



ISSN: 2447-3359

REVISTA DE GEOCIÊNCIAS DO NORDESTE

Northeast Geosciences Journal

v. 7, nº 2 (2021)

<https://doi.org/10.21680/2447-3359.2021v7n2ID21231>



SUBSISTENCE AGRICULTURE AND CLIMATE CHANGE: CASES OF THE DISTRICTS OF MAGUDE AND MOAMBA (SOUTH OF MOZAMBIQUE)

**Orlando Inácio Jalane¹; Edson Vicente da
Silva²; Carlos Henrique Sopchaki³**

¹Master in Geography, Department of Agronomy and Natural Resources, Institute of Agricultural Research of Mozambique (IIAM), Maputo / Mozambique.

ORCID: <https://orcid.org/0000-0001-5638-0311>.

Email: ojalane@gmail.com.

²PhD in Geography, Department of Geography, (UFC), Fortaleza / CE, Brazil.

ORCID: <https://orcid.org/0000-0001-5688-750X>.

Email: cacaueara@gmail.com.

³PhD in Geography, Department of Geography, UFC, Fortaleza / CE, Brazil.

ORCID: <https://orcid.org/0000-0001-8127-4529>.

Email: Carlos.geografia@ufc.br.

Abstract

This essay addresses the effects of climate change on Mozambican (family) subsistence agriculture, in lands with semi-arid climate trends, such as the south districts of the country, as Magude and Moamba, in Maputo province. The research was developed from bibliographical surveys and direct observation of the authors, who experienced the local reality. There is a cyclical trend of years of extreme drought, preceded by others of years like excess precipitation and slight concentration in increasingly shorter periods, which hinders the capacity of soils to absorb the impacts of water. The present work seeks to highlight the great exposure of subsistence agriculture in semi-arid regions, given the adverse climatic conditions and how it can impact the lives of farmers and their families, as well as the country's diet.

Keywords: Subsistence agriculture; Semiarid; Climatic changes.

AGRICULTURA DE SUBSISTÊNCIA E MUDANÇAS CLIMÁTICAS: CASOS DOS DISTRITOS DE MAGUDE E MOAMBA (SUL DE MOÇAMBIQUE)

Resumo

O presente ensaio aborda os efeitos das mudanças do clima na agricultura de subsistência (familiar) moçambicana, em terras com tendências climáticas semiáridas, como são os distritos a sul de país, casos de Magude e Moamba, na província de Maputo. A pesquisa foi desenvolvida a partir de levantamentos

bibliográficos e observação direta dos autores, que vivenciaram a realidade local. Existe uma tendência cíclica de anos de seca extrema, precedidos por outros de excessos de precipitação e ligeira concentração em períodos cada vez mais curtos, o que dificulta a capacidade dos solos de absorverem os impactos das águas. No presente trabalho busca-se evidenciar a grande exposição da agricultura de subsistência em regiões semiáridas, face aos cenários climáticos adversos e como isso pode impactar na vida dos agricultores e suas famílias, bem como na dieta alimentar do país.

Palavras-chave: Agricultura de subsistência; Semiárido; Mudanças climáticas.

AGRICULTURA DE SUBSISTENCIA Y CAMBIO CLIMÁTICO: CASOS DE LOS DISTRITOS DE MAGUDE Y MOAMBA (SUR DE MOZAMBIQUE)

Resumen

Este ensayo aborda los efectos del cambio climático en la agricultura de subsistencia (familiar) de Mozambique, en tierras con tendencias climáticas semiáridas, como los distritos al sur del país, como Magude y Moamba, en la provincia de Maputo. La investigación se desarrolló a partir de encuestas bibliográficas y la observación directa de los autores, que experimentaron la realidad local. Existe una tendencia cíclica de años de sequía extrema, precedida por otros de años, como el exceso de precipitación y la ligera concentración en períodos cada vez más cortos, lo que dificulta la capacidad de los suelos para absorber los impactos del agua. El presente trabajo busca mostrar la gran exposición de la agricultura de subsistencia en regiones semiáridas, dados los escenarios climáticos adversos y cómo esto puede afectar las vidas de los agricultores y sus familias, así como la dieta del país.

Palabras-clave: Agricultura de subsistencia; Semiárido; Cambios climáticos.

1. INTRODUCTION

Mozambique is east coast of Africa country, according to the 2017 population census, the country has about 28 million inhabitants and more than half live in rural areas, depending on agriculture for their survival (INE, 2018). Estimates indicate that about 36 million hectares of arable land are available, but only 15% are in use. More than 99% of the agricultural area consists of farms with less than 10 hectares and most of the land is managed in accordance with customary rules (CARRILHO et al., 2016).

