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Agricultural Structure in Somalia

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Abstract

Agricultural Structure in Somalia

Agriculte is an indispensable sector of Somalia due to the survival of the country's population, its contribution to national income and employment, providing raw materials and capital to other sectors, its direct and indirect impact on exports, imports, and also its contribution to biological diversity and ecological balance. This literature evaluated The Agricultural Structure in Somalian. Farmers in Somalia faced many challenges that affected their livelihoods, such as drought, lack of agricultural extension service and farmer knowledge, lack of quality seeds, and lack of appropriate irrigation systems. The main material of the literature was obtained from secondary data sources, the researchers also collected information from the literature and were carried out using all kinds of printed research, statistics, books, and journals related to Agricultural structure in Somalia. The finding of the literature reveals that farmers are not producing enough products for the country due to the continuation of their traditional practices as they cannot find adequate technical and support services from the government and other institutions. Also, the finding of the literature reveals that there are challenges and constraints that have a bad effect on whole the production for a long time. Since then, several types of research have been conducted in various different countries focusing on challenges facing crop production. For this reason, agricultural production is low. If these issues and challenges are not met in their true perspective, Somalia's economy in general and the rural economy, in particular, cannot sustain.

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1.Introduction

Agriculture is an indispensable sector and has played a key role in the development of human civilization. Until the Industrial Revolution, the majority of the human population worked in agriculture. The development of agricultural techniques has steadily increased agricultural productivity. The widespread use of these techniques over a period of time is often referred to as the agricultural revolution (Mendali & F, 2013). In parallel with the increasing population in the world, there is a significant increase in agricultural products. The beginning of the problems in the agricultural sector in Africa is the fact that more traditional methods are still used in agriculture - mostly with simple tools and equipment - and many obstacles are encountered in the transition to modern agriculture (Qureshi & Ismail, 2016). The main problems experienced in the agricultural sector, which has the potential to develop in Africa, can be listed as Low efficiency, advanced scarcity of inputs (seed, fertilizer, etc.), lack of Modern irrigation, infrastructure deficiencies, and costs in bringing the product to the market, trade barriers and taxation issues, concerns about investment due to political instability, insufficient Education Given to Farmers, droughts, and Floods (Debrat, J. M. 2011).

Mc Calla, A. F Spring, 2001, USA, talks about challenges to World Agriculture in the 21st Century. He not found only drought, but also other challenges, such as insecurity, environmental degradation, and a lack of knowledge and skills. In Somalia, the territory of most of the farms was controlled by the terrorist group Al-Shabab. Many farmers are afraid to visit their farms and grow naturally due to the state of insecurity. The main and threatening challenge was the drying up of rivers, which in some seasons can automate the loss of crops already and recently cultivated, awakening the general low morality of farmers for that planting and reconciling low yields for that season (Abdi-Soojeede, 2018).

Somali farmers continue their traditional practices as they cannot find adequate technical and support services from the government and other institutions. For this reason, agricultural production is low. Also, the link between the institution and the farmers is not strong. The biggest problems are lack of investment, limited technical knowledge, and skills, inefficient farming system, and lack of advanced irrigation methods suitable for agro-climatic and post- agricultural climatic conditions (Muse, 2017).

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2.Agricultural sector in Somalia

Somalia's total land area is 637,540 km2, of which 30% is classified as desert land unsuitable for agricultural production, 45% is covered by rangelands suitable for livestock grazing, 14% is covered by forest or woodland, and the remaining 11% is classified as arable land (FAO 2014). Agriculture is one of the major employment activity and is the largest backbone of the economic sector in Somalia. As we see (Table 1) agriculture contributed 60.1% of GDP of the country (FAO 2020). Economic growth is at the center of economic development of every country. When national income increases, real people also will benefit. Also the table shows economic indicators and sectoral distribution of gross domestic product, the GDP of the country was 4.9 billion dollars in 2020. It also includes indicators that represent factors known to be relevant to economic growth, such as GDP growth, GDP per capita, inflation rate, unemployment rate and also sectoral distribution of GDP of the country like services 32.5%, fishing industry 4.9%, agriculture 60.1%and manufacturing 2.5%.

Table 1 Economic indicators in Somalia

2020	Somali
GDP	$4.9 billion
Real GDP Growth	-1.5 %
GDP Per Capita	320 dolar
Inflation rate	4.1%
Unemployment rate	19.7%
Sectoral Distribution Of GDP	
Services	32,5%
Fishing industry	4.9%
Agriculture	60,1%
Manufacturing	2.5%

Source: Compiled by the Statistics Section, DFAT, using the latest data from the IMF and various international sources 2020.

a. GDP: Gross domestic product

b. Real GDP Growth: Real Gross domestic product Growth

c. GDP Per Capita: Gross domestic product Per Capita

d. DFAT: Department of Foreign Affairs and Trade

e. IMF: International Monetary Fund

There are two long rivers in Somalia: - The Jubba River is 1004 km long and the Shabelle River is 1130 km long. The climate in Somalia is semi-arid and arid, with an average annual temperature of 27ºC. The average annual precipitation is <100-700 mm (FAO 2005).

2.1.Crop production sector

Somalia's agricultural products can be divided into two main groups: food products produced for home consumption and export products. According to the World Bank's development indicators statistics, farmers are not producing enough products for the country while there is a lot of arable land in Somalia, which is a country with high agricultural potential. On the other hand, the soil is very suitable for agriculture, and it is even possible to harvest many crops 3-4 times a year. Despite this, the country's agricultural production is not enough to feed 15.9 million people. Farmers in Somalia were facing many challenges affecting their livelihoods such as drought, insufficient agricultural extension service, farmer knowledge, lack of quality seeds, lack of proper irrigation system, lack of mechanization, inadequate storage facilities, and lack of agricultural marketing (Abdi, 2018).

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2.1.1.Major agricultural products of Somalia

These are some major agricultural products in Somalia: - Grains: Sorghum, corn, and rice. Legumes: - Black-eyed peas and mung beans. Oil crops: - Sesame and sunflower: Commercial crops: - Bananas, citrus fruits, vegetables, sugarcane, cotton, and myrrh. There is an incredible difference between the harvested area in hectares and the yield per hectare. For example, less than one ton of corn is produced in one hectare (Gavin R, Hussein H, Jelinski N, Porter P in press). Inadequate technical and support services, insufficient infrastructure, lack of quality seeds, lack of credit system, and lack of appropriate irrigation system cause low yields as shown (Table 2).

Table 2. Harvested Area in Somalia

Crops	Area harvested (Thousand Ha)		Yield (Kg/ Ha)		Production (Thousand ton)	
	2019	2020	2019	2020	2019	2020
Sorghum	250,000	250,000	500	400	125,000	100,000
Corn	100,000	100,000	570	750	57,000	75,000
Cotton	17,815	17,901	400.4	400.1	7,133	7,163
Wheat	2,612	2,615	398.2	398.9	1,040	1,043
Banana	1,355	1,350	17,063.5	17,055.6	23,121	23,025
Paddy	1,317	1,651	975.7	716.5	1,285	1,183

Source: FAOSTAT - Production Statistics - Crops, Processed Crops, 2020.

Source: FAOSTAT - Production Statistics - Crops, Processed Crops, 2020.

a. FAOSTAT: Food and Agriculture Organization Corporate Statistical Database

b. Ha: hectare

c. Kg: Kilogram

As we see the following (Figure1), before the civil war in 1991, Somali farmers produced hundreds of thousands of tons of crops and fruits, but after the fall of the central government in 1991, crop and fruit production in Somalia declined as illustrated in the (Figure1). The decline in grain production has been so dramatic over the last three decades that recently (pre-drought) food aid and food imports have exceeded domestic grain production.

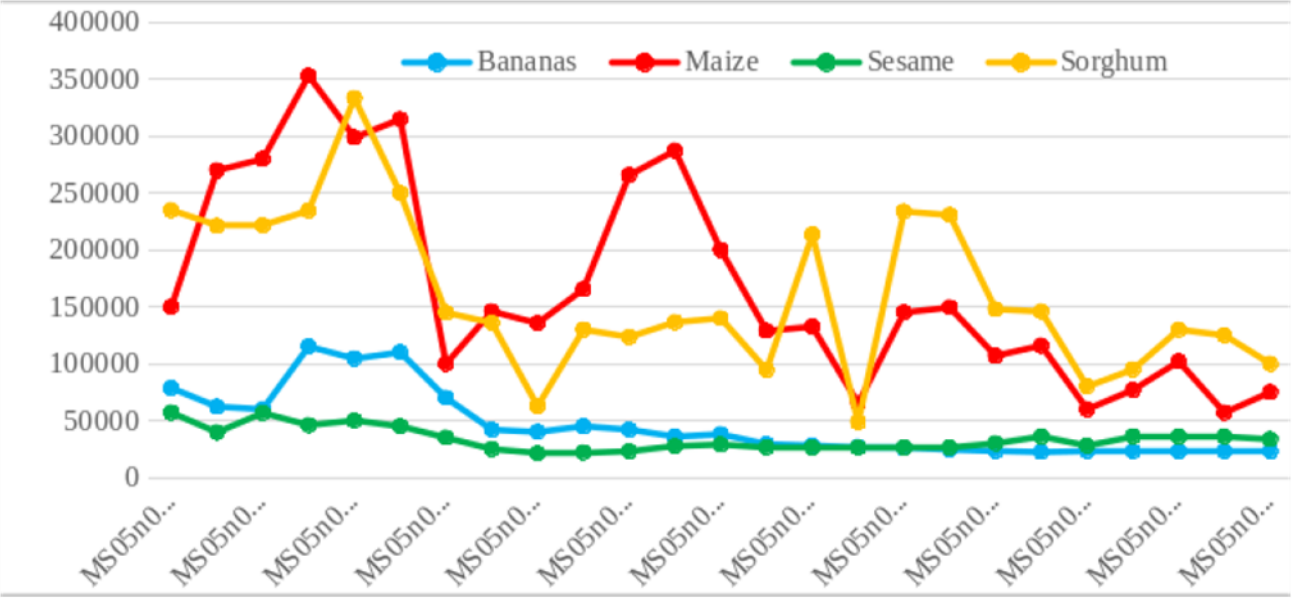

Figure1. Production of Cereals in Somalia (ton)

Source: FAOSTAT, 2020.

According to the FAOSTAT (2020), maize production totaled about 353,000 tons in 1988. During the 1995-2015 period, it decreased by an average of 63% to 120,000 tons. In the more recent drought years (2010–15), average corn production fell to about 110,000 tons, falling to 63,251 tons in 2016 as a result of below-average rainfall as shown in (Figure1). In 1988–90, sorghum production averaged 275,000 tons and increased to 330,000 tons in 1989. It decreased to 78,801 tons in 2016 as shown in the (Figure1). Somalia has been the second largest sesame producer in the world and plays an important role in the global sesame trade to the country. Despite major constraints such as civil strife, lack of investment, and lack of policy and regulation, sesame production in Somalia has increased sevenfold since 1991. It drops to 45,000-50,000 tons in the 1989-90 period just before the civil war begins (Figure1). “Each year, sesame income in Somalia is estimated at 300 Million USD 2017, accounting for 5.25% of the country's total GDP of 5.71 billion USD”.

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2.2. Livestock sector

Livestock has been one of the backbone of the Somali economy for centuries. Livestock provides a source of income and domestic consumption of meat and other animal products is an important source of food security. It was also one of the few production systems that remained unaffected during the civil war due to the relative mobility that livestock could easily move from conflict zones to more stable environments. The most important animals of the country are Camels, Cattle, Sheep and Goats. The country has 34.5 million head of animals, including 11.5 million goats, 11 million sheep, 7.2 million camels and 4.8 million cattle (FAOSTAT 2020). According to FSNAU, Goats are much larger than camels and cattle. Even after the death of the last drought, Somalia has the world's largest camel population, more than double the camel population of Kenya and Ethiopia combined in early 2010 (Mahmoud 2013).

Table 2. Number of Livestock in Somalia by Type (Heads)

Year	Camel	Cattle	Goats	Sheeps
1961	2,900,000.00	3,150,000.00	11,800,000.00	6,200,000.00
1980	5,800,000.00	4,358,000.00	17,000,000.00	10,300,000.00
1985	6,411,000.00	4,494,000.00	19,000,000.00	11,800,000.00
1990	6,700,000.00	4,000,000.00	18,500,000.00	13,000,000.00
2000	7,001,600.00	5,139,000.00	12,300,000.00	13,808,000.00
2010	7,000,000.00	4,800,000.00	11,500,000.00	12,000,000.00
2016	7,226,140.00	4,850,000.00	11,541,747.00	10,652,498.00
2017	7,222,181.00	4,800,000.00	11,524,496.00	11,000,000.00
2018	7,295,295.00	4,7388,92.00	11,6408,56.00	10,6352,36.00
2019	7,2952,95.00	4,7388,92.00	11,6408,56.00	10,6352,36.00
2020	7,2952,95.00	4,7388,92.00	11,6408,56.00	10,6352,36.00

Source: FAOSTAT, 2020.

Periodic droughts have serious effects on the livestock sub-sector. The livestock economy of the north-western regions was affected by the drought. The lack of rain at the end of 2016 resulted in asignificant drought affecting all regions, reduced water and pasture availability for livestock, high animal mortality, and a large reduction in the yield of surviving animals.

2.2.1 Milk production

Milk is an important food source for pastoralists, who tend to increase their household consumption during dry seasons (Center, 2019). Milk production in different ecological regions of the country provides employment and income in both rural and urban areas, especially for women who traditionally trade. In 2014, Somalia produced more than 1.1 million tons of camel milk, with a gross market value of 1.65 USD. Camels can produce more milk from poor forage than other animal species and yield an average of 2.5-3.5 liters per day. Milk production is inversely proportional to the season; production is high (wet seasons in Gu and Deyr); Low production Hagaa and Jilaal during dry seasons.

