming methods and production systems. Because of the simple farming tools and methods, they use and they produce very small yields. As the result, this study indicates that the main source of income for the household directly depends on land resource. Both crop and livestock production requires land and this aggravates the problem of land degradation in each target kebele. So, land resource and its degradation is the critical issue in the study area that directly or indirectly affects the livelihood of farming community (Table 3).

Perceived Magnitude of land degradation	No	%	
How do you see magnitude of land degradation	Highly degraded	37	0.774
	Medium degraded	6	0.176
	Low degraded	17	0.28
Total	60	1	

**Table 3.** Economic activity of the household heads.

As the table above show that majority of the respondent replied that land degradation is a severe problem. About 41 (77.4) Ganda respectively replied that their farmland is highly degraded and 6 (17.6%), and 7 (15.3%) of the respondents indicated as medium and low degraded respectively. As I observed the topography of this kebele is plain than and results in low degradation. Furthermore, as the information obtained from FGD and key informant interview expressed there is high land degradation in kebele, medium degradation.

### Perceived impacts of land degradation on livelihood

Land degradation has a negative implication to household food security status and contributes directly to the reduction in livelihoods among the rural communities in Ethiopia. The immediate consequence of land degradation is lower crop yields, leading to higher poverty rates among agricultural households. According to National Review Report, the country loses about 30,000 ha of agricultural land annually due to water erosion, and more than 2 million ha are degraded. Land degradation has both on-site and off-site effects in the country. The most critical and urgent on-site impacts of land degradation particularly of soil erosion to the farmers a decline in both the current and potential crop and livestock yields which translate into income loses. The consequences of soil erosion may also be viewed as the need to use more inputs to maintain soil productivity so as to attain the same level of yield. The effect of land use change (such as the expansion of the agricultural frontier and the migration of households and communities towards pastoral land, fragile ecosystem) is the off-site effect of soil erosion [5]. Like the other parts of the country, the severity of the impact of land degradation is high in the study area. Because the livelihood of the community is highly depending on both crop and livestock productivity and sometimes on selling woods and wood products like selling charcoal.

The impact of land degradation on crop productivity, livestock productivity, water resource and natural forests are the predictors for the severity of its impact in the study area. As shown in the below table from the total respondents about 98% of the respondent replied that land degradation affects their livelihood, and only 2% of the respondent replied that land degradation does not affect their livelihood. As the participant of focus group discussion and key informant interview expressed the livelihood of the community in the study area depends on crop and livestock production. So land degradation affects these activities and it forces them to sell their farm animal and labor. In addition to this, they said that the impacts of land degradation on crop and livestock productivity, its effect on water and firewood resource mostly leads to a reduction of a number of daily meals/eating frequency and sometimes it leads to reduce in quality of daily meals/ food quality and withdrawal of children from school and migration (Table 4).

Perceived Magnitude of land degradation	No	%	
Do you think Yes land degradation affects the livelihood of the farming community	49	0.98	
	No	1	0.02
Total	50	1	

**Table 4.** Perceived Effects of land degradation on livelihood of farming community kebele.

### Perceived impacts of land degradation on crop productivity

In Ethiopia, about 85% of the population depends on agricultural production to sustain their livelihood. In the country, a large portion of the agricultural land, which mainly located in the high land areas, in many rural areas of the country the livelihoods of the households mainly depend

on crop production. Crop production is determined by different factors in Ethiopia. But these factors vary from one area to the other because of topographic nature, climatic condition, etc. Crop production in Ethiopia is challenged by different factors. These factors include degradation of land and other natural resources, recurrent drought, land shortage, crop diseases and pests, lack of farm inputs. The availability and fertility of land is the major determinant for the livelihood of the farming communities in the study area. Because the quantity of productive land determines the amount of crop available for the households consumption. The major type of crops produced in the study area includes barley, wheat, Teff, potato, maize, chickpea, and lentil.

In addition to these there are perennial crops like buckthorn. The types of crops are varying from kebele to kebele because of climatic variations. For instance in addition to the above listed crops dagusa, chickpea, vetch, are very common in kebele. Peppercorn is common in kebele. But the productivity of these crops is declining as a result of land degradation. As shown in the table below 49 (98.0%) of the respondent replied that land degradation affects their crop productivity. Next to land degradation, less access to farm input, land shortage are the main challenges for crop productivity in the study area. Furthermore, the participant of FGD and key informant interview said that land degradation affects all types of crops, but the magnitude of its effect is vary from crop to crop. For instance, Teff and Bean are the crops seriously affected by land degradation. They were justified reasons for this. Teff is cultivated mostly in summer season and this aggravates the erosion rate and finally it affects its productivity. Now a day’s cultivation of bean is impossible as a result of reduction of soil fertility. As the participant of FGD and key informant interview said that the current status of crop production is insufficient to support the livelihood of their family livelihood. As a result of this farmers are forced to use fertilizer in order to increase crop productivity. As they expressed the use of chemical fertilizer becomes common in the last ten years and currently there is no any type of crop variety cultivated without fertilizer. The price of chemical fertilizer is increasing from year to year it becomes beyond their buying abilities. This negatively affects the net income from production (Table 5).