In Mozambique, most of the productive land is owned by small farmers and family farming, which makes these ranks the largest contributor to the country's diet. The great dependence of Mozambican agriculture on small family production puts it in situations of fragility to the current and future impacts of climate change, a fact that has been representing a reverse in the development projects of undeveloped countries and in particular of drought regions. Climates with negative water balance, as in the case of south of Mozambique. According to Smit & Skinner (2002), climate represents a powerful environmental constraint in most human activities, with agriculture and food production being one of the human systems most likely to be affected by climate change. Taking into account that agriculture is the weakest link in climate change, then the Mozambican scenario worsens, since a large part of its population lives and depends on it. Zambezia the border province with Malawi is only exception, where in some small regions have accumulate over 2,000 mm / year and in the north of Niassa Province (northern Mozambique), where there are records of more than 1,600 mm / year, the majority of the country has annual rainfall varying between 600 and 900 mm / year (EMBRAPA, 2020). The rainiest period occurs from December to March and is the summer time, the rest of the year the rainfall is low, and that way is drier. High levels of potential evapotranspiration, more than annual rainfall average that we found in southern districts of Mozambique put those like highly vulnerable to climate factors according to the Fourth Assessment Report of the International Panel on Climate Change (IPCC) (IPCC, 2007). According to MASA (2016), there are about 4 million farms in Mozambique, of which 3.9 million, that represent 98.7% of the farms are in the hands of small farmers and the rest (1.3%) are the result of medium and large farms. The same report indicates that the area cultivated in that period was 4.8 million hectares. This great concentration of the country's agriculture in the hands of small farmers, whose first objective is focused on their own survival and existence, with restricted access to the appropriate agricultural technologies to meet their production needs, adds the risks of it to the new ones climatic change scenarios.

For many authors, the exposure of African and particularly Mozambican agriculture to natural hazards is not only inserted in climate changes (rain patterns, rising temperatures, etc.). According to Morton (2007, p.1):

Some of the most important impacts of global climate change will be felt among populations, predominantly in developing countries, known as "subsistence" or "smallholder" farmers. Its vulnerability to climate change comes both from its predominant location in the tropics and from various socioeconomic, demographic and political trends that limit its ability to adapt to change.

There is a great natural dependence of a subsistence agriculture in Mozambique, that have influenced the development of agrarian activity across the entire country, particularly in regions with difficulties related to the availability of water sources and productive soils, in this case with hydrological deficit, like of districts inserted in the Maputo Province, with accumulated annual rains presenting low rates, of up to only 656 mm / year (EMBRAPA, 2020).

The risks have always been part of anthropic activities since the beginning, but we cannot denied that they have increased the frequency of occurrence, that fact has increasingly weighed

on activities with great dependence on natural factors, and family farming / subsistence has been among the most affected by this scourge, such as rural producers in the districts of Magude and Moamba.

Therefore, to analyse this problem within the agriculture of Mozambique the focus of the present study will be on a local territorial dimension and with great urban influences: the districts of Magude and Moamba, located in the south of the country, part of province of Maputo. It should also be noted that these districts are part of the main suppliers of agricultural products to the country's capital, Maputo city.

2. MOZAMBIKAN SUBSISTENCE AGRICULTURE

Is impossible describe or address the issue of subsistence agriculture in Africa without clarifying the concepts of subsistence and family agriculture in first place. According to Correia (2012, p. 121) there are clear elements to separate the two farming systems:

"(...) family farming is said to be keeping much of subsistence or traditional farming traits, although strongly conditioned by natural and socio-economic endogenous determinants, it is increasingly linked to markets, which is, influenced by exogenous socio-economic determinants. Subsistence systems, as the name implies, are systems that fundamentally aim at the survival of the household which makes them much more resistant to any change. Naturally, the constraints that can lead to the disappearance of the system may have reasons that are not just related to technical issues such as armed conflicts. For its part, commercial agriculture is, in essence, an economic activity that makes selling production its priority"

Therefore, according Correia (2012), there is a slight difference between family farming, which is based on its integration into the market for local and export products; and the concept of subsistence, which reveals itself with a slight exclusivity to the basic support of the family.

African subsistence agriculture is seen as an element of household existence, with very few external incentives for their progress.