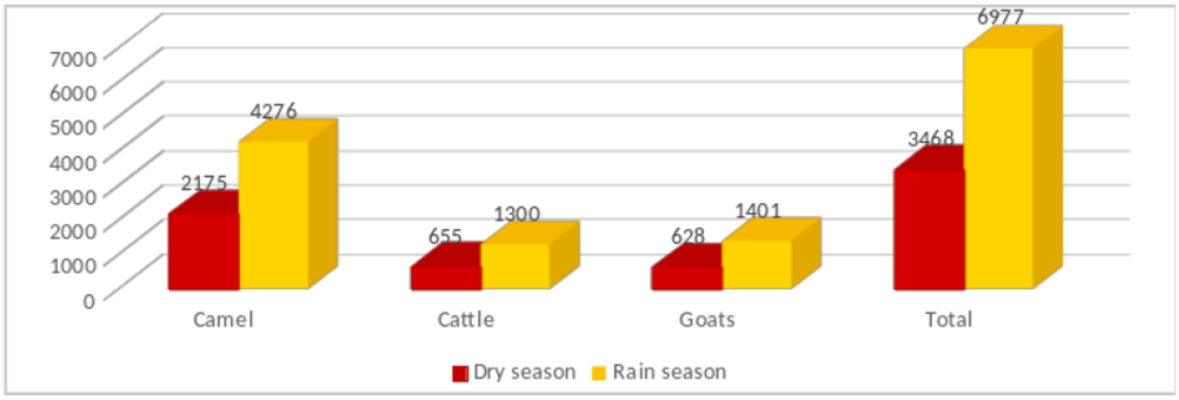

Figure 2. Milk production in Somalia (ton) (2017)
Source: FAOSTAT, 2017.

Milk prices, is inversely proportional to the level of production; prices are low when production is high, and when during dry seasons, as animals move in search of pasture and water, milk is less available and its price increases (Muse, 2017).

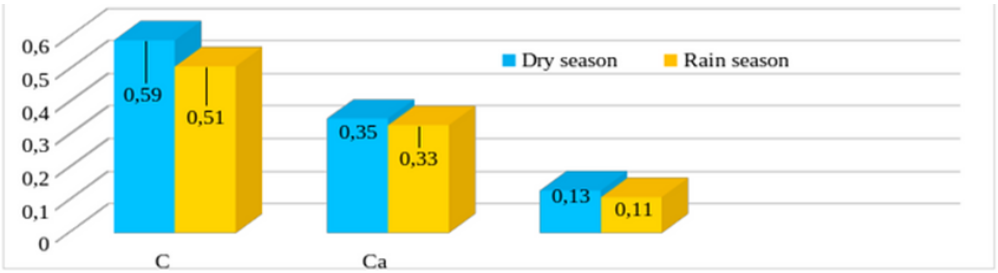

Figure 3. Milk Prices in Somalia (dollar/liter)
Source: FAOSTAT, 2017

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3. Agricultural trade sector

Somalia's foreign trade was mainly in agricultural products. The agricultural sector is not only the engine of Somalia's economy but also a source of livelihood for the majority of the Somali people. In the pre-war period, the second-largest export item was fruit, mostly bananas (Somalia also exported grapefruit and papaya), which was shipped mostly to Italy.

In recent years, fruit exports to the Gulf countries have been limited by some tests. Agricultural exports represented 93 percent of total exports in early 2010 (slightly below about 95% before the war). Much has changed over the past three decades, but Recorded export performance (estimated from partner country customs data) has been outstanding (Table 3). As we can see, there is an incredible difference between the country's exports and imports, which results in a negative export balance.

Table 3. Foreign trade in Somalia (Million USD)

	1996-2000	2001-05	2006-10	2011/14	2015
Total Agricultural Exports	112.3	141.1	208.9	518.1	634
Total Exports	119.9	169.5	282.5	559.1	688.5
	1996-2000	2001-05	2006-10	2011-14	2015
Total agricultural imports	122	201.9	525.9	1,217.90	1,496.80
Total imports	167.1	288.1	719.7	1,674.90	2,358.00

Source: FAOSTAT, 2016.

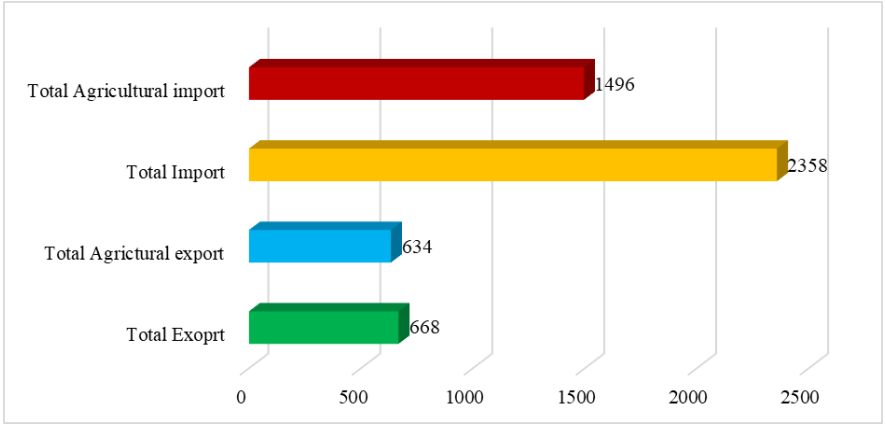

Figure 4. Foreign trade in Somalia (Million USD) (2015)

Source: FAOSTAT, 2020.

Somalia exported $195,4 million and received $2,1 billion in 2020, resulting in a negative trade balance of 2.04 billion USD in shown (Table 4). In 2020, Somalia's GDP was 4.9 billion USD and GDP per capita was 320 USD. In the pre-war period, the second largest export item was fruit, mostly bananas, which were mostly shipped to Italy (Somalia also exported grapefruit and papaya).

Table 4. Imports and exports of Somalia (dollars)

	2015	2016	2017	2018	2019
Exports	688.5 Million	631,3 Million	425,8 Million	488,2 Million	195,4 Million
Imports	2,3 Billion	2,8 Billion	3,3 Billion	3,4 Billion	2,1 Billion

Source: Ankara Chamber of Commerce, 2020.

Among the most exported products from Somalia; While there are live sheep and goats, cattle, gold, oilseeds and fruits, electronic integrated circuits, products imported from Somalia include; cane, beet sugar, rice, palm oil, wheat flour, milk cream.

The country is now recovering from the effects of a long civil war and repeated famines and droughts. Under a less influential government over the past 25 years, the economy was not doing well, and international trade was part of the economic sectors that suffered. The following graph shows the negative trade impact between export and import of the country.

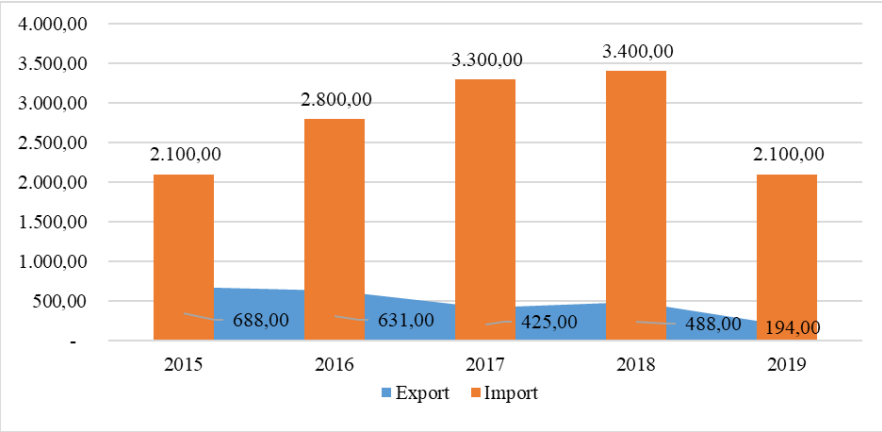

Figure 5. Export and import of Somalia (Million dollars)

Source: Ankara Chamber of Commerce, 2020.

Exports were small and only livestock played a crucial role. however, it failed to stabilize the country's trade balance account when other sectors did not have an export surplus.

However, the economy has been in steady growth over the past six years, but this has not affected the country's role in international markets. Somalia's integration into international markets is very weak. due to the absence of an effective government, lack of banks and financial institutions with international standards, weak infrastructure and lack of quality standards and controls to control exported products.

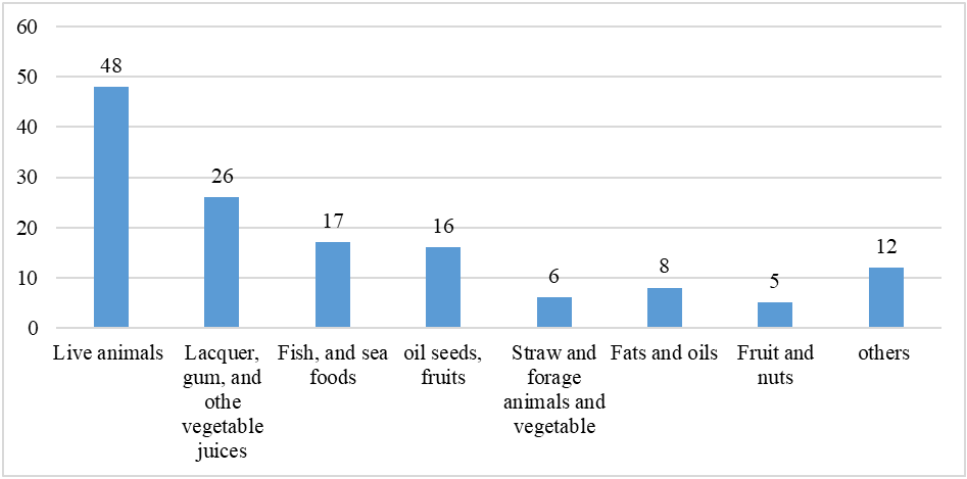

Figure 6. Major Product Groups in Somalia's Exports (million dollars) (2020)

Source: Trademap, 2021

Somalia's main exports are livestock, including goats, sheep, camels, and cattle; hides and skin; banana; Sesame; fish; main export partners are Saudi Arabia, United Arab Emirates, Oman, Yemen, and Brazil.

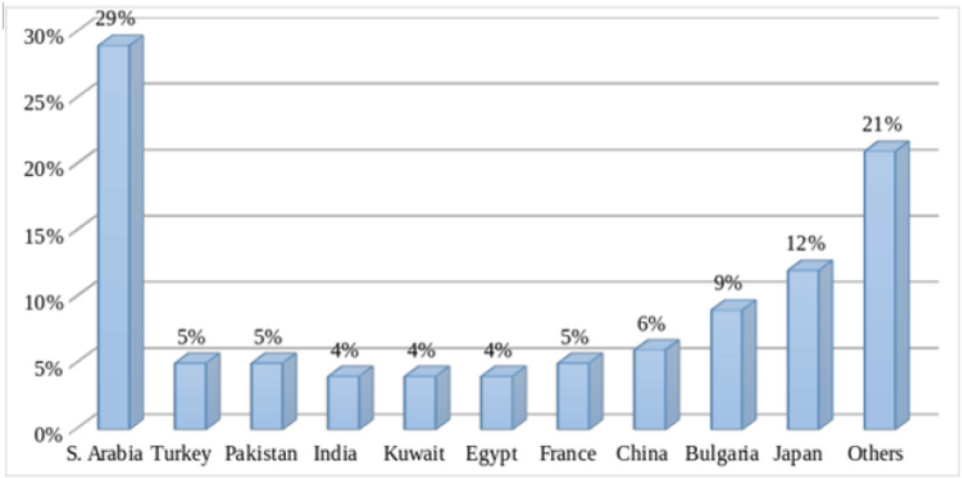

Figure 7. Somalia's Exports by (Country 2020)

Source: Trademap, 2021

On the other hand, the main import items are, food (sugar, wheat, flour, rising edible oil, etc.), manufactured goods (clothing, electronics, automobiles, etc.) and construction materials and khat. It is the second largest import after sugar, so the following (Figure 8) shows some products in Somalia's import Saeed, A. A. J., & Hussain, M. A. (2015)

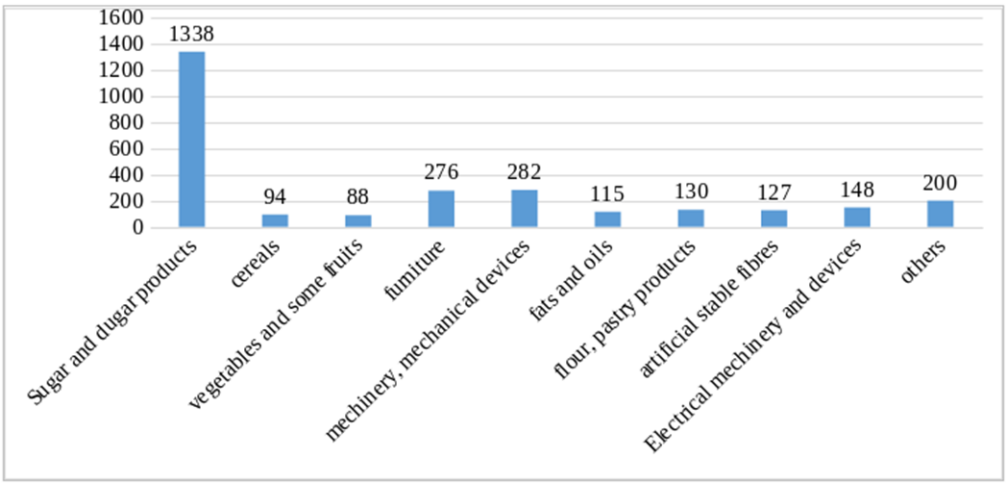

Figure 8. Major Product Groups in Somalia's Imports (million dollars) (2020)
Source: Trademap, 2021

