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CONTENT / İÇERİK

Managing Rural Employment for Sustainability and Efficiency of Agriculture

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Abstract

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Demand for agricultural labour use is persistent regardless of the improvements. There are many agricultural activities that call incorporation of low-skilled labour. With rising technology incorporation, demand for high-skilled labour rises. Keeping low-skilled workers in the sector is also important for macroeconomic concerns as management of unemployment or providing sustainable income for rural population to keep this population away from internal migration to city centres. Yet, there are effective factors in keeping this population in rural and in agricultural activities. Some of these factors were evaluated in this paper. The effect of recent COVID-19 process and in-boarder or foreign labour migration was searched and evaluated due to changing labour composition and varying costs. Thereafter, the gender problem related to women's over existence in agricultural activities and their intention to move out like as the young generations were evaluated depending on the recent literature and figures.

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1. Introduction

Even though many improvements do lead rising mechanisation and incorporation of IT technologies, agriculture has still been considered as a labour-endowed economic activity. It seems that awaiting technological improvements have been approaching sooner than expected everywhere in the world. However, labour force requirements of agricultural activities will not decline critically worldwide.

In addition to securing agricultural and food supplied for all, agricultural sustainability is essential to maintain the rural-urban balance. Rising income levels or expectations for future uprising mainly leads keeping rural population in rural and maintaining agricultural activities. On the contrary, declinations do lead migration from rural to urban. This population shift does not only refer to potential supply security problems, it also means potential rise in urban unemployment rates (Parlakci Dogan, 2020). Therefore, regardless of the technological progresses that ease farmers' lives, the farmers should continue to be essential for agricultural sustainability.

The urban-rural distribution of the population needs to be evaluated in order to comment on sustainability of agricultural activities. Due to records of the ILO, we know that 57 % of the world population lived in rural areas by 1990 and this figure declined to 44 % in 2020 and expected to decline further to 40 % by 2030 (Anonymous, 2020a). This reduction is expected to affect the world in two dimensions. One is reducing rural contribution to economy via declining agricultural production of all kinds. The second effect is related with over-urbanisation. Over-urbanisation may be read as more food security risks due to rising demand in contrast to declining supplies.

The relationship between agricultural sustainability and employment in agricultural and rural tasks were evaluated in this paper with its two specific dimensions. One is related with the migrating labour force due to several reasons and the second considers gender aspect as a driving force of maintenance of activities in almost everywhere in the world.

Therefore, the research aims to discuss and evaluate the impact of migration including the domestic movement of masses and differing male-female composition of the agricultural labour force. Previous studies and current secondary data recorded were used for evaluation.

2. Migration and Employment in Agriculture

Migration of labour force is important for agricultural processes bilaterally. While developed or agriculturally endowed western or European countries accept mostly temporary or seasonal labour contribution from outside, many developing countries experience outflow of labourers. There is internal movement of unskilled labour due to the seasonal requirements as well, which is valid for all countries. It is considered as contributory to assess both sides of labour flows and their impacts.

The inflow to developed countries is being controlled legally and mostly immigrant workers are allowed to get involved in labour intensive activities like harvest or transfer of outputs. These workers do not obtain permanent residency in the countries they move for economic reasons and they mostly receive temporary working permits during execution of activities. The effects of seasonal migration to the countries and sectors shall be considered briefly. Within this analysis, the intention is to differentiate the persistent seasonal migration and contemporary process attached to the COVID-19 pandemic and its effects. Following COVID-19 based interpretation, Turkish agriculture was evaluated with respect to incorporation of refugees in agricultural activities as an example to assess impact of sudden and heavy migration.

There have been some specific shifts in the history. Appearance and dispersion of COVID-19 all around the world has been recorded as one of those shifts. In accordance with devastating socio-economic changes, migration of low-skilled labour had become a concern.

On the other edge, many labour-intensive farm tasks do depend on seasonal migration. Lack of seasonal agricultural workers as cultivars migrating from Northern Africa or Eastern European countries like Bulgaria or Romania affected the harvest processes in southern Italy inversely within the COVID-19 process (Tagliacozzo, 2021). Under normal conditions, number of seasonal migrants has been 40 thousand in the winter and 60 thousand in spring and summer periods. This agricultural labour movement declined drastically due to mobility restrictions and economic activity in 2020. Maintenance of production and harvest activities were only assured through substantial medical services provision by the state authorities and NGOs, which brought up rising costs for the farmers and the sector.

In general terms, many agrarian countries allowed easy permit renewals in order to keep or call seasonal workers during the pandemic, even if their economy does not depend fully on agriculture. These countries can be exemplified as New Zealand, Canada, Chile and Israel and they also offered additional health and consultancy services for agro-food supply security (Triandafyllidou, 2022). As an instance, Canadian agriculture depends on mostly seasonal labour force supplied by Mexico and Jamaica and some other Caribbean countries. The labour supply is managed under Seasonal Agricultural Worker Program (SAWP). These mobile workers, who at most work 8 months per year and most of whom receive renewal of job-contracts by their agro-entrepreneurs, almost have no right to receive permanent residency.

Contemporarily Canadian agricultural labour needs are being met by two programmes. In addition to 50 years of cooperation under SAWP, Temporary Foreign Worker (TFW) programme is supplementary. TWF allows incoming labour for at most 2 years and for one time, while SAWP can be renewed (Anonymous, 2021).

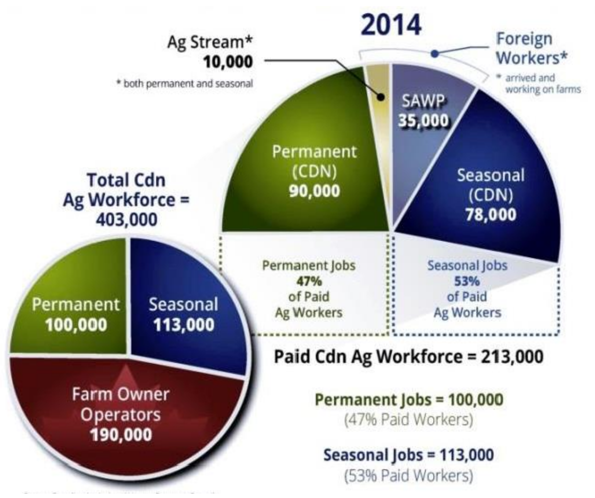

Figure 1. Labour Force Migration in Canada in 2014 (Anonymous, 2021).

SAWP reported the internal and external migration facts for 2014 as an instance (Anonymous, 2017). It was understood that 53 % of the agricultural labour used was temporary then. The SAWP contribution to overall force was 16 % and there was internal migration referring to 37 %.

However, for sustainability of the sector, these farm workers received exceptions from the Canadian government. They were also monitored respecting health protection acts as the initial massive COVID exposures were observed in farm operators (Macklin, 2022). As vegetable production, animal breeding slaughter and packing have been the duties described for these incomers, they had to be treated more after recognition of their vulnerability to the disease. In 2020, due to rising labour costs attributed to quarantine measures, especially number of TFWs involved in activities declined and local workers were exchanged with TFWs. Yet, the less productive local labour led to declinations in agricultural income as well (Laure, 2020). The recent statistics indicated that Canada accepted 61.735 foreign workers for agricultural production and 30.695 for food and beverages industry in 2021 with a 10 % annual rise following COVID-19 declinations (Anonymous, 2022).

It can be said that the pandemic process contributed to rising agro-food prices due to rising labour costs. Or else, the sector started to incorporate locals rather than paying and caring more to migrant workers. Especially low-skilled labour force transfer to the US was intervened while professional or technical knowledge bearers maintained their roles embracing health care services as well (Rosińska, and Pellerito, 2022).

The impact to Europe is important as well. Being the most significant agro-producers and traders of the EU, Spain and Italy got affected from the lock-downs and restrictions critically. Italy got affected from supply shocks and lost around 34 billion Euros, while Spain faced with declination in migrant labourers from 2019 to 2020 (Corrado and Palumbo, 2022). As the restrictions remained within the EU, Spanish agricultural income declined due to COVID-19. Yet, non-EU short term migrants were not accepted back to their countries (e.g. Morocco, Bulgarian Romans) and the migrant related health problems posed stress on the rural society. Rather than labour shortages, the countries accepted more European migration. This requested and used mobile workers led to rising costs and prices due to problems related with housing as well as diseases related concerns. However, right of the migrating workers were neglected mostly in exchange of food security. Yet, the northern countries as Germany or the Netherlands enforced migrated rural workers to leave at the initial phase (Sahin Mencutek, 2022; Hansen, 2020). However, many of those remained in the country they moved to work in farms as they did not get approval from their homelands. Thus, even if not reported, humanitarian problems became a part of COVID-19 related effects in the society (Corrado and Palumbo, 2022).

In addition to developed countries, overpopulated agrarian countries as India experienced COVID-19 related employment problems in the sector (Irudaya Rajan and Bhagat, 2022). Internal migration is essential for all sorts of labour dependent sectors in India. With the lock-down that started in March 2020, labour endowed production got disrupted. On the other hand, the workers that only depend on seasonal jobs had lost their security (Irudaya Rajan and Bhagat, 2022; Rajan and Heller, 2020). By June 2020, Indian government had to reverse the lock-down decisions and mobility restrictions for rural workers in order to empower urban industries. Besides, the migrants also faced with additional problems due to their own food and shelter requirements within the pandemic and these posed additional risks to the sector in accordance with the migrant labourers (Srivastava, 2020).

The changing agricultural labour flows were considered up until here emphasizing the COVID-19 process. However, flows out of agriculture are almost more important in terms of rural development and agricultural supplies. Young generations mainly intend to leave the sector and move to the urban centres. This tendency is not completely related to the expertise or education/job status of the individuals. With evolving technology and opportunities, less people intend to stay in agriculture.

Due to FAO stats, both rural and urban population is still in a rising tendency since the base year that was taken as 1990. However, when the change was overviewed, it can be seen that rise in urban population is more and speedy. The average change for five years is more than 11 % for urban population, the percentage change is below 2 % for the rural population. The impact of the pandemic can also be seen here when 2020 and 2021 is compared. The rise for rural population was 0,02 % while it was 1,81 % for the urban residents. Therefore, the movement from villages to city centres can be confirmed especially in the developed world as these figures represent the world population.

Table 1. Aggregate Rural – Urban Population (1990-2021) (FAO, 2022)

World	**1990**	**1995**	**2000**	**2005**
Rural	3,040,715,364	3,175,969,181	3,276,699,476	3,326,253,520
Urban	2,290,228,096	2,575,505,235	2,868,307,513	3,215,905,863
World	**2010**	**2015**	**2020**	**2021**
Rural	3,363,301,013	3,401,511,157	3,416,488,365	3,417,047,481
Urban	3,594,868,146	3,981,497,663	4,378,993,944	4,458,417,153

Besides, it is evident from the below graph that until 2005 the urban population was lower than rural population. However, the former passed number of rural residents in 2005.

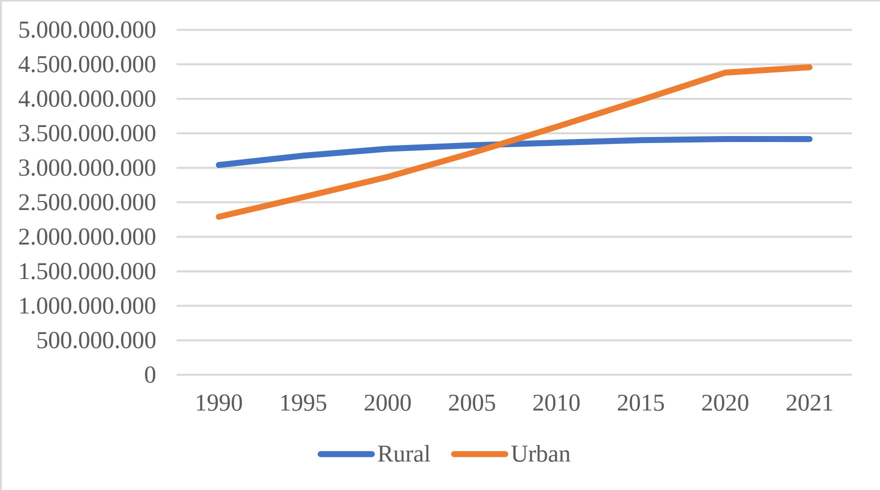

Figure 2. Rural – Urban Population (FAO, 2022)

Following the overall change, the percentage change for decades between 2000 and 2020 were calculated and demonstrated in the below table respecting the main continents. The statistics inferred that, both rural and urban population had risen in Africa and Australia and New Zealand. However, the rise is higher for urban population in percentile evaluation even in these continents where rural operations are particularly important for the economy and sustainability concerns.

Table 2. Decennial Population Change in Continents (%) (FAO,2022)*

AFRICA				AUSTRALIA - NEW ZEALAND				EUROPE			
2010 - 2000		2020 - 2010		2010 - 2000		2020 - 2010		2010 - 2000		2020 - 2010	
Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**
21	43	19	44	10	17	7	15	-5	4	-6	4
ASIA				**AMERICAS**							
2010 - 2000		**2020 - 2010**		**2010 - 2000**		**2020 - 2010**					
Rural	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**				
-1	34	-2	26	0	16	-2	13				

*Calculated by the author based on FAO data.

When the remaining world is considered, it is evident that number of rural residents had declined during the last two decades and the declination fastened up in the last decade.

Finally, the situation in Türkiye was demonstrated and evaluated as an interim country between Europe and Asia and as an agrarian country residing in the Mediterranean.

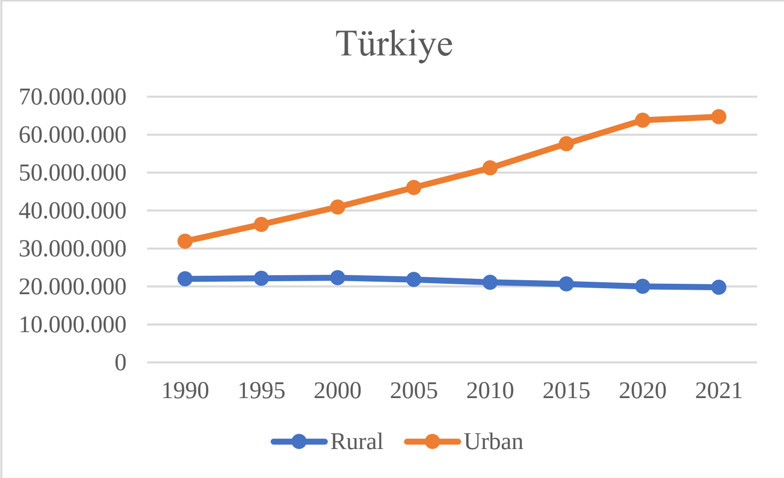

Figure 3. Changing Rural-Urban Population in Türkiye (FAO, 2022)

Taking the base years similarly, rural population has been in steady declination, while urban population has been rising. Accordingly, the number of people involved in agricultural activities is downsizing. Between 2000 and 2020, the average declination in rural population was around 2 %. On the other hand urban sites had experienced more than 12 % rise in population on average.

Table 3. Population Change in 5 years in Türkiye (%) (FAO, 2022)

Five Years	Rural	Urban
1995-1990	0.70	13.82
2000-1995	0.65	12.68
2005-2000	-2.06	12.51
2010-2005	-3.37	11.20
2015-2010	-2.12	12.48
2020-2015	-3.01	10.74
2021-2020	-1.15	1.42

In consideration of Turkish labour market, the refugees and their position should be visited briefly as well. The number of incoming Syrians has been significant in Türkiye. While the migration started in 2011, by 2021 the registered Syrian refugees counted more than 3,7 million and the recent statistic appeared as 3,5 million due to Ministry of Interior (Anonymous, 2023). It was noted that by 2016, 83 % of Syrian guests at working age was holding agricultural jobs and mostly they were employed for seasonal activities (Kavak, 2016). Research maintained in Izmir demonstrated that many unskilled refugees were involved in agricultural production and harvest processes.

The refugees under temporary protection have been accepted by the Ministry of Interior and given work permits after 6 months of residency. However, agriculture was exempted from working permission processes. Agricultural employment under informal conditions seemed to be easier for these people as the sector does not require complete work permits and eligible for informal employment (Sivis and Yildiz, 2019). Yet, the informal economy and inclusion of

Syrians to seasonal agricultural works led to loss of welfare for Turkish agricultural workers and contributed development of ‘working poor class (Eder and Ozkul, 2016). Actually, agriculture is the sector where informal employment is the highest with around 80 %, where locals/natives had lost a lot of seasonal recruitment opportunities (Oztek, 2021). Besides, official training was concerned for agricultural employment of these refugees as well. The FAO initiated an on-the job training project by 2015 to support 6.200 people in the south-eastern regions of Türkiye half of whom were chosen from refugees (Anonymous, 2020b). Therefore, the illegality has been intervened but the results were not demonstrated yet.

Following this migration related evaluation, the gender based challenges in agricultural labour would also provide insights for evaluation of sustainability.

3. Gender and Employment in Agriculture

Gender differentiation is important in interpretation of the total employment and employment in agricultural activities. Concerning all economic activities, the unemployment rates are higher for females. Many sectors still consider female workers as unprofitable and verify their ideas through maternity leaves or household tasks even in the developed world. Accordingly, keeping less educated women in the rural, even without payment is considered as more beneficial (Petrongolo and Ronchi, 2020).

Actually, the literature infers lower unemployment for females in the rural livelihoods in underdeveloped countries or countries at early stages of development under informal economy conditions (Demir, 2021). The unpaid family worker of the household is not recorded as unemployed for agricultural practices. In developing world, this is a long-way problem. Half of the Indian working women were employed in family farms by 2005 and this was followed with low wage employment by 27 % (Sarkar et al. 2019).

Ghana is a Western African country dependent on rural economics. By 2014, 82.5 % of the population were living in rural, mostly involved in breeding and aggregate sales of maize and cassava. It was noted that women focus more on production of food crops and men were involved in cash crop production Yet, paid private sector employment rate was low with 12 % for women and 29.5 % for men, while the shares were 4.5 % for women and 13 % for men in the rural by 2015 (Krumbiegel et al., 2020). The recent evaluations suggest empowerment of women more through inclusion to cash crop production and export oriented processes more.

The statistics published by the ILO emphasize the gender differences respecting education and job market position for rural and urban (Anonymous, 2019). The traditional gender roles lead differing results for rural and urban districts in the world. It can be seen that rural unemployment is lower than the urban. But rural unemployment is lower for women (26 %) than men (35 %) by 2019.

Table 4. Employment Status due to gender and rural/urban status (%) (Anonymous, 2019).