In Mozambican agriculture, and in most of the African region, the terms subsistence agriculture and family farming are usually considered synonymous.

In Mozambique, agrarian activity, according to Article 103 of the General Constitution:

1: "... it is the basis of national development".

2: The State guarantees and promotes rural development for the growing and multiform satisfaction of the people needs to achieve economic and social progress of the country.

In contrast to article 103 of the Republic Constitution, post-independence Mozambique made few investments in the base sector of the country's economy. Few efforts have been made to promote the development of the agrarian sector. The large plantations inherited from the Portuguese colonial system collapsed shortly after national independence, derived from several factors. Subsistence agriculture, which in the Mozambican context is equated with family farming, reinforces its importance in the country's agriculture, being responsible for employing more than 65% of the working-age population. Mosca (2014), the lack of investment in African agriculture is responsible for the high levels of poverty that have plagued the continent for decades.

Food insecurity and the need for food aid are cyclical due to several factors, such as adverse policies ("unfriendly") to the

agrarian sector, conflicts and displaced persons, effects of climate change, with Africa being one of the most at risk areas (Mosca, 2014).

The scarce investments by the Mozambican authorities, combined with the current changes in rainfall and temperature patterns, have brought new challenges for subsistence agriculture. The location of these districts in the African belt of the semiarid increases their exposure to future climatic effects on subsistence agriculture. Figure 2 shows the location of the study area and Figure 1 shows the distribution of the semi-arid climate in Africa, where it is possible to observe the framing of part of the study area in the hot semi-arid climate.

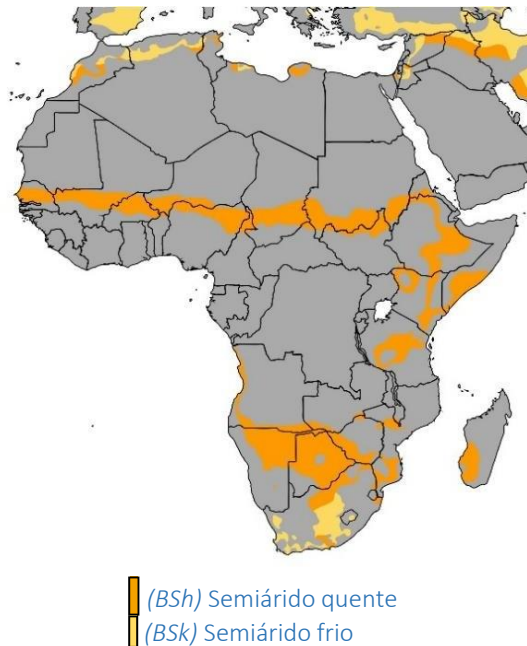


Figure 1 - The semiarid climate distribution in Africa. Source: adapted from <https://pt.wikipedia.org/wiki/Classifica> (2020)

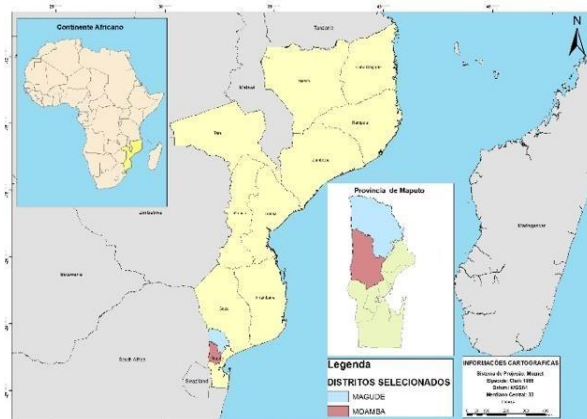


Figure 2 - Territorial framework of Mozambique and target districts in the National and African context. Source: The Authors (2020).

3. MAGUDE AND MOAMBA DISTRICTS, PRODUCERS AND SUPPLIERS OF AGRICULTURE PRODUCTS

Magude and Moamba districts are located to the northwest of the province of Maputo, with the district of Magude to the north of the province of Maputo, bordering the province of Gaza (MAE, 2005). Moamba districts has a territorial area of 4,623 km², occupied entirely by rural settlements.

MAE (2014), from a climatic point of view, the district of Moamba has two subtypes of climate according to the Köppen classification, which are the BS (steppe climate), with annual average temperature around 24°C and rainfall annual between 580 to 590 mm and, also, near the border with Ressano Garcia is BSW type climate, Steppe climate with dry winters and an average annual temperature between 23°C to 24°C, and low rainfall compared to the rest of the district. Therefore, there are two seasons in the district, hot and rainy that extends from October to March and another fresh and dry that runs from April to September. The average annual precipitation is about 517 mm, which is concentrated from December to January, and the average annual potential evaporation is high, with approximately 1,433 mm at 1,500 mm, quite high for the region's rainfall.