Somalia's import partners are the United Arab Emirates, which imports almost all Somali goods through the Dubai International Market; Oman; Djibouti; Sweetcorn; Ethiopia; Chinese; Kenya; Pakistan; and India are shown in (Figure 9)

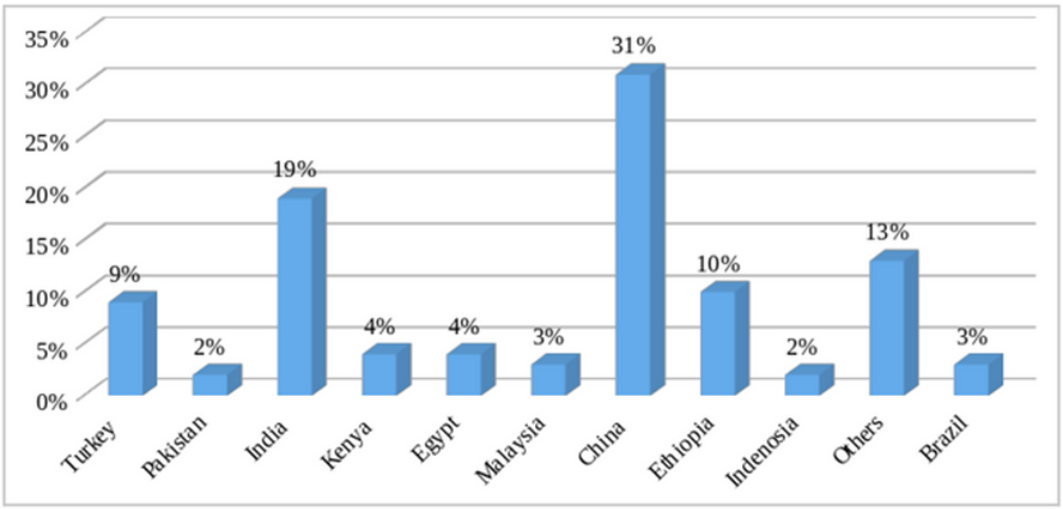

Figure 9. Somalia's Imports by Country
(2020) Source: Trademap, 2021.

4. Conclusion and suggestion

The findings of the literature reveal that the problems had a long-standing negative impact throughout the entire production. Since then, several studies have been conducted in different countries focusing on major and minor issues with crop production. While the country's production depended on rural farmers.

Our farmers continue traditional practices because they cannot find sufficient technical and support services in the country because there is no strong central government in the country and there is very little work done by the Ministry of Agriculture as rural areas are unsafe and not controlled by the government the territory of most of the farms are controlled by the terrorist groups Al-Shabab.

Many farmers are afraid to visit their farms and grow naturally due to insecurity. Therefore, there is very little communication between the ministry of agriculture and the farmers. Since the Ministry does not have direct contact with farmers, it offers projects to local non-governmental organizations and these organizations deliver projects to farmers, for this reason, agricultural production is low.

Somalia's integration into international markets is very weak. due to the absence of an effective government, lack of banks and financial institutions with international standards, weak infrastructure, and lack of quality standards and controls to control exported products and these resulted in negative trade impact between export and import of the country.

If these issues and challenges are not met in their true perspective, Somalia's economy in general and the rural economy, in particular, cannot sustain.

1) The government should establish Agricultural extension agencies that encourage farmers to adopt new and improved farming methods.

2) Farmers should attend all training and workshops related to crop production.

3) Farmers should use certified drought-resistant seeds.

4) Farmers should use appropriate irrigation systems that are beneficial to farmers to increase water use efficiency by minimizing non-useful water use.

5) NGOs and local state governments should raise awareness of the usability and usefulness of e-Agriculture through the organization of local seminars and training programs for farmers.

6) The government should conduct continuous research to find a solution for the farmer’s problems in order to increase the farmer's productivity.

7) The government should participate in rebuilding roads and should continue to monitor climate change.

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Analysis of Potatoes Growing Decisions with the Analytic Hierarchy Process Method in Burundi

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Abstract

Analysis of Potatoes Growing Decisions with the Analytic Hierarchy Process Method in Burundi

Potatoes cropingare paramount in Burundi and almost all the provinces of the country grow potatoes. However, there are several varieties of potatoes grown in Burundi. Farmers are facing with the difficulties of deciding which right variety of potatoes to grow. This work was carried out for helping farmers to make the right choice of the variety to grow. Analytic Hierarchy Process (AHP) method has been used. The Ndinamagara, Ingabire and Victoria potatoes varieties were the different decisions alternatives. The Prices of seeds, Yield, Marketing, Cost of producing and Sustainability were the mains criteria that were taken as the accountment for taking the decision process. In this work, it was a question of developing a multi-criteria decision-making process and determining the appropriate potatoes production system with the AHP method.The results shown that each criterion had it own highly preferred variety. According to the seed price criterion, the Victoria variety was found to be more important than the others. The Victoria potatoes had a priority weight of 66.4%. Since the coherence ratio was less than 0.10, the matrix was seen as coherent. For the yield criterion, the Ndinamagara variety has a weight of 50.1% and the consistency ratio was less than 0.10. According to the marketing criteria, the Ndinamagara variety still had a weight of 60.7% of points and the consistency ratio was also less than 0.10 and the matrix was also consistent. For the production cost criterion, the Victoria variety has a weight of 70.2%. For the sustainability criterion, the Ndinamagara variety has been found to be more important and had a weight of 0.776 points and the consistency ratio was 0.10. In concluding, for the final decision, the Victoria variety was determined to have a greater weight (48.6%) than the Ndinamagara variety (31.8%) and the Ingabire variety represented as the last with a rate of 19. 6%. Considering the results of this work, the suitable potatoes variety was decided as Victoria variety.

1. Introduction

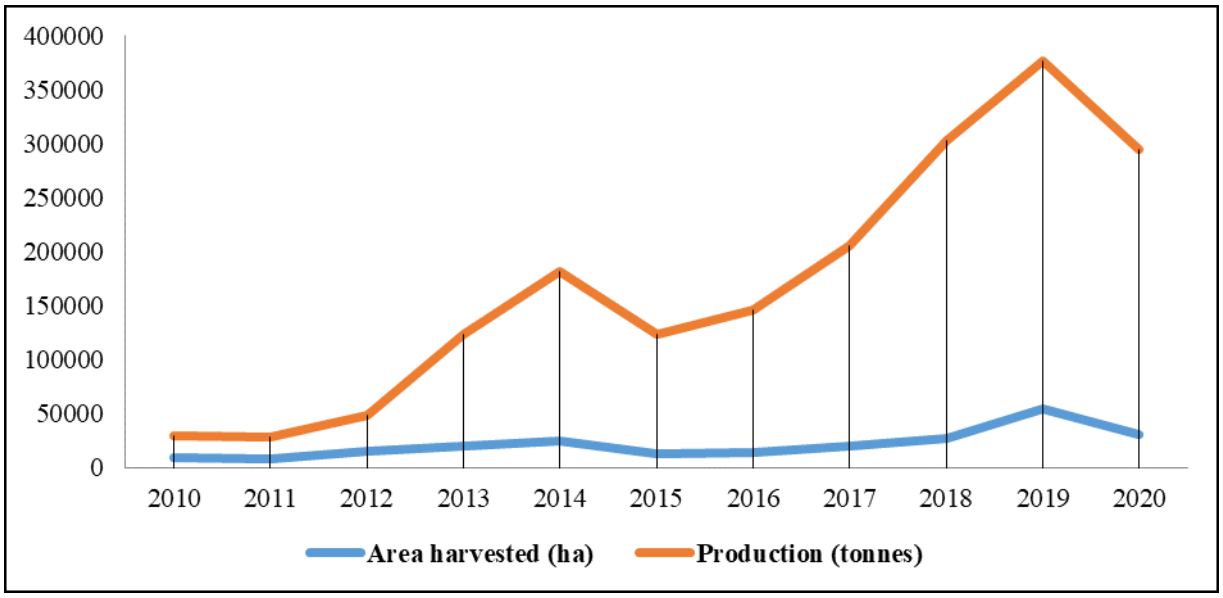
Potatoes are tubers produced by the species *Solanum tuberosum*, belonging to the Solanaceae family. It is native to the Andes Mountains in South America and more precisely to Peru. The Incas cultivated it under the name of "Papa" about 1000 years before J.C. Introduced in Europe in the sixteenth century, its food qualities were initially unknown, and it was not clear how to name it: *truffle* in France, *Kartoffel* in German, *potato* in English, *patata* in Spanish and Italian. The name potato has been said to have used for the first time in 1762 by the botanist Henri Louis Duhamel du Monceau (Harahagazwe et al, 2012). Its vegetative cycle is about 80 to 90 days. Compared to other tubers; its shortly maturity allows it to be grown all year round in rainy and irrigated systems (Okonkwo, 1992). Potatoes are grown in more than 150 countries and play an efficient role in the world food system. It is the main non-grain food product in the world; it ranks fourth after wheat, rice and corn, which form the basics of human nutrition (FAOSTAT, 2015). Worldwidly, 376,875,686 tons of potatoes are produced per year. China is the largest potato producer in the whole world with 99,122,420 tons of production volume per year. India comes as the second producer with 43,770,000 tons of annual production (ATLAS, 2022). Table 1 illustrates the top 10 potato-producing countries in the world during the 2021 year.

Table 1. Top 10 potatoes producing countries in the world

Countries	Production (tons)	Production / person (Kg)	Planting area (ha)
China	99.122.420	71,11	5.815.140
India	43.770.000	32,75	2.130.000
Russian	31.107.797	211,79	2.030.858
Ukraine	21.750.290	514,63	1.311.600
United States of America	19.990.950	60,99	407.810
Germany	10.772.100	130,19	242.500
Bangladesh	9.474.099	57,37	475.699
Poland	8.872.445	230,85	311.620
France	6.834.680	101,56	175.225
Netherlands	6.534.338	378,77	155.594
Belarus	5.985.810	631,53	292.401

Source: (ATLAS, 2022)

Potatoes production had increased significantly in sub-Saharan Africa, reflecting the importance of the crop in the region. This increasment was due to a rapid expansion of the planting area from 100,000 ha in 1994 to 240,000 ha in 2004 in the Great Lakes Region (Burundi, Rwanda, DR Congo and south-western Uganda) (Bararyenya et al, 2012). In Burundi and especially in its production area (Mugamba region), potatoes are taken as the first crop in terms of income (22%), the first root and tuber crop most appreciated and consumed in urban areas and the 4th in terms of food security (16.7%) (Harahagazwe et al, 2012).



Source: (FAOSTAT, 2022)

Figure1. Evolution of potatoes production in Burundi (2010- 2020)

Currently, 8 varieties are in wide distribution namely: Ndinamagara (the most used with 51%), Victoria (the 2nd with 16%). Ingabire, Ruhanyura, Magome, Rukuzi, Uganda11 and Mabondo have not yet achieved successfully in broadcast despiting their various quality. In Burundi, 94.3% of the population depends on food agriculture, and rural development begins mainly with agriculture and livestock (MINAEGRIE, 2011). Potatoes are a cash flow in various regions, where it suits better.

The objectives of this study are to determine the level of priority given by farmer's from the basic business decisions of producers and the criteria that are effective in making these decisions using Analytic Hierarchy Process (AHP). The study aimed to develop a multi-criteria decision-making process and implement a decision support system for the agricultural sector. Certain criteria were used to determine whether Ndinamagara potatoes, Victoria potatoes and Ingabire potatoes one of them should be preferred as the first potato in production. These criteriaes are choosed according to the prices, yields, marketing, cost and sus-

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2. Material and Method

Mugamba natural region was the main object of our study because it is a region where potatoes are a staple crop. To carry out this work, secondary data were used. These data were for 2019-2020's production period. Secondary data were on different potato varieties. And among these varieties, Ingabire varieties, Ndinamagara varieties and Victoria varieties have been chosen to serve as our decision choices.

Life is guided by the decisions made, whether it's personal or professional. In man's life, world and history have always been full of lessons that help him to realize these critical moments. Those life lessons are learned in trying and using examples. Making a decision quickly can be detrimental, but also delaying on decision can also cause the loss of opportunities. The main thing is systematic and comprehensive approach to decision-making. Decision-making is based on improving the quality of life and achieving the goal of life (Saaty, 2001). There are six basics steps to follow in decisions-making process: (a) determination of the problem in question and the factors that have impacted, (b) determination of decision criteria and objectives, (c) formulate a model or a relation between the objectives and the decisions' variables, (d) identification and evaluation of alternative solutions, (e) choosing the best alternative and lastly (f) implementation of the decision (Heizer and Render, 2003). For this work, a literature review was carried out to realize a situation of potatoes crop.

In addition, publications and statistics of public institutions and organizations are related to the topics that were consulted. In this study, the AHP method, which is one of the methods of multicriteria in decisions-making and one of the modern methods of decision support, was examined. A purpose of choosing a method of the Analytical Hierarchical Process (AHP) as a subject of this study is to help the decisions-makers to solve many complex decisions problem. In AHP, hierarchy is created by determination of the main criteria and its own alternatives. In terms of the accuracy and reliability of establishing a model, it should be noted as the hierarchical structure best reflects for this model (Aslan, 2009). The AHP is based on individual comparisons of the factors affecting the decision importance values of the decision itself points of these factors on the decision hierarchy using a predefined comparison scale. The Standard Preference Table is a scale table consulting of odd numbers, where the even numbers between them are also used as intermediate values.