POSITION IN THE JOB MARKET	World (%)		Women (%)		Men (%)	
	Rural	Urban	Rural	Urban	Rural	Urban
Underemployment	46	26	46	26	47	27
Unemployment	32	46	26	41	35	50
Eligible to work	22	28	28	33	18	23

When the same figures were overviewed for youth for 2019, the gender gaps can be seen. The underdevelopment rates are much higher in rural for both genders. But male unemployment seems higher both for rural and urban. This is significantly related to existence in the job market. Number of men that registered and in seek of a job is more than women mostly. Simultaneously, many women working in unpaid conditions assume themselves as they hold a job throughout the world.

Taking Türkiye as a reference, the aggregate unemployment and sectoral unemployment were considered and discussed briefly hereafter.

The aggregate unemployment figures for Türkiye were demonstrated below for 2013-2021.

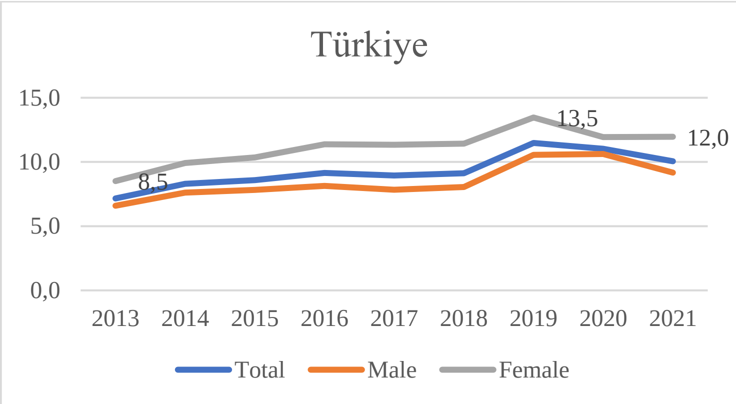

Figure 4. Changing Unemployment by Gender in Türkiye (Anonymous, (2019)).

According to ILO statistics, it can be said that the partly fluctuating unemployment rates were and are higher for females in Türkiye. The shift to non-agrarian paid jobs is visible in Türkiye in the urban districts. However, the share of urban employment was 38 % for women in 2018. Therefore, working women still faces with patriarchal relations in the society (Kocabicak, 2022). Thus, working women mostly take place in rural and in agriculture off-paid.

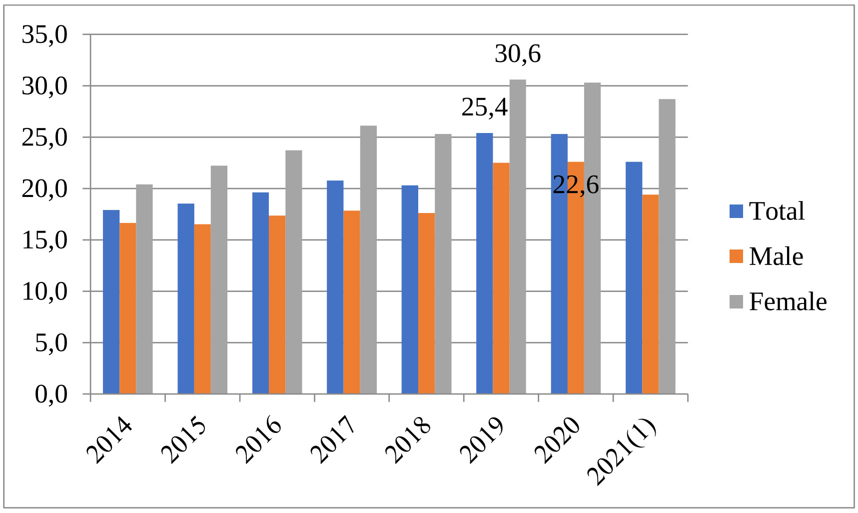

Figure 5. Changing Unemployment by Gender for Youth Population in Türkiye (Anonymous, (2019)).

The youth unemployment has the same variation due to gender differences in Türkiye. Yet, the rates are far high when compared with the aggregate statistics. The highest rates were recorded on 2019 (30.6 %) for females and on 2020 (22,6 %) for males. While the shift is also related with the pandemic process, it is inevitable to notice that the unemployment rates for young individuals are more than that of the society's averages.

The female's share can be viewed from rural to urban perspective. The data withdrawn from ILO enables evaluation of share of women labourers that reside in rural of Türkiye and signs a declination as demonstrated below.

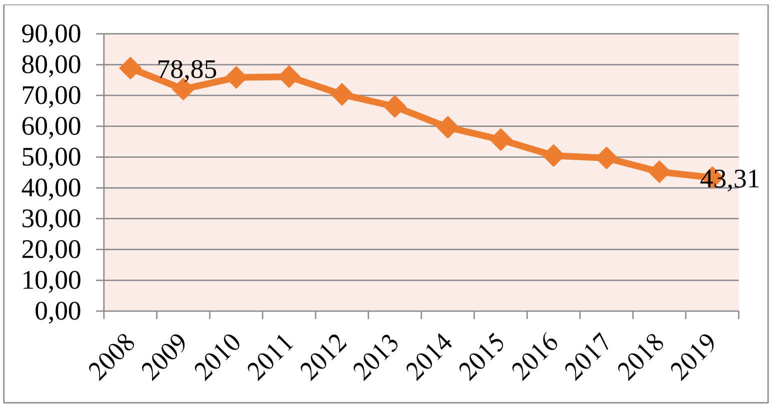

Figure 6. Share of Women Working in Agriculture in the Rural Districts (%) – 2008-2019 (Anonymous, (2020a))

The ILO data infers that number of women working in agricultural activities and living in rural areas has been in declination. The share of women contributing to agricultural activities was 78.85 % in 2008. The share declined to 43.31 % steadily until 2019. The shift has been towards urban centres and services sector.

Finally, female's employment status in agriculture in rural and urban can be visited from the same data. The table confirms the declination in the rural agricultural activities and involved female workers. However, the agricultural workers in the urban centres do not show a rising tendency. While 28.26 % of working women were in rural agricultural activities in 2008, the share declined to 15.51 % by 2019. The share of women employment in agriculture as a sum of rural and urban was more than 40 % in 2008 which declined to 25 %. Yet, the declination is not related with a movement out of urban enterprises. Therefore, this signifies the movement out of the sector once more.

Table 5. Female Agricultural Worker's Share in the Total Working Population (%) (Anonymous, (2020a)).

Female (%)	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Rural	28.26	25.83	27.19	27.24	25.15	23.76
Urban	12.00	11.96	12.01	12.03	11.95	11.79
Female (%)	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Rural	21.37	19.96	18.10	17.81	16.21	15.51
Urban	11.40	11.05	10.49	10.39	9.82	9.54

4. Results and Evaluation

It is almost evident that most of the population in rural districts either work in agriculture or run their own agricultural enterprises. Self-employment is rather widespread in the sector and in rural areas (Fields, 2019). However, supporting self-employment in agriculture and keeping the population in rural is essential. The declination in the share of people living in rural districts, towns and villages and most probably depending on agriculture for survival is important for maintenance of agricultural activities and keeping urban unemployment under control.

With this paper the intention was to evaluate agricultural labour supplies and its relationship with sustainability. There appeared two specific topics to consider employment in agriculture. The recent impacts of internal/external movement to agriculture sector were evaluated residing on COVID-19 and incoming refugees. The movement related to the shift of time and young generations' reluctance to stay in agricultural activities in the rural areas. The status of women in agriculture was considered as a second aspect.

In migration aspect, it is visible that seasonal migration for on-farm activities got disturbed in developed countries since the onset of COVID-19. These countries had to make additional health services expenses to keep workers that cannot be sent back their homelands on the one edge. Just on the opposite end, employing national workers in on-farm activities lead to rising labour cost and prices. For countries accepting outsiders for cheap farm work, the effects of lock-downs was negative on agriculture and food markets.

COVID-19 posed a compulsory ban of agricultural worker movements. However, refugee movements also affected the prices and welfare of national workers as they lost their reach to seasonal on site income. This situation may add on the tension of rising social costs of refugee hosting and should be managed properly.

In addition to voluntary or involuntary labour movements, the historical/traditional gender role and its changing composition worth to be considered. Till the end of 20th century, women had been the secret or even visible hand behind all agricultural activities. Their role has been managing all tasks of the family farm or small lands without getting paid. However, there is a significant movement of women out of agriculture. This may partly be related with mechanisation of agriculture and technological development. However, it mostly refers to urban migration of rural residents from villages, farmlands. These both mean potential reduction in national supplies, and rising demand from city centres.

As a whole, the migration and gender transition need to be monitored and the rural population needs to be kept within the sector. Main requisites are related with:

- Developing social security systems in agricultural activities maintained in rural areas,
- Getting prepared for unforeseen problems and occasions in order to prevent migration to the city centres,
- Coordinating the entry and stay of foreign employees in agriculture and rural areas,
- Minimisation of seasonality of activities and out of sector labour needs,
- Modernisation of women's role and acceptance in rural via increasing educational and social opportunities,
- Treating rural unemployment and hidden unemployment seriously.

These suggestions include very broad ideas. However, the labour market statistics of the world and agrarian countries infer taking these suggestions seriously. Therefore, agricultural and rural employment policies should be more important for public organisations. Development, implementation and monitoring of sustainable employment policies are essential for sustainability of agriculture as for macroeconomic stability.

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Green Information and Communication Technologies Strategies for Sustainable Agriculture

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Abstract

Green information and communication technologies (ICT) have the potential to revolutionize sustainable agriculture by minimizing environmental impact, reducing resource use, and enhancing productivity. This study examines the role of various green ICT strategies, including precision agriculture, smart irrigation systems, renewable energy technologies, livestock management, agroforestry, and blockchain traceability, in promoting sustainability in agriculture. The adoption of green ICT in agriculture presents both challenges and opportunities. Issues such as the digital divide, knowledge gaps, and policy frameworks must be addressed to realize the full potential of green ICT strategies. However, by leveraging the benefits of these technologies, such as reduced greenhouse gas emissions, water conservation, and enhanced food security, sustainable and resilient food systems can be achieved. Case studies from different regions and contexts provide a systematic analysis of the impacts of green ICT on sustainable agriculture. The findings suggest that the adoption of green ICT strategies can offer significant benefits for sustainable agriculture. However, a comprehensive approach that considers sustainability's social, economic, and environmental dimensions is necessary to realize these benefits fully. Policymakers, researchers, and practitioners can use these insights to promote the adoption of green ICT strategies in agriculture. By developing supportive policy and institutional frameworks and providing technical support and training, green ICT can be more widely adopted in agriculture to enhance sustainability and resilience in the sector.

1. Introduction

Agriculture is an essential sector for sustaining human life and the world economy. However, the agriculture industry is facing several challenges such as climate change, water scarcity, and environmental degradation (Klimova et al., 2016). To address these challenges, sustainable agriculture has become a top priority for policymakers, researchers, and practitioners (Klimova et al., 2016; Thabit et al., 2021).

In recent years, green information and communication technologies (ICT) have emerged as a promising solution to promote sustainable agriculture. Green ICT refers to the use of digital technologies to minimize environmental impact, reduce energy consumption, and increase resource efficiency (Thabit, Thabit Hassan, Hadj Aissa Sid Ahmed, Jasim, 2021). With the potential to transform agriculture, green ICT can enable precision farming, optimize water use, and reduce greenhouse gas emissions (Anser et al., 2021).

The use of green ICT strategies in agriculture is critical for promoting sustainable food systems, especially in developing countries (Goel et al., 2021). Green ICT can help increase productivity and efficiency while reducing environmental impact, contributing to food security and sustainable development goals. Green ICT can help farmers make informed decisions about the use of natural resources, such as water, fertilizers, and pesticides, reducing waste and improving yields (Aldakhil et al., 2019). For example, smart irrigation systems can optimize water use by providing farmers with real-time information about soil moisture levels, allowing them to irrigate only when necessary (Thabit, Thabit Hassan, Hadj Aissa Sid Ahmed, Jasim, 2021). Similarly, precision agriculture techniques, such as remote sensing and data analytics, can help farmers monitor crop growth and detect diseases early, reducing the use of pesticides and improving crop yields (Kumar et al., 2020 ; Yazdinejad et al., 2021).

However, the adoption of green ICT in agriculture faces several challenges. One major challenge is the lack of access to technology and digital infrastructure, particularly in rural areas (Goel et al., 2021; Thabit et al., 2021). This digital divide can limit the potential benefits of green ICT in agriculture, as many farmers may not have the necessary resources or skills to implement these technologies. In addition, the high cost of technology and the lack of technical support can also be barriers to adoption (Nayal et al., 2021). Moreover, the implementation of green ICT in agriculture requires careful consideration of ethical and social implications, such as data privacy, equity, and human rights (Yazdinejad et al., 2021). Addressing these challenges will require a comprehensive approach that involves collaboration between governments, the private sector, civil society, and academia, to promote equitable and sustainable access to green ICT in agriculture(Mazhar et al., 2021; Khan et al., 2021).

Despite the potential benefits, the adoption of green ICT in agriculture is still limited, particularly in developing countries where the digital divide is a major barrier. Moreover, the implementation of green ICT in agriculture requires a comprehensive approach that considers the social, economic, and environmental dimensions of sustainability (Nayal et al., 2021).

This research paper aims to analyze the role of green ICT strategies in promoting sustainable agriculture. Specifically, the paper will examine the potential of different green ICT strategies such as precision agriculture, smart irrigation systems, and renewable energy technologies to enhance resource efficiency and environmental sustainability in agriculture. The paper will also explore the challenges and opportunities associated with the adoption of green ICT in agriculture and provide recommendations for policymakers, researchers, and practitioners on how to promote the adoption of green ICT in agriculture to achieve sustainable and resilient food systems.

Overall, this research paper contributes to the growing body of literature on the role of green ICT in promoting sustainable development, particularly in the context of agriculture. By providing insights into the potential benefits and challenges of green ICT in agriculture, this research can inform policy and decision-making processes toward more sustainable and zestful food systems.

2. Green Information And Communication Technologies Approaches For Sustainable Agriculture

Green ICT strategies have the potential to significantly enhance resource efficiency and environmental sustainability in agriculture. This section will explore the most promising green ICT strategies that can be implemented in agriculture, including precision agriculture, smart irrigation systems, blockchain traceability, agroforestry, livestock management, and renewable energy technologies.

2.1. Precision Agriculture

Precision agriculture refers to the use of technology to optimize crop yield while minimizing resource inputs (Kumar et al., 2020). This approach involves collecting and analyzing data on soil quality, weather conditions, and plant growth, to identify areas of the field that require more or less water, fertilizer, or pesticides (Akhter & Sofi, 2022). By providing farmers with real-time information about their crops, precision agriculture can significantly reduce the resources required to produce a given amount of food while minimizing environmental impact (Akhter & Sofi, 2022).

2.2. Smart Irrigation Systems

Water scarcity is one of the major challenges facing agriculture, particularly in arid and semi-arid regions (Gill, 2021). Smart irrigation systems use sensors and weather data to optimize water use by applying water only where and when it is needed (Boursianis et al., 2021). These systems can reduce water use by up to 50% while maintaining or even increasing crop yield (MarketsandMarkets, 2020b; Khaled et al., 2022). By reducing water use, smart irrigation systems can also help farmers adapt to the impacts of climate change, such as droughts and unpredictable rainfall (Boursianis et al., 2021).

2.3. Renewable Energy Technologies

Agriculture is a significant source of greenhouse gas emissions, mainly due to the use of fossil fuels in machinery and transport (Padhan, 2023). Renewable energy technologies such as solar and wind power can help reduce these emissions by providing clean and affordable energy to power agricultural operations (Yurtkuran, 2021). By replacing fossil fuels with renewable energy, farmers can reduce their carbon footprint while also saving money on energy costs (Padhan, 2023).

According to the International Energy Agency (IEA), renewable energy sources are becoming increasingly important in the global energy mix. Among these sources, solar energy is the fastest-growing, accounting for 45% of all new renewable capacity additions in 2020 (International Energy Agency, 2021). Wind energy is the second-largest source of renewable energy worldwide, with over 733 GW of installed capacity (Global Wind Energy Council, 2021; Yurtkuran, 2021). Hydropower is the most significant renewable energy source, producing approximately 16% of the world's electricity (International Hydropower Association, 2021). Bioenergy is the second-largest renewable energy source, contributing to about 10% of global energy production (International Renewable Energy Agency , 2021). The United States has the largest installed geothermal capacity, with over 14 GW installed around the world (Geothermal Energy Association, 2021). Thus, renewable energy technology is a vast area, so it is not possible to cover all of the sources in this study. However, Table 1 shows how renewable energy technologies have been used in some energy sources around the world in recent years.

2.4. Blockchain Traceability

Blockchain technology can enhance traceability and transparency in the agriculture supply chain, which is crucial for ensuring food safety and quality (Lin et al., 2018). The use of blockchain can ensure that information on the origin, processing, and distribution of agricultural products are accessible and verifiable (Bodkhe, Umesh; Tanwar, Sudeep; Bhattacharya, Pronaya; Kumar, 2020)(Bodkhe et al.,2020). This can facilitate the identification and management of food safety issues and enhance consumer confidence. Additionally, blockchain can help reduce food waste by providing accurate informatihon on the shelf life of products and improving inventory management (Krithika, 2022). The use of blockchain technology for traceability can reduce food fraud (Lin et al., 2018).

Table 1. Global statistics on renewable energy technologies (2020)

Renewable Energy Technology	Global Capacity(GW[1])	Global Electricity Generation(TWh[1])	Average Cost of Electricity Production($/kWh[1])	Source
Solar PV	773	772	$0.068	(International Energy Agency, 2021)
Wind Power	743	1,335	$0.053	(Global Wind Energy Council, 2021)
Hydropower	1,308	4,315	$0.047	(International Hydropower Association, 2021)
Biomass	121	504	$0.084	(International Renewable Energy Agency, 2021)
Geothermal	14	97	$0.044	(Geothermal Energy Association, 2021)

2.5. Agroforestry

Agroforestry is a sustainable land use system that involves the integration of trees and shrubs with crops and livestock (Smith et al., 2022). This system can provide multiple benefits, such as soil conservation, carbon sequestration, biodiversity conservation, and

[1] *GW: Gigawatt, TWh: Terawatt-hour and kWh: Kilowatt-hour*

improved water quality (Rolo, 2022; Santiago-Freijanes et al., 2021). The integration of green ICT strategies in agroforestry can enhance its sustainability and efficiency. For instance, the use of remote sensing and GIS can facilitate the identification of suitable sites for agroforestry and the monitoring of tree growth and development (Bishaw et al., 2022).