The agricultural activity in the district of Moamba, mainly that which is practiced using irrigation systems, is based on the waters of the Incomati River, which crosses the district, coming from South Africa on the Transvaal plateau and enters Mozambique through Komatipoort Gorge and empties near the village of Marracuene. Its tributaries in Mozambique are Massintonto and Sábíè located to the north of the district (MAE, 2014).

The irrigation is basically done by associated farmers, who benefit from the technical support of Açucareira de Xinavane (AdX) for the production of sugar cane. Livelihood crops and family income are still in traditional molds of production, based on poorer and drier soils, with precipitation deficit and improved techniques.

The large part of farmers uses lowlands rivers areas for agricultural cultivation in Moamba and Magude districts, to keep the soils moist in vast period of the year, which is as well preferred lands of the agrarian companies that we found in these districts. The lowlands of the Incomati and Sábíè rivers stand out, where the largest sugar company in the southern region (Açucareira de Xinavane - AdX) are explore large areas with water availability and great land for agriculture.

Magude is Maputo province largest district, with almost 7,000 km², mostly located in flat regions with quotas below 100m. The local steppe climate prevails, and throughout the year there is little rainfall with an annual average of 712 mm and a high average annual potential evaporation rate of around 1528 mm. According to the Köppen climate classification, the climate is BSh (hot steppe climate) of low latitude and altitude, the annual average temperature in Magude is 23.3° C.

Like Moamba and Magude is also crossed by the Incomati River, with good condition for agricultural activity and fishing, a fact that allowed the installation of an irrigation network, covering an area of 3,744 hectares, mostly exploited by small farmers for the sugar cane production, through the promotion of the Xinavane Sugarcane company, which is one of the main agricultural products in the district (MAE, 2014).

Agriculture is economy basis of the districts, with vegetables, maize, manioc, beans, and sugar cane as the main crops. The predominant breeds are cattle, sheep and poultry, intended for family consumption and commercialization.

The family agricultural sector in these districts is expanding, and private farms, which occupy a significant part of the fertile land and absorb more than half of their wage labour.

Chart 1 shows the importance of the family sector or subsistence agriculture in local agriculture. It should be noted, as already explained above, that there is still a certain resistance in matching these two terms because it is clear that in Mozambique as well as in most sub-Saharan Africa, the two terms are quite coincident for most of their populations, as they do not exist an exclusively subsistence agriculture with a small tendency to markets, however small is.

Table 1 - Number of Farms by Type; Cultivated Areas in Maputo Province in 2015. Source: adapted from MASA data (2016).

Type of exploration	Number of exploration	Cultivated Area (hectares)
Small	775,971	207,629
middle		
large	252	21514

The table indicates that the highest percentage of the cultivated area in 2015 had been made by family farmers with a fair share of medium-sized agriculture, with a correspondence of about 90.6% of the total cultivated area, which represents more than 775,971 counted farms during this period, covering an area of 207629 hectares made by family farming and medium farms in the province of Maputo, a fact that reinforces the importance of family farming for the livelihood of the Mozambican population.

These numbers pointed out in these data collected may not constitute the real situation in Mozambique, according to Catsossa (2017, p.155),

[] from the years 2007/8, due to the crisis in prices of food verified in this period. However, it was from this point on that the Mozambican rural environment began to be marked by an intensification of practices linked to the capitalist model of production - agribusiness.

This finding can be justified by the UNAC & GRAIN report (2015, p. 1), which concludes that since 2006 at least 36 deals have been made with foreign investors for the production of food crops, in the space of more than 1.5 million of hectares.

Sitoe (2005), Mozambique has an agricultural potential of about 36 million hectares (ha) of arable land, which less than 10% is cultivated, that corresponds to 6 million hectares. The entry of these investments by the agrarian multinationals came to occupy a part of the areas formerly belonging to family farming, but they still not able to occupy their place as those responsible for the food sovereignty of most Mozambicans. Therefore, more than 73.7% of the country's cultivated land would still be in the hands of Mozambican family farmers, with large farms turned to the production of export commodities, peasant agriculture is still responsible for the country's food security.