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Table 2. Comparison Scale of Pairwise Saaty

Intensity of importance	Explaination
1	Equal importance
3	Moderate importance
5	Strong importance
7	Very high importance
9	Extreme importance
2, 4, 6 and 8	İntermediate values

After determining the relative importance of the elements in the comparison matrices of the AHP method, the order comes to calculate the Consistency Ratio (CR) of judgments in each comparison matrix to measure whether of the decision-maker behaves consistently when comparing the elements of the hierarchy. The goal of implementation of this stage is to study the quality, accuracy, validity and reliability of the final decision has to be made (Saaty, 2000). The consistency index (CI) of the entire decision-making process and its hierarchy can also be calculated in AHP. This ratio also makes it possible to measure the consistency of the entire decision-making process. This measure, called the Consistency Ratio (CR) makes it possible to identify poor evaluations of decision-makers in comparisons. A consistency ratio of 0.10 (which is acceptable upper limit for the CR) roughly expresses that there is a 10% probability that the elements were compared completely randomly. If the CR is higher than 0.10, the decision-maker is advised to reconsider his comparison. This is due to the fact that some of the decision-maker's assessments are contradictory (Topel, 2006).

$$\text{Consistency index} = \frac{\lambda\text{max} - \text{n}}{\text{n} - 1}$$

$$\lambda\text{max} = \frac{\sum_{i=1}^{n} di}{\text{n}}$$

And

$$\text{Consistency Ratio} = \frac{\text{Consistency index}}{\text{Random index}}$$

As a result of the study conducted on more than a hundred samples at the Oak Ridge National Laboratory, the random index for matrices of dimensions 1 to 15 is given in Table 3 (Topel, 2006).

Table 3. The RI values according to the dimensions of the comparison matrices

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.53	1.56	1.57	1.59

After determining the values of CI and RI, the Consistency Ratio (Consistence Ratio-CR) was calculated using:

$$CR = \frac{CI}{RI}$$

With this equality, it is decided that the comparison matrix is consistent if the defined CR is less than 0.10.

3. Results

As can be seen in the hierarchical tree model in Figure 1, the goal is to create an appropriate production system taking into accounted to the following criteria: price, yield, marketing, cost and sustainability. The following potatoes varieties Ndinamagara, Victoria and Ingabire are the different alternatives of choice.

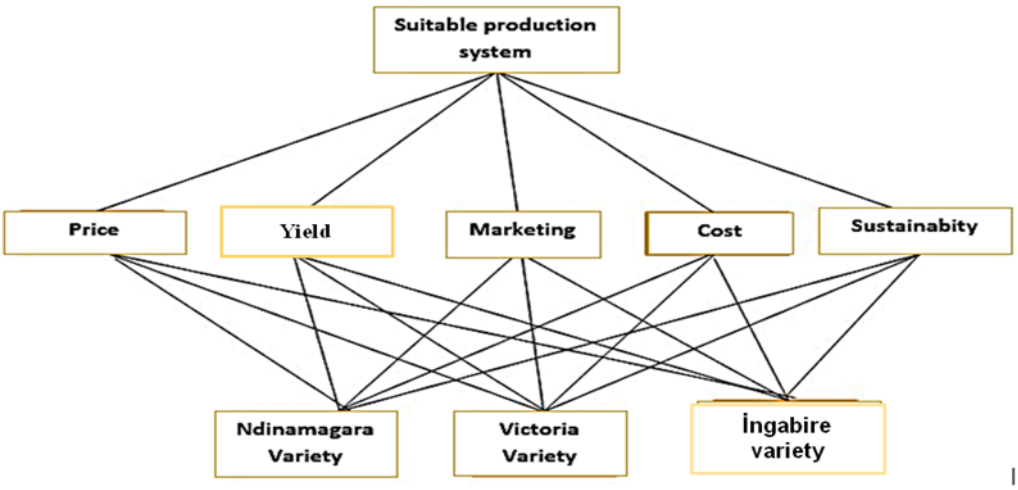

Figure 2. Hierarchical tree model

Table 4 illustrates matrix of comparing the criteria for choosing between them. The quotes are given by experts in the field or sometimes are drawn from surveys that had been made.

Table 4. Criteria comparison matrix

	Price	Yield	Marketing	Cost	Sustainability
Price	1	3	5	3	3
Yield	1/3	1	3	1/3	7
Marketing	1/5	1/3	1	1/5	1/3
Cost	1/3	3	5	1	5
Sustainability	1/3	1/7	3	1/5	1

Up to now, a matrix hasn't been reached by comparing the potatoes alternatives to be selected based on these criteria. Using the same method, it is also necessary to decipher the order of importance of the criteria among themselves. As in Table 5, the first matrix is constructed using the values of a normalized table.

Table 5. Comparisons of normalized factors

	Price	Yield	Marketing	Cost	Sustainability	Total	W (Weight)
Price	0,45	0,4012	0,2941	0,6338	0,1836	1,97	0,3935
Yield	0,15	0,1337	0,1764	0,0703	0,4285	0,96	0,1922
Marketing	0,09	0,0445	0,0588	0,0422	0,0203	0,26	0,0513
Cost	0,15	0,4012	0,2941	0,2112	0,3061	1,36	0,2728
Sustainability	0,15	0,0191	0,1764	0,0422	0,0612	0,45	0,0901

$\lambda max = ((1,97/ 0,3935)+(0,96/ 0,1922)+(0,26/ 0,0513)+(1,36/ 0,2728)+ (0,45/ 0,0901))/5 = 5,0081 = 5,01$

$CI = (\lambda max – n)/(n-1) = CI = (5,01-5)/(5-1) = 0,01/ 4=0,002$

RI = Rendom index =1, 12 and Consistency Ratio (CR) = CI/RI = 0,002/ 1,12 =0,002.

The most important value that should be paid attention to is the consistency ratio. The consistency ratio should be less than 0.10. The CR of the criteria turned out to be 0.002 in the comparison matrix. Since this ratio is less than 0.10, it was decided that the criteria comparison matrix is consistent. Analyzing the weight of the criteria, the price criterion is clearly the first in this choice of potatoes, and then the cost and yield follow as summarized in Table 6.

Table 6. Values of the weights of the criteria

Criteria	W (Weight)
Price	0,3935
Yield	0,1921
Marketing	0,0513
Cost	0,2728
Sustainability	0,0901

Table 6 shows the comparison of alternatives according to the price criterion and their priority points as well as their weights.

Table 6. Normalized price comparison matrix

	Ndinamagara variety	Victoria variety	Ingabire varie-ty	Total	W
Ndinamagara variety	0,2381	0,2172	0,25	0,7052	0,2351
Victoria variety	0,7142	0,6523	0,625	1,9916	0,6638
Kirundo variety	0,0476	0,1304	0,125	0,3031	0,1011

In order to determine the consistency of the triple comparison matrix of alternatives according to the price criterion, the relative weight of the matrix (λmax) must first be calculated.

λmax = ((0,7052/ 0,2351)+(1,9916/ 0,6638)+(0,3031/ 0,1011))/3 = 3,00008.

CI = (λmax – n)/(n-1) = CI = (3-3)/(3-1) = 0

RI = Random index =0,58

Consistency ratio (CR) = CI/RI = 0/ 0,58 =0.

Since the consistency ratio (CR) is less than 0.1, the triple comparison matrix of alternatives according to the price criterion consistent. For the price criterion, Victoria potatoes were considered more important than others. Victoria variety has a priority weight of 66.4%. Since the consistency ratio is less than 0.10, the matrix turned out to be consistent.After the price criteria, the triple comparison matrix on the yield criterion is given in the triple comparison matrix table 7.

Table 7. Normalized yield comparison matrix

	Ndinamagara variety	Victoria variety	Ingabire variety	Total	W
Ndinamagara variety	0,5455	0,3333	0,625	1,5038	0,5012
Victoria variety	0,1816	0,1111	0,0625	0,3552	0,1184
Kirundo variety	0,2727	0,5555	0,3125	1,1408	0,3802

$\lambda max = ((1,5038/ 0, 5012)+(0,3552/ 0,1184)+(1,1408/ 0,3802))/3 = 3.$

$CI = (\lambda max – n)/(n-1) = CI = (3-3)/(3-1) = 0/2=0$

$RI=0,58$ and the $CR = CI/RI = 0/ 0,58 = 0.$

In table 7, the comparison of alternatives according to the yield criterion and their priority weights are presented. For the yield criterion, Ndinamagara potatoes had a weight of 50.1%, the consistency ratio was less than 0.10 and then matrix turned out to be consistent. Table 8 clarifies the triple comparison matrix based on marketing criteria.

Table 8. Normalized marketing comparison matrix

	Ndinamagara variety	Victoria variety	Ingabire variety	Total	W
Ndinamagara variety	0,6523	0,4545	0,7142	1,8211	0,6071
Victoria variety	0,1304	0,0911	0,0476	0,2689	0,0896
Kirundo variety	0,2172	0,4545	0,2381	0,9098	0,3032

$\lambda max = ((1,8211/ 0, 6071)+(0,2689/ 0,0896)+(0, 9098/ 0, 3032))/3 = 2,99 =3.$

$CI = (\lambda max – n)/(n-1) = CI = (3-3)/(3-1) = 0/2=0$

$RI =0,58$ and $CR = CI/RI = 0/ 0,58 =0.$

Regarding marketing, Ndinamagara variety has a weight of 60.7%. The consistency ratio was less than 0.10, the matrix turned out to be consistent. Table 9 and 10 respectively shows that the triple comparison of potatoes varieties based on their cost and sustainability criteria.

Table 9. Normalized cost comparison matrix

	Ndinamagara variety	Victoria variety	Ingabire variety	Total	W
Ndinamagara variety	0,1111	0,1463	0,0454	0,3028	0,1009
Victoria variety	0,5555	0,7315	0,8182	2,1053	0,7017
Ingabire variety	0,3333	0,1221	0,1363	0,5918	0,1972

$\lambda max = ((0,3028/ 0, 1009)+(2,1053/ 0,7017)+(0, 5918 / 0, 1972))/3 = 2,9999=3$

$CI = (\lambda max – n)/(n-1) = CI = (3-3)/(3-1) = 0/2=0$

$RI = 0,58$, $CR = CI/RI = 0/ 0,58 = 0.$

For the cost criterion, Victoria variety potatoes had a weight of 70.2% points. The consistency ratio was observed and matrix was found to be consistent.

Table 10. Normalized sustainability comparison matrix

	Ndinamagara	Victoria	Ingabire	Total	W
Ndinamagara variety	0,7974	0,6923	0,8401	2,3297	0,7765
Victoria variety	0,0881	0,0769	0,0399	0,2054	0,0684
Ingabire variety	0,1142	0,2307	0,1200	0,4648	0,1549

$\lambda max = ((2, 3297/ 0, 7765)+(0,2054/ 0,0684)+(0, 4648/ 0, 1549))/3 = 3,00001=3$

$CI = (\lambda max – n)/(n-1) = CI = (3-3)/(3-1) = 0/2=0$; $RI = 0,58$ and the CR was 0.

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According to the sustainability criterion, Ndinamagara potatoes had been turned out as the more important and had a weight of 77.6%. Consistency ratio was 0.10.

In determining the appropriate production system using the AHP method was established. First a comparison of the criteria was carried out, then a comparison of the alternatives according to each criterion. According to the criteria and the relative importance values of the alternatives were obtained by combining the relative importance values of the alternatives and the relative importance values of the criteria. The relative importance values of the alternatives are multiplied by the corresponding weight in the relative importance values of the criteria and the sum of the row in which they are located was taken. Thus, the weight of the alternatives breaks down among themselves. The relative importance values of the alternatives are given in Table 11.

Table11. Multiplication of matrices

Alternatives	Price	Yield	Marketing	Cost	Sustainability
Ndinamagara variety	0,2351	0,5012	0,6071	0,1009	0,7765
Victoria variety	0,6638	0,1184	0,0896	0,7017	0,0684
Ingabire variety	0,1011	0,3802	0,3032	0,1972	0,1549

X

Criteria	W (Weight)
Price	0,3935
Yield	0,1921
Marketing	0,0513
Cost	0,2728
Sustainability	0,0901

The last calculation that has been performed will be to add up the row where each alternative is located in the matrix of alternatives by multiplying their values.

Ndinamagaravariety : (0,2351*0,3935)+(0,5012*0,1921)+(0,6071*0,0513)+ (0,1009*0,2728) + (0,7765*0,0901) = **0,3175**

Victoria variety : (0,6638 *0,3935)+(0, 1184*0,1921)+(0, 0896*0,0513)+ (0, 7017*0,2728)+ (0, 0684*0,0901) =**0,4862**

Kirundo variety : (0, 1011*0,3935)+(0, 3802*0,1921)+(0, 3032*0,0513)+(0, 197289*0,272849) + (0, 154936*0,090103) = **0,1962**

Table 12 gives the final result on the potato type, which was decided using the AHP method.

Table 12. Selected potatoes

Alternatifves	Points	
Ndinamagara variety	0,3175	31,75%
Victoria variety	**0,4862**	**48,63%**
Kirundo variety	0,1961	19,62%
Total	1	100,00%

In the final decision, Victoria variety potatoes were the first decided with a rate of 48.6%, in second place comes Ndinamagara variety (0.318) and Ingabire potato (0.196) was determined to have a lower weight than other varieties. Given in this example, the Victoria potatoes were decidedas a suitable variety for the potatoes growing system in Burundi. This research with the AHP method for variety decision is the first study done in this Mugamba region.

4. Conclusion

The AHP method of multi-criteria decision-making was provided as being important in this study. It clarifies the potato variety that can meet the different criteria and finally become the appropriate production system in Burundi. In this work, it was shown that the appropriate production system for potatoes growers is Victoria variety. The other potatoes varieties proved to be more important either in terms of price, yield, marketing and sustainability criteria. For properly conducting a good agricultural practice that can satisfy all the criteria in making crop choices, it is recommended to resort to the AHP method. Therefore, producers should be oriented towards the production of Victoria variety, and incentives and supports should be provided to producers to strengthen their decision-making process. In order to transfer resources to the future generations in a most efficient way, efforts should be focused informing producers about the conscious use of inputs.

