



THE FUTURE OF GROW WITH FOOD AND WATER: WHO OWNS THE WATER AND DO WE NEED WATER GOVERNANCE?

O futuro de crescer com alimentos e água: quem é o dono da água e precisamos da governança da água?

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ABSTRACT

The permanent conflict between the search for food for the needs of society and the use of existing resources for production is frequently noticed because of advances in communication, statistical and surveys on the subject and the numbers of malnourished people in the world. Drought represents a major long-term challenge for land and water management, locally and globally, and hinders efforts to reduce poverty and hunger. The problems that justify this conflict are diverse. Studies point to causes for inadequate agricultural practices, such as excessive irrigation and deforestation, especially in scarce water ecosystems. Significant changes in water quantity and quality are evident across the world. These impacts and the changes present an ongoing risk to coupled human and natural systems and related ecosystem services. The climate change, increased production, population growth and increased consumption are justifications for the inappropriate use of water. Factors of urbanization, such as the construction of buildings, the need for a combustion vehicle for locomotion and transportation of goods, and the growing increase in paved streets, are other reasons for the loss of water. The forecasts for the next two decades is shortage of water and food, particularly in developing economies. Future growth with food and water depends on changes in guidance on how to use water in a variety of personal and production activities. This article proposes analyze this question, amplified with identification of waters owner and create a policy for the management of water.

Keyword: Water Governance; Agricultural Practices; Food; Climate Change.

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O FUTURO DE CRESCER COM ALIMENTOS E ÁGUA: QUEM É O DONO DA ÁGUA E PRECISAMOS DA GOVERNANÇA DA ÁGUA?

The future of grow with food and water: who owns the water and do we need water governance?

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RESUMO

O conflito permanente entre a busca de alimentos para as necessidades da sociedade e a utilização dos recursos existentes para a produção é freqüentemente percebido por causa dos avanços na comunicação, estatísticas e pesquisas sobre o assunto e o número de pessoas desnutridas no mundo. A seca representa um grande desafio de longo prazo para a gestão da terra e da água, local e globalmente, e prejudica os esforços para reduzir a pobreza e a fome. Os problemas que justificam este conflito são diversos. Estudos apontam causas para práticas agrícolas inadequadas, como irrigação excessiva e desmatamento, principalmente em ecossistemas hídricos escassos. Mudanças significativas na quantidade e qualidade da água são evidentes em todo o mundo. Esses impactos e as mudanças representam um risco contínuo para os sistemas humanos e naturais acoplados e os serviços ecossistêmicos relacionados. As mudanças climáticas, aumento da produção, crescimento populacional e aumento do consumo são justificativas para o uso inadequado da água. Fatores de urbanização, como a construção de edifícios, a necessidade de um veículo de combustão para locomoção e transporte de mercadorias e o aumento crescente de ruas asfaltadas, são outros motivos para a perda de água. As previsões para as próximas duas décadas são de escassez de água e alimentos, principalmente nas economias em desenvolvimento. O crescimento futuro com alimentos e água depende de mudanças nas orientações sobre como usar a água em uma variedade de atividades pessoais e de produção. Este artigo se propõe a analisar essa questão, ampliada com a identificação do dono das águas e criar uma política de gestão das águas.

Palavra-chave: Governança da Água; Práticas Agrícolas; Alimentos; Mudanças Climáticas.

INTRODUCTION

The difference between developed countries and those in development is huge. When the comparison between the countries that integrate the G7 (Canada, France, Germany, Italy, Japan, the United Kingdom, the United States) is made with those underdeveloped, the difference between GDP – Gross Domestic Product is a monetary measure of the market value of all the final goods and services produced in a specific time period – and quality of life is significant.

Although the world is going through the pandemic caused by Coronavirus (COVID-19), this article proposes to present the data before the production stopped in the world in March 2020. Considering the information about the world development after March 2020 compromises the objective of the article which is to analyze the problem of the importance of water in people's lives and as a source of food.

During the population's confinement period, production was paralyzed and drop in GDP leave no doubt. The return of this population to work does not guarantee the resumption of production and inventories at the same pace as before March 2020.

Mahler et.al. (2020)¹ in his study points out that in April that COVID-19 is pushing between 40 and 60 million into extreme poverty. This has increased the death toll in low- and middle-income countries, induced longer shutdowns, and increased the economic costs of the pandemic. As a result, all estimates of the impact of the virus on global poverty have shifted as well.