2.6. Livestock Management

Livestock farming is a significant contributor to greenhouse gas emissions and environmental degradation (Gill, 2021). However, the adoption of sustainable livestock management practices can mitigate these impacts. Green ICT strategies can play a vital role in improving the efficiency and sustainability of livestock management (Nielsen et al., 2021). For example, the use of sensors and IoT devices can facilitate the monitoring of animal health, behavior, and productivity, leading to better decision-making and reduced environmental impacts (Akhigbe et al., 2021).

In recent years, the integration of green ICT strategies in agriculture has gained significant attention due to its potential to promote resource efficiency, sustainability, and competitiveness (Bremmer et al., 2021). In addition to precision agriculture and irrigation, there are other areas where green ICT can make a significant contribution. These strategies can provide multiple benefits, such as improving food safety and quality, reducing food waste, enhancing soil and water conservation, and mitigating greenhouse gas emissions (Raj et al., 2022).

Table 2 summarizes the impacts of green ICT approaches on several fields that meet the sustainability requirements of agriculture and figure 1 depicted the corresponding graph of this statistical data. This statistics-based table provides a glimpse into the potential benefits of using Green ICT strategies in agriculture and can be used to highlight the effectiveness of these strategies in improving sustainability and resource efficiency.

Overall, these green ICT strategies have the potential to significantly enhance resource efficiency and environmental sustainability in agriculture. By adopting these strategies, farmers can reduce their environmental impact while increasing their productivity and profitability. However, the adoption of these strategies also faces challenges such as a lack of access to technology and high initial investment costs.

3. Case Studies and Analysis

In this section, this research present case studies of the successful implementation of green ICT strategies in agriculture and provide an analysis of their impacts on resource efficiency and environmental sustainability.

3.1. Case Study 1: Precision Agriculture in the Netherlands and Australia

The Netherlands is a leader in precision agriculture, with many farmers using advanced sensors, GPS, and drones to optimize their crop yield (Ravi Kumar et al., 2020). By adopting precision agriculture, Dutch farmers have been able to significantly reduce their use of water and pesticides while maintaining high crop yields (Akhter & Sofi, 2022). According to a study by Wageningen University, precision agriculture has the potential to reduce pesticide use by up to 80% and water use by up to 30% (Bremmer et al., 2021).

Table 2. Summarizes the impacts of green ICT approaches on several fields

Practice	**Impact**				**Reference**
	Increased		**Decreased**		
	increased factor	**increased amount (%)**	**decreased factor**	**decreased amount (%)**	
Precision agriculture	crop yields	15-20%	water usage	20-30%	(Adhikari et al., 2021)
Precision livestock farming	meat quality	10%	feed costs	25%	(Nielsen et al., 2021)
Green computing	energy conservation	40%	greenhouse gas emissions	40%	(Bhardwaj et al., 2021)
Blockchain traceability	Productivity	30%	waste	20%	(Ali et al., 2021)
Agroforestry	crop yields	25%	Soil erosion	35%	(Dhakal et al., 2022)
IoT for livestock management	milk production	15%	Disease outbreaks	20%	(Olokunde et al., 2022)
Sustainable packaging	product self-life	20%	Plastic usage	50%	(Colley et al.,2022)
ICT-based weather forecasting	crop yields	30%	Water usage	25%	(Kumar et al., 2022)
ICT-based crop management	crop yields	30%	Water usage	25%	(Kumar et al., 2022)

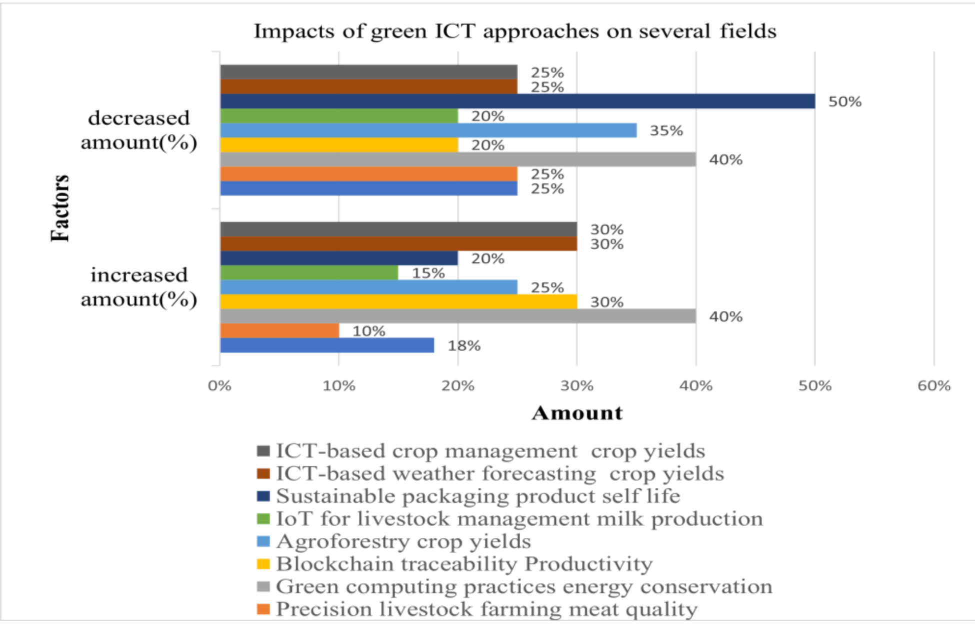

Figure 1. Impacts of green ICT approaches on several fields of practices

In Australia, farmers are implementing precision agriculture techniques that utilize a combination of IoT sensors, machine learning algorithms, and robotics to optimize crop production. By using green computing techniques to process and analyze large amounts of data collected by the sensors, farmers can make real-time decisions about planting, fertilization, and pest management (Bodkhe et al., 2020). This leads to improved crop yields, reduced use of inputs such as water and fertilizer, and increased environmental sustainability. In addition, precision agriculture techniques can reduce labor costs by automating tasks such as planting and harvesting (Akhter & Sofi, 2022).

Precision agriculture is gaining momentum in the Netherlands and Australia, with the market size, predicted to reach USD 12.9 billion by 2027, growing at a *Compound Annual Growth Rate* (CAGR) of 13.2% from 2020 to 2027, according to Grand View Research (Grand View Research, 2021). The European Commission suggests that precision agriculture technologies can increase yields by 10-20% and reduce the use of fertilizers and pesticides by 20-30% (European Commission, n.d.).

3.2. Case Study 2: Smart Irrigation Systems in India and Spain

In India, the state of Karnataka has implemented a successful smart irrigation system that uses sensors and weather data to optimize water use in agriculture. By providing farmers with real-time information about soil moisture levels and weather conditions, the system has been able to reduce water use by up to 40% while increasing crop yields by up to 20% (Boursianis et al., 2021). This has not only helped farmers save water and increase their profits but has also reduced the strain on water resources in the region (Yurtkuran, 2021).

In Spain, farmers are implementing smart irrigation systems that utilize IoT sensors to monitor soil moisture, temperature, and weather conditions (Khaled et al., 2022). These systems allow farmers to optimize their water usage and reduce waste by only irrigating when necessary. By using green computing techniques to process and analyze the data collected by the sensors, farmers can identify patterns and trends in their irrigation practices, leading to more efficient water usage and improved crop yields (Madhumathi et al., 2022). In addition, these systems can reduce the energy consumption associated with traditional irrigation practices by utilizing renewable energy sources such as solar panels (Padhan, 2023).

Smart irrigation systems are also gaining popularity in India and Spain, with the smart irrigation market expected to reach USD 2.07 billion by 2025, growing at a CAGR of 17.2% from 2020 to 2025, according to MarketsandMarkets (MarketsandMarkets, 2020b). The Food and Agriculture Organization (FAO) has reported that smart irrigation systems can potentially reduce water consumption in agriculture by up to 50% (FAO, 2012).

3.3. Case Study 3: Renewable Energy Technologies in Brazil

In Brazil, many farmers are adopting renewable energy technologies such as solar power to power their agricultural operations. By replacing diesel-powered generators with solar panels, farmers have been able to significantly reduce their energy costs and greenhouse gas emissions (Padhan, 2023). In addition, the Brazilian government has implemented policies that incentivize the adoption of renewable energy technologies in agriculture, which has helped accelerate the transition toward a more sustainable energy system (Yurtkuran, 2021).

The Brazilian Ministry of Mines and Energy reports that Brazil has taken significant strides in renewable energy, with a total of 47% of the country's installed power capacity coming from renewable sources in 2020 (Brazilian Ministry of Mines and Energy, 2021). Additionally, the FAO has found that implementing renewable energy in agriculture can reduce greenhouse gas emissions by up to 80% (FAO, 2018).

3.4. Case Study 4: Blockchain Traceability in the United States

In the United States, some farmers are adopting blockchain technology to provide traceability for their products (Lin, J., Shen, Z., Zhang, A. and Chai, 2018). By using blockchain, farmers can create a digital record of their product's journey from the farm to the consumer, providing transparency and accountability throughout the supply chain (Nayal, Raut, Narkhede, et al., 2021). This helps to reduce food waste and increase consumer trust in the food system. Additionally, blockchain technology can facilitate the development of sustainable supply chains by enabling farmers to receive fair prices for their products and ensuring that environmental and labor standards are met (Lin et al., 2018).

In the United States, blockchain technology is revolutionizing the traceability of food supply chains. According to MarketsandMarkets, the global market size for blockchain in the agriculture and food supply chain is predicted to reach USD 948.7 million by 2025, growing at a CAGR of 47.8% from 2020 to 2025 (MarketsandMarkets, 2020a). The World Economic Forum also suggests that utilizing blockchain technology for traceability can decrease food fraud by up to 50% (World Economic Forum, 2018).

3.5. Case Study 5: Agroforestry in Uganda

In Uganda, some farmers are implementing agroforestry practices, which involve integrating trees into agricultural landscapes. This approach can enhance resource efficiency and environmental sustainability by improving soil health, reducing erosion, and increasing biodiversity (Dhakal et al., 2022). In addition, agroforestry can provide farmers with additional income streams from tree products such as timber, fruits, and nuts (Smith et al., 2022). However, the adoption of agroforestry can be challenging due to a lack of awareness and knowledge among farmers, as well as policy and institutional barriers.

The World Agroforestry indicates that agroforestry is a sustainable agricultural practice gaining prominence in Uganda. Adopting agroforestry methods can result in improved soil health and crop yields that may increase by up to 50% (World Agroforestry, 2021). Additionally, the International Center for Tropical Agriculture reports that agroforestry has helped smallholder farmers augment their income by 30% in Uganda (International Center for Tropical Agriculture, 2017).

3.6. Case Study 8: Livestock Management in Brazil

In Brazil, farmers are using IoT-enabled livestock management systems to track and monitor the health and behavior of their animals. These systems utilize sensors and cameras to collect data on factors such as feeding habits, movement patterns, and vital signs (Gill, 2021). By using green computing techniques to process and analyze the data, farmers can identify potential health issues before they become serious and adjust feeding and management practices to improve animal welfare and productivity (Nandyala & Kim, 2016). In addition, these systems can reduce the use of antibiotics and other inputs by providing targeted interventions only when necessary.

The implementation of IoT-enabled livestock management systems has the potential to increase resource efficiency and environmental sustainability in the livestock industry (Thabit, Thabit Hassan, Hadj Aissa Sid Ahmed, Jasim, 2021). By improving animal health and reducing the use of inputs, such as antibiotics, farmers can improve their profitability and reduce the environmental impact of their operations (Nielsen et al, 2021). This case study provides an example of how green computing and IoT can be applied to diverse areas of agriculture beyond irrigation and precision agriculture.

According to the Brazilian Beef Exporters Association, Brazil is the leading global exporter of beef, contributing to 20% of the world's beef exports (Brazilian Beef Exporters Association, n.d.). The implementation of precision livestock farming technologies, as noted by the FAO, can enhance animal welfare, reduce environmental impact, and increase productivity by up to 20% (FAO, 2015).

These case studies demonstrate the potential of green ICT strategies to enhance resource efficiency and environmental sustainability in agriculture that summarizes in table 3 as well as the graphs represent in figure 2. However, the success of these strategies also depends on a range of factors such as the availability of technology, access to financing, and supportive policies.

4. Policy and Institutional Frameworks

In order to fully realize the potential of green ICT in agriculture, it is important to establish supportive policy and institutional frameworks. Policy and institutional frameworks are essential in promoting green ICT and sustainable agriculture. They provide an enabling environment for innovation, investment, and adoption of sustainable practices (World Bank, 2013). In addition, they offer incentives and support for research, development, and dissemination of new technologies and practices that can help to reduce the negative environmental impacts of agriculture (Bhati et al., 2018).

Table 3. Case studies and analysis of sustainable agriculture technologies and practices

Country/ Region	**Technology/ Practice**	**Market size (USD billions)**	**Growth rate (CAGR[2])**	**Impact/Benefit**
Netherlands & Australia	Precision Agriculture	12.9	13.2%	10-20% yield increase, 20-30% reduction in pesticide use (Grand View Research, 2021; European Commission, n.d.)
India & Spain	Smart Irrigation	2.07	17.2%	up to 50% reduction in water consumption (FAO, 2012; MarketsandMarkets, 2020b)
Brazil	Renewable Energy	-[3]	-	up to 80% reduction in GHG emissions (FAO, 2018; Brazilian Ministry of Mines and Energy, 2021)
United States	Blockchain Traceability	0.95	47.8%	up to 50% reduction in food fraud (World Economic Forum, 2018; (MarketsandMarkets, 2020a)
Brazil	Precision Livestock Farming	-	-	up to 20% productivity increase, improved animal welfare, and environmental impact (FAO, 2015; (Brazilian Beef Exporters Association, n.d.)
Uganda	Agroforestry	-	-	up to 50% crop yield increase, up to 30% increase in smallholder farmer income (International Center for Tropical Agriculture, 2017; (World Agroforestry, 2021; Smith et al., 2022)

[2] *CAGR: Compound Annual Growth Rate*

[3] *"-" in Market Size and Growth Rate columns indicates that the data is not available or applicable to that specific technology/application.*

These frameworks also ensure that access to ICT services and infrastructure is equitable and sustainable, particularly for smallholder farmers who may not have the resources to invest in expensive technologies (Bhati et al., 2018). Furthermore, monitoring and regulating the environmental and social impacts of ICT in agriculture is critical to ensuring that these technologies are deployed in a responsible and sustainable manner (Garrido et al., 2020). Overall, policy and institutional frameworks are essential tools for promoting sustainable agriculture and green ICT, and they must be designed and implemented with care to ensure that they are effective and equitable for all stakeholders.

There are several policies and initiatives that can be implemented to promote green ICT and sustainable agriculture (Garrido et al., 2020). Some examples include national strategies for green growth, digital transformation, and sustainable agriculture. International agreements and partnerships for climate change, biodiversity, and food security are also essential (Popp, J., & Lakner, n.d.). Additionally, multi-stakeholder platforms and networks for knowledge sharing, capacity building, and advocacy can play a significant role in promoting sustainable practices (Kuzma et al., 2020). Table 4 summarizes the policies and initiatives mentioned earlier.

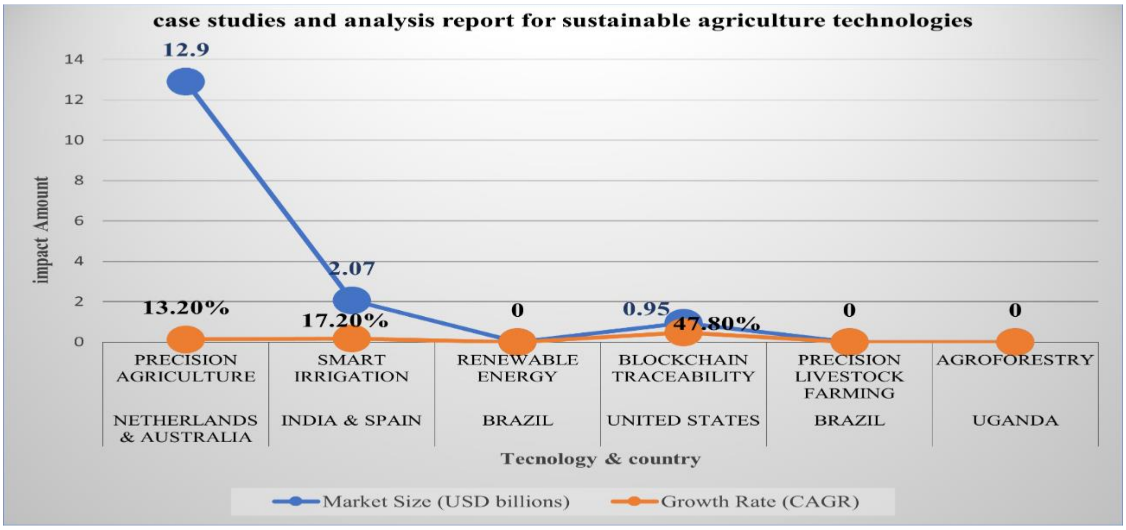

Figure 2. Case studies and analysis report of sustainable agriculture technologies

However, to be effective, these frameworks need to address the specific needs and challenges of different regions, sectors, and stakeholders. They must foster collaboration and coordination among different actors and levels of governance to ensure that all stakeholders are involved in the decision-making process (Garrido et al., 2020). Transparency, accountability, and participation in decision-making and implementation are also critical to ensure that the policies and initiatives are successful.

Overall, implementing policies and initiatives that address the specific needs of different sectors and stakeholders, and foster collaboration and coordination among different actors and levels of governance can play a crucial role in promoting sustainable agriculture and green ICT. Now this section will explore some of the key policies and institutions that can facilitate the adoption and implementation of green ICT strategies in agriculture.

Table 4. Summarizes the policies and initiatives that are effective in promoting sustainable practices

Policies and Initiatives	Description
National strategies for green growth	Strategies aimed at promoting environmentally sustainable economic growth.
Digital transformation	The integration of digital technology into all areas of a business or society leads to fundamental changes in how businesses and society operate.
Sustainable agriculture	Farming practices that are environmentally sustainable, socially beneficial, and economically viable.
International agreements and partnerships	Agreements between countries and partnerships between public, private, and civil society organizations aimed at addressing global challenges such as climate change, biodiversity, and food security.
Multi-stakeholder platforms and networks	platforms and networks that brings together different stakeholders, including policymakers, private sector actors, civil society organizations, and communities, to promote knowledge sharing, capacity building, and advocacy.