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Analysis of Milk Production and Trade in Iraq

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Abstract

Analysis of Milk Production and Trade in Iraq

Dairy farming plays an important role in rural economies, not only creating new jobs for rural landless and marginal farm laborers, but also contributing to the national economy. This sector also contributes to rural poverty reduction and inequity, while providing nutritional assistance to thousands of rural households. The production and trade of milk and dairy products have been increasing throughout the world due to their importance to human health and nutrition. The aim of this research is to analyze the production and trade of Iraqi milk and dairy products. For this purpose, the FAOSTAT dataset was used. World milk production was 886.86 million tons in 2020, and it is expected to increase by 2025. The most significant milk producers are India (21.74%) and the United States of America (11.42%), followed by Pakistan, China, Brazil and Germany. According to FAO data, the total number of dairy animals in Iraq increased by 16.2% in 2020 (12.4 million heads) compared to 2010 (10.4 million heads). Iraq's dairy market is heavily reliant on imports, as the country's domestic manufacturers can only meet less than 10% of domestic demand. However, the country is also among the top ten milk importers in the Middle East. The countries from which Iraq imports milk and dairy products have changed over the years due to political problems. For example, while the rate of milk imports from Türkiye varies between 7% and 20%, it is between 0% and 85% for Kuwait.

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1. Introduction

Dairy farming remains the economic backbone of high-potential livestock farming. It is estimated that there are approximately 250 million dairy cows in the world. More than 70% of all herds can be found in developing countries. However, non-industrial countries account for only 30% of total world milk production. More than one-fourth of the 570 million farm-holdings around the world keep at least one dairy animal, including buffaloes, camels, cows, sheep, and goats. There are estimated to be 202.4 million buffalo, 38.1 million camel, 1.51 billion holdings keeping dairy cattle, and sheep and goats with 1.1 and 1.2 billion heads respectively (FAOSTAT, 2022).

The world dairy industry is one of the most fiercely protected in the agro-food sector. Exports of milk products are dominated by the EU, the US, New Zealand, and Australia. The European Union, the United States, Mexico, Japan, Russia, and a number of other countries are major importers of dairy products (Meilke et al., 2001). The average global per capita milk and milk product consumption for 2009 was 103 kg. The average level of consumption in developed countries is 245 kg while it is only 66.2 kg in developing countries. Changes based on consumption patterns in different countries are mainly influenced by changes in per capita income, production, and urbanization (Blasko, 2011).

The Iraqi people depend heavily on milk and other livestock-based products in their regular diet. Due to the insufficient production of milk and dairy products, a significant part of the demand is imported from other countries. Total milk imports into Iraq are mainly from the Gulf States and Türkiye. As a result, the government has identified this drain of foreign exchange resources that flow out of the country and, as a relief measure, various policies have been implemented to regulate the dairy sector towards development, especially to increase domestic production (Abid-Al et al., 2017).

The general purpose of this article is to analyze the production, consumption and trade, as well as predict the quantity of Iraqi milk production.

2. Material and Method

The data about milk production and number of dairy animals between 1990 and 2020 were taken from FAOSTAT. Self-sufficiency rate (SSR) data were calculated using production, imports, and exports data from FAO based on the formula below.

SSR=Production*100/(Production+Imports - exports)

This study represents the first use of ARIMA models to evaluate global milk production, Iraqi milk production, cow milk production and the number of cattle in Iraq.

The main objective of time series analysis is the prediction of future values to determine the production of milk in Iraq during the period 2020–2025. Gretel was used to analyze the data.

It is popularly known as Box – Jenkins (BJ) Methodology. Autoregressive Integrated Moving Average Models were used in many studies (Kazemipour et al., 2017).

The general form of the ARIMA (p,d,q) is;

$$Yt = \phi 1Yt-1 + \phi 2Yt-2 \ldots \phi pYt-p + \epsilon t + \theta 1\epsilon t-1 + \theta 2\epsilon t-2 + \ldots \theta q\epsilon t-q$$

3. Results and Discussion

3.1 Milk Production in the World

World milk production increased by 23.75% in 2020 compared to 2010 and amounted to 886.86 million tons. Cow milk constitutes a large part of the total milk produced (80.96%), followed by buffalo milk (15.16%) and goat milk (2.33%). According to FAO data, 134.42 million tons of buffalo milk, 3.14 million tons of camel milk, 718.03 million tons of cow milk, 20.62 million tons of goat milk, and 10.61 million tons of sheep milk were produced in

Compared to 2010, the production of buffalo, goat, cow, camel and sheep milk production increased 45.33%, 28.75%, 20.49%, 15.14%, and 11.75% respectively (Table 1). The recovery and restocking period of 2010 to 2020 clearly indicates the rapid growth potential of cow herds relative to goat, sheep, buffalo, and camel; whereas the 2010 to 2020 period represents more normal long-term herd growth rates (Table 2).

Table 1. World milk production between 2010 and 2020 (tons).

Year	Milk whole fresh buffalo	Milk whole fresh camel	Milk whole fresh cow	Milk whole fresh goat	Milk whole fresh sheep	Total quantity
2010	92496372	2735822	595914598	16022588	9502049	716671429
2011	96114627	2678655	610118596	16556201	9464811	734932890
2012	99041124	2687714	629936935	18352509	9823579	759841861
2013	108448781	2825944	638443326	18438052	9881280	778037383
2014	114053395	2587351	659273388	18542383	9991480	804447997
2015	116025086	2763634	665306500	18771105	10057331	812923656
2016	120160488	2745259	669710681	19421038	10205743	822243209
2017	126117810	2970244	683209298	20136103	10485847	842919302
2018	132444138	2871985	700216426	20453075	10364548	866350172
2019	134791772	3087052	708264265	20066359	10617961	876827409
2020	134425197	3149997	718038443	20629610	10618551	886861798
Change (%) (2010-2020)	45.33	15.14	20.49	28.75	11.75	23.75

Table 2. Number of dairy animals in the world (Head).

Year	Buffalo	Camel	Cow	Goat	Sheep	Total
2010	194034343	25048490	1369822223	874457191	1046140329	3315468233
2011	195181279	25463726	1374454720	901517441	1065359028	3366794915
2012	196409774	30468768	1427257421	951405119	1132940091	3542071399
2013	196776730	31311625	1431886790	969908079	1157187874	3590294368
2014	198288978	32124803	1439387463	984372329	1151093273	3606977868
2015	199650185	32981414	1451963866	1004730745	1182177688	3671853713
2016	200904517	33866555	1470385681	1029023580	1197723570	3730999386
2017	201282401	34971120	1477057966	1045350517	1206686523	3764066126
2018	202813970	35871027	1493931621	1066922560	1213972478	3810697686
2019	202454780	38156315	1511107043	1108972959	1240310138	3898546455
2020	203532944	38654378	1525939479	1128106236	1263136644	3955836737
Change(%) (2010-20)	4.90	54.32	11.40	29.01	20.74	19.31

Major dairy producing countries are India, the USA, Pakistan, Brazil, China, Russia, Germany, France, New Zealand, and Türkiye (Table 3). Examining world milk production in 2020, it is seen that India has achieved 21.74% of total production with 183.95 million tons. Pakistan follows with 101.27 million tons, and the United States with 60.77 million tons. Fifteen countries now contribute to 70% of the overall global milk supply. Iraq has reached 0.05% of total milk production with 404,246 tons.

Table 3. Top 15 largest milk producing countries in the world in 2020 (tons).

Country	Quantity	Percent (%)
India	183955490	21.74
United States of America	101276991	11.42
Pakistan	60770000	6.85
China	38769118	4.37
Brazil	36806788	4.15
Germany	33188890	3.74
Russian Federation	32219165	3.63
France	26152110	2.95
New Zealand	21871305	2.47
Türkiye	21839351	2.46
Great Britain	15558000	1.75
Netherlands	14932000	1.68
Poland	14830870	1.67
Italy	13509520	1.52
Mexico	12783734	1.44
Other	258398466	29.14
Total	886861798	100.00

Source: FAOSTAT, 2022.

3.2 Milk Production, Consumption and Trade in Iraq

Livestock production in Iraq mainly consists of cattle, sheep and goats. Buffalo and camel breeding is done on a limited scale. According to FAO data, the total number of dairy animals in Iraq decreased by 2.02 million heads in 2020 compared to 2010. Sheep comprised 64% of the total number of livestock, followed by cows and goats (Table 4). The number of buffalo, cows, goats, and sheep decreased by 20.86%, 23.18%, 10.97%, and 15.37% respectively. These figures demonstrate that the number of dairy cows is not significant for milk production. This situation could be attributed to unsuccessful dairy investment policies.

Table 4. Total number of milking animals in Iraq (Head).

Year	Buffalo	Camel	Cow	Goat	Sheep	Total
2010	295000	60000	2629000	1519000	7945000	12448000
2011	302000	62000	2707000	1565000	8183000	12819000
2012	312000	65000	2720000	1612000	8200000	12909000
2013	180662	57489	2780000	1195675	6515825	10729651
2014	187401	68000	2900000	1216898	6545146	10917445
2015	194391	67048	1823184	1238498	6574599	9897720
2016	201642	72408	1860887	1260481	6604185	9999603
2017	209163	78196	1899370	1282856	6633904	10103489
2018	216965	84447	1938649	1305627	6663757	10209445
2019	225058	91198	1978740	1328802	6693744	10317542
2020	233453	98488	2019660	1352388	6723866	10427855
Change (%) (2010-2020)	-20.86	64.15	-23.18	-10.97	-15.37	-16.23

Source: FAOSTAT, 2022.

Table 5. Milk production quantity (thousand tons) by animal species and average yield (kg/head) per dairy animal in Iraq

Year	Buffalo		Camel		Cow		Goat		Sheep	
	Quantity	Yield	Quantity	Yield	Quantity	Yield	Quantity	Yield	Quantity	Yield
2010	60454	7881	165	471	226000	6384	19497	248	66158	177
2011	27206	3478	176	500	233000	6401	18769	220	55783	145
2012	63220	7867	180	500	234900	6401	20000	234	67568	175
2013	41386	8030	170	459	238000	6485	18000	212	58402	186
2014	30716	5782	215	202	235000	6369	17007	263	56527	179
2015	31593	5769	235	223	263323	6926	17203	262	56775	179
2016	33348	5908	255	537	267727	6921	17402	260	57050	179
2017	33348	5731	274	537	272205	6916	20887	307	57297	179
2018	35103	5853	294	432	276758	6911	21224	307	57545	179
2019	35981	6718	333	600	281387	6906	21609	308	57821	179
2020	37737	7027	353	607	286093	6901	21994	309	58069	179
Change (%) (2010-2020)	-37.58	-10.84	113.94	28.87	26.59	8.10	12.81	24.60	-12.23	1.13

Source: FAOSTAT, 2022.

Table 5 refers to the quantity of milk produced and the average yield per animal in Iraq between 2010 and 2020. In 2010, buffalo milk production was 60,454 tons and decreased to 37,737 tons in 2020. Camel milk production was 353 tons in 2020, cow milk production was 286,093 tons, goat milk production was 21,994 tons, and sheep milk production was 58,069 tons.

Although the number of milk cows has decreased by 23.18% in the last 10 years, cow milk production has increased by around 26.59%. Approximately 85% of milk cows in Iraq are local breeds with very low milk yield, and the rest consist of hybrid breeds. The main local cattle breeds are Sharabie and Junobie (FAO. 2022a).

The milk yield per cow increased from 6,384 kg in 2010 to 6,926 kg in 2015 and decreased to 6,901 kg in 2020. When the yields per animal of buffalo, camel, goat, and sheep were examined, they were found to be lower.

Iraq is uniquely positioned to harness the potential of its younger generation to promote prosperity, despite the multiple challenges it faces (Mahmud, 2021). The demand for dairy products is expected to grow, with support plans by large international organizations. The average per capita consumption of dairy products is expected to rise from 52 liters to more than 60 liters (FAO, 2022b).

Table 6. Consumption of cow milk in Iraq between 2015 and 2020.

Year	Production (Tons)	Imports (Tons)	Consumption (Tons)	Self-sufficiency (%)
2015	263323	67779	331102	79.53
2016	267727	76124	343851	77.86
2017	272205	65000	337205	80.72
2018	276758	51380	328138	84.34
2019	281387	55000	336399	83.65
2020	286093	34856	320973	89.15

Source: FAOSTAT, 2022

Dairy production has ceased, and the vast majority of dairy products consumed in Iraq are imported. Imports include fresh and powdered milk, cheese, and yogurt. Türkiye Iran, and Saudi Arabia, as well as several European countries have also reportedly made investments in dairy infrastructure, including the largest dairy processing factory in the country. Cross-border smuggling also distorts the market, and the lack of enforcement undermines the effectiveness of governmental import controls. In addition, neighboring countries strategically support the export of their products to the Iraqi market as a way of gaining foreign currency.

Consumption of milk and dairy products has been increasing in recent years in all countries. In Iraq, the decrease in demand has led to a decrease in imports of whole fresh cows. In terms of volume, Iraq's imports of whole fresh cows changed from 67,779 tons in 2015 to 34,856 tons in 2020 (Table 7). However, Iraqi imports of dairy products traditionally consist of butter and cow milk. Buttermilk Cheese, processed cheese, whole cow milk cream, fresh milk, natural constituents milk products, skimmed cow milk, skimmed dried milk, whole condensed milk, whole dried milk, whole evaporated milk, whole fresh cow milk, whey, dry yogurt, concentrated or not. Iraq is also among the top ten milk importers in the Middle East. Belgium, Canada, Denmark, Egypt, France, Germany, United Kingdom, Uruguay, India, Indonesia, Ireland, Italy, Jordan, Malaysia, Netherlands, Poland, Spain, Sweden, Switzerland, Iran, Türkiye, Saudi Arabia, Kuwait and, United Arab Emirates are among the countries that export dairy products to Iraq.