This study published by the World Bank shows the scale of the problem caused by the coronavirus. In it, the authors consider two possible scenarios and evaluate the reflexes in the GDP of the world economy, the most affected are low-income economies with a drop in GDP of more than 10%. Even with this drop in GDP, significant changes in water quantity and quality are hope across the world. The conflict between society's needs for food and clothing is evident and worsens with population growth and drop in GDP.

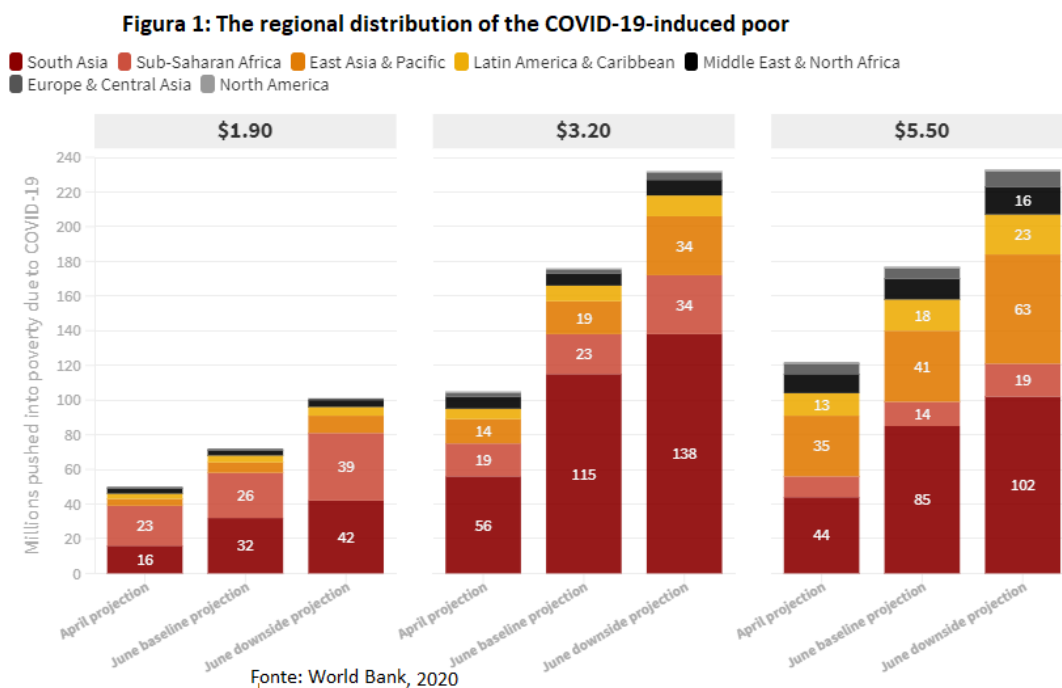
The world population is now close to 7.5 billion and continues to grow. Population growth must accompany the increase in food production and this presses the use of available resources, water is one of these resources. Anyway, identifying the owners of water, proposing measures for rational use in different productive fields and making an efficient management of this resource, is will made here.

1. THE REGIONAL DISTRIBUTION OF THE COVID-19 – INDUCED POOR

Starting this part by presenting data on different countries according to their level of wealth helps to understand how world production suffers from COVID-19, and the poorest are harmed according to the World Bank².

¹ https://ec.europa.eu/info/food-farming-fisheries/farming/international-cooperation/international-organisations/g7_en

² <https://blogs.worldbank.org/opendata/updated-estimates-impact-covid-19-global-poverty>



The richest countries appear discreetly with the gray color in a small space and the other countries have a large figure and a more visible color. The projections were made by the authors and indicate how the GDP of the poorest countries remains with the fall in economic activity. Once the data is consolidated based on the daily lives of these countries, they are worse than the projections.

Eating habits, production costs and final prices for people around the world are different. Even so, a person living on less than \$ 2.00 a day compromises their physical and intellectual development. Analyzing the figure, the number of new poor at \$ 1.90 is not a subset of the new poor on the highest poverty lines. If someone in sub-Saharan Africa sees their daily income drop from \$ 2.00 to \$ 1.50 because of COVID-19, they will be an additional poor person in the \$ 1.90 line, but not in the \$ 1.90 line. 3.20, where they were counted as poor before and after the pandemic (Mahler et.al, 2020).