4.1. Policy Frameworks

i. National Agricultural Policies: Governments can develop and implement national agricultural policies that encourage the adoption of sustainable agricultural practices, including the use of green ICT. These policies can provide financial incentives, technical support, and regulatory frameworks to facilitate the adoption and diffusion of green ICT in agriculture (FAO, 2016).

ii. Environmental Regulations: Governments can also establish environmental regulations that require farmers to adopt sustainable practices, such as the use of precision agriculture or smart irrigation systems, and penalize those who fail to comply. Such regulations can provide a powerful incentive for farmers to adopt green ICT practices (Garrido et al., 2020).

4.2. Institutional Frameworks

i. Research and Development Institutions: Agricultural research institutions can play a critical role in developing and testing new green ICT strategies and technologies. These institutions can also provide technical support and training to farmers and other stakeholders to promote the adoption and implementation of green ICT practices (Popp, J., & Lakner, n.d.).

ii. Agricultural Extension Services: Agricultural extension services can provide farmers with information and guidance on sustainable agricultural practices, including the use of green ICT. These services can also provide training and support to farmers to help them implement new practices and technologies (Garrido et al., 2020).

iii. Industry Associations: Industry associations can facilitate the diffusion of green ICT strategies and technologies by providing a forum for collaboration and knowledge sharing among stakeholders. These associations can also work with governments to develop and implement supportive policies and regulatory frameworks (World Bank, 2013).

By establishing supportive policy and institutional frameworks, governments and other stakeholders can create an enabling environment for the adoption and implementation of green ICT in agriculture. This can help to enhance resource efficiency, reduce environmental impact, and promote sustainability in the agricultural sector. Supportive key policy and institutional frameworks and their provided incentives illustrated in figure 3.

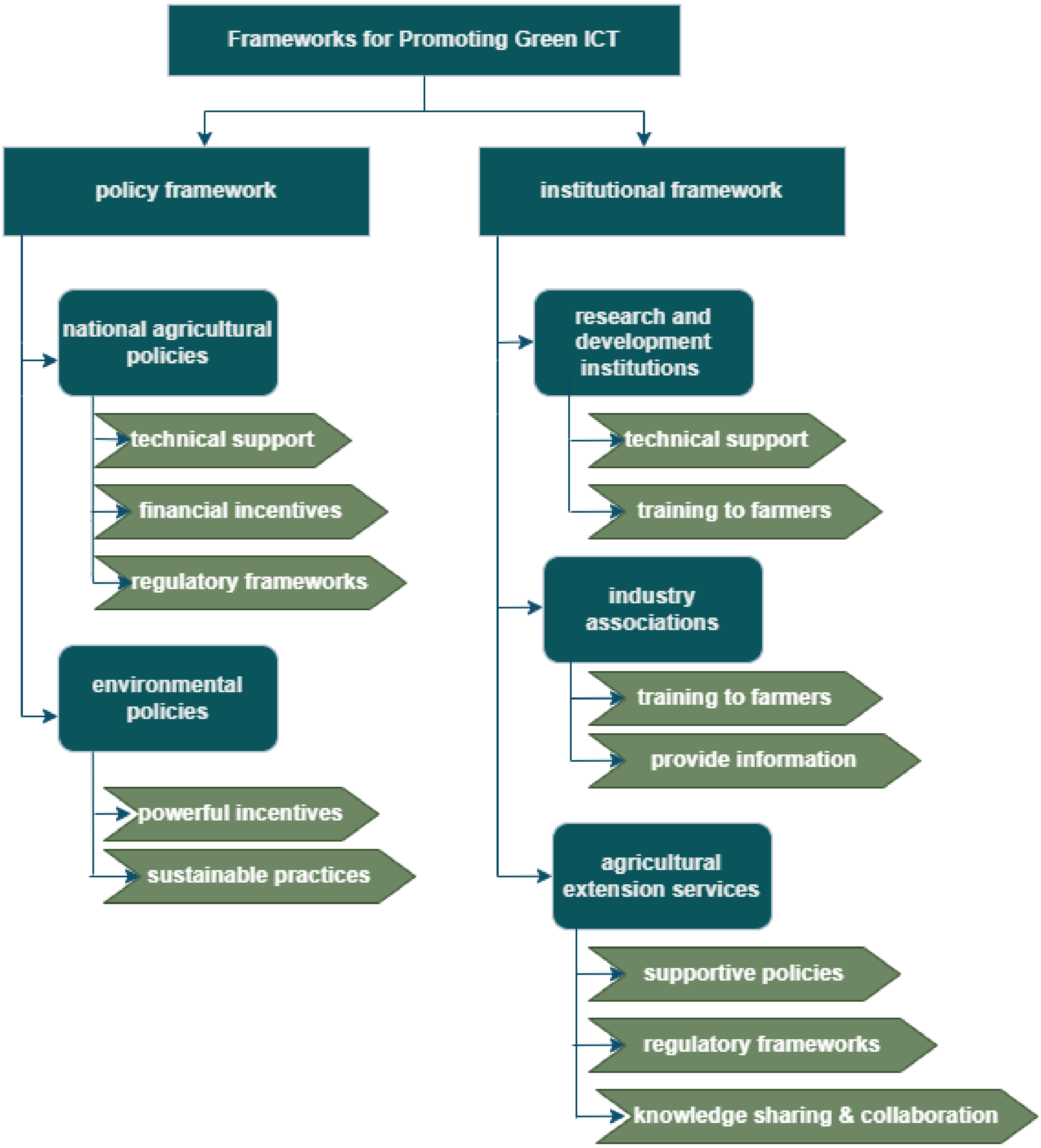

Figure 3. Supportive frameworks and their provided incentives

5. Conclusion and Recommendations

Green ICT has emerged as a powerful tool for enhancing resource efficiency and promoting sustainability in agriculture. The case studies and analysis presented in this paper demonstrate the potential of green ICT strategies, such as precision agriculture and smart irrigation systems, to reduce environmental impact and increase productivity in the agricultural sector. However, the adoption and implementation of green ICT in agriculture face several challenges, including high costs, lack of technical expertise, and inadequate policy and institutional frameworks.

It's crucial to create supportive regulatory and institutional frameworks in order to fully exploit the promise of green ICT in agriculture that provide financial incentives, technical support, and regulatory frameworks to facilitate the adoption and diffusion of green ICT practices. Governments can develop and implement national agricultural policies that encourage the adoption of sustainable practices, and establish environmental regulations that require farmers to adopt sustainable practices. Agricultural research institutions, extension services, and industry associations can provide technical support, training, and collaboration opportunities to promote the adoption and implementation of green ICT in agriculture.

Lastly, this paper highlights the potential of green ICT strategies for enhancing resource efficiency and promoting sustainability in agriculture. However, the adoption and implementation of these strategies require supportive policy and institutional frameworks. Governments, research institutions, extension services, and industry associations all have a role to play in facilitating the adoption and implementation of green ICT practices in agriculture. By working together, stakeholders can create an enabling environment for the adoption and implementation of green ICT strategies in agriculture, and contribute to a more sustainable future for agriculture and the planet as a whole.

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Dünyada ve Belli Başlı Ülkelerde Nüfus ve İşgücü Gelişiminin İncelenmesi

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Özet

Üretim faktörlerinin ana unsurlarından birisi olan işgücünün incelenmesi, onunla ilgili politikaların geliştirilmesi ve uygulanması tüm ülkelerinin ekonomik kalkınması açısından önemlidir. Bu çalışmanın temel amacı, üretim faktörlerinin ana unsurlarından olan işgücünün nüfus gelişimi ile doğru orantılı olarak geliştiği göz önünde bulundurularak, dünyada ve belli başlı ülkelerin nüfus ve işgücü piyasasındaki yerini tespit etmek, elde edilen sonuçları göz önünde bulundurarak işgücü potansiyelinden doğru yararlanmak ve işsizliğin azaltılması için öneriler sunabilmektir. Ülke seçiminde; küreselleşme sürecinde Türkiye'nin rekabet gücüne katkı yapacak gelişmiş ülkelerden başta Amerika Birleşik Devletleri olmak üzere, Avrupa Birliği, Rusya, gelişmekte olan ülkelerden nüfus hızıyla dünya ekonomisine entegrasyon olan Çin ve Hindistan, Türkiye'nin Güney Amerika'da en büyük ticaret hacmine sahip olduğu Brezilya gibi 6 ülke seçilmiştir. Araştırmada Uluslararası Çalışma Örgütü (ILO) ile Birleşmiş Milletler Nüfus Birimin (UNPD)'den elde edilen 21. yüzyılın ilk 21 yılına (her beş yılın ortalaması esas alınarak) ait ikincil veriler kullanılmıştır. İkincil verilerin gösteriminde oran hesaplamasından yararlanılmıştır.

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Abstract

One of the main elements of production factors is to examine the labor force, and its relating political development and implementation are of greater importance for the economical development of all countries of the world. The basic aim of this study is to provide recommendations for reducing unemployment by considering the results and the potential benefits from production factors, which is one of the main elements of labor and developed in line with the development of the population of major countries in the world. Country Selection will contribute to Türkiye's competitiveness in the process of globalization in developed countries, including the United States of America, the European Union, Russia and the population of developing countries, China and India, with a speed of integration into the world economy, Türkiye has the largest trading volume in South America countries such as Brazil, where 6 countries were selected.In the research, secondary data for the first 21 years of the 21stcentury (based on the average of every five years) obtained from the International Labor Organization (ILO) and the United Nations Population Division (UNPD) were used. Percentage calculation was used in the representation of secondary data.

1. Giriş

Nüfus veya popülasyon belirli bölgede, belirli bir zaman dilimi süresinde yaşayan toplam insan sayısıdır. Nüfus, sadece sayısal veriler sunmakla kalmamakta tarihsel olarak incelendiğinde toplumsal değişim ve dönüşümlerin resmini çizmekte ve analizlerine imkân vermektedir. Ayrıca, toplumlar için çok önemli potansiyel güçlerden biridir. Dolayısıyla bu gücün öneminin farkına varmak, onunla hangi iş ve rollerin gerçekleşeceğini bilmek toplumsal sistemin geleceği için çok gereklidir. Beşerî kaynakların niteliklerinin belirlenmesi ve ileriye dönük planlanması, kalkınma hedefleri, plan ve projeleri için önemlidir (Halike ve Direk, 2021).

Üretim faktörlerin ana unsurlarından olan işgücü, bir ülkede emek arzını insan sayısı yönünden ifade eden bir kavramdır. Üretim faktörleri arasında en önemli olanı emek faktörüdür. Zira insan faktörü olmadan diğer üretim faktörlerinin kendi başına üretimde bulunmaları düşünülemez. Diğer üretim faktörlerini toplayan, bunları üretim sürecine sokan ve yönlendiren insanın kendisidir. İstatistik terimi ile işgücü genellikle 15 yaşından yukarı ve 65 yaşını aşmayan ve kazanç getirici bir işte çalışanların toplamını ifade etmektedir (Halike ve Direk, 2019).

Emek (işgücü) ve müteşebbisin kaynağını oluşturan nüfus varlığı ile ekonomik kalkınma arasında çok yakın ilişkisi söz konusudur. Ülkelerin sosyal, siyasal ve ekonomik yaşamında nüfusun niceliği kadar niteliğinin bir göstergesi olan işgücünün kullanım etkinliği de önemlidir. İşgücünün incelenmesi, onunla ilgili politikaların geliştirilmesi ve uygulanması tüm dünya ülkelerinin ekonomik kalkınması açısından büyük önem taşımaktadır.

Bu çalışmanın temel amacı, üretim faktörlerinin ana unsurlarından olan işgücünün nüfus gelişimi ile doğru orantılı olarak geliştiği göz önünde bulundurularak, dünya ve belli başlı ülkelerin nüfus ve işgücü piyasasındaki yerini tespit etmek, elde edilen sonuçları göz önünde bulundurarak işgücü potansiyelinden doğru yararlanmak ve işsizliğin azaltılması için öneriler sunabilmektir. Dünya genelinde hızla artış gösteren kentleşme sürecinde, dünyada ve belli başlı ülkelerde sektörel faaliyetlerin sürdürebilir şekilde devam etmesi için gerekli işgücü ve istihdamın ne durumda olduğunu ortaya koymaktadır.

2.Materyal ve Yöntem

2.1. Materyal

Bu araştırmada, materyal olarak ikincil veriler kullanılmıştır. Bu veriler konuyla ilgili kurum ve kuruluşlardan: Uluslararası Çalışma Örgütü (ILO) ile Birleşmiş Milletler Nüfus Birimi (UNPD)'den alınan resmi istatistikî verilerden oluşmaktadır.

Ülke seçiminde Türkiye'nin rekabet gücüne katkı yapacak ülkeler dikkate alınmıştır. Konu ile ilgili literatür taramasında, FAO veri tabanından elde edilen nüfus sayımı, milli gelir ve iş gücü piyasasına ilişkin veriler ile ülke seçimleri yapılmıştır.

2.2. Yöntem

Araştırmada, konuyla ilgili daha iyi değerlendirme yapabilmek 21. yüzyılın ilk 21 yılına (her beş yılın ortalaması esas alınmıştır) ait toplanan veriler bilgisayar ortamında tablolaştırılarak, sayısal verilerin özelliklerine ve çalışmanın amacına uygun yöntemlerle veriler analiz edilmiştir.

3. Bulgular ve Araştırmalar

Üretim faktörlerinden birisi olan işgücünün nüfusun gelişimi ile doğru orantılı olarak geliştiği göz önünde bulundurularak bu çalışma, incelenen ülkeler bağlamında nüfusun gelişimini inceleme ile başlatılmıştır. Nüfus gelişiminin işgücü piyasasını oluşturması sonucu, işgücü, istihdam ve işsizliğin gelişimini olarak devam ettirilmiştir.

3.1. Nüfus ve Gelişim Göstergeleri

Nüfus; ülkelerin kalkınmasında, ülkenin dünyadaki etki alanını genişletmesinde potansiyel bir güç olarak önemli bir faktördür. Nüfusun potansiyel gücü, nüfus miktarı ve nüfusa ait niteliksel özelliklerle ilişkilidir (Anonim, 2022). ILO 2022 yılı verilerine göre dünya nüfusu 7,9 milyarı geçmiş seviyededir. FAO tarafından hazırlanan bir çalışmada, dünya nüfusunun 2050'de %34 artışla 9,1 milyara ulaşacağı, dolayısıyla dünya nüfusunun beslenme ve istihdam sorununun tüm dünya ülkelerinin ve uluslararası kuruluşların öncelikli politika alanlarından birisi olacağı öngörülmüştür. Dünya nüfusunun yarıya yakını kırsal kesimdeyaşamakta, nüfusun yaklaşık %28'i geçimini tarımdan sağlamaktadır. Dünya nüfus artışı günümüzün önemli sorunlarından biridir (Şahin, 2018).

Dünya ve seçilmiş belli başlı ülkelerin 2000-2021 yıllar arası nüfusun gelişimi Tablo 1'de verilmiştir. Veriler ele alındığında, AB haricindeki tüm ülkeler nüfusunda doğrudan artış görülmüştür. Nüfusu sürekli artış eğiliminde olan AB'nin 2020-2021 yılında bir önceki döneme göre 63 milyon 889 bin değer kaybetmesinin temel sebebi ise 2020 yılında İngiltere'nin AB birliğinden geri çekilmesi ve Korona virüsü salgını dolayısıyla AB'nin toplam nüfusu görülür şekilde azalmıştır.

Tablo 1. Dünyada ve belli başlı ülkelerde nüfusun gelişimi (1000 kişi)

Yıl	Dünya	AB	ABD	Rusya	Çin	Hindistan	Brezilya	Türkiye
2000-2004	6.302.048	489.542	287.154	145.229	1.307.084	1.093.208	179.468	65.136
2005-2009	6.706.645	498.345	300.631	143.383	1.345.984	1.182.940	190.068	69.596
2010-2014	7.125.944	504.472	313.943	144.033	1.384.170	1.265.358	199.263	74.715
2015-2019	7.547.247	511.229	325.028	145.479	1.420.670	1.338.481	207.797	81.049
2020-2021	7.834.882	447.340	331.959	145.923	1.441.770	1.386.707	213.276	84.691

Kaynak: UNPDV, 2022; EUROSTAT, 2022

Belli başlı ülkeler nüfusunun dünya nüfusu içindeki payına bakıldığında, en yüksek paya sahip olan ülke Çin (%18,40) ve Hindistan (%17,70), en az paya sahip olan ülke Türkiye (%1,08) ve Rusya (%1,86) olarak görülmektedir. Fakat bu zaman diliminde hem ulusal nüfus artışına hem de dünya nüfusuna artış göstererek hizmet eden tek ülke ise Türkiye olarak tespit edilmiştir (Tablo 2). Zamanla yaşanan sosyal ve ekonomik değişimler, Türkiye'nin Ortadoğu içerisindeki stratejik önemi sonucunda aldığı göçler bu değişimin temel sebepleri arasında sayılabilir.

Tablo 2. Belli başlı ülkeler nüfusunun dünya nüfusundaki Oranı (%)

Yıl	AB	ABD	Rusya	Çin	Hindistan	Brezilya	Türkiye
2000-2004	7,77	4,56	2,30	20,74	17,35	2,85	1,03
2005-2009	7,43	4,48	2,14	20,07	17,64	2,83	1,04
2010-2014	7,08	4,41	2,02	19,42	17,76	2,80	1,05
2015-2019	6,77	4,31	1,93	18,82	17,73	2,75	1,07
2020-2021	5,71	4,24	1,86	18,40	17,70	2,72	1,08

Kaynak: UNPDV, 2022; EUROSTAT, 2022

3.2. İşgücü ve Gelişim Göstergeleri

İşgücü bir ülkenin potansiyel emek arzı kapasitesini gösterir. Bu bakımdan bir ülkede emek arzı potansiyelini tayin eden faktör, genel nüfus ve çalışan nüfus miktarından çok, işgücünün miktarı ve işgücüne katılım oranıdır.

Verimlilik çalışmalarında iki boyut önem taşımaktadır. Birincisi ülkelerin kendi içindeki gelişimlerini görmek, ikincisinde de ülkelerarası kıyaslamaları gerçekleştirmektir. Gerek araştırmacılar gerek iş dünyasının yetkilileri gerekse iktisat politikalarını oluşturan kamu kesimi yöneticileri bu iki boyutu inceleyerek geleceğin eğilimlerini belirlemeye çalışırlar (Halike ve Direk, 2019). Çalışmanın bu kısmında dünyada ve belli başlı ülkelerde işgücünün gelişim eğilimi incelenmiştir.