The countries from which Iraq imports milk and dairy products have changed over the years due to political problems. For example, while the rate of milk imports from Türkiye varies between 7% and 20%, it is between 0% and 85% for Kuwait (Table 7).

Table 7. Iraq's dairy milk import quantity by country (tons).

Countries	2015	2016	2017	2018	2019	2020
Kuwait	57644	56760	164	40389	0	21802
Türkiye	4607	5943	6080	5368	6136	6845
Saudi Arabia	4427	48	212	477	46	5317
Un. Arab Emirate	901	1437	11748	4835	2144	672
Germany	91	575	673	108	77	32
France	25	96	112	33	4	32
Netherland	15	47	94	43	335	46
Other	69	11218	45917	127	46258	110
Total	67779	76124	65000	51380	55000	34856

Source: FAOSTAT, 2022.

3.3. Applying the ARIMA Model to Forecast Global and Iraqi Milk Production

The ARIMA model was used to forecast global milk production, Iraqi milk production, cow milk production in Iraq and number of cattle in Iraq. The main problem in the ARIMA modeling technique is how to choose the most appropriate values for p, d, and q. To meet the study objectives, different ARIMA models were tried, and the best model for forecasting each variable was as below:

The ARIMA (2,1,0) model was selected as the most suitable for predicting global milk production. Figure 1 shows total production of 944.26 million tons is expected in 2025.

ARIMA (1,0,0) was chosen as the best model for milk production in Iraq. Figure 2 shows that Iraqi milk production in 2025 is forecast to decrease by 7.48%.

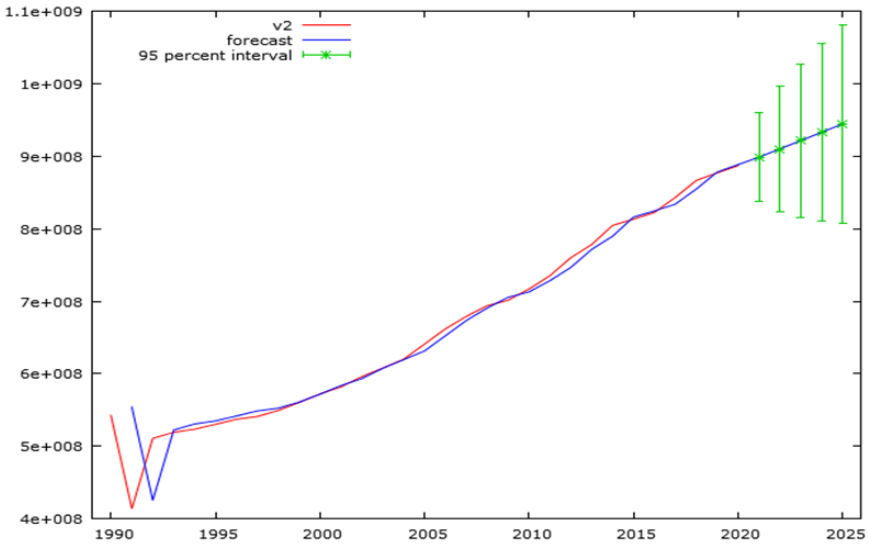

Figure 1. Long-term trends in global total milk production.

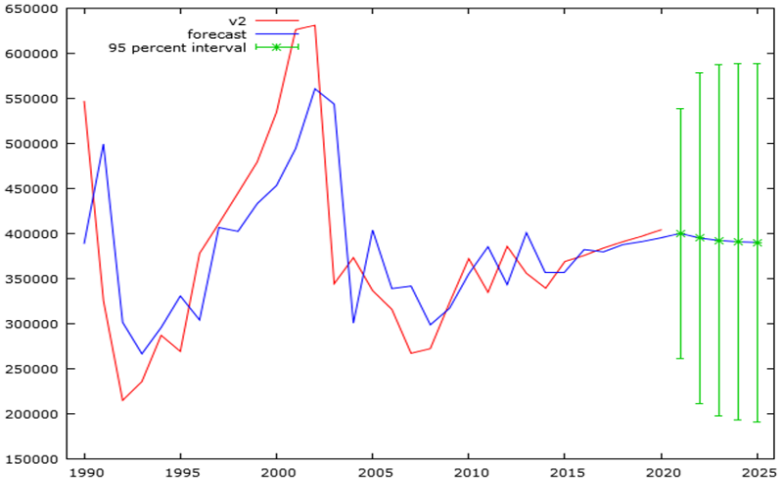

Figure 2. Long-term trends in Iraqi milk production.

The results showed that the most suitable model for cow milk production in Iraq was ARIMA (1,0,0). The average milk production from cows for 2025 is estimated to be 245,655 tons, as can be seen in Figure 3.

In addition, ARIMA (0,0,1) was selected as the most suitable model for the number of cattle in Iraq. Figure 4 shows the number of cattle will decrease by 10.30% to 1,811,613 head.

Figure 3. Long-term trends in Iraqi cow milk production.

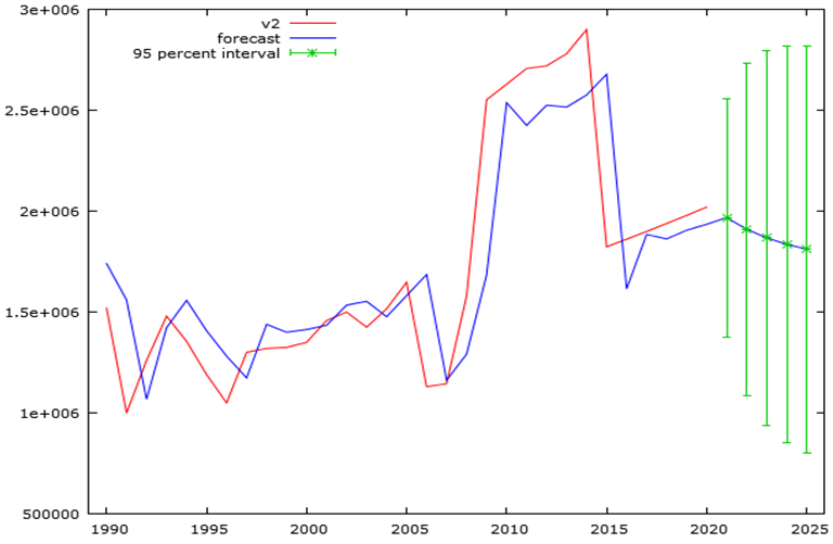

Figure 4. Long-term trends in number of cattle in Iraq.

4. Conclusion and Recommendations

Milk has been one of the most important basic foods for thousands of years, and it will be an integral part of healthy human consumption in the future as well (Vasylieva, 2017). After the economic crisis of 2009, the dairy sector is showing signs of improvement for the future (Berry, 2009). This study also supports this positive trend and predicts further development of the dairy sector in developing countries, mainly in Middle East.

According to the results, global milk production will increase by 6.47% in 2025. Around 44% of this will be produced by India, China, the United States of America, and Pakistan.

Generally, Iraq has faced many challenges that have had a direct impact on all sectors of the country's economy. These include weak institutions, insecurity, corruption, deterioration of basic services and social indicators such as education and health, as well as widespread unemployment (Woertz, 2017). The problems confronting the agricultural sector are inextricably linked to the larger picture. Furthermore, the sector's low efficiency and growth rates can be attributed to a variety of issues and government policies.

In Iraq, it is expected that milk production, which was 404,246 thousand tons in 2020, will decrease by 7.48% in 2025 if the number of dairy animals and the trend of milk yield don’t change.

Addressing these factors only on paper will not increase dairy productivity until these factors are reduced through appropriate policies. To improve the economic viability of dairy farming communities, it is critical to create opportunities for international companies to collaborate on projects such as dairy in Iraq.

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ÇİN HALK CUMHURİYETİNDE TARIMSAL ÜRETİMİN GELİŞİMİ

IMPROVEMENT OF AGRICULTURAL PRODUCTION IN THE PEOPLE'S REPUBLIC OF CHINA

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Özet

ÇİN HALK CUMHURİYETİNDE TARIMSAL ÜRETİMİN GELİŞİMİ

Ülkelerin ve toplumların kalkınmasında mühim rol oynayan tarım sektörünün önemi, küreselleşen ekonomik sistem, artan rekabet ortamları ve hızla değişen pazar şartlarının da etkisiyle giderek artmaktadır. Çin Halk Cumhuriyeti, sahip olduğu nüfusu, doğal kaynaklar ve nüfusun beslenmesinde gerçekleştirilen tarımsal üretim büyüklüğü ile Dünyada lider konumdadır. Bu çalışmada Çin Halk Cumhuriyeti'nin tarımsal üretimindeki gelişimlerle ilgili bilgilere yer verilmiş, elde edilen sonuçlar ışığında tarımsal üretimin ve ekonomik büyümenin sürdürülebilir şekilde devam etmesi için öneriler sunulmuştur. Çalışmada Çin Halk Cumhuriyeti Devlet İstatistik Kurumundan elde edilen ikincil veriler kullanılmıştır.

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Abstract

IMPROVEMENT OF AGRICULTURAL PRODUCTION IN THE PEOPLE'S REPUBLIC OF CHINA

The importance of the agricultural sector, which plays an important role in the progress of countries and societies, is increasing due to the globalized economic system, increasing competitive environments, and rapidly changing market conditions. The People's Republic of China has distinct importance in terms of its dense population, streams, and ecological diversity, both in terms of vegetables, animals, and aquaculture. In this study, general information about the progress in agricultural production of the People's Republic of China was given and proposals were presented considering the results obtained from the literature for the sustainable continuation of agricultural production and economic growth. The secondary data obtained from the State Statistics Institute of the People's Republic of China is the secondary source in the study.

1.Giriş

Tarım, insanların temel gereksinimlerini karşılamak amacıyla doğa kaynaklarını kullanıp işleyerek yaptıkları ekonomik faaliyetlerdir (TÇVY.1997). Tarım, ekonomik bir faaliyet olmasının yanı sıra aynı zamanda sosyal, bölgesel, kültürel, ekolojik ve sağlığın korunması konusunda büyük önem taşıyan toplumsal bir süreçtir (TÜİK.2008). Tarım sektörü, tarımsal üretim yapmanın yanı sıra diğer sektörlere de katkı sağlaması açısından büyük önem taşımaktadır. İnsanların en önemli temel gereksinmelerinin karşılanmasını sağlayan tarım sektörü, her ülke için vazgeçilmez ve uzun vadeli planlarında önemle yer verdiği bir sektördür (Kaya ve Aktan.2011**).** Bu sektör, Çin ekonomisinde temel sektör halindedir.

01 Ekim 1949 yılında kurulan, 9 milyon 598 bin km² yüzölçüme sahip Çin Halk Cumhuriyeti 23 eyalet, beş özerk bölge, dört doğrudan yönetilen şehir ve iki özel idari bölgeye egemendir. Ülke sınırları, Moğolistan, Rusya, Kuzey Kore, Vietnam, Laos, Birmanya, Hindistan, Bhutan ve Nepal, Pakistan, Afganistan, Tacikistan, Kırgızistan ve Kazakistan ile çevrilidir (Anonim. 2022a). Günümüzde yaklaşık 1,4 milyar nüfusu ile dünya nüfusunun %18,5'ni oluşturmaktadır. Son yıllarda göstermiş olduğu ekonomik büyüme ile bütün dünya ülkelerinin ilgiyle izlediği ve sıkça hakkında konuştuğu bir ülke konumundadır. 2021 yılı Çin doğal nüfus artış hızı %0,4, doğum oranı % 7,5, ölüm oranı da %7,12'dir. Ekonomik açıdan, dış ticaret fazlası ise 524 milyar doları bulmuştur (Halike ve Direk. 2022). Tarımsal GSYİH'nin genel GSYİH içerisindeki payı %7,3'tür. Bu oranın diğer sektörle kıyasla az olmasının nedeni diğer sektörlerin GSYİH artışının tarım sektörünün GSYİH'daki artışından daha yüksek oranda gerçekleşmesidir.

Tarımsal üretim ve gelişim göstergeleri, ülke nüfusunun yaşamını sürdürebilmesi, milli gelire ve istihdama katkısı, diğer sektörlere hammadde ve sermaye sağlaması, ihracata doğrudan ve dolaylı olarak etkisi ve biyolojik çeşitlilik ile ekolojik dengeye olan katkısı nedeniyle tüm dünyada vazgeçilmez bir sektör niteliğindedir. Bu nedenle tarım sektörü, ekonomik, sosyal ve çevresel boyutlarıyla, toplumun bütün kesimlerini yakından ilgilendirmektedir (Doğan ve Ark. 2015).

Bu çalışmanın temel amacı Çin Halk Cumhuriyeti'nin 2011-2020 yılları arasında tarımsal üretimdeki değişimini tespit ederek, tarımsal üretimin mevcut durumunu ve ekonomideki yerini ortaya koymak, elde edilen sonuçlar ışığında geleceğe yönelik çözüm önerileri sunabilmektir. Çalışmada Çin Halk Cumhuriyeti Devlet İstatistik Kurumundan elde edilen ikincil veriler kullanılmıştır (Çin'de 1 Dönüm=666.67m², 1 Hektar=15 dönüm, 1$=6.36¥, 1¥=0.1575$, ¥=yuan, $=dolar).