Table 1. Real GDP

Region	2017	2018	2019	2020(f)	2021(f)
World	3.3	3.0	2.4	- 5.2	4.2
AVECO	2.5	2.1	1.6	-7.0	3.9
United States	2.4	2.9	2.3	- 6.1	4.0
Euro Area	2.5	1.9	1.2	- 9.1	4.5
Japan	2.2	0.3	0.7	- 6.1	2.5

Fonte: World Bank, 2020 (AVECO = Advanced and Economies)

As shown in Table 1, the world economy grew by 3.3 in 2017, to 3.0 in 2018 and a final figure of 2.4 in 2019. With the Coronavirus pandemic, forecasts indicate a fall of -5.2 in 2020 and a growth to 4.2 positive in 2021. The figures for other economies such as the United States show figures of 2.4 for 2017, 2.9 for 2018 and 2.3 for 2019. The fall is in the forecast for 2020 with -6.1, higher than the average forecast for the world economy. More important than these data for the growth or fall of GDP is how much these countries will consume natural resources to generate the products needed for their society. Among the natural resources is water, the subject of this article.

Table 2. Real GDP – poor countries

Region	2017	2018	2019	2020(f)	2021(f)
Sub-Saharan Africa	2.6	2.6	2.2	-2.8	3.1
Nigeria	0.8	1.9	2.2	-3.2	1.7
South Africa	1.4	0.8	0.2	-7.1	2.9
Angola	-0.1	-2.0	-0.9	-4.0	3.1

Fonte: World Bank, 2020

As may be seen in Table 2 Sub-Saharan Africa has numbers very close to those of some developed countries, but the need for growth in very high values must be repeated more frequently so that the population has a better quality of life. The results presented show that in 2017 its growth was 2.6 and was repeated in the following year. For 2019 there was a drop to -2.8 due to climatic, political factors and lack of structural investments. The forecast for 2020 expects to drop to -2.8 and with a slight increase in the forecast for 2021 reaching a total of 3.1.

Nigeria shows very modest values in 2017 of 0.8, rising to 1.9 in 2018 and slightly increasing to 2.2 in 2019. The fall to 2020 predicts a value of -3.2 and a slight increase to 1.7 in 2021, according to this World Bank forecast for 2021.

Knowing how much of this growth represents in terms of consumption of natural resources, especially water, is important for planning the rational use of this resource, avoiding the fall in agricultural production caused by the lack of water.

A frequent situation where a country imports food from another country, it is also buying the water that was used to produce that food. So, when consumers buy food that country imported, he is taking home some of the water that the exporting country used to produce that food.

2. WATER: WHERE IS BASIC RESOURCE LOCATED?

The Earth seen from space is blue because of the seas that surround the seven continents. That's 326 million cubic miles of endless blue sea occupying the expanse in between our seven continents (Castelo, 2020). With this excessive amount of resources, it is possible to deduce that there will be no problem for human beings with the scarcity of water, almost 70% of the earth's surface is covered in it.

Considering the current stage of technological evolution in several fields of science, the ocean is still little known. Basically, humanity explores it as a way of transport with ships carrying goods or carrying out fishing to feed society. Water location may be seen on Table 2.

The knowledge of the depth of the ocean reaches only 5%, and the depth of the ocean is 11 kilometers (7 miles), which demonstrates the abundant capacity of water to serve humanity. The concentration of sodium in seawater is very dangerous for human health. Therefore, it is necessary to do the desalination so that it is drinkable and used to quench thirst, irrigate plants and serve for personal hygiene.

Water location may be seen on Table 3; but the percentage of the amount of drinking water on the planet are very small. What reassures humanity is that the planet is very large and the low percentage of availability of drinking water can satisfy all of humanity. Of the waters occupying 70% of the earth's surface, only 3% is considered fresh water. Furthermore, about 2.6% of this freshwater is inaccessible for humans. They're either locked up in polar ice caps and glaciers, stored in the atmosphere or soil, are highly polluted, or are too far underneath the earth's surface to be extracted (Castelo, 2020).