Tablo 3'deki veriler değerlendirildiğinde, dünya genelinde işgücü sayısında doğrudan bir artış görülmektedir. Ülkelere bakıldığında Türkiye ve ABD'de işgücü rakamlarında sürekli bir artışın ortaya çıktığı görülmektedir. İngiltere'nin AB'den ayrılması, salgın ve göç verme sonucu 2020-2021 yılı işgücü rakamlarında kritik bir azalım görülmektedir. Bunun yanı sıra Covid-19 salgınının olumsuz etkisi Çin, Hindistan ve Brezilya'da belirgin boyutta görülerek işgücü rakamlarının azalmasına neden olmuştur (WHO, 2022).

Tablo 3. Dünyada ve belli başlı ülkelerde işgücünün gelişimi (1000 kişi)

Yıl	Dünya	AB	ABD	Rusya	Çin	Hindistan	Brezilya	Türkiye
2000-2004	2.852.510	230.633	147.933	72.895	760.773	414.860	81.898	22.301
2005-2009	3.064.392	240.272	154.717	75.424	789.101	451.047	91.319	23.166
2010-2014	3.223.661	245.997	157.903	76.090	799.584	459.509	95.197	27.254
2015-2019	3.397.754	250.579	163.332	75.120	813.085	472.834	101.387	31.887
2020-2021	3.439.221	216.094	164.897	73.367	809.149	464.539	97.984	32.122

Kaynak: ILO, 2022.

Tablo 4'te sunulan veriler değerlendirildiğinde, genel itibariyle dünyada ve belli başlı ülkelerde işgücüne katılım oranlarında oransal bir azalışın yaşandığı görülmektedir. Dünyada ve seçilmiş ülkelerde işgücüne katılım oranlarının dalgalı gelişimi birden fazla faktörün etkisinden meydana gelmektedir. Özellikle, eğitime ağırlık verilmesi, göç, Covid-19 (etkilenen yaş grubu 35-50) gibi birçok faktörden etkilendiğini söylemek mümkün (ILO, 2022).

Tablo 4. Dünyada ve belli başlı ülkelerde işgücüne katılım oranı (%)

Yıl	Dünya	AB	ABD	Rusya	Çin	Hindistan	Brezilya	Türkiye
2000-2004	64,09	56,43	65,55	60,43	75,71	57,44	64,16	48,80
2005-2009	63,15	57,16	64,86	61,79	72,80	56,10	65,22	46,15
2010-2014	61,69	57,50	62,73	62,61	70,78	51,82	62,73	49,52
2015-2019	60,77	57,86	61,94	62,65	69,74	48,74	62,31	52,41
2020-2021	58,84	56,88	60,81	61,63	68,15	45,25	57,84	49,74

Kaynak: ILO, 2022

3.3. İstihdam ve Gelişim Göstergeleri

İstihdam, "üretim faktörleri olan emek, sermaye, girişimci ve doğal kaynakların optimal kullanılarak üretim sürecine katılmasını" ifade etmektedir (Bekiroğlu, 2010). Bir ülke ekonomisinin mevcut durumu ve yapısal değişimi hakkında fikir edinebilmenin bir yolu, o ülkedeki istihdamın yapısının değerlendirilmesidir. Her ülke için istihdam olanaklarının artırılması, gerek ekonomik refahın gerekse sosyal refahın sağlanması açısından önem arz etmektedir. Küreselleşme süreci, istihdamın yapısını değiştirmiş, eğreti istihdam biçimleri yaygınlaşmış ve bu temelde çalışanların ortak hareket etme olanakları da sınırlanmıştır (Özpınar ve ark, 2011). Çalışmanın bu bölümünde dünyada ve seçilmiş ülkelerde istihdamın gelişim durumu incelenmek üzere istihdam oranı, istihdamın sektöre göre gelişimi incelenerek devam edilmiştir.

Tablo 5'de görüldüğü gibi 2000 yılından 2021 yılına doğru Dünya istihdamında sürekli bir artışı görülmektedir. Fakat seçilmiş ülkeler ele alınarak incelendiğinde tüm ülkelerin istihdam sayısı 2019 yılın öncesi sürekli artış eğiliminde sonrasında ise sürekli azalış eğiliminde olduğu görülmektedir. 2019 yılın sonunda hissedilmeye başlayan küresel salgının tüm dünya ülkelerinin sosyolojik ve ekonomik gelişimini etkilediği özellikle işveren-işçi dengesini olumsuz etkileyerek istihdam sayılarının gerilmesine neden olduğunu söylemek mümkündür (ILO, 2022).

Tablo 5. Dünyada ve belli başlı ülkelerde istihdamın gelişimi (1000 kişi)

Yıl	Dünya	AB	ABD	Rusya	Çin	Hindistan	Brezilya	Türkiye
2000-2004	2.682.254	209.840	140.225	66.567	729.726	391.674	74.097	20.219
2005-2009	2.890.650	220.966	145.613	70.191	753.417	426.021	83.583	20.819
2010-2014	3.038.480	221.118	145.220	71.528	763.042	434.469	88.531	24.738
2015-2019	3.210.480	231.254	156.133	71.259	776.659	447.478	89.786	28.275
2020-2021	3.220.284	200.900	153.760	69.478	769.433	432.146	84.215	27.866

Kaynak: ILO, 2022

Tablo 6'da genel itibariyle Dünya ve seçilmiş ülkelerin yıllar içerisinde istihdam oranlarında oransal bir azalış yaşandığı görülmektedir. Özellikle ABD, Çin ve Hindistan'ın istihdam oranında sürekli azalış görülmüş iken AB, Rusya ve Türkiye'de ise 2019 yılına doğru sürekli artış sonrasında ise azalış görülmüştür. İstihdam rakamlarının artmasına rağmen istihdam oranının gerilmesi işsizlik artışının net göstergesi olarak yorumlanabilir.

Tablo 6. Dünyada ve belli başlı ülkelerde istihdam oranı (%)

Yıl	Dünya	AB	ABD	Rusya	Çin	Hindistan	Brezilya	Türkiye
2000-2004	60,26	51,34	62,14	55,18	72,63	54,23	58,05	44,26
2005-2009	59,57	52,56	61,06	57,51	69,51	52,99	59,69	41,48
2010-2014	58,15	51,68	57,68	58,86	67,54	49,00	58,33	44,95
2015-2019	57,42	53,39	59,20	59,43	66,62	46,12	55,19	46,49
2020-2021	55,09	52,88	56,70	58,37	64,81	42,09	49,72	43,15

Kaynak: ILO, 2022

İstihdamın sektörler itibarıyla dağılımı her şeyden önce bir ülkenin ekonomik gelişmişlik seviyesini belirleyen önemli göstergelerden birisidir. İstihdamın ekonomik gelişmeye bağlı olarak değişimini açıklayan üç sektör kanunu ekonomik gelişme aşamasına geçilmesiyle beraber tarım sektörünün payı azalırken, sanayi sektörünün payı sürekli olarak artar. Hizmetler sektörünün payı ise zaten sürekli artış eğilimindedir. Tarım sektörünün payı hala olması gerekenden yüksek seyrederken, sanayi sektöründe anlamlı bir artış yaşanmamıştır. Sanayi sektöründe yeterince istihdam yaratılamaması sonucu hizmet sektörü kontrolsüz bir şekilde artarak son yıllarda %50'lere ulaşmıştır. Günümüzün gelişmiş ülkelerinde, özellikle AB ülkelerinde, üç sektör kanunu tam olarak işlediği, toplam istihdam içerisinde tarım sektörü istihdam payının % 3,00-4,00 seviyesinde olduğu, sanayi sektörü payının %25,00-30,00, hizmetler sektörü payının ise % 65,00-70,00 seviyesinde olduğu görülmektedir (İşkur, 2010).

İstihdamın yıllar itibariyle sektöre göre oransal gelişimi ele alındığında (Tablo 7) Dünya istihdam oranı içinde hizmet sektörünün payı yaklaşık %50,00, sanayi sektörünün payı ise yaklaşık %23,00 olarak görülmektedir. Üç sektör kanununa göre tarım sektörünün payı (yaklaşık %28,00) hala olması gerekenden yüksek seyrederken, sanayi sektöründe ise anlamlı bir artış yaşanmamıştır. Dünya ortalamasında tarım sektörü istihdam payının yüksek olması tarım sektörünün hem üretim hem de iş imkânları açısından önemini korumakta olduğunu görebiliyoruz.

Tablo 7. Dünyada istihdamın sektöre göre oransal gelişimi (%)

Yıl	Tarım	Sanayi	Hizmet	Toplam
2000-2004	37,72	22,16	40,12	100,00
2005-2009	35,22	21,96	43,05	100,00
2010-2014	31,35	23,20	45,94	100,00
2015-2019	27,92	23,07	49,53	100,00

Kaynak: ILO, 2022

Tarım sektörünün**,** yalnız bitkisel ve hayvansal üretim faaliyetinde bulunarak ülke nüfusunun gıda ve diğer tarımsal kökenli ihtiyaç maddelerini karşılayan, ihtiyaç fazlasının da ihracatına olanak sağlayan bir uğraşı olarak görülmesi, önemli bir eksikliktir (Erkuş ve ark, 2005).

Tarımdaki istihdamın oransal gelişimi incelendiğinde (Tablo 8), dünyada ve seçilmiş ülkelerde tarımdaki istihdamın oranı azalış trendi göstermektedir. 2015-2019 yılları arasında nüfusun; Dünyada (%27,92), Hindistan'da (%45,06), Çin'de (%26,71), Türkiye'de (%19,09), Brezilya'da (%9,89), Rusya'da (%6,17), AB'de (%4,17) ve ABD'de (%1,41)'i tarım alanında istihdam edildiği görülmektedir.

Tablo 8. Dünyada ve belli başlı ülkelerde tarımdaki istihdamın oransal gelişimi (%)

Yıl	Dünya	AB	ABD	Rusya	Çin	Hindistan	Brezilya	Türkiye
2000-2004	39,27	7,19	1,54	11,83	49,28	58,61	16,81	26,04
2005-2009	35,22	5,59	1,36	9,16	41,07	54,69	14,99	23,46
2010-2014	31,35	4,93	1,39	7,30	33,22	48,70	11,76	22,84
2015-2019	27,92	4,17	1,41	6,17	26,71	45,06	9,89	19,09

Kaynak: ILO, 2022

Dünya ve Türkiye ekonomisinde tarım; nüfus ve istihdam, beslenme, tarımsal üretim, yurt içi tüketim, tarımın sanayiye olan katkısı, milli gelir ve ödemeler dengesi açsından önemini sürekli koruyan bir sektör konumundadır. Tarım, ekonominin diğer sektörlere sermaye ve işgücü transferini de üstlenmektedir.

3.4. İşsizlik ve Gelişim Göstergeleri

İşsizlik, gelişmişlik seviyesinden bağımsız olarak tüm ülkelerin ortak sorunu olup, birey ve toplum üzerinde ciddi ekonomik ve sosyal etkilere sahiptir. Bireyler için bu etkiler, ekonomik olarak gelir kaybı ve alım gücünün azalması, sosyal olarak ise umutsuzluk ve yaşam kalitesinin düşmesi olarak ifade edilebilir. Toplum için ise ekonomik açıdan üretici kaynakların bir bölümünün etkin olarak kullanılamaması, sosyal açıdan ise suç oranının artması ve refah seviyesinin düşmesi gibi sonuçlara neden olabilmektedir (Ataman, 1999).

Tablo 9'da sunulan işsizlik verileri incelendiğinde, Rusya haricinde Dünyada ve tüm seçilmiş ülkelerde işsizlik rakamları sürekli bir artış gösterdiği göstermektedir. AB ve ABD'de 2014 yılındaki ekonomik kriz sonucu işsizliği en yükseklerde seyrederken 2020-2021 yılı içinde de diğer ülkeler gibi işsizlik sorunu ile karşı karşıya kaldığı görülmektedir. Bu zaman diliminde tüm dünya ülkelerinin işsizlik rakamları artarken; AB nüfusunun 20 milyon793 bin'den 15 milyon 195 bin'e düşmesinin önemli sebeplerinden biri İngiltere'nin AB'den geri çekilmesi diğeri ise Covid-19 sürecinde hızlı nüfus kaybına maruz kalması olarak değerlendirebiliriz.

Tablo 9. Dünyada ve belli başlı ülkelerde işsizliğin gelişimi (1000 kişi)

Yıl	Dünya	AB	ABD	Rusya	Çin	Hindistan	Brezilya	Türkiye
2000-2004	170.256	20.793	7.707	6.328	31.048	23.186	7.801	2.082
2005-2009	173.742	19.307	9.103	5.233	35.683	25.026	7.736	2.347
2010-2014	185.180	24.879	12.683	4.562	36.543	25.040	6.666	2.516
2015-2019	187.274	19.326	7.199	3.861	37.286	25.356	11.601	3.612
2020-2021	218.938	15.195	11.137	3.889	39.015	32.394	13.768	4.256

Kaynak: ILO, 2022

Tablo 10'da verilen işsizliğin oransal gelişimine bakıldığında, 2000 yılından 2021 yılına doğru geçen zaman diliminde Rusya haricinde (yaklaşık %8,68-%5,30) tüm dünya ülkeleri işsizlik oranında artış yaşanmıştır. Özellikle Türkiye (%13,25) ve Brezilya (%14,05) gibi ülkeler işsizliğin %10,00'un üzerinde olması oldukça dikkat çekicidir. En yüksek işsizlik oranı ABD'de 2010-2014 (%8,04), 2020-2021 (%6,76) döneminde, AB'de 2010-20214 (%10,11), 2020-2021 (%7,03) döneminde, Hindistan'da ise 2020-2021

(%6,99) döneminde yaşanmıştır. Salgınla mücadele yılı olan 2020 yılının tüm dünya ülkelerini olumsuz yönde etkilediği görülmektedir. ABD'de istihdam ve işsizlik oranın beraber artması bu ülkede kayıt dışı ekonomik faaliyetlerin yüksek olduğunu göstermektedir.

Tablo 10. Dünyada ve belli başlı ülkelerde işsizlik oranı (%)

Yıl	Dünya	AB	ABD	Rusya	Çin	Hindistan	Brezilya	Türkiye
2000-2004	5,97	9,02	5,20	8,68	4,07	5,59	9,53	9,32
2005-2009	5,67	8,04	5,87	6,94	4,52	5,55	8,48	10,10
2010-2014	5,75	10,11	8,04	5,99	4,57	5,45	7,00	9,24
2015-2019	5,51	7,72	4,42	5,14	4,59	5,36	11,42	11,29
2020-2021	6,37	7,03	6,76	5,30	4,82	6,99	14,05	13,25

Kaynak: ILO, 2022

3.5. İşsizliğin Sürekli Artmasının Temel Sebepleri

2001, 2008, 2020 yılındaki küresel kriz ve yanlış politikaların uygulanması, gizli işsizlik, nüfusun düşük eğitim seviyesi, düzensiz göç alımı ve Covid-19 salgını sonucu hemen hemen bütün dünya ülkeleri işsizlik rakamlarında artış görülmüştür. Diğer yandan bakıldığında bilgi ve teknolojinin hızlı gelişmesine karşın tarım, sanayi ve hizmet sektörlerinde insan gücü yerine makine, robot ve bilgisayar teknolojilerinin yer alması; bazı mesleklerin değer kaybetmesi; geri dönüşü olmayan küreselleşme çerçevesinde iş prosesinin bölgesel bağımsızlığı, iş yerlerinin değişimi karşısında uyum sağlamada esneklik; bireylerin eğitim düzeyinin yeterli olmaması, düşük ücret karşılığında iş beğenmeme gibi değişimler neticesinde dünyada işsizlik rakamları sürekli bir artış göstermektedir.

4. Sonuç ve Öneriler

Bulgular ışığında elde ettiğimiz sonuçlara göre; her beş yılı esas alan 2000-2021 yıllar arası Dünyada ve seçilmiş belli başlı ülkelerde nüfus rakamları sürekli artış eğilimi göstermektedir. Dünya nüfusunun yaklaşık %18,40'ını Çin, %17,70'i Hindistan, %5,71'ini AB, %4,24'ünü ABD, %2,72'isini Brezilya, %1,08'ini ise Türkiye oluşturmaktadır.

İşgücü gelişimine bakıldığında; Dünyada ve seçilmiş ülkeler işgücü sayısında artış trendi görülmektedir. İşgücüne katılım oranında sadece Rusya'da (%60,43-%61,63) artış eğilimi görülmektedir. 2020-2021 yılı işgücüne katılım oranı; dünyada %58,84; Hindistan'da %45,25, Türkiye'de %45,74, Brezilya'da %57,84, AB'de %56,88, ABD'de ise %60,81 olmaktadır.

İstihdam; yıllar itibariyle tüm dünya ülkelerinde artış trendi göstermektedir. Fakat istihdam oranı AB (%51,34-%52,88) ve Rusya (%55,18-%58,37) haricinde ters orantılı artış kaydetmiştir. 2020-2021 yılı işgücüne katılım oranı; dünyada %58,09, ABD'de %56,70, Çin'de %64,81, Hindistan'da %42,09, Brezilya'da %49,72, Türkiye'de ise %43,15 olmuştur. Dünya istihdamın içinde hizmet sektörünün payı yaklaşık %50,00, sanayi sektörünün payı yaklaşık %23,00, tarım sektörün payı ise yaklaşık %28,00 olmaktadır. Tarımdaki istihdamın oransal gelişimi tüm dünya ülkelerinde azalış göstermekte olup 2015-2019 yılı verilerinde tarımdaki istihdam; dünyada %27,92, AB'de %4,17, ABD'de %1,41, Rusya'da %6,17, Çin'de %26,71, Hindistan'da %45,06, Brezilya'da %9,89 ve Türkiye'de ise %19,09 olarak görülmüştür.

İşsizlik; 2000-2021 yılı aralığında AB ile Rusya hariç tüm dünya ülkelerinde işsizlik sürekli bir artış eğiliminde olmaktadır. İşsizlik oranı ele alındığında AB ve Rusya haricinde tüm dünya ülkelerinde oransal artış söz konusudur. 2020-2021 yılı işsizlik oranı dünyada %6,37, AB'de %7,03, ABD'de %6,76, Rusya'da %5,30, Çin'de %4,82, Hindistan'da ise %6,99 olmuştur. Özellikle Türkiye'de %13,25 ve Brezilya'da%14,05 olan işsizlik oranının %10'un üzerinde olması oldukça dikkat çekmektedir.

Modernleşme sürecinde, küresel kriz ve yanlış politikaların uygulanması, gizli işsizlik, düşük eğitim seviyesi, düzensiz göç, Covid-19 salgını sonucu tüm dünya ülkeleri işsizlik sayısında artış görülmüştür. İşsizlik ile mücadelede aşağıdaki öneriler değerlendirilebilir.