Perceived Magnitude of land degradation		No	%
Dose degradation affects crop productivity	Yes	49	0.98
	No	1	0.02
	Total	50	1

Table 5. Perceived Effects of land degradation on crop productivity.

### Perceived impacts of land degradation on livestock

Livestock production is an integral part of the economy and it is considered as an asset. Because it is important to overcome the problem of food shortage during crop failure and land cultivation is undertaken by using animals like oxen. In the study area livestock production is the major economic activity on which households depend on it next to crop production. There are different types and kinds of livestock owned by households. The major type of livestock in the study area includes ox, cow, calf, sheep, and donkey. The number of livestock is the major determinant factor for crop production because it provides the power for land cultivation. But the productivity of livestock is declining over time as a result of land degradation. As shown in the table and graph below the trend in livestock productivity is declining over time because of different reasons next to land degradation.

The respondents were listed reasons for declining of livestock productivity like shortage of grazing land, population pressure and diseases. In addition to the response of survey result, the participant of FGD and key informant interview reported that there is livestock change from traditional type in to a small number within better quality livestock. Now days, there is the introduction of cattle with better quality rather than having a large number of cattle in each target kebeles. Based on the view of the FGD participant and key informant interview land degradation

affects all types of livestock but its effect varies from cattle to grazing animals. As they expressed sheep and donkey are seriously affected by land degradation, because both of them are grazing animals. As the participant of FGD and key informant interview expressed the productivity and size of grazing land is declining over time as a result of the expansion of farmland on grazing to compensate crop productivity loss and area enclosure for rehabilitation purpose are the main reason for declining of grazing land. Based on the view of them the declining of grazing land as a result of population pressure is the other factor which affects the productivity of livestock in the study area (Table 6) [7].

Perceived Magnitude of land degradation		No	%
What looks like the trend of livestock productivity over time	Increase	48	0.8
	Decrease	10	0.16
	Remain the same	2	0.04
Total		60	1

Table 6. Perceived Trend of livestock productivity.

### Strategies applied by the community to overcome the effect of land degradation on their livelihood

To avoid the negative impacts of land degradation on the livelihood of rural households several options need to be applied to tackle the problem. But these options may be positive or negative. From the negative way of overcoming the problem is cutting down trees and making charcoal to sale and cutting down trees for expansion of farmlands. This idea is supported by the result of LULCC analysis of the watershed in the above parts. In this part, a huge amount of vegetation and forest lands were changed into agricultural land between 12 years of interval [6]. For instance, vegetation cover in 2006 was 29% but it declines up to 7% in 2018 and forest resource in 2006 was 13% but it declines up to 4% in 2018. In the study area the positive way of overcoming the problem including daily labor, farm animal sale, handcraft, and irrigation. So the majority of the respondent 48 (98%) said that there are options to overcome the effect of land degradation on livelihood. As the participant key informant interview expressed and as I observe these options vary from kebele to kebele [8].

### Conclusion

The finding the study indicates that there is a serious land degradation problem and it seriously affects the livelihood of the farming community area. Different land management practices have been implemented but these practices were not effective. Land resource degradation is the major environmental problem negatively affecting economic development in general and livelihood of the farming community in particular in Ethiopia. So the study tried to investigate the land degradation in Kake Woreda. As the finding of the study indicates the livelihood of all sampled household heads depend on mixed farming activity both crop production and livestock rearing (90%) of the sample respondents. As the result of this study specifies that like the other parts of the country land degradation is the serious problem which negatively affects the livelihood of the farming community. From the finding of the study indicates crop and livestock productivity of the household heads are declining over time because of land degradation. In addition to land degradation snow, land shortage, less access to farm inputs are the main challenges for crop production and expansion of farmland on grazing land to compensate the loss of crop as a result of land degradation and area enclosure for restoration practices are the main challenges for livestock production.

### Recommendations

Based on the results of the study, the following recommendations are forwarded:

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