About 69% of the fresh water is in form of ice cap and glacier in places like the Antarctic and Greenland ice sheet, further reducing the quantity of the available drinking water. So, if only 31% of the fresh water is available for drinking, this means 31% of 2.5%=0.00775, which equates to less than 1%. Therefore, less than 1% of the earth's water is drinkable. In some areas, the glacier often melts in summer to provide additional drinking water. However, the amount of water from glacier melt is not sufficient to increase the available fresh water to above 1% (Misachi, 2018).

Table 3. Worldwide Water Supply

Water Facts	Water Supply
groundwater	Almost all the available freshwater (excluding glacier) is groundwater. Groundwater provides approximately 40% of the drinking water.
the surface freshwater	Another important source of drinking water is the surface freshwater. The surface water is held in lakes, rivers, dams, and streams. Although rivers and dams are critical for water supply, they contain only 1% of the freshwater.
atmospheric vapor	About 0.001% of the freshwater is contained in the form of atmospheric vapor, small amount considering its important function in weather.
rains and snow	The rains and snow are crucial in replenishing the surface water. The atmospheric waters recycle several times in a year between the atmosphere and the earth's surface, leading to rains and snows.

Source: adapted from Misachi, 2018.

Nearly 1 billion people do not have access to safe and clean drinking water for daily consumption. This fact ends up generating 3.6 million people killed annually from diseases resulting from unsafe drinking water. These people are part of third world countries where clean water is not provided for everyone.

The urban population currently consumes a lot of water and in a small space because of the urban concentration installed in residential and commercial buildings. The source of this water is rain and reuse or treatment after use, which is redistributed for consumption again.

Climatic factors interfere with precipitation or rain, this is decisive in the supply of water. Protecting and managing groundwater and surface water is an essential task in ensuring the availability of drinking water.

Water management policy is necessary for the resource to be better distributed, the population to be educated to consume just enough and without waste and to create production mechanisms with rational processes so that each drop is well used.

3. DURATION OF DROUGHT AND FOOD PRODUCTION

Much of the products manufactured in the world have parts from different countries and their consumption does not always happen in the same place of production. World Development Report (2020)³ cites the example of the \$ 4,995 Pedego Conveyor electric bicycle, produced in Vietnam with parts from around the world. Gears, pedals, brakes and other components are shipped from China, Europe, Indonesia, Japan and other economies to

³ https://openknowledge.worldbank.org/bitstream/handle/10986/32437/9781464814570_Ch03.pdf

Vietnam for assembly, and the bike itself is shipped to the United States for final sale. Approximately 60% of the bicycle's value is from outside Vietnam (World Development Report, 2020)⁴.

This production chain, involving several countries in the world, generates negative externalities for the global environment. Batteries and tires, some of the most damaging parts to the environment, are manufactured in a country that does not have legislation for environmental protection.

Think about it including the other products that are part of a country's economy, with a volume of technical and human resources and the generation of wealth it provides. Agriculture, for example, generates job and income, moves a series of other producers in its chain, such as agricultural machines, seeds and seedlings for planting, transporters, producers of packaging, fertilizers and other resources.

World Development Report (2020) cites as an example of this potential in wealth generation that in 2015, US agricultural producers contributed US \$ 136.7 billion to the economy and represented 2.6 million jobs. About half of the revenue comes from livestock production. Other sectors related to agriculture in the food supply chain contributed US \$ 855 billion in gross domestic product and represented 21 million jobs.

As mentioned, climatic factors interfere with precipitation or rain, which is decisive in the water supply. In regions with greater frequency and duration of drought, the tendency is for food production to fall, reflecting an increase in malnutrition. The increase in temperature caused by global warming intensifies the incidence of burning of natural forests, as will be seen next summer in several regions such as: Australia, Portugal, California (USA), India, Brazil, which will face a problem with drought, depletion water supplies for irrigation and expand the distribution and incidence of pests and diseases in crops and livestock.

Ideally, raw materials should be purchased as close as possible to natural resources. This leads to savings in transport and factors that generate pollution and global warming, for example. Another advantage, the final price of the product would be reduced and help in the process to create other food producing regions.

Much water is consumed in food production. Agriculture is the production sector that consumes more water, around 93%. The industry consumes about 4% and the rest is consumed by the population. The country that imports this food has an advantage because it is consuming the water of the exporting country and saving its own. The water incorporated in cereals and oils that will be consumed by people and animals, incorporates large amounts of water.