Öneriler:

İşsizlik konusunda *kapsamlı, detaylı* ve *uzun dönemli çözümler* bulmak ve uygulamaya koymak gereklidir. Özellikle eğitim ve istihdam arasındaki ilişkinin sağlıklı bir biçimde kurulması gerekmektedir.

Tüm dünya ülkeleri için işsizliği azaltmada etkisi oldukça büyük olan ve dikkat edilmesi gereken hususlar: Eğitim ve eğitim kurumlarının kalitesine önem verilmeli; Halka açık mesleki kurs imkânları olmalı; İş ve meslek danışmanı hizmetlerine önem verilmeli; İşveren- işçiye yönelik Psikolojik destek hattı sağlanmalı; İş kura teşvik fonlarına önem verilmeli; Ulusal ve Uluslararası iş birliği kombinasyonu olmalıdır.

Türkiye için öneriler:

Türkiye'deki işsizlik rakamlarının azalması için genel anlamda yapılması gereken çalışmalar şunlardır: İşletme ve girişimcilik desteğinin istikrarlı şekilde devam etmesi gereklidir; Eğitim ve beceri geliştirme programlarına önem verilmelidir; Devlet ve özel iş yerleri iş birliği kombinasyonu sağlanmalıdır; İstihdama teşvik proje ve çalışmaların sayısını arttırmak gereklidir; İŞKUR gibi istihdam ve işsizlik takip sisteminin geliştirilmesi gereklidir; Mesleki kurslar ile işvereni buluşturma platformlarının yaygınlaştırılmalıdır; Memuriyet sınavlarında yaş sınırının kaldırılmalıdır; Halkın beslenme kalitesine önem verilmesi gerekmektedir.

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Agricultural Production Systems in Sudan

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Abstract

Agriculture is one of the strategic elements of any developed or developing country. It's fundamentally related to political and social stability. Sudan is characterized as an agricultural country that has all the extended factors of that. Agriculture and cultivating-related activities are carried out in many different patterns which are adopted and practiced in Sudan. Agricultural production in Sudan is generally practiced through three systems: small-scale farming using a traditional rain-fed system, mechanized rain-fed systems, and irrigated farming systems. Each system produces specific crops and is located in appropriate regions with varying levels of mechanization in the production areas. Manually carried tools and animal power dominate in the traditional rain-fed system. Mechanical energy and sophisticated tools are commonly used in irrigated and mechanized rain-fed systems. Different crops are grown in Sudan regarding of farming system. Here we are presenting the common agricultural practices systems in Sudan, which help those who are unfamiliar and/or interested in this country to get closer by knowing the cropping systems in Sudan.

1. Introduction

Geographically, Sudan is a large country lying within the Sudano-Sahel region of northeast Africa between latitudes 10° and 23° N, and longitudes 21° 45′ and 38° 30′ E, and is located in the middle part of the Nile Basin. It covers an area of about 1.9 million km^2, and most of the country consists of vast arid plains broken by a few widely spaced ranges of hills and mountains. The country borders are South Sudan, Ethiopia, Eritrea, Egypt, Libya, Chad, the Central African Republic, and Saudi Arabia across the Red Sea. The country's population has been estimated at approximately 43 million, with an annual population's growth rate of 2.9 % (Central Bank of Sudan, 2017; Osman & Ali, 2021)

The economy of Sudan is based on agriculture, which contributes about one-third of Gross Domestic Product (GDP). Sudanese agriculture has different cropping and livestock production systems. Agriculture supplies the growing population with food, creates employment opportunities, and supplies the industry with raw materials. Sudan considered one of the three countries in the world that can contribute to international food security if it manages their resources wisely. Sudan is divided into five different ecological zones: desert, semi-desert, forest savannah, floodplain, and mountainous vegetation. About 72 % of the land in Sudan is semi-desert. It has been reported that agriculture supports the national economy; it estimated about 90.7 million ha are suitable for cultivation, but only 23.5 million ha are in use (FAO, 2022). Sudan's economy heavily depends on the agricultural sector, with almost 65 % of the population engaged in agriculture, which makes it the main supplier of raw materials for industry. The agricultural sector, including forestry, livestock, and fisheries, accounted for 20 percent of the GDP in 2020. In addition, Sudan raises livestock, with an estimated total livestock population in 2021 of about 111 million head of cattle, sheep, goats, and camels, mainly depending on natural grazing land for fodder and hafirs*****, rivers, seasonal streams, and wells for watering (FAO, 2022). The Sudan embed with the Great Nubian Sandstone, which is part of the largest source of freshwater on Earth, the Umm Ruwaba, and many aquifers, as well as the Nile River Basin, which is providing about

80–85 % of the water used in Sudan (Lee and Chula Vista, n. d.).

Agricultural production in Sudan is mainly practiced through three systems: traditional rain-fed system, mechanized rain-fed system, and irrigated farming system, each producing specific crops and utilized different levels of mechanization (Abdalla & Abdel Nur, 2001). Hand tools and animal power dominate in the traditional rain-fed system (Siddig et al., 2011). An improved animal-drawn plow seeder is introduced into this system. Mechanical power and advanced technologies are commonly used in irrigated and mechanized rain-fed systems. Somehow, the country utilizes significant wind and solar energy to some extent, especially in rural areas, solving the problems of unavailability of electricity and petroleum supply for irrigation pumps and other agricultural activities. Agricultural mechanization in Sudan faces numerous technical problems that can be solved by providing training programs for machine operators and mechanics, and improved management system. Here the aim of this paper is introducing the common cultivation systems in Sudan, and its constraints.

2. Crop Production Systems

In Sudan is practiced according to the following patterns**:**

1. Irrigated agriculture, which includes major national irrigation schemes (Gezira, Suki, New Halfa, and Rahad) using water from the Nile and its tributaries,
   - Large flood irrigation systems (Gash and Tokar) using seasonal flooding.
   - Small irrigation along the banks of the Nile and its tributaries.
2. Mechanized rain-fed agriculture.
3. Traditional rain-fed agriculture.

2.1. Irrigated agricultural system

Irrigated agriculture plays a significant role in expanding agricultural mechanization and production. It considers the most effective production system regard of using agricultural inputs and crop productivity. In this sector, the major mechanized operations are land preparation, planting, spraying, and fertilizer application. Weeding and harvesting are still somehow carried out manually (Awadalla et al., 2019). This system covers approximately 1.9 million ha, irrigated primarily by the Nile and its tributaries; this system includes the largest irrigation schemes in the country (Gezira, New Halfa, and Rahad), in addition to sugar cane schemes. Major crops grown under irrigation systems include cotton, sugarcane, sorghum, groundnut, wheat, legumes, fruits, vegetables, and irrigated forage crops. The sub-sector contributes 100 % of the wheat and sugar, about 99 % of the cotton, 52 % of the groundnut, and 25 % of the sorghum. On average, the irrigated sub-sector accounts for about 64 % of the total crop contribution to GDP (Abdalla & Abdel Nur, 2001). Although its contribution to crop production is less than that of the rain-fed sub-sector, it is more stable. In drought years, it plays an important role to meet consumption needs of the population (Mohamed, 2011). Including large-scale mechanized federal schemes, approximately 1.9 million ha are accounted for, including the Gezira scheme, which at approximately 1 million ha is one of the largest irrigation schemes in the world that is irrigating by surface system with the land slopes. The irrigation sector is the main user of imported agricultural inputs as yields and therefore production are more reliable (Figure. 1). Irrigation water is mainly obtained from the Nile and its tributaries by gravity or pumping. All agricultural activities in this sector are carried out with machines (FAO, 2022). The production system of this sector consists of main channels leading from the Nile towards the northern part flooding the water by gravity. The irrigation system in this farming system is completely carried out by gravity (surface irrigation system). The system is supplied with irrigation water from the Sennar and Roseires dams on the Blue Nile. Annual water flow from the Blue Nile is estimated to average about 50 billion cubic meters, measured at Roseires. However, this stream is characterized by strong annual and seasonal fluctuations. From the end of June it rises steeply to a peak at the end of August. Water storage in the reservoirs of the Sennar and Roseires dams begins in early September, after the flood period. Irrigation water is channeled to the scheme areas through a network of channels covering the entire area. The network consists of thousands of kilometers of main channels passing through the scheme (Plusquellec, 1990).

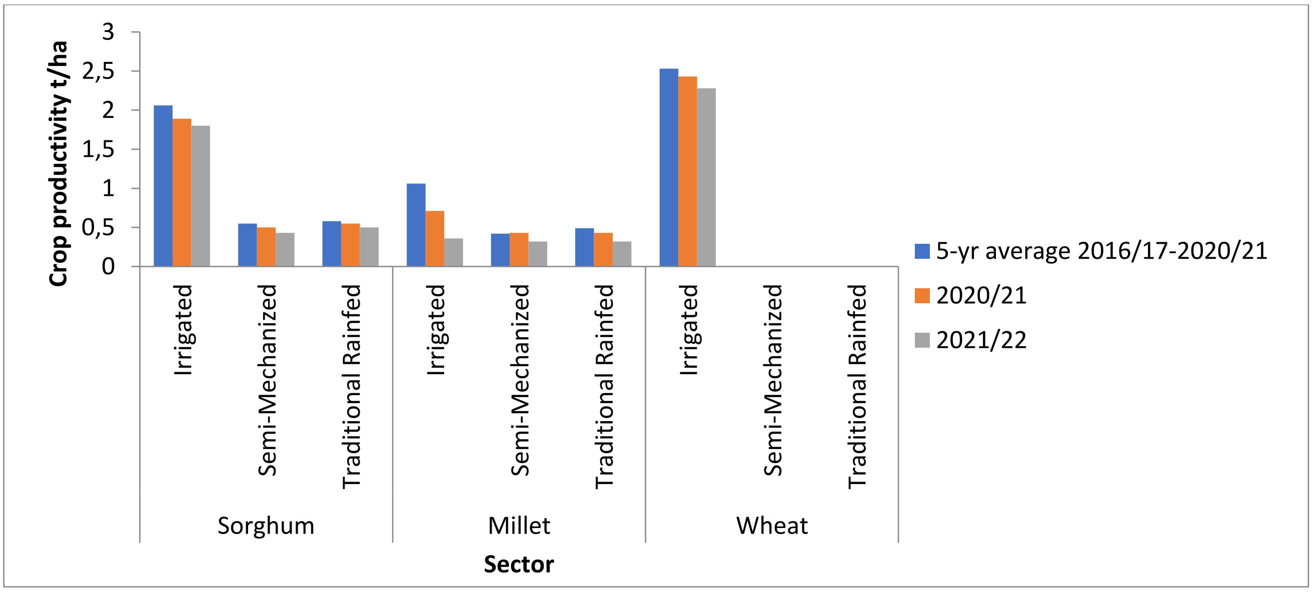

Figure 1: Some cereal productivity under different sectors (t/ha) (FAO, 2022).

For example, the irrigation system of Gezira consists of about 2300 km of main channels and 8000 km of sub-channels. Water is channeled to the irrigated areas of the scheme through two main channels (the Gezira and Managil main channels), which converge from the reservoir at Sennar. The two channels run 57 km north of the dam to a group of regulators. The main Gezira channel runs another 137 kilometers further north, branching into many larger channels to irrigate the different areas of the main Gezira. The large channels in turn branch into smaller channels, which direct the irrigation water through closed field outlet pipes to field ditches called Abu Ishreens. Each Abu Ishreen irrigates 90 fed (the regulated area that divided the scheme for irrigation), which ends in the field getting through farrow (Eldaw, 2004).

2.2. Mechanized rain-fed agricultural system

The mechanization of cultural practices and its impact on agricultural productivity were studied by many researchers in different areas of the world. In Sudan, traditionally, farming is practiced in the heavy clay soil with annual rainfall between 400 and 800 mm. The cropped area varies and depending on the amount of rainfall. The average annual area under mechanized rain-fed farming is practiced in a broad belt of about 8 million ha, running mainly through the states of Gedaref, Blue Nile, Sennar, White Nile, and South Kordofan, and receiving an average of more than 500 mm of rainfall annually. This system completely depends on rainfall. Mechanized farming accounts for about 65 % of sorghum, 53 % of sesame, 5 % of millet, and almost 100 % of sunflower (Figure 2). On average, mechanized rain-fed agriculture accounts for about 18 % of crops' contribution to GDP. In this farming system, mechanization is used in all of the practices, e.g., soil preparation, seeding, and harvesting, but sometimes some of the field work is carried out manually. Sorghum is a commonly grown crop, accounting for about 80 percent of the total area under cultivation and typically meeting about 45 percent of the country's needs. Besides, considerable area of cotton is grown in this sector. Farms in the mechanized system are often very large, with an average area of 420 ha to more than 50,000 ha owned by farmer. Crop yield in this sector depends on the amount and distribution of rainfall during the growing season (Abdalla & Abdel Nur, 2001; FAO, 2022).

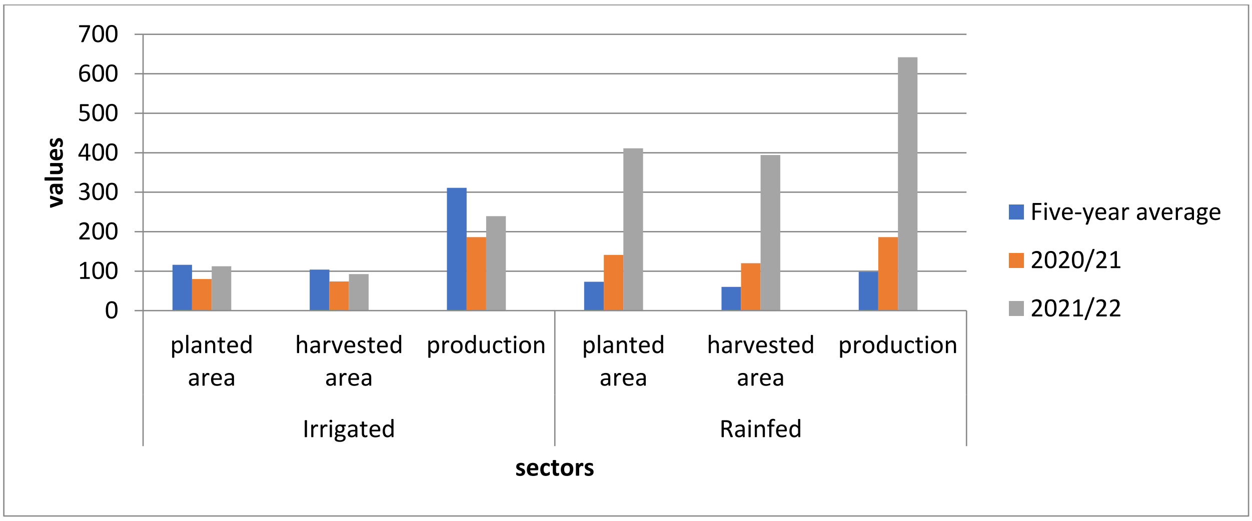

Figure 2: Cotton production 2021/22 compared to 2020/21 and five-year average (FAO, 2022).
Area in '000 ha, production in '000 ton

2.3. Traditional rain-fed farming system

Traditional rain-fed farming covers about 9 million ha and employs most farmers. The sector is characterized by small family units farming 2 to 50 ha for both income and self-consumption. The agricultural practices are conducted manually or by animals' power. Only larger units are mechanized for land preparation, but the other farm work is conducted manually. Traditional rain-fed farming is prevalent mainly in the western parts of the country, the Greater Darfur region, and most of the Greater Kordofan region, where the main crops are millet, groundnut, and sorghum (Figure. 3). Input levels are low, and yield particularly vulnerable to unfavorable rainfall. Other important crops in this sector are sesame, hibiscus, watermelon, and gum Arabic (Abdel Rahman et al., 2022). The productivity of this sector is very low. Because of low soil fertility and the hazard of applying fertilizers. Harvesting in this system is partially done with small machines. Crops production in rain-fed sector represents about 95 percent of the planted area shown variations in annual rainfall regard to frequency and distributions. That led to late sowing or even a wave of severe drought. It's often made the needed for reseeding or completely crop failures (Ibrahim et al., 2015).

3. Agricultural Production Constraints in Sudan

Despite the fundamental roles of agriculture in Sudan, it is still faces and surrounds with so many challenges. Agricultural growth and expansion are constrained by various factors, such as natural and structural, technology, socio-institutional, policy, infrastructural, and exogenous constraints (Abdalla &Abdel Nur, 2001).

Table 1. The Sudan - Sesame production 2021/22 compared to 2020/21

	Mechanized Rainfed		Traditional Rainfed	
	2020/21	**2021/22**	**2020/21**	**2021/22**
Planted area	2768	1473	4281	5950
Harvested area	1997	1075	3274	3997
Yield	299	275	260	107

(FAO, 2022)

Area in '000 ha, yield kg/fed

It is clear that the most common challenges in any sector or production system are the irrational prices of production inputs (certified seeds, fertilizers, fuel, and labor) or sometimes even the unavailability of these inputs, especially at the beginning of sowing times. In addition, there is a lack of technical support and extension services, as well as marketing and storage capacities. Furthermore, the sub-sector also has some limitations; these include low yields, high production costs, a lack of formal credit, and poor infrastructure (Table 1). Shortage of extension services for the small farmers, poor access to marketing services, and insecure land tenure with a dominance of the traditional rain-fed agriculture sector (Mohamed, 2011). Rainfed farming is located in vulnerable zones where instability of rainfall and overall climate change and variability, one way or another, a major impact on land and crop productivity, which is directly related to the contribution rural communities make the livelihoods of areas where rain-fed agriculture occupies more than 90 % of the cultivated land of Sudan (Siddig et al., 2020). This considers the biggest problems that face mechanized and traditional farming systems in Sudan. Weak in political stabilities and fluctuate of economic and financial support. As well as, fragile of administrates and implementation capacity of the governmental institution (Osman & Ali, 2021).

Lack of crop rotation, which is one of the agricultural practices that manage land use and limit frequent land overutilization, optimizes nutrient and water use efficiencies, Often, rain-fed agriculture damaged land through shifting cultivation practices and overgrazing of livestock, limiting land value and crop production. The mechanized systems cause deforestation and erosion. However, implementing irrigation techniques such as drip and pivot irrigation greatly desalinates the water supply while producing higher yields (Lee & Chula Vista, n. d.).

Deficiency of transportation and related infrastructure, lack of proper communications infrastructure, and rough terrain has kept production areas isolated. It was difficult, and sometimes impossible, to take agricultural products out of large production areas to take advantage of manufactured goods and government services. This situation has traditionally suppressed farmers get prices and led to high prices for industrial consumer goods and services in remote and relatively isolated areas (Getahun, 1978). Moreover, with the products during harvesting times being very cheap or even unmarketable, this means more losses and a negative aspect to the farmers' welfare.