4. AGRARIAN SYSTEMS

For Sitoe (2008), the analysis of agrarian systems in a given place is based on the assumption that analysing and explaining an object is also studying its dynamics, evolution over time and the relationships that this system maintains with the rest of the world in different stages of evolution. But is not the central objective of this article to make a proposal for agrarian temporal analysis and evolution of systems, but a short description of them in order to have a better understanding of their vulnerability to climatic events.

The districts of Magude and Moamba are part of the national agrarian logic, mostly family, with little use of advanced agricultural technologies and without great external incentives, both from the state and from the private sector. Just over 70% of its active population depends on the cultivation of the land, done in a traditional way, with great dependence on climatic conditions.

This article analyse agrarian systems, related to the different forms of production and organization of the same. The districts have two distinct types of agrarian systems, the irrigated system, and the rainfed system.

It should be noted that the agrarian system can be defined as a way of exploiting the historically constituted environment, a technical system adapted to the bioclimatic conditions for a given space, which responds to the conditions and social needs at the moment. A way of exploiting the environment that is the specific product of agricultural work, using an appropriate combination of inert means of production and living means to explore and reproduce a cultivated environment, resulting from the successive transformations historically suffered by the natural environment (MAZOYER; ROUDART, 1999 apud AMILAI, 2008).

The irrigated system is found on the plains of the Nkomati and Sábie rivers, or through irrigation pipes, the vast majority of which are installed by the Xinavene sugarcane company, to promote the sugar cane production, between farmers' associations and along the water courses several small streams, where small and medium-sized agribusinesses are found in both districts.

The rainfed system is normal done on marginal lands, with exclusive dependence on natural conditions, which has the most severe effect for family farmers. It is basically characterized by constant deforestation through the burning of the savannas, as a way of cleaning the fields. The urbanized agrarian system would be the last that stand out in poultry production and horticulture, focused essentially on urban consumption.

More than 80% of family farmers in the districts of Magude and Moamba still resort to the use of rudimentary production techniques, as are the cases of the practice of burning, crops and manual sowing, as shown in Figure 3.



Figure 3 - Examples of family farming production techniques in the districts of Magude and Moamba: on the left Horticultural fields along downtown Sábié; on the right, upland production, using a hoe.

5. SUBSISTENCE AGRICULTURE RISK FACTORS

Climate change is the new enemy in developing countries, especially coastal countries such as Mozambique, which is already experiencing the effects with increasing severity. Mozambican agriculture is poorly developed in the technological sense, dependent, in its entirety, on the natural conditions of the climate, making it an activity of great risks and therefore with little attraction for investments, both publicly, especially private. However, these are not the only factors that explain the few investments made and the lack of attractions for Mozambican agricultural exploitation.

The combination of long-term drought, rapid urbanization and population growth is increasing pressure on the already limited supply of fresh water to Maputo and other coastal cities.

Communities continue to rely heavily on agriculture, rain and food production. "Corn does not grow and rain is less frequent, people are growing corn in dry fields", a farmer interview in local TV channel (STV, Jornal da Noite on 03/02/2019).

The rapid growth of urban areas has been one of the great challenges of agricultural production, according to Mosca (2014, p.2):

Urbanization, motivated by different reasons, economic and non-economic, has caused exodus of different dimensions without being accompanied by structural changes that allow increased production and productivity, to meet the demand for food in the cities, which is aggravated by growth rates population, generally high.

National agrarian policies have been identified as one of the major obstacles to agriculture development, especially in Mozambican family farming, however they are not the only obstacles. According to Smit and Skinner (2002) citing Parry and Carter (1989) and Reilly (1995), agriculture is inherently sensitive to climatic conditions and is among the sectors most vulnerable to the risks and impacts of global climate change. This scenario by itself was already alarming, however it has been getting worse in countries with few resources and a lack of political will to boost agriculture. According to the Maputo declaration in 2013, the African Union (AU) suggested that African governments allocate at least 10% of the state budget to the development of agricultural activities in their territories in favour of small farmers to agriculture and rural development. (FLY, 2014). To give you an idea according to Aiuba & Mosca (2018), the Mozambican state in the interval from 2010 to 2018, the budget allocated to agriculture did not exceed the ceiling of 5%, which is half of that proposed in the Maputo declaration, only in the year 2019 reached 6.4% of the country's general budget.

Smit and Skinner (2002, p. 88), reinforce the impact of the lack of investment in agriculture in developing countries:

Despite the important influence of climate change, including variability and in addition, adaptation in agriculture does not work and evolves with respect only to these climatic stimuli. Non-climatic forces, such as economic, political, environment, society and technology conditions, have significant implications for agricultural decision-making, including adaptive decision-making.