Approximate crop water requirements to produce food harvested as alfalfa consumes 900 to 2000 kg of water per kg of food produced. Corn / maize consumes 1000 to 1800 kg of water per kg of food produced. These foods are then consumed by both humans and animals. To produce steak, you must have 15,000 kg of water per kg of food produced. When the country imports these products, it takes all this amount of water with it, saving yours that can be used in other activities.

4. WHO OWNS THE WATER?

Technological changes, greater cargo capacity for ships, planes, trains and improved communication processes have increased global trade. Growth in global economic activity has generated a greater demand for various products, such as food. This increased water consumption and countries that import food have benefited because they save their water.

Who owner water? That is the big discussion today. Find the owner of this water so that management policies can be put into practice and everyone will benefit from the rational use of this scarce resource in several regions. For example, water is a valuable asset in Tunisia - especially in the province of Kairouan, one of the warmest regions in Tunisia. Rain is becoming increasingly rare there. Better water management should help to resolve tensions between farmers (DW, 2020).

As mentioned earlier in this article, urbanization factors, such as the construction of buildings, the need for a combustion vehicle for locomotion and transportation of goods and the growing increase in paved streets, are other reasons for the loss of water. The new habits acquired with technological developments and other amenities

⁴ https://openknowledge.worldbank.org/bitstream/handle/10986/32437/9781464814570_Ch05.pdf

created by the market, requires energy consumption to move these devices. This energy comes from dams built on rivers and provide electricity for this comfort.

In this case, the examples of dam construction are numerous. The Three Gorges Plant in China generates enough energy to sustain its average GDP of 7%, but it has side effects such as the 32.0 million people homeless due to the rains and the lack of drainage capacity for this water. Another example, Ethiopia and Egypt are fighting for water from the Nile, some want electricity, others need water. The construction of the Renaissance dam has led to violent disputes between Ethiopia and Egypt and Sudan (DW, 2020).

This resource belongs to the territorial authority of each country. Surface water belongs to the citizen who occupies that location. Groundwater complies with larger legislation at the federal level. The concern is with the rational use of this water so that everyone, both locally and globally, can enjoy and not have a problem with the lack of water.

With global water management, conflicts like that between Ethiopia and Egypt and Sudan would be avoided. In addition, when consuming imported food, the price of the product should incorporate a certain value to be used in management policies for this resource⁵.

Major beverage producers are among the largest consumers of water. They are large companies that help any country to have income and jobs, but with a high cost of environmental degradation due to the large-scale use of water in the production of soft drinks and beers, mainly.

The countries where these manufacturers are installed have no interest in banning or creating rules for the consumption of water, since they generate taxes, move the economy, employment and income for the population.

Very populous countries are among the most interesting for these and other manufacturers. The lack of efficient management to control water use and other activities is common in these countries.

As there is weak supervision, there is an abuse in the search for more production and an easy gain of wealth, so accidents are inevitable. Low cost and abundant labor attract industries with the main objective of exporting to generate more profit. Examples are not lacking in different periods of history. Tragic incidents, such as the April 2013 collapse of the Rana Plaza building in Dhaka and the garment factory it housed, where 1,134 lives were lost. Calls for the building to close were ignored by clothing makers, residents and shopkeepers (World Bank, 2020)⁶.

5. WHY DO WE NEED WATER GOVERNANCE?

Changes in people's habits, urbanization, technological availability, congestion, growth in the supply of goods, lead to an increase in water consumption. On the other hand, deforestation and climate change reduce rainfall in some regions or intensify in others.

This fact makes the drought more intense in the region with lack of precipitation and with less impact in flooded regions. Extreme precipitation events are projected to increase in a warming climate and may lead to more severe floods and greater risk of infrastructure failure in some regions (Lall et al. 2018).

In Brazil, on January 1st to August 14th, 32,728 fires were recorded by the National Institute for Space Research (INPE) in the biome. Fire is normally used to clear the land after deforestation. The smoke triggers a series of respiratory problems in those who live in the region, which also generates public health expenses and economic losses due to the absence of employees. The effect of these fires was noticed in several countries around the world.