Restriction of investment and development of agriculture sector especially the rain-fed sector. With the current situation in techniques development, agricultural systems have the ability to adapt to these factors such as climate change, increased food demand, and prices of inputs; however, many new technologies are imported and adapted to local conditions (Hardy et al., 2011).

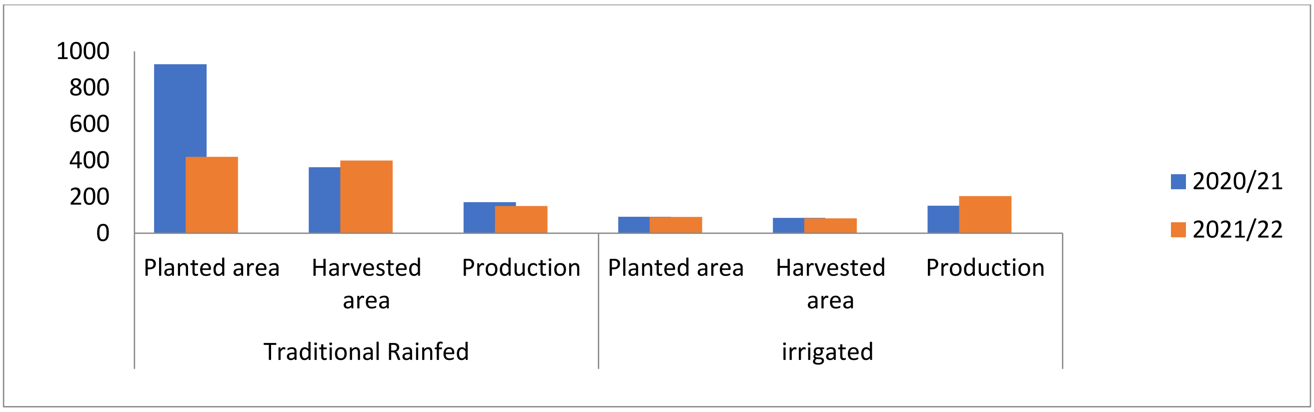

Figure 3. Groundnut production 2021/22 compared to 2020/21 (FAO, 2022)

*Area in '000 ha, production in '000 ton

4. Suggested and recommended solutions to overcome some constraints of agriculture production

In spite of all constraints that are surround agriculture in Sudan, often there are several way to clear it out. The lack of access to agricultural inputs (seeds, fertilizers, fuel and credit) is solved through serious legislation intervention. Besides, exploit the related institutions (Agricultural Bank of Sudan) to act their roles of provide these inputs before the beginning of the growing season. In addition, to change in credit policy with very simple guarantees that comes in useful for any farmer.

Sudan is characterized by large genetic variations of the most common crops, which opens the way for the selection of cultivars with different qualities in terms of maturity, unpredictable growing conditions, drought resistance, resistance to pests and diseases, etc., to adapt them to different environmental regions and consumer tastes. Breeders at the research institutions have produced high-quality varieties suitable for both irrigated and rain-fed systems. Moreover, farmers in remote areas are increasingly using appropriate technology packages to increase productivity and promote the comparative advantage of production in Sudan.

There is a great opportunity to optimize current farming and production systems through an enabling policy framework, the use of modern technology to increase sustainable productivity, and improve rural area, public and physical infrastructure. Current levels of productivity per farmer or land unit are low in both crops and livestock. The potential for irrigated and mechanized rain-fed agriculture lays primarily in the increase use of appropriate technology packages, including high-yielding varieties, the use of machinery and improved crop production methods. In addition, the utilizing of advanced storage tools significantly will decrease the losses of crops due to the traditional storage methods (Ahmed, 2004). Further attention should be paid to the mechanized rain-fed sub-sector as it is a large and effective sub-sector that has considerable potential for building a national food supply and earning foreign exchange through exports and trade exchanges.

Efforts should be aimed at removing barriers and promoting foreign and domestic private investment, which can make a momentous contribution to agriculture development. Furthermore, institutionally provides relevant agricultural extension packages to meet farmers' needs for culture practices (Siddig et al., 2011). Early price declaration or ensuring a minimum price level and improving market information regarding crop supply and demand to increase crop productivity and production in the regions strongly important and encourage farmers. Implement institutional and legal reforms, including laws on taxes, prices and labor relations, with the aim of facilitating resource allocation and increasing efficiency of utilizing resources (Bello et al., 2016; Ibrahim et al., 2014). In the private sector of mechanized rain-fed farming system in Sudan, the government's role in providing incentives for the provision of modern inputs, better infrastructure and other basic services should be enhanced. Counseling services should be strengthened by expanding extension services, upgrading extension staff's qualifications and providing them with the better necessary facilities. The credit system should be improved. Loaning to farmers should be expanded in order to maintain access to credit from banks, especially medium- and long-term credit for investments in agricultural production. The credit system should also be more flexible, with simpler loan application forms and procedures, longer repayment periods, and more accurate monitoring and tracking (Mustafa, 2006).

The development process does not mean that the traditional methods are harmful, but rather that the new is more globally competitive and better able to bring hard currency. Therefore, more attention, planning and tireless work in this sector will move the rural communities for sufficient and mobile to emerging whole country, all of this steps would be firmly by the statements of the minister of agriculture and to set up a food security strategies (Ibrahim et al., 2020).

5. Conclusion

The agricultural sector and its products in Sudan supply and secure about 80 % or more of food demand. Agriculture production in Sudan is mainly practiced through different systems; traditional rain-fed system, mechanized rain-fed system, and irrigated farming system. Mechanical energy and some production technology are commonly used to enhance crops production. Furthermore, modern and advanced production technique is well practiced around the Nile banks. That depends entirely on pumping water from the Nile and Nubian basin using a modern agricultural system. The variations of Sudan's climate make it possible to cultivate different types of crops. Regardless of, these opportunities agriculture practices face significant and severe limitations. Complementing and providing inputs and formal credit is critical and important to prove and solve these limitations in order to achieve sustainable and more stable cultivation. Investments in machinery, fertilizers, and packaging are well needed to make serious revolution change in agriculture production. The harsh environment in which most farmers have had to work since the beginning of farming in the country has ensured that those who continue to farm make efficient use of their limited resources.

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The Assessment of Türkiye's Competitiveness in Cherry Trade

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Abstract

Cherries are a fruit that thrives in warm climates and has a robust presence in the global market. As cherry production areas expand, there is a corresponding increase in demand for this fruit worldwide. The trade of agricultural products has gained importance with the development of global trade. Cherries have a crucial place in Turkish agricultural exports. Fresh cherries are in the scope of this study. This study examines Türkiye's position in the global cherry trade, specifically in the fresh cherry market. Türkiye is a leading country in cherry production and plantation area and has seen an average annual export growth of 18.4% between 2001 and 2020. However, Türkiye's share in the world cherry market has decreased from 14% to 5.9% due to low unit export value. Chile, the USA, Hong Kong, Austria, Spain, and Canada are significant cherry exporters, with Chile dominating the market with a 72.5% share in 2020. The Trade Intensity Analysis Method which represents the course of trade flow among countries is used in the study. The study indicates that European countries which are Türkiye's traditional trade partner has the biggest trade share with Türkiye and that share did not change much over the years. By the way, the Asia market especially China, became a game-changer in cherry trade and Türkiye should prepare itself for this situation.

1. Introduction

Adam Smith's The Wealth of Nations which he wrote in 1776, is the beginning of modern economics. One of the most important parts of the book is the chapter on the theory of absolute advantages. This theory reveals that foreign trade is in favor of countries and has an impact on welfare (Smith, 1776). Although it has been more than 240 years since Smith's work and several theories have been developed, the fact that foreign trade is in favor of the countries has taken its place in the economic literature as a general acceptance.

Especially after the 1990s, the World Trade Organization sanctions on trade liberalization have accelerated the increase in world trade. As of 2020, world trade volume and value have grown by 4% and 5% on average since 1995 (WTO, 2020). Although world trade has shown an upward trend in the course of time, there has also been a decrease in some periods. As a matter of fact, the growth rate in world trade remained at 3.0% in 2018 and 2.6% in 2019, growth could then rebound to 3.0% in 2020. The main reasons for this periodic decline were the shrinking demand of developed countries and the trade agreements held in the regional dimension (TİM, 2016).

Trade volume is increasing in Türkiye as well as in the world. Türkiye's foreign trade volume in the last 30 years (1987-2020) was above the world average, with an average annual growth of 18.4%. However, Türkiye is a country that has tackled foreign trade deficits for many years. As a matter of fact, the exports accounted for 17 billion 850 million dollars $ in 2020, and the imports accounted for 22 billion 381 million dollars in the same year. As a result, the foreign trade deficit was 49 billion 915 million dollars, and the rate of exports meeting imports was approximately 72.5% (TUIK, 2020). Türkiye ranks 29th in the world with export exported $177B. On the other hand, Agrofood exports make up 12.4% of Türkiye’s total exports. It is understood that Türkiye's agricultural product exports perform better than total exports. Cherry is an important product subject to trade in world agricultural products. Cherry trade, especially in recent years, continues to increase. The total world cherry export value reached 3.8 billion $ in 2020 from 348 million $ in 2001. In this increase, Chile has a significant share. Chile increased its share of cherry exports from 5.4% to 72.5% in that period (FAO, 2020). Türkiye ranks first in terms of world cherry production area and quantity according to the 2016 data. However, it ranks fourth in cherry exports (FAO, 2020). Chile has become the world leader in cherry trade and has changed cherry market balances with its breakthrough.

Although there are many studies on cherries in the literature, there are a limited number of studies showing the course of cherry trade and trade concentration. Açıkköse & Gürbüz (2018), in the Bursa region, Çerçinli Öz and Bal (2016) in the Isparta region, and Tekdemir (2011) in the Konya-Ereğli region, discussed the overview of cherry exports, regional importance, and export increasing measures. Adanacıoğlu (2017) showed that cherry is an important export item and producers can obtain a revenue advantage if they use direct marketing methods. Gül et al. (2016) emphasized the importance of raising the quality of cherries and raising the awareness of producers. Akkoyunlu (2013), in his study called Agricultural Innovation in Türkiye, in Kemalpaşa district of Izmir, has described the contribution of innovation to production and sales made in cherry. Sredojevic et al. (2011) examined the production of cherries on the basis of the competitiveness of Serbia in agriculture. In their work, an export-oriented value chain and the rise in Serbia's cherry exports were examined.

Türkiye, a major agricultural country, can take better advantage of the existing agricultural potential to close the foreign trade deficit. For this reason, increasing the number of studies on the trade of agricultural products is extremely important.

The aim of this study is to determine the position of Türkiye in the world cherry trade. Besides, the overall changes in the direction and value of the cherry trade between Türkiye and importer countries will be examined. Thus, the share that Türkiye has in the cherry markets of importer countries and the change in that share will be determined. Another purpose of this study is to discuss the impact of cherry export from various countries, especially Chile on Türkiye's cherry trade.

2. Material and Method

The main material of the study is the data obtained from the International Trade Center database (ITC-Trade Map). In addition, we benefited from scientific studies related to the subject and the documents of the institutions like The United Nations Food and Agriculture Organization (FAO), and Türkiye Statistical Institute (TUIK), Türkiye Exporters Assembly (TIM).

Many methods can be used in the analysis of international commercial developments. In this study, the trade Intensity Analysis method is used which shows the progress of bilateral trade relations. With this method, the change in trade shares between the exporting country and importing country and the trade intensity between the two countries can be demonstrated (Froment and Zighera, 1964; Eraktan, 1988). Thereby, it contributes to the future planning of trading countries by determining the stability and continuity of the product trade between the two countries.

The model depends on the assumption that the importer country's export ratio is fixed If this constant rate changes over time, some factors will be considered to play a role (Froment and Zighera, 1964; Arisoy et al., 2014).

Trade Concentration (territorialism) Coefficient = $Xij * Xk / Xi * Xj$

$Xikj$ = k product export value of j country to i country

Xk = world foreign trade value of product k

Xjk= k product export value of j country

Xik= k product import value of i country

If the importing and exporting countries do not fall under the influence of structural and regional factors, the share of the exporter country in the importer country and the share of the importing country in total world trade will not change for this product. If the increase in the world trade share of the exporting country is higher than it should be theoretically, the concentration variable shows that as a trade partner, the importing country has an increasing attitude and interest in favor of the exporting country.

By dividing the world trade share by the expected world trade share, one can determine determined how the concentration of the selected product trade between the two countries. The increase in this concentration coefficient in time shows the development of the time dimension of trade relations. Greater than 1 of the concentration coefficients indicates that the importing country has shifted to the product of the exporting country above the theoretically expected rate (Froment and Zighera, 1964; Eraktan, 1988; Eraktan and Arisoy, 2012).

In this study, the concentration coefficients between Türkiye and selected countries like Germany, Russia, Netherlands, Austria, Sweden, and Italy were calculated. These countries were selected since they represent approximately 85% of Türkiye's total export value of cherries.

3. Results and Discussion

Cherry is a fruit that grows in hot climates and is widely traded. World cherry demand has scaled up over time correspondingly with the increase of the production area. Total cherry production area raised by 26% in the period between 2001 and 2020. Cherries are cultivated in many countries around the world. Türkiye has the largest plantation area for cherries, and it corresponds to 174% of all plantation areas. Türkiye's plantation area tripled during the period between 2001 and 2020. As one can observe from Table 1, which covers the seven biggest plantation areas of cherries and the world's total plantation areas, Spain and Iran's plantation areas stayed constant, while the USA and Chile experienced an increase in that period. Especially, Chile's plantation area increased almost six times.

Table 1. World cherry area (hectare)

Years	World	Türkiye	USA	Syria	Italy	Iran	Spain	Chile
2001	353640	30200	27559	11187	27320	25302	27830	6210
2005	355457	43000	32027	12000	27888	27815	23515	7100
2010	396328	67046	34411	27521	30020	27817	24290	13143
2011	404534	69985	34730	28022	30207	28166	24967	13174
2012	403606	74414	34961	29674	29736	28537	24972	13642
2013	416948	76459	36462	29536	30581	32110	25300	16243
2014	408422	79042	36300	29471	29766	20748	25594	16933
2015	411829	81409	36353	30016	30123	21300	26492	20591
2016	420582	84746	37110	35004	29970	28397	25252	24498
2017	420701	85401	37430	29702	29274	18784	27592	25109
2018	416191	84087	34400	30383	29160	12581	27370	30179
2019	439500	83447	34600	29961	29210	28330	27470	38392
2020	445068	82729	34400	30317	29010	24033	27760	39645

Source: FAO Statistics. 2020.

Türkiye not only leads global cherry production but also leads the plantation area. Türkiye meets almost one quarter of the world's cherry production. The USA and Chile come after Türkiye for cherry production. Moreover, in cherry yield the USA is the leading country, however Türkiye follows a fluctuating course in years. (FAO, 2020).

Table 2. World cherry export (000 $)

Years	World	Chile	USA	Hong Kong. China	Türkiye	Austria	Spain
2001	348359	21674	152093	176	48702	27546	15521
2005	647759	56044	217871	1138	92146	66516	39127
2010	1271081	300782	356467	33807	147828	85647	64092
2011	1528721	368615	449223	73845	131001	72652	79842
2012	1666011	377332	523535	98855	156394	105107	74657
2013	1564522	390200	427603	78424	154717	69973	66445
2014	1948191	659676	475011	127816	145032	57715	97439
2015	1758994	509291	427294	181804	122672	55265	65646
2016	2412423	850547	455074	347643	182539	55265	66488
2017	2259711	571249	604094	301736	159042	97294	80861
2018	3068879	1078972	500458	647801	161674	69908	73968
2019	3576901	1559684	477744	764728	183839	54528	93206
2020	3814810	1594769	477671	849068	223709	52619	66408

Source: FAOSTAT, 2020.

The world's total cherry export value was 3.8 billion $ in 2020 (Table 2). World cherry export increased approximately six times between 2001 and 2020. The most crucial cherry exporter countries in the world are, respectively, Chile, the USA, Hong Kong, Türkiye, Austria, Spain and Canada. Those countries consist 84% of the cherry exports. It is striking that Chile has experienced a dramatic change. In 2001, Chile's share of world cherry export was 5.4%. However, in 2020 that value rose to 72.5%. Thanks to huge investments in cherry production (Ramondo, 2009; Blonigen et al., 2014; Luong, 2018). Chile's cherry export went up in the same period, and then Chile became a leading country in cherry export.

Türkiye's cherry export with an average growth of 18.4% annually in spite of the fluctuations between 2001 and 2020. However, Türkiye's annual export rise for the same period was 18.4% (FAO, 2020). Türkiye's export value increased over the years, however Türkiye's share of export in the world diminished. In 2001, Türkiye's share in the world export of cherries was 14% in 2001, while it decreased to 5.9% in 2020 (Table 2). There are two reasons for the fall of the market place in Türkiye. First, the upward trend in cherry export is higher than in other exporting countries excluding Türkiye. Secondly, Türkiye's unit export value is low compared with other exporting countries (Table 4).

The most important cherry importer countries are China, Hong Kong, Germany, South Korea, Austria, and Canada (Table 3). The share of Asian countries in cherry imports is relatively high. Besides, the Asian market draws attention as a developing market. In recent years, especially in China, there has been a demand rise in parallel with the rise in global demand. China applied a consumption based growth strategy after the 2008 economic crisis, and became a significant market for cherry. Even though China was not one of the biggest 10 importer countries in 2007, nowadays it has become the biggest cherry importer. On the other hand, several countries have decreased their imports. For example, Japan was the biggest importer in 2001, but now it ranks 11th. The main reason is the increase in Japan's cherry production.

Table 3. World cherry import (000 $)

Years	World	China	Hong Kong. China	Germany	South Korea	Austria	Canada	Taiwan. China
2001	421684	46705	19622	55895	1365	34439	23903	26740
2005	718339	73278	21507	85738	8851	75240	62603	50513
2010	1246879	270565	124454	77220	33051	87343	131120	56847
2011	1555921	438655	179401	128950	43101	70766	160578	80412
2012	1771228	644298	248075	135358	82711	98720	160321	88585
2013	1644381	567325	199542	138146	89844	80384	138574	68594
2014	2046671	962737	338670	124009	125452	66021	131312	92249
2015	2074125	1082825	333843	112378	125801	63309	110982	75404
2016	2547947	1421588	535114	160744	124976	118147	107475	88312
2017	2540380	1324675	441915	192653	160405	77864	139065	110655
2018	3494222	2243069	835167	162446	163096	66768	124012	103541
2019	3680980	2491802	989897	164218	136758	71470	125189	100648
2020	393252	2601000	862291	187407	140748	103339	149058	93294

Source: FAOSTAT, 2020.