2. Araştırma ve Bulgular

Çin'in tarımsal üretim yapısı: bitkisel üretim, ormancılık, hayvancılık, balıkçılık ve yardımcı sanayiyi kapsamaktadır. Çin topraklarının %54,7'si tarım arazisidir, (ekilebilir arazi %12,9 ve kalıcı otlak %41,8) orman arazisi %22,3'tür (Anonim. 2022b). Tarım alanları hali hazırda çiftçilere 30 yıla kadar uzatılabilen kiralama anlaşmalarıyla kiralayan köy topluluklarına aittir. Bu yarı-özelleştirme sonucu hem üretkenlikte hem de üretimde ciddi bir tarımsal üretim patlaması meydana gelmiştir.

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2.1. Bitkisel Üretim

Devlet ekonomisini dünya'ya açmaya ve reforme etmeye başladığı 1978 yılından bu yana, ülkenin gayri safi mili hâsılası her yıl neredeyse %10 oranında artmıştır. Bununla birlikte ekonomik değer bakımından en çok tarım ürünü ithal eden ikinci ülke konumundadır. Çeltik, buğday, patates, darı, arpa, yer fıstığı, elma, pamuk, yağlı tohumlar, çay, balık gibi birçok tarım ürününde dünyanın önde gelen üreticilerindendir (Anonim.2022c). Hayvancılık ve su ürünleri yetiştiriciliği de Çin ekonomisinin önemli bir bölümünü oluşturmaktadır.

Çin Halk Cumhuriyeti'nde geçmişte uygulanan feodal tarım sistemi nüfusu besleyememiştir. Böylece geri kalan tarımsal üretim yetersizliği sonucu açlık ve yoksulluk kırsal alanda ciddi bir sorun olmuştur. Ancak devrimden sonra değiştirilen politikalar sonucunda tarımsal üretim ciddi oranda artmış, nüfusu besleyebilecek duruma gelmiştir. Birçok üründe kendi kendine yetebilecek duruma gelmekle birlikte, nüfusu besleyebilmek için ciddi oranda da tarım ürünü ithal eder bir ülke konumundadır. Bitkisel ürünler (tarla ve bahçe bitkileri) çeşitleri Tablo 1'de verilmiştir. Araştırmanın bu bölümünde, başlıca bitkisel ürün çeşitleri, üretim alanı, yıllık üretim miktarı ve kişi başına düsen miktarı (kg) verilmiştir.

Tablo 1. Tarım ürünlerinin ekim alanı (1000 /hektar)

Yıl	Toplam Ekim Alanı	Hububat	Baklagiller	Yağ Bitkileri	Şeker*	Pamuk	Sebze	Diğer
2011	160,360	94,615	10,367	13,471	1,834	4,523	17,909	17,641
2012	162,071	97,142	9,405	13,434	1,886	4,359	18,496	17,349
2013	163,702	99,287	8,892	13,437	1,844	4,162	18,836	17,244
2014	165,183	101,086	8,823	13,394	1,737	4,176	19,224	16,743
2015	166,829	103,225	8,432	13,314	1,572	3,774	19,613	16,899
2016	166,939	102,701	9,287	13,191	1,555	3,198	19,553	17,454
2017	166,332	100,764	10,051	13,223	1,545	3,194	19,981	17,574

(Ekim alanı tarla bitkileri, endüstriyel bitkileri ve bahçe bitkileri olarak verilmiştir)
*Çin'de hem şekerpancarından hem de şeker kamışından şeker elde edilmektedir.
Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

Tablo 1'de görüldüğü gibi yıllar itibariyle artış gösteren toplam ekim alanı 10 yıl içinde 7 milyon 127 bin hektar artış kaydederek 2020 yılında 167 milyon 487 bin hektar olmuştur. 2020 yılında tahıl ekim alanı bir önceki yıla göre 117 bin hektar artarak 97,96 milyon hektar, baklagiller ekim alanı ise 519 bin hektar artarak 11,59 milyon hektar olmuştur. Pamuk ekim alanı 171 bin hektar azalarak 3,17 milyon hektar, yağ bitkileri ekim alanı 204 bin hektarlık artışla 13,13 milyon hektar, şeker (şeker pancarı ile şeker kamışı) ekim alanı 42 bin hektar azalarak 1,57 milyon hektar olmuştur. Sürekli artış gösteren sebze alanı ise 21,49 milyon hektara ulaşmıştır. Diğer ürünler ekim alanında da artış görülmekte olup 2011 yılında 17,64 milyon hektar iken 2020 yılına doğru 18,58 milyon hektara çıkmıştır.

Tablo 2. Başlıca bitkisel ürünlerin yıllık üretim miktarı (1000/ton)

Yıl	Hububat/Tahıl	Baklagiller	Yağ Bitkileri	Şeker*	Pamuk	Sebze
2011	540,617	18,633	32,125	116,631	6,519	597,666
2012	566,590	16,806	32,856	124,518	6,608	616,245
2013	586,504	15,424	33,480	125,550	6,282	631,980
2014	596,015	15,645	33,719	120,887	6,299	649,487
2015	618,184	15,125	33,905	112,152	5,907	664,251
2016	616,665	16,507	34,001	111,760	5,343	674,342
2017	615,205	18,416	34,752	113,788	5,653	691,927
2018	610,036	19,203	34,334	119,374	6,103	703,467
2019	613,697	21,319	34,930	121,691	5,889	721,026
2020	616,743	22,875	35,864	120,140	5,911	749,129

(Ekim alanı tarla bitkileri, endüstriyel bitkileri ve bahçe bitkileri olarak verilmiştir)
*Çin'de hem şeker pancarından hem de şeker kamışından şeker elde edilmektedir.
Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

Tablo 2 incelendiğinde, 2011-2020 yılları arası giderek arış gösteren tahıl üretimi 2020 yılında bir önceki yıla göre %0,5 artışla 616,74 milyon ton, baklagiller üretimi %7,3 artarak 22,88 milyon tona yükselmiştir. İktisadi ürünlerden, pamuk üretimi %0,4 artış göstererek 5,91 milyon ton, yağlı tohumlu bitkileri %2,6 artışla 35,86 milyon ton, şeker üretimi (şeker pancarı ile şeker kamışı) ise %1,2 düşüşle 120,14 milyon ton olmuştur. Üretim miktarında sürekli artış gösteren sebze üretimi ise 749,13 milyon tona ulaşmıştır.

Çin'in tarımsal üretim yapısını oluşturan önemli dallardan biri de tarımcılıktır. Tarımcılığın toplam tarımsal üretim değerindeki payı incelendiğinde (Tablo 3), yaklaşık %53 ağırlığında olduğu görülmektedir. 2011 -2020 yılı içinde giderek artışı elde eden tarımsal üretim değeri içinde tarımcılığın payı 2018 yılından sonra nispeten gerileme göstermiştir (%54,11-%52,07).

Tablo 3. Tarımcılığın ekonomik değeri (milyon /yuan ¥, %)

Yıl	Toplam Tarımsal Üretim Değeri	Tarımcılık	Payı (%)
2011	78.836,980	40.339,620	51,17
2012	86.342,150	44.855,720	51,95
2013	93,173,700	48.943,940	52,53
2014	97.822,510	51.851,120	53,01
2015	101.893,520	54.205,340	53,20
2016	106.478,730	55.659,890	52,27
2017	109.331,720	58.059,760	53,10
2018	113.579,530	61.452,600	54,11
2019	123.967,940	66.066,450	53,29
2020	137.782,170	71.748,230	52,07

Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

Yıllık kişi başına düşen gıda, sebze ve meyve miktarı Tablo 4'de verilmiştir. Veriler incelendiğinde, kişi başına düşen gıda ile sebze ve meyve miktarında her geçen sene artış görülmektedir. Çin Halk Cumhuriyeti nüfusu 2011 yılında 1,35 milyar iken 2020 yılına geldiğinde ise 63 milyon 440 bin kişi artarak 1,41 milyara ulaşmıştır. Sürekli artış gösteren nüfusun besin ihtiyacını gidermek ve katma değer kazanmak oldukça güç görünse de Çin Halk Cumhuriyeti bunu başarmış görünmektedir.

Tablo 4. Kişi başına düşen tarımsal üretim miktarı (yıllık/kg)

Yıl	Gıda	Sebze	Meyve
2011	438	445	156
2012	452	456	164
2013	462	466	168
2014	466	476	171
2015	479	484	179
2016	476	489	177
2017	474	499	182
2018	469	505	184
2019	472	-	196
2020	474	-	-

Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

2.2. Ormancılık

Orman, karasal ekosistemin ana gövdesi, insan ile doğa arasındaki uyumu gerçekleştirmenin ana cephesidir (Zhao. 2013). Ormancılık sadece önemli bir kamu refahı girişimi değil, aynı zamanda önemli bir endüstridir. Ekolojik ürün ve ekosistem güvenliğini sağlama gibi önemli bir sorumluluğu üstlenmekle beraber ekonomiye katma değer sağlamaktadır.

Çin'de tarımsal üretim yapısını oluşturan dallardan ikincisi ormancılıktır. Çin'de orman ürünleri oldukça fazla olup, bu hususta dünyanın önde gelen ülkelerindendir. Çin'in ormancılık endüstrisinin toplam değeri, 1978'de (tarım reformun başladığı yıl) 17,96 milyar yuan iken 2020 yıla geldiğinde 5,97 trilyon yuan olarak gerçekleşmiştir. Bu 40 yılda 400 kat demektir. Çalışmanın bu bölümünde başlıca orman ürünleri üretim miktarı ve toplam orman ürünlerinin ekonomik değerinin toplam tarımsal üretim değeri içindeki payına yer verilmiştir. Başlıca orman ürünleri üretimi miktarı Tablo 5'te verilmiştir.

2011- 2020 yılları arası başlıca orman ürünleri üretim miktarı incelendiğinde, kauçuk ve odun üretiminde artış görülmektedir. Kauçuk üretiminde inişli çıkışlı bir üretim vardır. 2019 yılına doğru üretimde azalma eğilimi gösteren kamelya tohumu üretimi 2020 yılı tekrardan canlanmaya başlamıştır. Çin, orman ürünleri üretiminde dünyanın önde gelen ülkelerinden olmasına rağmen yoğun nüfusu ve artan talep nedeniyle birçok orman ürünü ithal edilmektedir.

Tablo 5. Başlıca orman ürünleri üretim miktarı (1000/ton; m³)

Yıl	Kamelya tohumu	Kauçuk	Odun(m³)
2011	1,480	751	81,460
2012	1,727	802	81,750
2013	1,776	865	84,380
2014	2,023	840	82,330
2015	2,163	816	72,000
2016	2,164	816	77,760
2017	2,431	817	83,980
2018	2,629	824	88,110
2019	2,679	810	100,460
2020	3,141	826	102,570

Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

Tablo 6. Ormancılık üretimin ekonomik değeri (milyon yuan/¥, %)

Yıl	Toplam Tarımsal Üretim Değeri	Ormancılık Üretim Değeri	Payı (%)
2011	78.836,980	3.092,440	3,92
2012	86.342,150	3.406,970	3,95
2013	93.173,700	3.847,440	4,13
2014	97.822,510	4.189,980	4,28
2015	101.893,520	4.358,450	4,28
2016	106.478,730	4.635,900	4,35
2017	109.331,720	4.980,550	4,56
2018	113.579,530	5.432,610	4,78
2019	123.967,940	5.775,710	4,66
2020	137.782,170	5.961,580	4,33

Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

Ormancılığın toplam tarımsal üretim değerindeki payı incelendiğinde (Tablo 6), yaklaşık %4,5 payının olduğu görülmektedir. 2011-2020 yılı içinde giderek artış gösteren ormancılık üretim değeri 5 trilyon 962 milyar 580 milyon yuana yükselmiş ancak bu rakamın artmasına rağmen toplam tarımsal üretim içinde aldığı payı %4,33'e gerilemiştir. Bunun nedeni ise diğer dalların ekonomik değerinin ormancılıktan daha fazla artmış olmasıdır.

2.3. Hayvancılık

Çin Halk Cumhuriyeti'nin tarımsal üretim yapısını oluşturan dallardan üçüncüsü de hayvancılıktır. Çin, hayvancılığın gelişimine elverişli zengin doğal kaynaklara sahiptir. Doğuda Büyük Hinggan Dağlarının eteğinden başlayarak iç Moğolistan üzerinden güneybatı yönünde Qinghai, Sincan ve Tibet Platosuna kadar uzanan kullanılabilir otlakların toplam alanı 313,33 milyon hektardır. Çin'deki Büyükbaş hayvanların yüzde 80'inden fazlası sığırlardan (besi/çekme için kullanılan sığır, manda, yak ve süt inekleri) oluşmaktadır. Küçük evcil hayvanlar arasında domuz, koyun ve keçi bulunmaktadır. Domuz, genellikle çiftliklerde, koyun ve keçi ise kırlarda yetiştirilmektedir. Tavuk, kaz ve ördek, Çin çiftliklerinde yetiştirilen kümes hayvanların başlıca türleridir ve en yaygın olarak yetiştirilen tür ise tavuktur (Halike ve Tan. 2014). Çalışmanın bu bölümünde başlıca hayvansal üretim miktarı ve toplam tarımsal üretim değeri içindeki payına yer verilmiştir.

Tablo 7. Başlıca hayvansal üretim miktarı (1000/ton)

Yıl	Dana Eti	Koyun Eti	Domuz Eti	Süt
2011	6,108	3,980	51,317	31,099
2012	6,148	4,045	54,436	31,749
2013	6,131	4,099	56,186	30,008
2014	6,157	4,276	58,208	31,599
2015	6,169	4,399	56,454	31,798
2016	6,169	4,603	54,255	30,640
2017	6,346	4,711	54,518	30,386
2018	6,441	4,751	54,037	30,746
2019	6,673	4,875	42,553	32,012
2020	6,725	4,923	41,133	34,401

Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

Tablo 7'de başlıca hayvansal et üretim miktarına yer verilmiştir. Verilere bakıldığında, domuz eti ağırlıklı olarak üretilmektedir. Dana eti, koyun eti ve süt üretim miktarında her geçen sene artış görülmektedir. 2011 yılında 51,32 milyon ton olan domuz eti üretimi giderek düşüş göstererek 2020 yılına geldiğinde 41,13 milyon tona gerilemiştir. 2019 yılında ortaya çıkan Afrika domuz gribi bunun başlıca sebebi olarak gösterilebilir. Özellikle et üretim hızının tüketim hızının gerisinde kalması, başta arazi, işçilik ve yem maliyetlerinin artış göstermesi ile birlikte Çin'de son dönemlerde et ve süt fiyatlarının yükselmesi bu ürünlerin ithalatını daha cazip hale getirmektedir (Anonim.2022d).