To reduce the impact of the lack of water, it is necessary to plan and predict how the population will be with the drastic reduction in the volume of water. Water management strategies designed in view of an evolving future we can only partially anticipate will help prepare the Nation for water- and climate-related risks of the future (Lall et al. 2018).

The authorities must plan the areas for housing, the physical structure, areas of shade and cooling for the construction and the use of technological resources that assist in the reduction of water consumption. Although

⁵ <https://www.dw.com/de/%C3%A4thiopien-und-%C3%A4gypten-streiten-um-nil-wasser/av-51939577>

⁶ <https://www.worldbank.org/en/publication/global-economic-prospects>

this is a recommendation for strategic water management, when planning to build a factory in a region, they want to know if the place has an abundance of water or not, especially if the product is a soft drink, juice or metallurgy.

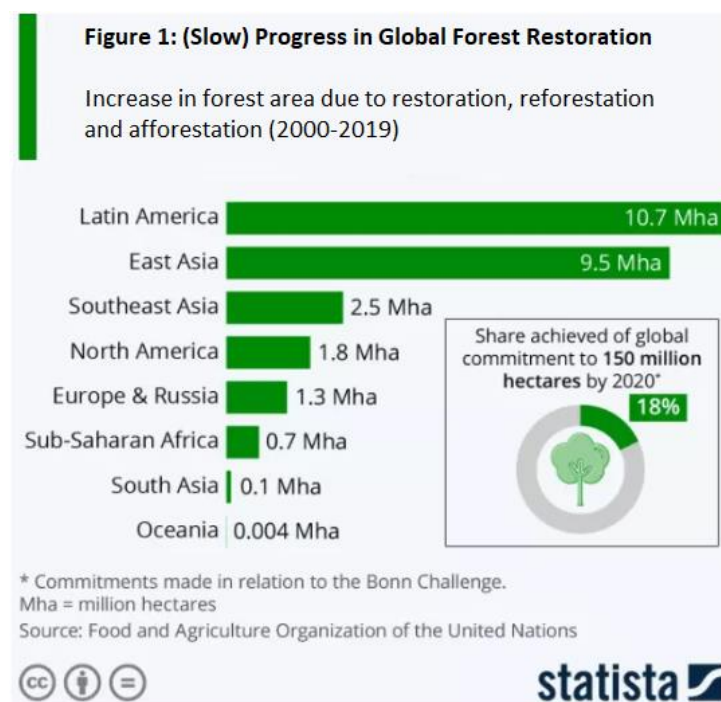
To facilitate water management, data on rainfall, consumption, climate history, water and sewage treatment structure, reach of the supply network, topography of the land, total of industries installed in the region, total housing, type of housing, total buildings, parks, area with trees, data on people's water consumption, industry consumption, so they give so much information that should be made available to everyone (Santos, Amorim, Guevara; 2017).

The quality of the information, the participation of research centers and good technicians to analyze the data, represent the principle that water management will be successful. This information changes over time and new factors must be considered so that the planning is always up to date. It is important that everyone involved should participate and know the decisions made. For example, for an industry, the amount of water available and its supply capacity must be informed. This facilitates production planning and the industry's business success.

Feeding the population is always a challenge because it is a matter of survival. Agriculture is the production sector that consumes more water, around 93%. The challenge until 2050 of feeding almost 9 billion people is to produce more food while using less water, building resilience for agricultural communities to deal with floods and droughts, applying clean water technologies that protect the environment (FAO, 2020)⁷.

A negative measure is to subsidize fishing and agriculture because the environmental damage is greater caused by the growth in deforestation and in frequent fishing. Deforestation is done to increase the planted area and consequently obtain more subsidies. In addition, soil erosion and chemical runoff in bodies of water are greater than they would otherwise be, and natural biodiversity decreases.

Trade creates advantages for increasing production with land degradation for agricultural use, one of the main causes of forest loss. Only four products - soy, cattle, palm oil and wood products - are responsible for 40% of global deforestation, at an average rate of 3.8 million hectares per year (FAO, 2020).



With the restoration of the forest, the gains for the environment and people's lives are significant. People take care of reforestation, this means jobs, income and more food to satisfy their needs. There are people around the world who live on firewood for cooking, heating water for bathing and cleaning in general. To obtain firewood, people like southern Sudan use reforested wood to have fire to cook their food (Broom, 2020)⁸.