Türkiye is also responsive to the developments in Asian markets. Even though Türkiye does not export to China, it takes measures to enter the Chinese market. In this context, the Republic of Türkiye Ministry of Agriculture and Forestry and the Republic of China's Quality Control, Inspection and Quarantine General Administration (AQSIQ) has prepared the "Protocol for Plant Health Requirements for Cherry Exports from Türkiye to China", and "Regulation for Plant Quarantine" (Anonymous, 2015).

Besides, according to a study made in Chile, one third of Chinese consumers tend to consume cherries in the summer (Anonymous, 2017). It is an advantage for Türkiye since it harvests cherry in the summer.

Türkiye generally uses road transportation for cherry trade. Çerçinli Öz and Bal (2016) determined that 97.59 % of exporting firms prefer road transportation. This is an obstruction preventing competition with Chile.

Every country wants to increase export incomes. That is why unit export value is as important as the quantity of exports (Vandenbussche, 2014). In 2013, Türkiye and Chile exported nearly the same amount of cherry, but Türkiye had an export income of half of what Chile earned. Chile had a competitive advantage since Chilean cherry producers organized and cooperated. Besides, Chile had a price advantage since Chile's harvest time is different from Europe, and its R&D based production in the global value chain (Bamber and Femandez-Stark, 2015).

Table 4. Unit export values for cherry exported countries

Exporter Countries	Unit export value ($/ton)					Export value (000 $)	Export Quantity (Tons)
	2016	**2017**	**2018**	**2019**	**2020**	**2020**	**2020**
World	4405	4324	4335	4827	5057	3814810	754387
Chile	7189	7010	5846	7083	6872	1594769	232055
USA	6288	5664	5960	5887	7520	477671	63524
Hong Kong. China	4259	4353	4684	4559	5144	849068	165065
Türkiye	2288	2645	2147	2283	2564	223709	87252
Austria	3726	3909	3688	3476	3870	73352	18954
Spain	3132	2906	2338	3443	3582	66408	18537
Canada	6231	5493	6447	6208	7927	54096	6824
Uzbekistan	1582	2190	4172	1942	1935	60705	31371
New Zeeland	11794	14936	13602	15856	14835	41376	2789
Australia	10538	12480	11149	11481	13229	55693	4210

Source: FAOSTAT, 2020.

In Table 4, unit export values for cherry exporting countries are given. The world average cherry export income is 5057 $/ton for the year 2020. Türkiye has relatively poor performance with half of the global average cherry export income. The only country which had a worse performance than Türkiye is Uzbekistan. With respect to unit prices, Spain is the closest country to Türkiye. In general, the cherry price exported from Europe is lower than in other parts of the world. The unit value of exports in Türkiye has been decreasing over the years. The simultaneous maturation of cherries in Europe and Asia is one of the factors that reduce the unit value of exports, and the quality, type and consumer preferences of the cherry can also lead to a change in the unit export value.

Table 5. Türkiye's unit export values for imported countries

Imported Countries	Unit export value ($/ton)					Export value (000 $)	Export Quantity (Tons)
	2016	**2017**	**2018**	**2019**	**2020**	**2020**	**2020**
Total	2288	2645	2147	2283	2564	223704	87254
Germany	3228	3659	3568	3197	3501	90642	25894
Russia	1548	1510	1306	1712	1749	51774	29599
Netherlands	4318	4715	4773	3977	3579	7663	2141
Austria	3021	4021	2959	2981	3519	13638	3876
Sweden	2549	2678	243	2778	2432	6698	2754
Italy	2549	2678	243	2778	2432	6698	2754
Norway	4387	4674	4471	4701	5156	7847	1522
Iraq	283	397	287	274	612	4431	7243
Denmark	3191	3199	3134	2735	3176	3932	1238
Belgium	6630	6804		2550	2544	201	79
United Kingdom	2367	3311	3155	232	2838	3896	1373
Saudi Arabia	1634	2574	1572	2685	821	46	56
Belarus	757	1212	931	1192	1580	1708	1081
Singapore	6507	5572	4492	3938	4426	2275	514
Hong Kong. China	5155	4752	3672	4026	4459	5922	1328

Source: ITC. 2020

In Table 6, we select the countries which are the biggest trade partner of Türkiye in cherry trade. After that, we calculated the concentration coefficient for the selected countries between 2001 and 20120 (Table 7, Graph 1).

Table 6. Chile's unit export values for imported countries

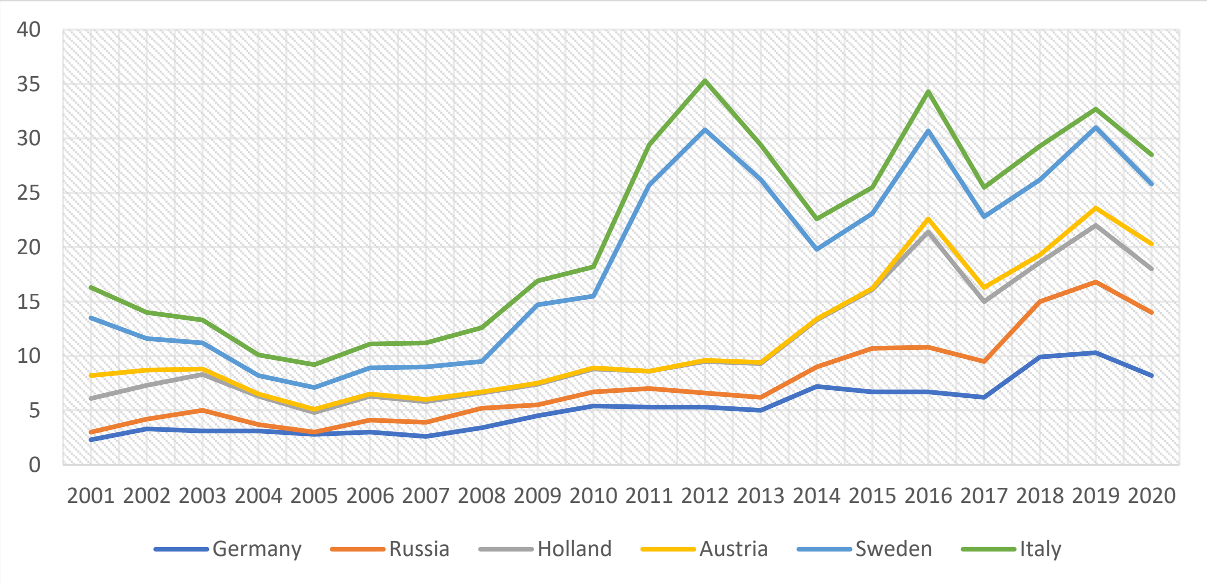
Imported Countries	Unit export value ($/ton)					Export value (000 $)	Export Quantity (Tons)
	2016	**2017**	**2018**	**2019**	**2020**	**2020**	**2020**
Total	7189	7010	5846	7083	6873	1594439	231991
China	7652	7558	5974	7247	6935	1469081	211844
USA	4551	4450	4253	5400	5593	26213	4687
Taiwan. China	7501	7072	5901	6930	7982	16715	2094
Hong Kong. China	4481	5147	5185	6268	6399	3430	536
Brasilia	4675	3810	4515	4766	5314	11786	2218
United Kingdom	6298	5598	5237	5326	5340	10013	1875
South Korea	7180	7247	7522	7441	8172	25644	3138
Thailand	7880	7833	6668	8056	8097	8057	995
Spain	6345	5313	5749	7421	7853	2670	340
Netherlands	6179	5655	5773	6619	6787	2579	380
Ecuador	2040	2063	2099	1963	2387	3850	1613
France	7771	8619	7629	8660	8433	1130	134
Mexico	5885	7647	6552	8855	8398	949	113
Italy	7255	6676	7311	7136	8458	406	48
Germany	7612	7765	8429	10670	11321	600	53
Canada	4984	5644	4854	5807	5336	3079	577
Russia	10711	9581	10852	11101	11853	1375	116

Source: FAOSTAT, 2020.

Table 7. Major countries' cherries foreign trade (000 $)

Years	World Export Value	Türkiye Export Value	Germany's Import Value	Türkiye's Exports to Germany	Russia's Import Value	Türkiye's Exports to Russia	Netherlands's Import Value	Türkiye's Exports to the Netherlands	Austria's Import Value	Türkiye's Exports to Austria	Sweden's Import s Value	Türkiye's Exports to Sweden	Italy's Import Value	Türkiye's Exports to Italy
2001	401787	49284	55895	15587	4705	400	15242	5742	34439	8952	2507	1629	17147	5881
2002	433263	49384	48706	18396	3322	344	18861	6648	34007	5451	2865	933	12131	3331
2003	546738	77696	64068	28012	10727	2917	25483	11777	49717	3806	3742	1275	21315	6212
2004	589564	118001	80349	50544	29202	3454	30357	15655	99983	3045	6139	2095	39749	14911
2005	646730	93594	85738	35032	41856	1360	25877	6741	75240	2750	5969	1737	23498	7151
2006	768875	129261	94915	47443	59737	10976	26835	9831	91400	2911	5961	2423	30110	11344
2007	856747	144203	96788	42948	96001	21404	29686	9269	87832	2509	6199	3127	25677	9722
2008	1047748	113458	100537	37079	92099	18315	37542	5817	73022	468	4531	1370	26556	8906
2009	958158	132939	72810	45702	121678	17424	35136	9290	88895	1259	2348	2347	34387	10704
2010	1201773	147835	77220	51618	143674	22725	31398	8289	87343	1081	3272	2643	30271	9924
2011	1570436	131042	128950	57043	125580	17847	32640	4433	70766	82	3425	4885	30302	9475
2012	1647798	156394	135358	67610	110195	13259	27394	7518	98720	516	3624	7290	31768	13549
2013	1582427	154717	138146	66930	122066	14445	28353	8686	80384	727	4498	7387	23992	7531
2014	1938715	145032	124009	67067	93912	12973	29730	9572	66021	435	12323	5860	28415	5866
2015	1763437	122672	112378	52465	71053	21452	23502	8906	63309	558	11559	5550	20096	3370
2016	2388961	182539	160744	81972	85386	26766	20035	16288	118147	10624	16081	10004	32758	8917
2017	2259711	159042	192653	84021	94517	21704	31020	12062	77864	7060	11834	5395	18427	3489
2018	3068879	161674	162446	84398	116816	31369	32761	6196	66768	2323	11685	4259	23245	3848
2019	3576901	183839	164218	86898	129323	43464	37578	10125	71470	5845	8263	3131	37937	3239
2020	3814810	223710	187407	90642	150978	51776	32574	7663	103339	13638	12459	4019	42101	6698

Source: FAOSTAT, 2020.



Graph 1. The concentration coefficients of Türkiye in cherry

Türkiye has increased its cherry trade with Germany which takes place on the top of importing countries. The concentration coefficient which was 2.3 in 2001, increased to 8.2 in 2020. Türkiye's trade density with Germany continues to increase in cherry exports (Table 8).

Table 8. The concentration coefficients

Years	Germany	Russia	Netherlands	Austria	Sweden	Italy
2001	2.3	0.7	3.1	2.1	5.3	2.8
2002	3.3	0.9	3.1	1.4	2.9	2.4
2003	3.1	1.9	3.3	0.5	2.4	2.1
2004	3.1	0.6	2.6	0.2	1.7	1.9
2005	2.8	0.2	1.8	0.3	2.0	2.1
2006	3.0	1.1	2.2	0.2	2.4	2.2
2007	2.6	1.3	1.9	0.2	3.0	2.2
2008	3.4	1.8	1.4	0.1	2.8	3.1
2009	4.5	1.0	1.9	0.1	7.2	2.2
2010	5.4	1.3	2.1	0.1	6.6	2.7
2011	5.3	1.7	1.6	0.0	17.1	3.7
2012	5.3	1.3	2.9	0.1	21.2	4.5
2013	5.0	1.2	3.1	0.1	16.8	3.2
2014	7.2	1.8	4.3	0.1	6.4	2.8
2015	6.7	4	5.4	0.1	6.9	2.4
2016	6.7	4.1	10.6	1.2	8.1	3.6
2017	6.2	3.3	5.5	1.3	6.5	2.7
2018	9.9	5.1	3.6	0.7	6.9	3.1
2019	10.3	6.5	5.2	1.6	7.4	1.7
2020	8.2	5.8	4.0	2.3	5.5	2.7

Source: FAOSTAT, 2020

The other important importing country is Russia. The concentration coefficient demonstrates that the trade density between Türkiye and Russia increased from 0.7 to 5.8 between 2001 and 2020. Even though the two countries had political issues after 2015, it is striking that the concentration coefficients were 6.5 and 5.8. There are two potential reasons behind this record. The first reason is that cherry is a seasonal product, and its trade takes a short period of time, which is why the cherry trade was not affected due to the jet crisis. This crisis started on November 24, 2015, and lasted until June 12, 2020. However, the cherry exports were not affected. The second one is the sanctions imposed on Russia by the EU, the US, Canada, and Norway because of Russia's annexation of Crimea, and de-escalation efforts in Ukraine. Due to sanctions, Russia halted its food exports from those countries, but it increased its cherry imports from Türkiye.

Türkiye's cherry trade with Netherlands, Sweden, and Italy has also increased throughout years. However, its cherry trade with Austria has significantly declined (Table 8). Even though Austria has increased its cherry imports, it has chosen some other markets.

4. Conclusions

Cherry, which is a seasonal fruit and must be stored, can grow in different geographies of the world. Türkiye is a leading country in cherry production but comes after the US and Chile in cherry exportation. Besides exports, domestic consumption of cherries is high in Türkiye.

Türkiye has increased its cherry exports over the years. However, its share in the cherry market has decreased over the years. Türkiye has chosen to focus on European markets because of geographical proximity, suitable trade policies, and the relative prosperity of European consumers. For example, Iraq, which is the third biggest country in Türkiye's cherry exports with respect to quantity, exported only 4431 $/ton in 2020. The value of exports to European countries is around 3000-4000 $/ton. The focus on prosperous countries has also increased Türkiye's exports.

As a result of the study, there are two trends in the world cherry markets. The first one is the dramatic rise of Chile in cherry markets. Second is the rise in cherry imports from Asian countries. Chile has accomplished this level of exports through all-out policies. The continuity in R&D policies played an important role in this success. China has implemented policies encouraging consumption in order to encounter the 2008 economic crisis. In this context, its cherry exports have significantly boosted throughout those years. In addition to China, other Asian countries such as Hong Kong, South Korea, Taiwan, and Japan have also raised their cherry imports.

Türkiye has played its cards well and tried to obtain shares in cherry imports from those countries by making bilateral trade agreements. After negotiations with Chinese delegations, the reason why Türkiye has lagged behind in cherry exports was revealed. The quality and taste of cherries are affected when they are stored in cold stores for 16 days as a protection caution for Mediterranean fruit flies. In order to solve this issue, the delegations of the two countries have negotiated and made progress. Herein, all stakeholders, especially exporting firms, should pay attention. Türkiye has the advantage that consumers in China tend to consume cherries in the summer.

While Chile which has an important share in cherry imports from China exports cherry through the sea route, Türkiye prefers to export through road transport. That is why Türkiye opts for the neighboring countries. Yet, it needs to increase its capacity in sea routes in an attempt to reach far and new markets.

In conclusion, Türkiye is an important country in cherry exports and is taking steps to enter to new markets. In addition to those steps, it is important to make progress in some areas like augmentation in modern packing facilities, the discovery of methods for the speedy shipment, and making publicity and advertisement for new markets like Asian markets. The coordination between the cherry producers and exports will bring about a cut down in production costs, and provide a competitive advantage. Therefore, cooperation should be encouraged. In order to boost the incomes of cherry exports, it is needed to enter into the Far East countries such as China and South Korea.

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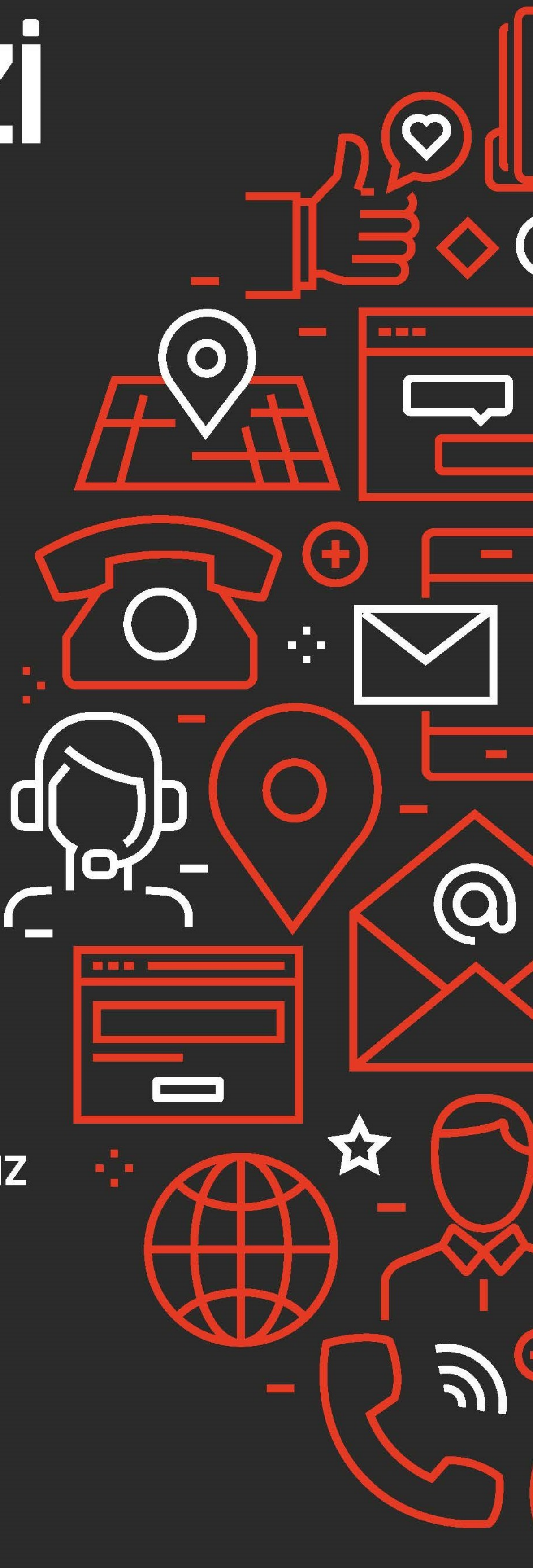

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