Tablo 8. Hayvansal üretimin ekonomik değeri (milyon yuan/¥, %)

Yıl	Toplam tarımsal üretim değeri	Hayvansal Üretim değeri	Payı %
2011	78.836,980	25.194,160	31,96
2012	86.342,150	26.491,210	30,68
2013	93.173,700	27.572,370	29,59
2014	97.822,510	27.963,390	28,59
2015	101.893,520	28.649,320	28,12
2016	106.478,730	30.461,170	28,61
2017	109.331,720	29.361,190	26,86
2018	113.579,530	28.697,400	25,27
2019	123.967,940	33.064,350	26,67
2020	137.782,170	40.266,670	29,22

Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

Hayvancılık üretim değerinin toplam tarımsal üretim değerindeki payı incelendiğinde (Tablo 8), yaklaşık %28,6 oranında payının olduğu görülmektedir. 2011-2020 yılları içinde giderek artış gösteren hayvancılık üretim değeri 40 trilyon 266 milyar 670 milyon yuana yükselmiş, toplam tarımsal üretim değeri içinde aldığı payı ise %29,2 olmuştur.

2.4. Su ürünleri

Çin, dünya nüfusunun yedide birine sahip ve dünyada rapor edilen balık üretiminin üçte birine ve dünyanın rapor edilen su ürünleri üretiminin üçte ikisine sahiptir. Aynı zamanda önemli bir deniz ürünleri ithalatçısıdır ve ülkenin deniz ürünleri pazarının 2027 yılına kadar 53,5 Milyar ABD doları değerinde bir pazar büyüklüğüne ulaşacağı tahmin edilmektedir (Anonim.2022e).

Çin, su kaynakları açısından da oldukça zengindir. 2,6 milyon hektar kıyı alanı ve 17,47 milyon hektar iç tatlı su alanlarına sahiptir. Bohai denizi, Sarı deniz, Doğu Çin denizi ve Güney Çin denizinin kıyı alanlarında balık, karides, kabuklu deniz canlıları, yosun ve deniz alg dâhil olmak üzere en az l,500 deniz ürünü türü yaşamaktadır. Çin, geçmişte balıkçılığa önem verirken kültür balıkçılığı üretimi toplam üretimin sadece yüzde 26'sını oluşturmuştur. Ancak bugün kültür balıkçılığı üretiminin payı, %50'nin üzerine çıkmıştır. Su ürünlerine kabuklu canlılar ve yosundan sonra karides, yılan balığı, tarak, yumuşak kabuklu kaplumbağa ve pavurya katılmıştır (Halike ve Tan. 2014). Çalışmanın bu bölümünde başlıca su ürünleri üretim miktarı ve toplam tarımsal üretim değerindeki payına yer verilmiştir.

Tablo 9. Başlıca su ürünleri üretim miktarı (1000/ton)

Yıl	Balık	Karides, Yengeç	Kabuklular	Yosungiller
2011	10,752	3,218	12,128	1,630
2012	9,573	3,457	12,648	1,790
2013	9,729	3,626	13,276	1,885
2014	10,425	3,830	13,717	2,029
2015	10,782	3,863	14,140	2,115
2016	10,632	3,961	14,769	2,193
2017	11,158	3,707	14,814	2,248
2018	10,915	3,682	14,870	2,362
2019	10,605	3,662	14,802	2,556
2020	10,554	3,586	15,163	2,637

Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

Çin'de yetiştirilen kabuklular ve yosungiller üretim miktarında 2011- 2020 yılları arasında sürekli artış meydana gelmiştir. Fakat balık, karides ve yengeç üretimi ise dalgalı şekilde artış göstermektedir (Tablo 9). Tablo 10'da su ürünlerinin ekonomik verileri sunulmuştur. Buna göre, yıllar itibarıyla su ürünlerinin ekonomik değeri sürekli artış göstererek 2020 yılında 12 trilyon 775 milyar 860 milyon yuan değer kazanmıştır. Fakat tarımsal üretim değeri içindeki payı bir önceki yıla göre %0,8 azalma göstererek %9,27 olmuştur.

Tablo 10. Su ürünlerin ekonomik değeri (milyon yuan/¥ %)

Yıl	Toplam tarımsal üretim değeri	Su ürünleri üretim değeri	Payı %
2011	78.836,980	7.337,370	9,31
2012	86.342,150	8.403,910	9,73
2013	93.173,700	9.254,480	9,93
2014	97.822,510	9.877,540	10,10
2015	101.893,520	10.339,090	10,15
2016	106.478,730	10.892,920	10,23
2017	109.331,720	11.577,090	10,59
2018	113.579,530	12.131,510	10,68
2019	123.967,940	12.572,400	10,14
2020	137.782,170	12.775,860	9,27

Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

2.5. Tarımsal GSYIH Değeri

Tablo 11. Tarımsal GSYİH'nin genel GSYIH içerisindeki payı (milyon yuan/¥, %)

Yıl	Toplam GSYİH	Tarımsal GSYİH	Tarımsal Üretimin GSYİH'daki Payı (%)
2011	48.794,020	4.478,150	9,2
2012	53.858,000	4.908,460	9,1
2013	59.296,320	5.302,810	8,9
2014	64.356,310	5.562,630	8,6
2015	68.885,820	5.777,460	8,4
2016	74.639,510	6.013,920	8,1
2017	83.203,590	6.209,950	7,5
2018	91.928,110	6.474,520	7,0
2019	98.651,520	7.047,360	7,1
2020	101.356,700	7.803,090	7,7

Kaynak: ÇHC Devlet İstatistik Kurumu. 2022

Tarım sektörü, tarımsal üretim yanı sıra diğer sektörlere de katkı sağlaması açısından büyük önem taşımaktadır. İnsanların en önemli besin ihtiyaçlarının karşılanmasını sağlayan tarım sektörü, her ülke için vazgeçilmez ve uzun vadeli planlarda önemle yer verilen bir sektördür (TÇVY.1997). Aynı zamanda Çin ekonomisi içinde oldukça önemli bir sektördür. 2021 yılında tarım sektörünün nominal GSYİH'ya olan katkısı %7,3 civarında gerçekleşmiştir.

Tablo 11'de 2011-2020 yılları arasında tarımın Çin ekonomisindeki durumu görülmektedir. Toplam GSYİH, 2011 yılından 2020 yılına kadar sürekli bir artış göstermiştir. Benzer şekilde tarım sektörünün GSYİH değeri de artmıştır. Fakat buna rağmen tarımın toplam GSYİH içindeki payı yıllar itibariyle düşmüştür. Bu gerilemenin nedeni, diğer sektörlerin GSYİH artışının, tarım sektörünün GSYİH'daki artışından daha yüksek oranda gerçekleşmesidir. Tarımın toplam GSYİH içindeki payı özellikle 2011 yılından sonra 2020 yılına kadar sürekli bir düşüş yaşamıştır. 2011yılında %9,2 olan bu değer, 2020 yılında %7,7 olmuştur.

Tarım sektöründe tutarlı bir büyümenin olmaması, GSYİH'sının mutlak değer olarak artmasına rağmen payının azalması, Çin'in tarım performansının araştırılması gereğini ortaya çıkarmaktadır. Kaynak kullanım performansının değerlendirilmesinde engel olarak verimlilik ve etkinlik kavramları kullanılmaktadır. Verimlilik, performansın tanımlayıcı bir ölçüsüyken, etkinlik ise normatif bir ölçüsüdür (Subhash. 2004).

3. Sonuç ve Öneriler

Çin'de 2020 yılı toplam tarımsal üretim değeri içinde; Tarım %53, Ormancılık %4,5, Hayvancılık %29, Su ürünleri %9,4, yardımcı sanayi ise %4,1 oranında katkı sağlamıştır.

Çin'de 70 yıl önce yetersiz olan tahıl üretimi, arz-talep bakımından dengeye oturarak yeterli düzeye çıkmıştır. Yıllık pirinç üretimi (211 milyon ton), Buğday (134 milyon ton), Mısır üretimi (260 milyon ton) Sebze üretimi (749 milyon ton) Meyve üretimi (286 milyon ton) olarak her gecen yıl artış göstermektedir. Kişi başına düşen Gıda (475kg), Sebze (505kg), Meyve (196kg) miktarları diğer ürünlerden fazla olmasına rağmen yeterli değildir. Bunun başlıca nedeni bu ürünlerin çoğunlukla ihraç edilmesi, ülke vatandaşlarının tüketimine yansımamasıdır. Zira Çin aynı zamanda dünyada en önemli ihracatçı ülkelerden birisidir.

Çin'in tarımsal üretimde kendi kendine yeterliliği hususunda endişeye gerek olmadığı, normal şartlarda, iyi bir planlama ile hububat ithalatının, toplam tüketiminin %5'ini geçmeyeceği de belirtilmektedir. Çin'de tarımsal üretim teknikleri hızlı biçimde gelişmektedir. Özellikle seracılık bütün ülke genelinde oldukça yaygın olup, güney bölgelerinde hububat tarımı yılda iki mahsul alacak şekilde yapılmaktadır (Rapor. 2022). Et üretim hızının tüketim hızının gerisinde kalması, başta arazi, işçilik ve yem maliyetlerinin artış göstermesi ile birlikte Çin'de son dönemlerde et ve süt fiyatlarının yükselmesi bu ürünlerin ithalatını daha cazip hale getirmektedir.

Tarımın toplam GSYİH içindeki payı özellikle, 2011 yılından 2020 yılına doğru sürekli bir düşüş yaşamıştır. 2011 yılında %9,2 olan bu değer, 2020 yılında % 7,7 olmuştur. Tarım sektöründe tutarlı bir büyümenin olmaması, GSYİH'sının artmasına rağmen payının azalması, Çin'in tarım performansının araştırılması gereğini ortaya çıkarmaktadır.

Tarımsal üretim miktarında artış görülse de nüfusun sürekli artması, kente göç, doğal afetler ve uygulanan politikaların yetersiz kalmasıyla üretim potansiyelinde hali hazırda sorunlar bulunmaktadır.

Hükümet, çiftçilerin tahıl üretimini teşvik etmek, tarımsal istihdam ve gelir beklentilerini artırmak amacıyla düşük tahıl fiyatlarına ve ürünün elde kalma riskine karşı belirli periyotlarda ve belirli bölgelerde belli başlı tahıl çeşitleri için taban fiyat, alım ve depolama garantisi gibi destek politikaları uygulamaktadır. Devletin uyguladığı tarım yönetimi, 2016 yılından bu yana çeltik ve buğdayda taban fiyatı kademeli olarak iyileştirirken, devletin alım oranını ise düşürüyor. Bu durum dengeli bir tahıl üretiminin oluşmasına katkı sağlamaktadır.

Öneriler:

Tarımsal üretim faaliyetlerinin sürdürebilir şekilde devam etmesi için mutlak süratte tahıl üretimini stabilize etmek, yağlı tohumlu bitkileri üretimini artırmak ve ekilebilir arazilerin korunması gerektirmektedir. Üretim faaliyetleri sürecinde karşılaşılan zorluklara aktif olarak yanıt verebilmek ve belirlenen hedeflere ulaşabilmek için aşağıdaki düzenlemeler yapılabilir;

1. Ekilebilir tarım arazilerinin verimliliklerini güçlendirmek ve ürün çeşitlerin kalitesini iyileştirmeye devam edilmelidir. Özellikle hububat ve baklagiller üretiminde bitki tohumlarının kalitesini sürekli iyileştirmek şarttır. Soya fasulyesi ve yağlı tohumlu bitkilerin üretimine rehberlik etmek gerekir. Böylece gıda ham maddesi ve kakı maddesi üretimi gelişecektir.

2. Çin Halk Cumhuriyeti'nde tarımsal faaliyetler yarı özelleştirilmiş kolektif olarak işletilen çiftliklerde gerçekleşmektedir. Kırsalda modernleşme ve refah düzeyine ulaşabilmek için genç ve orta yaşlı çiftçiler hedef alınmalıdır. Özellikle kırsal iş gücünün geri dönüşünü sağlamak, kırsal kesimde yaşayanların gelirlerini korumak ve kırsal sanayinin gelişimi teşvik etmek (Xu. 2022) öncelikli amaç olmalıdır.

3. Ticari alt yapı optimizasyonu geliştirilmeli, özellikle başlıca tarım ürünlerinin çift yönlü tedariki sağlanmalıdır. Hem iç hem dış pazar olanakları ile doğal kaynaklardan tam olarak yararlanmak gerekmektedir. Bu amaçla iç ve dış talep ile ithalat ve ihracatın koordineli gelişimini aktif olarak teşvik etmek ve iç gıda talebini karşılamak için uluslararası piyasayı etkin şekilde kullanmak gereklidir.

4. Tarım sigortasını teşvik etmek gerekmektir.

5. Piyasada stokları kontrol etmek ve geliştirmek gerekmektedir. Etkin bir stok politikası izlemek sürdürülebilirliği sağlayacaktır.

6.Üretim zincirinin düzenli ve sürdürebilir olması açısından kırsal alanlarda lojistik koşulların iyileştirilmesine önem verilmelidir.

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