⁷ <http://www.fao.org/3/a-i1688e.pdf>

⁸ <https://www.weforum.org/agenda/2020/07/tree-cocoons-reforestation-harsh-climates/>

However, many other commodities - such as cocoa, coffee, spices, vanilla, bananas, cut flowers, orange juice and natural rubber - are facing growing global demand that threatens the environment at the critical points where these products grow.

Indirect strategic measures for water management include modern approaches to genetic improvement and the use of new genes from wild crop relatives that make it possible to develop crops with higher yields and tolerant to climatic stress caused by the lack or total scarcity of water. Irrigation systems modern so that they are more productive and less harmful to the environment with the right amount of water for the plant and without waste.

The population must be oriented towards the rational use of water, how to preserve streams and rivers, forests and trees that protect water sources, how to make conscious planting and adapted crops for each region, how to increase water productivity in domestic, industrial and agricultural.

CONCLUSION

In 1950, the world population was estimated at about 2.6 billion people, it reached 5 billion on July 11, 1987. In 37 years, the world population has doubled and food production has followed this growth, reflecting the fall in prices of food by the year 2000 and with an increase in the price of grains from 2004. The world population reached the mark of 6 billion people on October 12, 1999. In 2019, it is estimated at approximately 7 billion and may reach a top of about 9.7 billion by 206, and so then may start to shrink (IHME, 2020)⁹.

In the meantime, the challenge continues between population growth and increased food production. The future depends on the production of food and water for this purpose. The data presented over the period of forty years the world population has doubled and this happened because of the food supply. Deforestation has been expanded, giving way to agriculture and cattle raising. This requires a large amount of water to generate the volume of food needed to satisfy people's needs in an Sustainable way (FAO, 2017)¹⁰.

Food habits, production costs and final prices for people all over the world are different. Even so, a person living on less than \$ 2.00 a day compromises their physical and intellectual development.

The article also identified that low-income countries have little availability of good quality water for daily use and for growing their food. This harms society as a whole, because the increase in the number of diseases caused by malnutrition increases the budgetary costs of health.

The volume of water in the oceans represents 326 million cubic miles of endless blue sea, this does not mean that the world population will not have problems with the lack of water. This water has an excess of salt that damages people's health. With technological developments, this water is treated in several regions so that it is consumed as drinking water.

Another result of this article is the lack of knowledge of the oceans, mainly of its depths, even with aquatic robots that can dive and withstand the pressure of water in depth. The use of the oceans is summed up as a means of transport with ships carrying goods or fishing to feed society. Knowledge of the depth of the ocean reaches only 5%, and the depth of the ocean is 11 kilometers (7 miles), which demonstrates the abundant capacity of water to serve humanity.

Climatic factors, deforestation, misuse of land, disordered urbanization, interfere with precipitation or rain, impairing the water supply. This causes an increase in drought periods in several countries, a reduction in the supply of food, an increase in diseases caused by the consumption of clean and non-potable water (Baladin, 2020).

Who owns water? The article identified clean drinking water for drinking and other purposes. To obtain water the population has to travel a greater distance or the cost to treat the water and distribute it in the urban area, is also becoming more expensive.

The need for water management is to prevent the scarcity of the product from compromising human survival and the paralysis of economic activities, especially those related to agricultural production, particularly in development regions like Latin America and the Caribbean (OECD, 2012).

⁹ <https://www.sciencedaily.com/releases/2020/07/200715150444.htm>

¹⁰ <http://www.fao.org/3/a-i7959e.pdf>

The strategy proposed by this article considers that the actions must be elaborated on several fronts, a multidisciplinary action with measures to control the emission of pollutants and climate targets to reverse global warming or at least soften the impacts. Another measure is the control of the water that is available on the planet, without interfering in the sovereignty of each nation, but with measures of orientation for rational use and strict rules in case the country does not comply with what was determined.

Changes in the planting process, researching crops that are more resistant on less fertile land and being able to cover with less water, propagate irrigation techniques that use less water in agriculture. Finally, a water management policy at the global level and if necessary, include a percentage on the price of products traded on the international market to subsidize working groups and remunerate countries that export agricultural products that consume water from their territory. So the question is are there alternative pathways to overcome the challenge of food for all (FAO, 2018).

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