This reinforces that the few or the lack of investments for agricultural development in Mozambique has contributed to its exposure to external factors, whether they are climatic or not. It

is not only the lack of clearer agrarian policies that leave Mozambican agriculture at the mercy of climate problems, but also the lack of territorial organization programs that take into account the real potential of the territory.

This poor land planning has contributed to the urban pressure on rural, with greater intensity on the central urban areas or close of them, which is the case of Moamba and Magude district, which may be even more susceptible to the impacts of climate change.

6. THE IMPACT OF CLIMATE CHANGE ON AGRICULTURAL SYSTEMS

There are many discussions regarding the patterns of climate change on agrarian activities. For Smit and Skinner (2002), the place specificity and the context of agricultural adaptations, indicate that it will be unlikely that most adaptations to climate change will be carried out independently of initiatives related to risk management, given that the conventional scenarios of climate impact they usually focus on changes in average temperature and humidity.

Despite the current scenario and the increase in temperature, it is also true that the major concern of Mozambican subsistence agriculture is turning to increasingly frequent periods of extreme drought or excessive rainfall. Farmers point out the scarcity and excess water phenomena as the most impacting to agrarian activity in Mozambique, mainly in the southern region of the country.

Stratum of an interview by the cattle owner to newspaper O País in the district of Magude.

"I was not prepared to face the drought. I was used to the normal years when it is a few months or a year and then it rains. And we also had a war and this was all deserted, there was no population and there was no need to confine livestock because when there was no grass on one side, there was on the other. Now there is more population and a lot of cattle and there is a shortage of pasture. This drought has worsened" (Langa, 2017).

Subsistence farmers are currently subjected to new climatic realities that have been changing their planting habits, which is due to the alteration of the normal rainy season, a factor that affects the crop growth period. This makes them worry about the survival of the families in these districts, as they live with scarcity. This reality can be added due to the expected future climatic scenarios.

The impacts of global climate change will be felt among populations, predominantly in developing countries, known as "subsistence" or "smallholder" farmers (MORTON, 2007). Their vulnerability to climate change comes both from their predominant location in the tropics and from various socioeconomic, demographic and political trends that limit their ability to adapt to change.

The probable climate changes that are expected for East Africa can also have a profound impact on the populations and economies of that region, the main changes being related to changes in the frequency, intensity and predictability of rainfall and temperature (UELE, LYRA, & DE OLIVEIRA JÚNIOR, 2017).

The current scenario of subsistence agriculture in southern Mozambique, and particularly in the districts of Magude and Moamba, is characterized by cyclical drought, with an exponent in the last 20 years, conditioning the production capacity to

support many families that depend almost exclusively on agrarian activity.

The effects of climate change on Mozambican agriculture go beyond the dimensions of family farmers, as medium-sized agrarian companies installed in these districts have experienced several difficulties in the production process because of the scarcity of water in the only reservoir available to supply agricultural activities.

In recent years, the largest banana producer and export company in Mozambique, Bananalândia, has announced the reduction of its production capacity by about 50%, going from 300 thousand tons per unit of production to 150 thousand tons, due to the climatic phenomenon of the scarcity of rains in Mozambique southern region (MACAUHUB, 2018).

Livelihood production in the Magude and Moamba districts in 2018/9 agricultural campaign was severely affected by the low of rain, which led to the loss of more than 6000 hectares of maize and 300 hectares of peanuts, which are extremely important crops for the southern region of Mozambique (O PAÍS, 2018). Water deficit has become an increasingly increasing phenomenon within the rural and urban communities of Mozambique, and it affects not only agriculture, but also urban activities that depend on its availability.

The deficit process has been contrasted by the excess through cyclical floods that devastate fields with different cultures year after year. According to Coelho (2004, p. 2018):

Mozambique has been a victim of sudden climatic variations, regularly suffering the scourge of droughts, torrential rains with floods, and cyclonic winds. In the twenty-five years of independence the country has been hit by two violent droughts lasting more than two years each, at least sixteen registered cyclones and several floods, two of which are large.

These events has conditioned Mozambican family farming, which has faced great challenges in recent years since the turn of the 21st century, with less and less productive capacity, which endangers the family's livelihood and their existence, that fact has become more worrying in the last 20 years, due to severe droughts (CEMO, 2010).

The drought conditions and rain deficits has resulted in large losses in agricultural productivity (MATYAS E SILVA, 2013), but also periods of excess water are a problem with a greater negative impact on agricultural production than in relation to periods of low rain in Mozambique (REASON, 2007). Currently, farmers in the north-western districts of Maputo province live in extremely difficult conditions, basically without the minimum conditions to guarantee the survival of their family members, let alone the livestock in their possession, due to the dramatic reduction of the pasture areas due to the drought that has plagued in Magude and Moamba districts.

7. FINAL CONSIDERATIONS

During the present analysis, the real situation of Mozambique's exposure to extreme weather events, resulting from global climate change, was evident. These impacts will be more severe in agricultural activity, especially when considering that such activity in Mozambique is poorly developed technologically and therefore depends exclusively on natural conditions (rainfed agriculture), and in the south of the country it is aggravated by severe drought conditions. There is therefore an urgent need to design agrarian policies with a view to helping national family farmers to mitigate the effects

of the increasingly devastating changes for Mozambican agriculture.

It is worth mentioning that this scenario already weighs in the production modes of communities that live in dependency, especially those that practice family farming, potentially in regions with semi-arid characteristics.

The level of exposure to the anomalous effect of changes on subsistence farmers in the districts of Magude and Moamba has reached quite high levels in the past 20 years, since the great floods of the 2000s in southern Mozambique. Discussions around Mozambican agriculture point to some possible solutions, which have been hailed by several national academic sectors, such as the increase in the capacity of dams to conserve water, which in periods of excessive rains cause severe socio-environmental damage .

It also points out some concerns related to the real effectiveness of these actions in the face of climate change, it is questioned whether it would be really effective to increase the capacity of damming without adopting the communities of appropriate tools for the sustainable use of this resource and of many others that are keys to better adaptability to mitigate climate effects.

The country's current situation in relation to agriculture requires a commitment from all stakeholders. From the communities and local and central public bodies responsible for the implementation of public policies.

It is the duty of the State to collaborate with greater investment and commitment to national agriculture, by increasing the budget allocated to this sector, especially greater attention to family farmers, since they collaborate with the country's food security.

The changes are a concern for Mozambique's fragile economy, still largely based on agrarian, which has suffered damaging effects, due to the little attention that has been given to this sector. The biggest challenge facing Mozambican agriculture, and in particular the studied districts, still has a great dependence on natural factors, the restricted use of quality inputs, the lack of policies that seek and encourage the improvement of soil fertility and the weak irrigation capacity of agricultural fields.

8. REFERENCES

- AIUBA, R.; MOSCA, J. Orçamento geral do estado para o sector agrícola e desenvolvimento rural. OMR. Destaque rural nº 46. 2018.
- AMILAI, C. M. Evolução e Diferenciação De Sistemas Agrários: Situação E Perspectivas Para A Agricultura E Agricultores No Perímetro Irrigado De Chókwè/Moçambique (Vol. 49). Universidade Federal Do Rio Grande Do Sul.2008.
- CATSOSSA, L. A. O campo moçambicano no século XXI: dilemas e perspectivas do campesinato frente às grandes corporações do agronegócio. Revista Nera – Ano 20, Nº. 38 - Dossiê - ISSN: 1806-6755, 2017.
- CEMO. O impacto da política agrícola em moçambique. Maputo. 2010.
- COELHO, J. P. B. Estado, Comunidades e Calamidades Naturais no Moçambique Rural. In: Boaventura. S. (org.).

- Os caminhos da biodiversidade e dos conhecimentos rivais. Porto. Afrontamento, 2004. p. 217 -251.
- CORREIA, A. M. A Agricultura Familiar versus A Agricultura De Subsistência no âmbito da Segurança Alimentar no Espaço dos países da CPLP. In: LIMA, S.C.; MAGALHÃES, R.; FONSECA, L.E.; CARVALHO, A.; (Org.). Segurança alimentar e nutricional na Comunidade Dos Países De Língua Portuguesa: Desafios e Perspectivas. Fiocruz. Rio de Janeiro. 2012.
- Jornal da Noite. Maputo: STV, 02 de março 2019. Notícias.
- Langa, D. A tempestade não passou em Magude. *Jornal o País*, Maputo, 18 jun. 2017. Disponível em: <https://opais.co.mz/api/a-tempestade-nao-passou-em-magude>. Acessado em 12. Fev.2020.
- EMBRAPA – Monitoramento por Satélite. WebGIS Moçambique. Disponível em: <http://mapas.cnpm.embrapa.br/mocambique/mapa.html>. Acesso em: 20.fev.2020.
- INE - INSTITUTO NACIONAL DE ESTATÍSTICA; Censo Agro –Pecuário 2009 –2010: Resultados Definitivos – Moçambique. Maputo. 2011.
- IPCC 2007 Climate Change 2007: IPCC Fourth Assessment Report, Climate Change 2007: Synthesis Report— Summary for Policymakers, Contribution of Working Groups I–III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, eds. L. Bernstein et al. Cambridge, UK: Cambridge University Press, 2007.
- LEWIS, P.; MONEM, M. A; IMPIGLIA, A. Impacts of climate change on farming systems and livelihoods in the near east and north africa - With a special focus on small-scale family Farming. Cairo, FAO.92 pp. Licence: CC BY-NYC-AS 3.0 IGO.2018.
- MACAUHUB. Falta de água reduz a metade produção da empresa Bananalândia de Moçambique. 2018. Disponível em: <https://macauehub.com.mo/pt/2018/01/12/pt-falta-de-agua-reduz-a-metade-producao-da-empresa-bananalandia-de-mocambique/>. Acessado em: 18/04/2018.
- MINISTÉRIO DA ADMINISTRAÇÃO ESTATAL (MAE). Perfil do distrito de Magude província de Maputo. Maputo – Moçambique. 2014. Disponível em <http://www.portaldogoverno.gov.mz>. Acessado em: 23/12/2019.
- MINISTÉRIO DA ADMINISTRAÇÃO ESTATAL (MAE). Perfil do distrito de Moamba província de Maputo. Maputo – Moçambique. 2005. Disponível em <http://www.portaldogoverno.gov.mz>. Acessado em: 23/12/2019.
- MINISTÉRIO DA ADMINISTRAÇÃO ESTATAL (MAE). Perfil do distrito de Moamba província de Maputo. Maputo – Moçambique. 2014. Disponível em <http://www.portaldogoverno.gov.mz>. Acessado em: 23/12/2019.
- MORTON, J. F. The impact of climate change on smallholder and subsistence agriculture.2007.
- MOSCA, J. A agricultura familiar em Moçambique: Ideologias e Políticas. 2014. *Revista Nera – Ano 20, Nº. 38 - Dossiê - ISSN: 1806-6755*, 2017.
- SITOE, T. A evolução dos sistemas agrários no vale do Infulene, cidade da Matola -província de Maputo: Uma Abordagem Sistêmica. Anais do 4º Congresso Brasileiro de Sistemas – Centro Universitário de Franca Uni-FACEF. ISBN: 978-85-87406-40-8, 2008. Disponível em http://legacy.unifaccef.com.br/quartocbs/trabalhos_aprova-dos.asp. Acessado em: 05/03/2020
- SITOE, T. Agricultura familiar em moçambique estratégias de desenvolvimento sustentável. Maputo. 2005.
- SMIT, B.; SKINNER, M.W. Adaptation options in agriculture to climate change: a typology. *Mitigation and Adaptation Strategies for Global Change* 7. (2002). p. 85–114. <https://doi.org/10.1023/A:1015862228270>.
- UELE, D. I.; LYRA, G. B.; DE OLIVEIRA JÚNIOR, J. F. Variabilidade espacial e intranual das chuvas na região sul de Moçambique, África Austral. *Revista Brasileira de Meteorologia*,32(3). p.473–484. <https://doi.org/10.1590/0102-77863230013>.2017.
- UNAC & GRAIN. Os usurpadores de terras do Corredor de Nacala-Uma nova era de luta contra plantações coloniais no Norte de Moçambique. Maputo. 2015.
- REASON, C.J.C. Tropical cyclone Dera, the unusual 2000/01tropical cyclone season in the southwest Indian Ocean and associated rainfall anomalies over Southern Africa. *Meteorol Atmos Phys*, v. 97, p. 181-188. 2007.

9. ACKNOWLEDGMENTS

The authors would like to thank the CAPES PGPSE Proc. 88887.123947 / 2016-00: Coastal Environmental Systems and economic occupation of the Northeast; CAPES PRINT Proc. 88887.312019 / 2018-00: Integrated socio-environmental technologies and methods for territorial sustainability: alternatives for local communities in the context of climate change; and CAPES / FUNCAP Proc. 88887.165948 / 2018-00: Support to the Strategic Cooperation Strategies of the Graduate Program in Geography - UFC.

Received in: 04/06/2020

Accepted for publication in: 23/07/2021

